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A COMPETENT PERSONS REPORT FOR THE KAGEM EMERALD AND BERYL MINE, ZAMBIA AND THE MONTEPUEZ RUBY AND CORUNDUM MINE, MOZAMBIQUE

Prepared For

Gemfields Group Limited

Nominated Advisor:

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Report Prepared by

srk consulting

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UK30688

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EXECUTIVE SUMMARY
A COMPETENT PERSONS REPORT FOR THE KAGEM EMERALD AND BERYL MINE, ZAMBIA AND THE MONTEPUEZ RUBY AND CORUNDUM MINE, MOZAMBIQUE

1 INTRODUCTION

1.1 Background

SRK Consulting (UK) Limited (SRK) is an associate company of the international group holding company, SRK Global Limited (the SRK Group). SRK has been commissioned by Gemfields Group Limited ("GGL" or "Gemfields"), hereinafter also referred to as the "Company" or the "Client") to undertake an update of the Competent Persons Report ("CPR") for the Kagem emerald and beryl mine in Zambia (known as "Kagem"), and the Montepuez ruby and corundum mine in Mozambique (known as the Montepuez Ruby Mine, or "MRM"). Previously, SRK has produced CPR documents for these assets separately, but for this update, this document covers both assets. The previous CPR documents were produced for Gemfields plc, which was a London listed entity. The operating company for the two assets has remained the same throughout SRK's involvement with the assets.

SRK has been requested to limit the CPR to the Kagem and MRM assets. Kagem Mining Ltd is the Kagem mine operator and Montepuez Ruby Mining Limitada is the MRM mine operator. Both operating companies are 75% owned by Gemfields. A summary table for the relevant assets are included in Table ES1.

Table ES 1: Summary Table of Assets

Asset	Holder	Interest	Licence Expiry Date	Licence Area (km^2)	Start of Production
Kagem	Kagem Mining Ltd	75%	26 April 2045	42.37	1 November 2007
MRM	Montepuez Ruby Mining Limitada	75%	11 November 2036	349	1 November 2012

This CPR has been prepared to support the reporting of Mineral Resources and Ore Reserve estimates in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code or JORC), 2012 Edition. SRK understands that the CPR forms part of the requirements for a dual-listing on AIM, as the document will be prepared for material assets of the Company, and will be reproduced, in full and without adjustment on the Company's website, and reproduced in part in the announcement to be made by the Company (the "Rule 2 Announcement").

1.2 Project Description

The Kagem emerald and beryl mine ("Kagem") is situated in the Ndola Rural District, Copperbelt Province, Zambia, approximately 260 km north of Lusaka, the capital city of Zambia. The site is some 31 km south-southwest of the Copperbelt town of Kitwe and the licence is bisected by the administrative boundary between Ndola Rural District and Luanshya District. The site is accessed along a combination of national (10 km south of Kitwe to Fisenge along the M4) and local (22 km) southwest towards the settlement of Sempala, a total travelled distance of 32 km. Sempala has a population of some 1,225 within a 7 km radius and is located in the northernmost corner of the licence area. The Company also holds additional licences in the region, but these do not form part of this CPR.

The Montepuez ruby and corundum mine ("MRM") is located in Cabo Delgado province in north-eastern Mozambique, approximately 170 km west of Pemba. The concession area is 34,996 ha. The nearest village is Namanhumbir less than 1 km from the Project camp and approximately 6.6 km from the mining areas. The main operations offices, stores and accommodation are located at the Namanhumbir camp. The camp is accessed from the highway via a 1.2 km long dirt road. The road passes through Namanhumbir from the regional Route 242 which connects Pemba and Montepuez. The road is shared with local traffic for a further 6.6 km up to the mine gate. The Company also holds additional licences in the region, but these do not form part of this CPR.

2 KAGEM EMERALD AND BERYL MINE

2.1 Geology

2.1.1 Deposit Geology

The Kagem emerald and beryl mine, which comprises three separate deposits, namely Chama, Libwente and Fibolele is situated in the Ndola Rural Emerald Restricted Area ("NRERA") within the Kafubu area of the Copperbelt Province of Zambia. The currently defined emerald and beryl deposits of the mine are hosted by talc-magnetite schists ("TMS") of the Muva Supergroup. Broadly, the stratigraphy of the Chama deposit can be described (from bottom to top) in terms of footwall mica schist, overlain by TMS, amphibolite ("AMP") and quartz-mica schist of the Muva Supergroup. The whole sequence is intruded by steeply dipping discordant and locally concordant quartz-feldspar pegmatite ("PEG") dykes and quartz-tourmaline veins. Although there are local differences in the average thickness of individual units, the stratigraphic sequences at both Fibolele and Libwente are largely similar to that described for Chama. That said, some key distinctions exist, most notably at Fibolele, where the AMP horizon in the hangingwall of the TMS unit is absent.

The Chama, Libwente and Fibolele deposits form part of a semi-regional scale tight-isoclinal fold system, which trends northeast or east-northeast, ranging in dip from near flat-lying to up to 60° to the southeast or south-southeast, and is locally offset by a series of predominantly north-northwest striking structures. The suite of PEG dykes and quartz-tourmaline veins that intrude the stratigraphic succession throughout the Kagem deposits occupy a range of trends, both concordant and discordant to the local stratigraphy. At Chama, the majority of discordant dykes strike north or north-northwest, dipping at around 50° to 75° towards east-northeast. The discordant dykes and veins at Libwente and Fibolele occupy the same trend set, striking north-northwest, but with a steeper, typically sub-vertical dip.

Emerald and beryl mineralisation in the Kafubu area, including the Kagem deposits, belongs to a group referred to as "schist-hosted emeralds", relating to the interaction of Be-bearing fluids relating to pegmatoid dykes or granitic rocks, with Cr-rich mafic and ultramafic schists or weakly metamorphosed ultramafic rocks. At the Mine, emerald and beryl mineralisation is hosted by the ultramafic TMS unit, with three main styles of mineralisation recognised:

- discordant reaction zone ("RZ") material adjacent to the PEG and quartz-tourmaline vein contacts;
- concordant RZ material concentrated along the footwall and rarely the hangingwall contacts of the TMS unit; and
- discordant RZs hosted by brittle structures within the TMS unit distal to the PEG and quartz-tourmaline veins.

2.1.2 Data Quantity and Quality

The main exploration methods being employed at the Kagem Mine include diamond drilling, and bulk sampling from trial pits, most of which has been undertaken since 1998. This key data is supplemented by geological mapping of the main operating open pit at Chama and the trial mining pits at Fibolele and Libwente, in addition to some airborne geophysical survey maps. Diamond drilling is primarily aimed at determining the nature and geometry of the TMS units and PEG dykes / quartz-tourmaline veins. The main exploration tool used to determine emerald grade and quality is through current open-pit mining operations at Chama, and trial mining at Fibolele and Libwente. The grade of each deposit is determined through recovered emerald quantity and quality data from the sort house. The approximate exploration expenditure completed to date is given in Table ES 2. Since June 2018, no significant exploration has been completed.

Table ES 2: Kagem: Approximate Exploration Expenditure to June 2018

Item	Cost (USD)
Drilling (Diamond)	2,436,220
Geophysics Surveys (Airborne and Ground Based)	7,151
Core Photography	1,000
Handheld XRF/ LIBS and other core analysis (as applicable)	62,265
Consultancy (e.g. thin sections, geophysics, optical sorting etc)	232,000
Total	**2,738,636**

SRK has not been supplied with any specific planned exploration programmes for the three deposits which form the focus of the Kagem Mine. Any further drilling is likely to be operational in nature, and provided for in the sustaining capital provision, and / or operating costs. Furthermore, SRK has not been supplied with any anticipated greenfield exploration programmes which fall outside the confines of the Kagem Mine.

Drilling to date, across the three deposit areas in question (Chama, Fibolele, and Libwente), comprises a total of 707 drillholes for a total meterage of 67,457.60 m. This includes 348 holes for 35,771 m at Chama, 117 holes for 9,875 m at Fibolele and 242 holes for 21,810 m at Libwente. All drillholes are diamond core holes.

Grade and quality data for Chama comes from production data derived from the open-pit mining operation, which has been Gemfields main operational focus since acquiring the Kagem licence in 2008. Available production data for Fibolele also comes from production, which has been in operation since August 2012. Two bulk sampling pits were completed in the Libwente deposit area: Libwente South and Ishuko. These pits are both currently on care and maintenance.

Gemfields has a logical logging and data capture procedure for diamond drilling, to guide the on-site staff through the technical process. This aims to ensure a consistent methodology for the process of capturing data throughout any drilling campaigns to allow for subsequent meaningful analysis. All logging is carried out by Gemfields geologists, with methodologies which are considered to be consistent with normal industry practice for this commodity type.

SRK has reviewed the drillhole databases for the respective deposits and summary logging of a series of drillholes. The geological information being recorded by Gemfields geologists is of a good quality, lithological identifications are consistent and downhole contact depths have been captured to an appropriate level of accuracy. There is a degree of inconsistency between the logging of the older, pre-2008 holes and more recent drilling with the latter being carried out to a superior standard compared to what was applied in the past, but this is not considered to be material.

2.2 Mineral Resources

2.2.1 Geological Modelling

Mineral Resource models were constructed, estimated and classified independently for the Chama, Fibolele, and Libwente areas. All geological modelling was undertaken in ARANZ Leapfrog Geo software, with grade and tonnage estimates being completed in either GEMS or Datamine, as relevant.

A similar geological modelling process was conducted for each of the Chama, Fibolele, and Libwente deposits, as described below:

1. Construction of a TMS model, through sectional polyline interpretations of the TMS footwall and hangingwall. TMS and RZ logging codes were used as an explicit control on the TMS model geometry, with downhole Niton XRF chromium grades used to refine the contact surfaces where appropriate.
2. Development of a discordant PEG model. At Fibolele and Libwente this was completed through a manual process of creating interval selections of PEG / quartz-tourmaline vein intersections considered to form part of individual dykes or veins, and subsequent modelling using the Leapfrog vein tool. At Chama, the discordant PEG model was generated using a Leapfrog indicator interpolation of all discordant PEG intersections, applying a trend guided by a series of surfaces based on downhole PEG trends and geological mapping within the open pit. The discordant PEG models were cut from the TMS solids.
3. Two RZ domains were constructed: one to define the TMS footwall RZ (concordant), and another based on areas where the PEG model is in contact with the TMS model (discordant).

To define the basis for the footwall RZ model, all logged RZ intervals at the base of the TMS solid volumes were manually selected and assigned a footwall RZ code. RZ hangingwall surfaces were then generated from the hangingwall points of the footwall RZ interval selection, using the TMS footwall surface as a framework to guide the trend of the model. The Fibolele concordant RZ model comprises solid volumes at both the footwall and hangingwall of the TMS unit, whilst the Chama and Libwente concordant RZ models only comprise a footwall volume.

The discordant RZ models were created as a buffer around the discordant PEG models and within the TMS unit. The discordant RZ thickness was adjusted on a deposit basis in order for the ratio of combined concordant and discordant RZ volume relative to modelled TMS volume above the most recent pit survey wireframes to reflect the RZ to TMS ratio in the Gemfields production analysis for each pit to date.

2.2.2 Grade and Tonnage Estimation

Block models were used to quantify the volume, tonnage, and grade of the modelled RZ for the three separate deposits. The volumes of the discordant and concordant RZ were defined from the geological model. The tonnage was estimated using an average density value of 2.85 g/cm^3. The anticipated grade of emerald and beryl is based on the extrapolation of the recovery of these minerals from the tonnage of RZ processed during the period covered by the historical mining production statistics. The minimum size (bottom cut-off) of stone which can be recovered from the wash plant is 3 mm. Given the complexity associated with the estimation of RZ tonnage as well as the concentration of emerald and beryl within the RZ, the Mineral Resource estimate on appropriately factored production and bulk sampling data combined with the geological interpretation of the TMS, PEG, and RZ lithological units.

2.2.3 Mineral Resource Classification

SRK notes that the exploration and production activities completed by Gemfields since 2008 have significantly improved the geological knowledge and understanding of the deposits; however, the derivation of Mineral Resources is largely dependent on the availability of the results of bulk samples or equivalent such as historical production statistics, as gathered and supplied by the mine. This provides the confidence in the grade of the individual deposit, and therefore the contained gemstones in the estimate.

In order to develop a classification scheme for the Mineral Resources at Kagem, SRK has taken the following factors into account. These factors were refined into guidelines for each Mineral Resource classification:

1. Quantity and quality of the underlying data, the level of geological understanding for each deposit, and across the property as a whole.
2. Confidence in the geological continuity of the TMS, PEG, and RZ.
3. Confidence in the grades, as derived from the production/bulk sampling and the understanding of the grade variation at a given production scale.
4. The stage of development for each deposit (such as exploration, production, care and maintenance, etc).
5. The perceived level of risk associated with deviations from the assumptions made in defining and classifying the Mineral Resources. In particular, the definition of a Measured or Indicated Mineral Resource specifically requires there to be sufficient confidence for the subsequent application of modifying factors, and so the risk in classifying as such needs to be understood.

2.2.4 Mineral Resource Statement

The Mineral Resource Statements for Kagem, on a 100% basis are included in Table ES 3, and on a 75% basis in Table ES 4. The Competent Person ("CP") with overall responsibility for reporting of the Mineral Resource is Dr Lucy Roberts, MAusIMM(CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. SRK considers that the Mineral Resource Statements are reported in accordance with the JORC Code.

Table ES 3: Kagem: Mineral Resource Statement, as of 1 July 2019, for the Kagem Beryl and Emerald Deposit (100% basis)

Deposit	Classification	Tonnage (kt)	PE&E Grade (ct/t)	Beryl Grade (ct/t)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Measured	480	73	177	250	122
	Indicated	3,710	79	191	270	994
	Inferred					
	Measured + Indicated	**4,190**	**79**	**191**	**270**	**1,117**
Fibolele	Measured					
	Indicated	130	38	122	160	20
	Inferred	1,200			160	192
	Measured + Indicated	**130**	**38**	**122**	**160**	**20**
Libwente	Measured					
	Indicated					
	Inferred	200	-	-	46	9
	Measured + Indicated	**-**	**-**	**-**	**-**	**-**
Stockpiles	Measured	295	41	98	138	41
	Indicated					
	Inferred					
	Measured + Indicated	**295**	**41**	**98**	**138**	**41**
Total	Measured Mineral Resources	775	60	150	210	163
	Indicated Mineral Resources	3,840	75	190	265	1,015
	Inferred Mineral Resources	1,400			145	201
	Measured + Indicated	**4,615**	**75**	**180**	**260**	**1,178**

Table ES 4: Kagem: Mineral Resource Statement, as of 1 July 2019, for the Kagem Beryl and Emerald Deposit (75% basis)

Deposit	Classification	Tonnage (kt)	PE&E Grade (ct/t)	Beryl Grade (ct/t)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Measured	360	73	177	250	92
	Indicated	2,783	79	191	270	746
	Inferred					
	Measured + Indicated	**3,143**	**79**	**191**	**270**	**838**
Fibolele	Measured					
	Indicated	98	38	122	160	15
	Inferred	900	-	-	160	144
	Measured + Indicated	**98**	**38**	**122**	**160**	**15**
Libwente	Measured					
	Indicated					
	Inferred	150	-	-	46	7
	Measured + Indicated	**-**	**-**	**-**	**-**	**-**
Stockpiles	Measured	221	41	98	138	31
	Indicated					
	Inferred					
	Measured + Indicated	**221**	**41**	**98**	**138**	**31**
Total	Measured Mineral Resources	581	60	150	210	122
	Indicated Mineral Resources	2,880	75	190	265	761
	Inferred Mineral Resources	1,050	-	-	145	151
	Measured + Indicated	**3,461**	**75**	**180**	**260**	**883**

In reporting the Mineral Resources for the Kagem area, SRK notes the following:

- The average value of the beryl and emerald, as reported in the Mineral Resource Statement is USD5.92 /ct. The value of the different product splits, are as follows:
  - Premium Emerald and Emerald – USD20.87 /ct; and
  - Beryl (Beryl 1 and Beryl 2) - USD0.075 /ct.

- Mineral Resources are quoted at appropriate economic cut-off grades which satisfy the requirement of 'potentially economically mineable' for open-pit mining; furthermore, the commodity prices incorporated into the cut-off grade calculations for derivation of optimised shells are those as stated previously, with a 30% mark up, to reflect an optimistic view.
- In addition, SRK has also completed a pit optimisation exercise which quantifies the amount of material which is likely to be mined using open pit methods. The optimised pits were derived using the same input parameters as those in the mining study (Section 2.4), but with a commodity price which reflects an optimistic view.
- Mineral Resources are quoted with a bottom cut-off size of 3mm, which is consistent with what can be recovered in the plant and picked by hand from the belts.
- All Mineral Resources are quoted at 100%, and derivation of attributable Mineral Resources would necessitate application of the Company's 75% equity interest.
- All total grades quoted reflect beryl and emerald combined, expressed as carats per tonne. For the Measured and Indicated Mineral Resources, the product splits are consistent with those determined historically. "PE&E" is Premium Emerald and Emerald combined, "Beryl" is Beryl-1 and Beryl-2 combined, and "B&E" is beryl and emerald. One carat is defined as 0.2 g. Conversely, this equates to a conversion factor of 5 carats per gram.
- Mineral Resources are reported inclusive of Ore Reserves.

2.3 Geotechnical Studies

SRK carried out a detailed geotechnical assessment for the current and anticipated mining areas of the Chama Pit in 2015. This comprised the following:

- Detailed geotechnical and discontinuity mapping of the rock masses forming the Chama Pushback 4 hangingwall slopes.
- Detailed geotechnical logging of a selection of resource boreholes drilled between the crest of the Pushback 4 hangingwall slope and the design crest position of the Pushback 5 hangingwall slope.
- Compilation and review of all rock strength data derived from various programmes of laboratory rock strength testing carried out between 2008 and 2015.
- From the geotechnical data collected, detailed deterministic and probabilistic kinematic (joint controlled) stability analyses were carried out to determine appropriate bench face angles and berm widths.
- Deterministic and probabilistic rock mass stability analyses were also carried out on an overall slope profiles to ensure that the overall slope design met appropriate international slope design criteria for factor of safety and probability of failure.

Based on these analyses, Kagem engineered the pit with a 53º overall slope angle for the 140 m high hangingwall slope in all pit sectors. This overall slope angle was achieved using 10 m high benches cut at a bench face angle of 65º, separated by 3 m wide catch berms. As at June 2019, the Pushback 5 hangingwall slope had been formed to a vertical height of about 62 m. The achieved slope profile was slightly shallower than design at 48º rather than 53º. From the survey drawings provided, this appears to be due to bench face angles being mined at 55º rather than to the design bench face angle of 65º.

SRK is satisfied that the Chama pit slopes are stable, and the pit slopes are performing as designed. Kagem could work on improving berm definition to ensure that design berms are achieved. Whilst the geotechnical design criteria developed in 2015 for Pushback 5 are appropriate, if a Pushback 6 is planned, a geotechnical review is recommended prior to the design being finalised.

2.4 Open Pit Mining

The Kagem mine is an established conventional open pit mining operation in operation since 2008. The production cycle includes: drilling, blasting, loading, hauling, waste dumping (backfill and waste dumps) and ore stockpiling. Free digging of the weathered rock is occurring in the upper 20 to 30m.

Kagem is an owner operator mine, of which the primary production equipment consist of hydraulic backhoe excavators (2.4 m^3 to 6 m^3 buckets) and are used in conjunction with a fleet of 45t, 40 t and 30 t capacity articulated dump trucks (“ADT”). The current mining fleet is supported by a number of ancillary equipment including wheel loader, track dozers, graders and water trucks.

The mining areas consist of the Chama pit (main production area) and the Fibolele pit, a satellite pit located 4km from Chama.

SRK both reviewed and updated the mining related technical work for the Kagem mine, resulting in the following findings:

- an update of the open pit optimisation for the Chama and Fibolele deposit on ore classified as Measured and Indicated in the resource model was done based on up to date economic input parameters. Based on the optimisation results and strategic objectives, SRK selected optimum pit shells for Chama and Fibolele;
- pushback shells were selected to optimise stripping and provide optimal discounted cashflow and NPV whilst providing a balance between stripping ratio and quality of emeralds mined;
- based on the optimal pit shells, the final pit designs with ramps and approved geotechnical geometry were done for Chama and Fibolele;
- the waste dump design for Chama (in pit backfill and ex-pit combined) was updated with the latest topography, and SRK can confirm it will provide for sufficient capacity for the material within the pit after a swelling factor of 20% is applied;
- the production scheduling based on targets set by the mine for Chama and Fibolele achieved a LoMp of 23 years, enabling a processing plant feed of 145kt Reaction Zone ore to the plant per annum. A LoM stripping ratio of 75 (t_{waste}:t_{RZ})was achieved in the LoMp.
- the production schedule incorporated selected optimal pit shell pushbacks in order to optimise the economics;
- the variable occurrence of reaction zone in the production schedule will require sufficient stockpiling of ore to take place over time. To cater for a constant processing plant feed, a stockpiling capacity of 400kt is required next to the wash plant.
- SRK noted that the current primary equipment totals are sufficient for the next four years in the LoMp, after which an increase equipment numbers within the primary equipment fleet was identified.

- SRK notes that the LoMp is achievable, economically optimal and that no major risks are foreseen for mining production.

2.5 Ore Reserves

The Ore Reserve statement for Kagem, on a 100% basis is presented in Table ES 5 , and on a 75% basis in Table ES 6. The CP responsible for reporting Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the Institute of Material, Minerals and Mining ("IOM3"), a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code. Mrs Anderson has review and relied on:

- the mining technical evaluation and mine plan authored by Mr. Hanno Buys Pr.Eng MEng MSAIMM, a Senior Consultant (Mining Engineering) with SRK;
- the review of the mineral processing undertaken by Dr John Willis, MAusIMM(CP) MAIME PhD a Principal Consultant (Minerals Processing and Metallurgy) with SRK; and
- the review of the environmental and social aspects by John Merry, a Principal Consultant (Environmental and Social Management), Dr Cathryn MacCallum FIMMM CEnv CSci, a Principal Consultant (Social Development and Management), and Ms Insiya Salam, MSc, a Consultant (Social Development and Management), all with SRK.

Table ES 5: Kagem: Ore Reserve Statement, as at 1 July 2019, for the Kagem Beryl and Emerald Deposit (100% basis)

Deposit	Classification	Tonnage (kt)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Proved Ore Reserve	386	210	81
	Probable Ore Reserve	2,840	218	620
	Proved + Probable	**3,226**	**217**	**700**
Fibolele	Proved Ore Reserve	-	-	-
	Probable Ore Reserve	100	139	14
	Proved + Probable	**100**	**139**	**14**
Stockpiles	Proved Ore Reserve	295	139	41
	Probable Ore Reserve	-	-	-
	Proved + Probable	**295**	**139**	**41**
Total	Proved Ore Reserve	681	179	122
	Probable Ore Reserve	2,940	215	633
	Proven + Probable	**3,621**	**209**	**755**

Table ES 6:: Kagem: Ore Reserve Statement, as at 1 July 2019, for the Kagem Beryl and Emerald Deposit (75% basis)

Deposit	Classification	Tonnage (kt)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Proved Ore Reserve	290	210	61
	Probable Ore Reserve	2,130	218	465
	Proved + Probable	**2,420**	**217**	**525**
Fibolele	Proved Ore Reserve	-	-	-
	Probable Ore Reserve	75	139	10
	Proved + Probable	**75**	**139**	**10**
Stockpiles	Proved Ore Reserve	221	139	31
	Probable Ore Reserve	-	-	-
	Proved + Probable	**221**	**139**	**31**
Total	Proved Ore Reserve	511	179	91
	Probable Ore Reserve	2,205	215	475
	Proven + Probable	**2,716**	**209**	**566**

SRK makes the following comments in relation to the Ore Reserve declaration:

- The Ore Reserve is presented on a 100% attributable basis. SRK notes that Gemfields shareholding in Kagem is 75%.
- The Mineral Resource grades are quoted with a bottom cut-off stone size of 3 mm.
- The reported grades are recovered grades, as opposed to in situ grades, due to the nature of the type of mineralisation and operation.
- A Probable Ore Reserve has been derived from the reported Indicated Mineral Resource, and a Proved Ore Reserve has been derived from the Measured Mineral Resource.
- No material classified as Inferred Mineral Resources has been converted to Ore Reserves.
- The mining production plan has been revised and updated by SRK and deemed achievable. The mining method and equipment remain unchanged. The Ore Reserves has been constrained and optimised applying relevant economic criteria.
- The mining operation at Kagem is an efficient, low-cost conventional mining operation which is not expected to present any major technical or logistical challenges in the future.
- A discounted cashflow model has been prepared to evaluate and demonstrated Kagem's economic viability.
- The relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties and capital costs have also been included.
- The average commodity prices applied in the discounted cashflow model vary between USD 4.96/ct in 2019 and USD 6.33/ct in 2026. This covers high quality auctions, low quality auctions, and other sales;
- Premium Emerald and Emeralds account for 99% of revenue; where High Quality Auctions account for 83% and the Low-Quality Auctions for 16%. This leaves Beryl accounting for 1% of revenue only.
- 100% of sales revenue from Kagem stones is attributed to the mine;
- The economic evaluation has resulted in an NPV of USD 600 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM.
- SRK has relied upon the Company to confirm that the required permits and licences are in good standing, and expected to remain so for the duration of the LoMp.
- SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve.
- SRK highlights that the key risk to the forecast production and revenue presented in the LoMp, is the nature of the mineralisation leading to difficulty in estimating grades; and the split between stone quality.

2.6 Processing and Washing

The washing plant at the Kagem Mine consists of a series of comminution, screening, washing, and sorting facilities which are located close to the current mining activities. The plant currently in operation was commissioned in 2006 and has an operating capacity of approximately 330 ktpa of ore.

The washing plant products, together with the high-quality product directly recovered from the mine known on site as RoM, are sent to the secure sort house facility. The prospective beryl and emerald gemstones are sorted and upgraded using manual methods. The sorting house is a high security area and access is controlled. The drop safe type boxes from the mine and the plant are opened and emeralds are picked out from the remaining material which is washed and tumbled. Products from this are also picked and the fines and waste separated. Where necessary, the product is chipped to upgrade the gemstone and further lightly tumbled and cleaned.

There is sufficient capacity at the wash plant to handle the on-going production from the Chama pit (approximately 100 to 120 ktpa), as well as the ongoing production at Fibolele, and bulk sampling at other deposits as required.

2.7 Infrastructure

The mine is well served with infrastructure and the site is accessed by good quality gravel roads which connect to the main highway. Power is sourced from the national transmission grid to transformers at the camp and wash plant and backup diesel generators are used when the fixed connection is interrupted to ensure operations remain unaffected. Process and non-potable water is sourced from river water, and potable water is provided by treated ground water. The site has appropriate communication systems in place.

2.8 Social, Environment, and Health and Safety

Review of the social, environment, and health and safety aspects of the operation focused on compliance with applicable Zambian environmental legislation and environmental authorisations, performance relative to good international industry practice ("GIIP", including the requirements of the London Stock Exchange ESG reporting guidelines.); appropriateness of the existing management systems and corporate social responsibility ("CSR") activities; environmental and social issues of concern; risks and liabilities; the appropriateness of closure planning and cost estimates; and recommendations for improvement to existing management measures and reduce risk.

The review builds on a previous review in 2015. The update is based on a further site visits to Kagem by John Merry in August 2019 and Insiya Salam in October 2019. The update includes a review of legislation pertinent to mining and environmental management in Zambia and a study of documents provided by Kagem, including policy and strategy documents, audit reports, correspondence with the Zambian Environmental Management Agency ("ZEMA") and Mine Safety Department ("MSD"), permits and licences, environmental project briefs ("EPB"), the 2016 environmental impact assessment; environmental management plans ("EMP") and monitoring data.

The Kagem mining licence is valid until April 2020. On 12 December 2019, the licence was extended by 25 years.

The Mining Law includes specifications for mine closure. Kagem does not have an in-house life of mine closure plan or detailed cost estimate; however, the annual Kagem EMP and audit include a section on closure costs. This primarily relates to infrastructure demolition and rehabilitation of current levels of disturbance. This cost estimate is required as part of the Environmental Protection Fund (“EPF”) Audit to assess the cash contribution Kagem needs to pay to the EPF (as per the Mines and Minerals Act) on an annual basis.

Kagem commissions regular independent Environmental Protection Fund audits to determine the degree of compliance of the operation to the EMP. This is then used to determine the value that has to be paid annually to the Government environmental protection fund. If the operation is deemed to be largely compliant with its obligations, they receive a 95% discount on the full value of the calculated liability. Kagem has been deemed compliant and therefore only contribute 5% of the fund value in any one year. The current calculated closure cost is just over USD 1 million. Based on SRK’s experience of other mine closures and given Gemfields commitment to GIIP, SRK consider this figure to be low. SRK considerers a more realistic cost to be in the range of USD 6-10 million. This estimate also takes into account an estimate for redundancy and retraining costs. A more conservative figure has historically been used in the financial model.

Gemfields has publicly committed their operations to implementing environment, social and health and safety (“ESHS”) management systems compliant with ISO 14001 and OSHAS 18001. Gemfields has adopted a global risk management process to ensure that risk across the business is assessed regularly and effectively mitigated. The Gemfields management team has recently drafted a suite of corporate policies covering all aspects of corporate governance. There are separate policies for human rights, environment, health and safety, and community engagement and livelihoods. At the time of the site visits, these policies were still to be rolled out to the operating sites.

Security at Kagem is taken seriously with clear evidence of strict implementation of formal and spot searches, applied to all persons on site and at all times. Security teams are assisted by CCTV at various locations around the site and infrared cameras at the pits. There are also dog patrols. Historically, people detained by the Kagem security were held at site for a period of time but this practice was discontinued and the standard operating procedure is that if an illegal miner is caught they are immediately handed over to the Zambian police; in most instances, they are simply escorted off-site. SRK observed a number of randomly selected CCTV records of artisanal miner incursions onto the Kagem licence. In all cases the security personnel reacted in a very calm and measured manner and were seen ushering the intruders back off the site. Both Kagem security personnel and private security personnel are contractually subject to immediate dismissal for any type of human rights violation. Furthermore, Kagem and Gemfields has the right to request immediate removal and replacement of any private security personnel who have been found to be in violation of any company policy and procedure, and to immediately terminate an entire private security company contract for human rights violations

2.9 Emerald and Beryl Market and Pricing

Kagem's emerald production in Zambia has had a material impact on the global emerald sector. According to Gemfields' estimations, Colombia and Zambia are the main global producers, closely followed by Brazil. Efficient mining and distribution practices and coordinated marketing efforts by Gemfields have been crucial to the development of the Zambian market, as Gemfields' Kagem Mine still accounts for roughly 70% of Zambian emerald production by value.

Emeralds tend to be among the most included of all natural gemstones. It is possible to fill internal inclusions by forcing oil through the surface-reaching fissures. The result is improved clarity since the light performance of the filled cracks is similar to that of natural emerald. Kagem's mine production consist of a vast range of emerald grades, therefor requiring some treatments. Gemfields ensures that all treatment is disclosed and that its auction clients to appropriately informed.

Gemfields has developed and implemented an innovative grading and auction system for selling its rough gemstones. Gemfields runs two auction classes, one offering higher quality gemstones and the other for the larger volume of lower quality gems.

Historically, a key constraint to the sale of coloured gemstones has been the limited quantities and erratic nature of the supply. With the bulk of world production coming from small scale miners, the downstream supply chain has not had access to a consistent supply of rough. This has constrained certain product lines or the ability to support these with the necessary marketing campaigns. Since Gemfields entering the market, cutters can purchase large parcels of consistent grade emerald product at auction. This enables retailers and manufacturers to plan larger production runs of jewellery that rely on consistent supply, stable pricing and the reliable grading of the rough and they can in turn support this with an increased level of consumer focussed marketing. The result of this is the opportunity to grow the size of the market and broaden the appeal of the products while keeping prices stable or increasing.

Since 2014, emerald prices have been increasing, reaching a peak in 2015, and continuing on an upward trend till today. Gemfields has also seen a direct increase in auctions prices, primarily driven by higher quality auctions. A detailed analysis of the auctions and market prices is presented in the main body of the CPR in Section 2.10. The High Quality Auctions consist of Premium Emeralds and Emeralds. 18% of the Emerald category stones fall under HQA, the remaining 82% constitute the Low Quality Auctions. The Other stones account for most of the volume, however a near insignificant portion of revenue due to the low value of these stones. Forecast prices are presented in Table ES 8.

Table ES 7: Kagem Forecast Commodity Prices

Commodity Prices (USD/ct)	2019	2020	2021	2022	2023	2024	2025	2026
Average	4.96	5.10	5.26	5.22	5.64	5.62	6.24	6.33
High Quality Auctions	72	74	77	80	83	86	89	89
Low Quality Auctions	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
Other	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075

2.10 Economic Analysis

SRK has prepared an independent discounted cash flow model (“DCF”) for the mine to assess the economic viability of the LoMp and associated Ore Reserves. The Ore Reserves amount to 3,621 Mt with an average recovered grade of 208.5 ct/t, resulting in a total contained carats of 755 Mct. The DCF is based on technical and economic inputs (“TEP”) provided by the Company and reviewed by SRK. SRK has incorporated adjustments where deemed appropriate, in discussion with the Company. Working capital movements have been modelled. VAT movements have not been deemed material. SRK has compared forecast unit costs to historical costs achieved during the last 5 years.

SRK presents the LoMp production and revenue summary in Table ES 8. The operating and capital costs, and resulting economic outputs, and presented in Table ES 9. The annual figures are detailed in the main body of the CPR, Section 2.11.

Table ES 8: Kagem LoMp Production and Revenue Summary

	Units	Total/Ave
Production Mining		
Total Waste	**(kt)**	**252,198**
Chama	(kt)	247,201
Fibolele	(kt)	4,997
Total Ore	**(kt)**	**3,326**
Chama	(kt)	3,226
Fibolele	(kt)	100
Total Material Moved	**(kt)**	**255,524**
Chama	(kt)	9,480
Fibolele	(kt)	1,112
Stripping Ratio	**(t:t)**	**75.82**
Chama	(t:t)	99
Fibolele	(t:t)	52
Processing		
Total Ore Treated	**(kt)**	**2,730**
Chama	(kt)	2,635
Fibolele	(kt)	96
Stockpile	(kt)	891
Total Grade	**(ct/t)**	**208.52**
Chama	(ct/t)	**213.45**
Fibolele	(ct/t)	**139.13**
Stockpile	(ct/t)	**201.40**
Total Content	(ct 000's)	**755,141**
Chama	(ct 000's)	562,353
Fibolele	(ct 000's)	13,290
Stockpile	(ct 000's)	179,499
Stone Production		
HQA	(ct 000's)	42,169
LQA	(ct 000's)	169,940
Beryl	(ct 000's)	543,033
Commodity Prices		
Average Price	**(USD/ct)**	**5.92**
HQA	(USD/ct)	87.28
LQA	(USD/ct)	4.39
Beryl	(USD/ct)	0.08
Revenue		
HQA	(USDM)	3,680
LQA	(USDM)	747
Beryl	(USDM)	41
Total	**(USDM)**	4,468

Table ES 9: Kagem LoMp Costs and Economic Results

	Units	Total/Ave
Unit Operating Costs		
Mining and production costs	(USD/t Treated)	191
Administrative expenses	(USD/t Treated)	27
Management and auction fees	(USD/t Treated)	154
Mineral royalties and export duty	(USD/t Treated)	77
Total Operating Costs	**(USD/t Treated)**	**450**
Operating Costs		
Mining and production costs	(USDM)	693
Administrative expenses	(USDM)	96
Management and auction fees	(USDM)	558
Mineral royalties and export duty	(USDM)	280
Total Operating Costs	**(USDM)**	**1,619**
Capital Costs		
Expansion	(USDM)	16.6
Sustaining Capital	(USDM)	175.7
Closure	(USDM)	8.0
Total Capital	**(USDM)**	**200.3**
Economics, Real		
Sales Revenue	(USDM)	4,468
Operating Costs	(USDM)	1,629
Operating Profit - EBITDA	(USDM)	2,839
Tax Liability	(USDM)	793
Capital Expenditure	(USDM)	200
Working Capital	(USDM)	1
Net Free Cash Flow	**(USDM)**	**1,844**
Discount Rate	**8.0%**	**719**
	10.0%	**600**
	12.0%	**510**

SRK considers that the mine has favourable economics and based on the assumed commodity prices is considered robust in terms of the estimated operating margins and return on investment. The NPV at a discount rate of 10% is USD 600 million and annual cash flows are positive for the duration for the life of mine. On this basis SRK confirms the economic viability of the Ore Reserve.

SRK recommends further refinement of capital cost estimates is undertaken in order to optimise mine profitability; and that the financial model is updated regularly to reflect new production data relating to revised mine plans, resource grade estimates and prices realised at auction.

2.11 Risks and Opportunities

The Mine is subject to certain inherent risks and opportunities, which apply to some degree to all participants of the international mining industry. These include:

- **Commodity Price Fluctuations:** these many be influenced, inter alia, by commodity demand-supply balances for gemstones, specifically rough and cut emeralds. In all cases, these are critically dependent on the demand in the primary sales markets in which cut gemstones are consumed, an indication of which is the disposable income as generally reflected by the projected growth in GDP. Furthermore, the sales price varies significantly between both rough and cut gemstones and within the specific quality categories. Historical prices as recorded for the Mine production are largely based on a weighted average price received from auctions. Increased production of emeralds has the potential to adversely impact the market price for rough and/or cut emeralds. Increased production could come from the Kagem Mine or other parts of the world where gemstones could be mined.

- **Foreign Exchange and CPI Risk:** CPI for each specific country/currency is impacted by the assumed relationship between exchange rates and the differential in inflation between the respective currencies, that is, purchase price parity or non-purchase price parity. Given the low exposure to non-USD related expenditures as noted by Kagem, the overall foreign exchange risk is however considered immaterial.
- **Country Risk:** specifically country risk including: political, economic, legal, tax, operational and security risks.
- **Legislative Risk:** specifically changes to future legislation (tenure, mining activity, labour, occupational health, safety and environmental) within Zambia.
- **Mineral Resource and Ore Reserve estimation risk:** the presence and proportion of premium or higher quality gemstones may be more erratic than indicated from the bulk sampling (mining) undertaken to date. The total B&E ct/t grade may also be more variable than indicated to date. It is possible that certain parts of the deposits are richer than others and this has not yet been fully appreciated at this stage of the mine life.
- **Water Management Risk:** this risk relates to managing the impact of dewatering and discharge on water resources used by the local community.
- **Reputational risk – management systems**: There is a potential reputation risk (also addressed at the Gemfields Group level) associated with the, as yet, poorly developed management systems on site. Given the mine has been in operation for a number of years and given the high-profile marketing campaign, the relatively informal approach to some elements of the environmental programme could attract criticism. SRK has noted the new initiatives to address this issue.
- **Reputational risk - biodiversity management:** Gemfields has made some very strong statements about being an industry leader in the areas of sustainability. A number of commitments have been made to implement a more formal approach to biodiversity management. This is yet to be actioned.
- **Lack of a social management system**: the work of the CSR team is directed by the existing community development (sustainability) strategy for Kagem which is heavily focused on delivery of outputs through CSR activities. The socioeconomic and cultural impacts identified in the EIS are not being fully addressed through the mitigation measures identified.
- **No stakeholder engagement process, plan or grievance mechanism**: stakeholders have not been mapped and there is no formal system for stakeholder engagement, consultation and participation, and recording of stakeholder meetings. Although it is noted that incidents are logged with the SHEQ department and that respective departments deal with community complaints, there is no centralised system to log community grievances which details how the grievance was raised, the date, the department/person responsible and how it was resolved. This does not reflect the global policy commitments on community engagement and livelihoods which include development of an engagement strategy and grievance mechanism.
- **Limited primary socioeconomic data for the targeted communities:** currently, other than the visual process used, there is no clear baseline against which to measure how standards of living are improving in the communities.

- **Lack of proactive engagement with illegal/artisanal miners:** there does not appear to be an assessment or study carried out to fully understand the dynamics of the illegal/artisanal mining presence in the area. This, together with the apparent lack of proactive engagement and dialogue with this group leaves the operation open to the potential risks posed by the illegal miners. In-migration linked to the influx of illegal/artisanal miners and the associated socioeconomic impacts is also a risk.
- **Injury to artisanal miners:** The Kagem security team is very aware of the challenges associated with the task of managing illegal incursions onto the property. They have identified that a key risk is the potential for an intruder to be injured as a result of falling or dislodging large rocks on the waste rock dump.
- **Historical challenges:** Historically, the security team did allow guard dogs to be released from their leads and to chase illegal miners. This has resulted in complaints in the past. In the same way historical behaviours has been used against the company at MRM, old practices could pose a risk if this issue is exploited by compensation seekers.

The principal opportunities with respect to the Kagem Mine are largely constrained to:

- **Mineral Resource:** Potential increases through completion of successful exploration drilling at the Mine and the broader area within the licence. Additional drilling and bulk sampling may also supply additional information regarding the grade trends noted at the mine to date, and potentially help to define the underlying causes.
- **Ore Reserve:** Potential increase through:
  - refining current estimates with further exploration drilling and bulk mining to help to calibrate the estimation process and better define the presence of high value gemstones; and
  - upgrading of the Inferred Mineral Resources and unclassified material to Indicated and Measured through additional drilling.
- **Plant Throughput:** Improvement through implementation of an expansion beyond that planned in this LoMp; however, further production rate increases are likely to be contingent upon the capacity of the world market for emeralds.

3 MONTEPUEZ RUBY AND CORUNDUM MINE

3.1 Geology

3.1.1 Deposit Geology

The Montepuez ruby and corundum deposit is located in north eastern Mozambique. Ruby and corundum mineralisation is found in two styles: namely, primary amphibolite, and secondary gravel beds. The main source of rubies and corundum is the secondary mineralisation, although mining has also occurred from the primary mineralisation. The current genetic model for the secondary ruby deposit proposes initial deposition within one or more major flooding events, followed by redistribution of the rubies by alluvial processes, such as those in a braided river system. The secondary gravel bed horizon comprises variably rounded quartz and clastic fragments, and forms a semi-continuous horizon, at or near the basement contact. Typically, the gravel bed horizon is generally less than 2 m thick, with an average thickness of 0.45 m. The primary mineralisation is associated with a variably weathered amphibolite unit, which is currently being mined in the Maninge Nice area.

Rubies and corundum from the primary mineralisation are typically tabular hexagonal crystals, with a strong basal cleavage. The gemstones are typically highly fractured and included, and a lighter pink in colour than those found in the Mugloto area.

Within the gravel bed unit, the quality and quantity of ruby gemstones varies significantly across the deposit. This may be a result of the variability of the primary host lithology, the geomorphology of the area, as well as the nature of the physical and chemical weathering during the transportation and deposition of the secondary mineralisation.

In the case of the Maninge Nice area (within the vicinity of the main pit Pit 3), the secondary deposit can be geochemically correlated, through XRF analysis of the trace elements, with the underlying primary amphibolite deposits. Here, the gravel bed lies very close to the primary source, resulting in a higher number of carats per tonne being recovered. The relatively short distance of transport is also indicated by the morphology of the stones, which tend to be more platy in shape reflecting the typically tabular hexagonal crystals, with a strong basal cleavage observed in the primary source. The secondary stones at Maninge Nice are also similar to those recovered from the primary sources in terms of their being highly fractured and included.

Based on XRF studies completed by Gemfields, the chemical composition of the Glass and Maninge Nice secondary deposits appear similar, however those of the Mugloto area appears to be different. Ruby / corundum stones recovered from the secondary Glass deposits are typically higher in Cr and V, and lower in Fe than those stones in Mugloto deposits. These differences in composition are interpreted to reflect a difference in primary source, which in turn is thought to be the main driver for the differences in quality of stones recovered. The chemical characteristics of the Glass and Maninge Nice secondary deposits are postulated to be correlated genetically with stones recovered from amphibolite sources.

Whilst the stones recovered for the Glass and Maninge Nice Pit 3 areas are compositionally similar, the physical nature of the stones differ. Typically, stones recovered from the Glass area indicate a higher transportation distance, are more rounded, and the number of stones recovered is reduced. Stones recovered from the Mugloto area are relatively high in Fe content. The primary source for these stones is yet to be identified. The source is thought to lie outside the area currently delineated by exploration drilling and pitting. The stones are typically dark red in colour, more transparent' with fewer inclusions, and often rounded or tumbled in shape, which suggests a reasonable degree of transportation.

3.1.2 Data Quantity and Quality

MRM has been undertaking exploration and mining at Montepuez since 2012. The main sources of information include auger and diamond drilling, small scale exploration pits, bulk sampling and mining. This key data is supplemented by limited geological mapping, satellite imagery and geophysical and soil geochemistry surveys. The approximate costing of exploration completed to date is given in Table ES 10.

Table ES 10: MRM: Approximate Exploration Expenditure to June 2019

Item	Cost (USDk)
Satellite Images	25,000
Drilling Rig and Accessories (Rock Drill)	300,000
Exploration Pitting	170,000
Contractual Auger/Core drilling	1,900,000
Airborne Geophysical Survey	300,000
Drone Survey	10,000
Boseman's Jig	50,000
Geological & Survey Instruments (DGPS, Total Station, GPS, Laptops etc)	165,000
Leica Geosystems, Permanent Base Station	50,000
Geological Software (Leapfrog, Surpac, Target, etc)	125,000
Hydraulic Drilling Rig & Accessories (Sandvik DE 710)	800,000
Geology Site office & Core-Shed	250,000
Petrographic studies	25,000
Exploratory Processing Unit (10tph)	200,000
Light Motor Vehicles	350,000
Total	**4,720,000**

SRK has not been supplied with any specific planned exploration programmes for MRM. Any further drilling is likely to be operational in nature and provided for in the capital provision of USD0.7 Mpa up to 2047. Furthermore, SRK understands that there are no planned greenfield exploration programmes which fall outside the confines of the MRM Mine area.

The auger drilling has been mainly used to target the secondary mineralisation with the aim of determining the thickness and nature of the gravel bed and the overlying material. Diamond drilling is predominantly aimed at determining the nature of the basement geology with the aim of defining the primary mineralisation at Maninge Nice and understanding the bedrock geology. The main exploration tool used to determine ruby and corundum grade is through bulk sampling, and later, production.

Drilling within Concession Area comprises a total of 3,385 drill holes for a total meterage of 42,377 m, which comprises 2,972 auger holes and 413 diamond holes. The auger drilling is primarily on an approximate 140 m grid throughout most of the deposit, with areas of wider spaced drilling on a 200 m grid in the far west of the project and in an approximate 3 km wide area between Mugloto and Maninge Nice. A number of small pockets of close-spaced auger drilling on a 30-40m grid have been completed in the Mugloto area. The distribution of diamond drill holes is relatively sporadic and confined to the Maninge Nice area. Across the entire deposit, the auger holes are drilled to an average depth of 7.1 m, whilst the diamond holes are drilled to an average depth of 51.2 m. All diamond and auger holes are drilled vertically and have not been surveyed.

In addition to auger and diamond drilling, MRM has also conducted close spaced exploration pitting in a number of key areas. The exploration pits are shallow excavations with an average depth of 3.9 m and typical dimensions of 1 m^2 in cross section. A total of 823 exploration pits were completed between early 2012 and November 2013, for a total depth of 3,224 m. The exploration pit data is predominantly focussed on the central Mugloto and Maninge Nice areas. The pits are typically arranged in grids at a spacing of 50 m by 50 m, 100 m by 50 m or 200 m by 100 m. A total of 175 of the 823 exploration pits were terminated prior to reaching the planned depth, due to various technical difficulties, and these pits have been excluded from the database for modelling, as they were considered to contain incomplete data which may bias any models generated from this data.

MRM has implemented a logical logging and data capture procedure for diamond and auger drilling. This aims to ensure a consistent methodology for the process of capturing data, and so provide data which is suitable for the subsequent geological modelling.

The only source of ruby quality distribution at the Project is the mine production records. For the period of July 2012 to the end of June 2019, approximately 21.5 Mt of material has been removed from the pits, including approximately 3.8 Mt of mineralised material. The mined material was processed through the onsite processing plant, and hand sorted to derive both the grade and quality of the contained gemstones. MRM has developed a classification scheme for the recovered gemstones, based on the size and quality of the individual gemstones. The minimum size of stone recovered is 1.6 mm.

Bulk and in situ density measurements of the top soil, clay, gravel bed and weathered basement are routinely recorded once a month in the mining areas. Density measurements are also taken routinely from the diamond core, using industry standard methodology for density determinations from diamond core. The drill core density measurements were used to derive the tonnage estimates, as the core data covers a wider geographical space.

3.2 Mineral Resources

3.2.1 Geological Model

The auger, diamond and exploration pit data were used as the basis of the geological modelling. The secondary gravels, overburden unit and the primary bedrock lithologies were modelled. In addition, topography and top of basement surfaces were modelled.

A 3D volumetric model of the secondary gravel bed was constructed, based on the derivation of hangingwall and footwall surfaces from the logged auger holes and exploration pits. Between drill holes, the trend of the gravel bed footwall and hangingwall surfaces was guided by the geometry of the modelled basement contact. In areas where no gravel bed was intersected, the model pinches out to a zero thickness mid-way between holes. Due to the relatively thin average thickness of the gravel bed, and the inherent small-scale thickness variability associated with the unit, it is not possible to mine the horizon in isolation. For this reason, the mining operation chooses to mine the secondary deposits accepting significant dilution rather than risk excluding potentially mineralised material. To account for this approach, a gravel bed "skin" model was created to reflect the mining dilution incorporated as part of the standard mining practice at Montepuez, based on the gravel bed model expanded by 0.3 m on in the footwall and hangingwall directions, or set to a standard 1.5 m thickness where the gravel bed model is <0.9 m thick.

The Maninge Nice amphibolite body, host to the primary mineralisation, was modelled through sectional polyline interpretations, based on logged amphibolite in diamond holes and exploration pits, cropped to the modelled basement surface.

3.2.2 Grade and Tonnage Estimation

For the secondary mineralisation it is noted that the production grades maintained by Gemfields include mining dilution which is a significant factor given the thin nature of these beds and the practise of over digging to maximise extraction. In order to convert production grades to in-situ grades the production grades were factored based on the thickness ratio of modelled gravel bed to gravel bed plus skin, considering waste as having zero grade value.

Undiluted grades and stone quality breakdown of the various stone types have been assigned to the coded gravel bed blocks in each of the modelled domains based on the following criteria:

- within 100 m of each production pit, the gravel bed blocks have been assigned values from the corresponding production pit;
- where a gravel bed block is within 100 m of at least two production pits, the block has been assigned values from the nearest production pit;
- blocks more than 100 m from a production pit have been assigned average values from the pits inside the corresponding domain weighted by the production tonnage in each pit; and
- for domains that do not have any production data, values have been taken from the nearest domain with available production data. In this case, the production grade from the nearest domain has been adjusted in line with how the declustered average grade from auger drilling and exploration pits in the nearest domain compares with production data in the domain under consideration.

Tonnages were estimated by applying average in situ density values to the undiluted domains coded in the block models, using values derived from the core sampling. Average density values were applied separately to the gravel bed blocks and the primary amphibolite blocks.

The block model has been depleted to account for production to date, based on the most recent Gemfields pit surveys, and also to account for exploitation by illegal artisanal miners in various areas.

3.2.3 Mineral Resource Classification

SRK has made a series of assumptions with the mineralising system at the Montepuez deposit. SRK has assumed that characteristics of the host lithology, whether primary amphibolite or secondary gravel bed remain constant to extents of the modelled unit with no changes in geology. Similarly, it is assumed that there is no changing in the mineralising system with depth. The host mineralisation was modelled using a combination of the regional scale interpretation, in-pit mapping, and available drill hole, auger, and exploration pit intersections.

Grade data is sourced from historical production data, either directly, or indirectly (where no production data is available in the vicinity) based on factoring production grades with data from auger drilling and exploration pitting. Grade estimates are therefore largely dependent on historical data for validation.

In order to develop a classification scheme for the Mineral Resources at Kagem, SRK has taken the following factors into account.

1. quantity and quality of the underlying data, the level of geological understanding for each type of mineralisation, and across the property as a whole;
2. confidence in the geological continuity of the host mineralisation;
3. confidence in the grades, as derived from the production and the understanding of the grade variation at a given production scale; and
4. the perceived level of risk associated with deviations from the assumptions made.

3.2.4 Mineral Resource Statement

The Mineral Resource Statements for MRM, on a 100% basis is given in Table ES 11 and Table ES 12, and on a 75% basis in Table ES 13 and Table ES 14. The CP with overall responsibility for reporting of the Mineral Resource is Dr Lucy Roberts, MAusIMM (CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. SRK considers that the Mineral Resource Statements are reported in accordance with the JORC Code.

Table ES 11: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Secondary Mineralisation (100% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Secondary	Indicated	2.01	18,900	0.14	0.6	3.1	3.8	72
	Inferred	2.01	39,800	0.03	0.1	11.1	11.3	449
Stockpiles - Secondary	Indicated	1.40	797	0.05	0.2	4.4	4.6	4
Total - Secondary	Indicated + Inferred	2.00	59,497	0.07	0.3	8.5	8.8	524

Table ES 12: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Primary Mineralisation (100% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (ct, 000)
Primary	Indicated	2.53	1,100	0.003	3.7	94.2	97.9	108
	Inferred	2.53	240	0.003	3.7	94.2	97.9	24
Stockpiles – Primary	Indicated	1.40	43	0.01	2.4	45.3	47.7	2
Total Primary	Indicated + Inferred	2.49	1,383	0.00	3.7	92.7	96.3	133

Table ES 13: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Secondary Mineralisation (75% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Secondary	Indicated	2.01	14,175	0.14	0.6	3.1	3.8	54
	Inferred	2.01	29,850	0.03	0.1	11.1	11.3	336
Stockpiles - Secondary	Indicated	1.40	598	0.05	0.2	4.4	4.6	3
Total - Secondary	Indicated + Inferred	2.00	44,623	0.07	0.3	8.5	8.8	393

Table ES 14: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Primary Mineralisation (75% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (ct, 000)
Primary	Indicated	2.53	825	0.003	3.7	94.2	97.9	81
	Inferred	2.53	180	0.003	3.7	94.2	97.9	18
Stockpiles – Primary	Indicated	1.40	32	0.01	2.4	45.3	47.7	2
Total Primary	Indicated + Inferred	2.49	1,037	0.00	3.7	92.7	96.3	100

In presenting this Mineral Resource, the following apply:

- Mineral Resources for the gravel bed are reported inclusive of dilution to reflect the anticipated mining method, which has a minimum mining with of 1.5 m, or a total of 0.6 m of dilution where the gravel bed is greater than 0.9 m thick.
- Mineral Resources for Maninge Nice Pit 3 Primary amphibolite are reported as undiluted.
- The block model has been depleted to the relevant pit surveys, to match the effective date of the Mineral Resource of 1 July 2019.
- The average value of the ruby and corundum, as reported in the Mineral Resource Statement is USD17.68/ct. SRK notes that the price assumptions used are conservative when compared to the prices received from the auction process to date. The assumed prices for the different products, as provided by Gemfields, are as follows:
  - Premium Ruby: USD975.56 /ct; and
  - Ruby: USD37.93 /ct.
- Other (low ruby, -4.6 mm, corundum, sapphire): USD0.75 /ct. Premium ruby and normal ruby are presented individually whilst other classes are combined; these comprise low ruby, corundum, sapphire, low sapphire and -4.6 mm mixed ruby / corundum combined (“LR+CO+SP+LS+4.6”). A total grade for all classes is also presented for clarity.

- Mineral Resources are quoted with a bottom cut-off size of 1.6 mm, which is consistent with what can be recovered in the plant, and processed in the sort house.
- All figures are rounded to reflect the relative accuracy of the estimate. Where minor errors in summation occur, these are not considered to be material.
- Mineral Resources are reported inclusive of Ore Reserves.

3.3 Open Pit Mining

The mining method at MRM comprises conventional open-pit mining which include: excavate, load and haul to in-pit backfill, waste rock stockpile locations and stockpiles at the wash plant facility. The operation is 'free dig' for the gravel bed (Secondary Mineralisation) ore and the weathered zone within the amphibolite ore (Primary Mineralisation). Based on the logging of the primary mineralisation, the weathered zones were found to extend to a depth of 40 m. This assumes that no drilling and blasting will be required for either the primary or secondary mineralisation.

In mining the gravel bed, waste is stockpiled on nearby clearings and then re-handled to be used as back-fill in the mined-out areas. SRK notes that backfilling of mined out areas is an established practice on site and therefore achievable.

A stockpiling strategy has been included in MRM's plan to manage the expected variability in the gemstone grading distribution and the impacts of the wet season on productivity. The stockpiling strategy provides more than six months of production stockpiled near the wash plant.

The stripping ratio, thicknesses and mineralisation type were the main strategic drivers for the LoMp sequence to optimise economic potential. The approach to the mine plan has been to balance the following priorities:

- gravelled areas with low stripping ratios
- areas in close proximity to the stockpiles / was plant
- areas with historically high premium rubies.

The current LoMp as outlined by MRM requires a ramp up from the 2018 annualised total rock mining of 4.4 Mtpa total to 7.5 Mtpa by 2021, with ore mining from 800 ktpa to 1.5 Mtpa by 2021. The production schedule commences on 1 July 2019. The current LoMp production is projected to extend until 2030, resulting in a life of mine of 12 years. The LoMp has been optimised to mine material classified as Indicated only and achieves an overall stripping ratio SR = 4 (t_{waste}:t_{ore}).

The primary excavators selected are CAT336D hydraulic excavators with CAT 730C ADT's for waste mining and TATA 2523 Prima tipper trucks for ore mining. The smaller tipper trucks are more suitable for longer haulage distances (>5km) to transport ore to the stockpiles and primary crusher, whereas the ADT's are best suitable in poor underfoot conditions associated with the rainy season.

As part of the mine planning process, SRK has run a check on the total trucks required for ore hauling at MRM and is satisfied that the equipment fleet sizes and types are compatible with the estimated production schedule tonnage and haulage distances.

Open pit mining at MRM is well established and SRK does not foresee any major risks related to mining and believes that the forward looking LoMp is achievable.

3.4 Ore Reserves

The Ore Reserve statement for MRM, on a 100% basis is presented in Table ES 15, and on a 75% basis in Table ES 16. The CP responsible for reporting Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the IOM3, a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code. Mrs Anderson has review and relied on:

- the mining technical evaluation and mine plan authored by Mr Hanno Buys Pr.Eng MEng MSAIMM, a Senior Consultant (Mining Engineering) with SRK;
- the review of the mineral processing undertaken by Dr David Pattinson CEng, MIMMM, BSc, a Corporate Consultant (Minerals Processing and Metallurgy) with SRK; and
- the review of the environmental and social aspects by Mr John Merry, a Principal Consultant (Environmental and Social Management) and Dr Cathryn MacCallum FIMMM CEnv CSci, a Principal Consultant (Social Development and Management), both with SRK.

Table ES 15: MRM: Ore Reserve Statement, as at 1 July 2019, for the Montepuez Ruby Deposit (100% basis)

Classification	Tonnage (kt)	Premium Ruby (ct/t)	Ruby (ct/t)	LR+CO +SP+4.6 (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Probable Ore Reserves						
Primary						
Mineralisation	1,084	0.003	3.66	94.22	97.88	106.1
Stockpiles	43	0.003	3.66	94.22	97.88	4.2
Secondary						
Mineralisation	18,844	0.141	0.58	3.09	3.81	71.8
Stockpiles	797	0.046	0.36	4.27	4.67	3.7
Total						
Mineralisation	19,928	0.134	0.75	8.05	8.93	178.0
Stockpiles	840	0.044	0.52	8.88	9.45	7.9
Total Probable	**20,768**	**0.130**	**0.74**	**8.08**	**8.95**	**185.9**

Table ES 16: MRM: Ore Reserve Statement, as at 1 July 2019, for the Montepuez Ruby Deposit (75% basis)

Classification	Tonnage (kt)	Premium Ruby (ct/t)	Ruby (ct/t)	LR+CO +SP+4.6 (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Probable Ore Reserves						
Primary						
Mineralisation	813	0.003	3.66	94.22	97.88	79.575
Stockpiles	32	0.003	3.66	94.22	97.88	3.15
Secondary						
Mineralisation	14,133	0.141	0.58	3.09	3.81	53.85
Stockpiles	598	0.046	0.36	4.27	4.67	2.775
Total						
Mineralisation	14,946	0.134	0.75	8.05	8.93	133.5
Stockpiles	630	0.044	0.52	8.88	9.45	5.925
Total Probable	**15,576**	**0.13**	**0.74**	**8.08**	**8.95**	**139.425**

SRK makes the following comments in relation to the Ore Reserve declaration:

- The Mineral Resource grades are quoted with a bottom cut-off stone size of 1.6 mm.
- The reported grades are recovered grades, as opposed to in-situ grades, due to the nature of the type of mineralisation and operation.
- A Probable Ore Reserve has been derived from the reported Indicated Mineral Resource. No Proved Ore Reserve has been reported, notably as no Measured Mineral Resource has been reported.
- No material classified as Inferred Mineral Resources has been converted to Ore Reserves. No Proved Reserves have been declared.
- The mining production plan has been revised and updated by SRK and deemed achievable. The mining method and equipment remain unchanged. The Ore Reserves has been constrained and optimised applying relevant economic criteria.
- The gravel mining operation at MRM is a shallow, efficient, low-cost free dig mining operation which is not expected to present any major technical or logistical challenges in the future.
- The mine will keep at least six months of ore on a RoM stockpile to mitigate the effect of the variability of the gravel beds in terms of gemstone distribution, and interruptions due to weather conditions.
- The Ore Reserve is based on an increase in process plant capacity, from 800 ktpa to 1,500 kpta. The flowsheet is to remain unchanged and the plant is to be constructed in 2020 for commissioning in 2021. Whereas delays in construction may occur, SRK find the projected production to be reasonable.
- A discounted cashflow model has been prepared to evaluate and demonstrated MRM's economic viability.
- The relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties and capital costs have also been included.
- The stones prices applied in the discounted cashflow model are USD 976/ct for Premium, USD 38/ct for Ruby, and USD 0.75/ct for the Other category of low-quality stone.

- SRK notes that Premium stones account for 79% of revenue, and Ruby stones for 17% of revenue.
- 100% of sales revenue from MRM stones is attributed to the mine
- The economic evaluation has resulted in an NPV of USD 567 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM.
- SRK has relied upon the Company to confirm that the required permits and licences are in good standing and expected to remain so for the duration of the LoMp.
- SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve.
- SRK highlights that the key risk to the forecast production and revenue presented in the LoMp, is the nature of the mineralisation leading to difficulty in estimating grades; and the split between stone quality, as prices per category vary more than 1000 fold

3.5 Processing, Washing, and Waste Management

3.5.1 Processing

The wash plant comprises the log washer and the wash screen from the old plant, along with a scrubber and a Dense Media Separation ("DMS") plant. The mass balance varies significantly depending on the ore source and consequently equipment has been sized taking in to account relatively large variations. Large RoM stockpiles are maintained ahead of the plant. The stockpiles are segregated by pit designation and in-pit location. Ore can be fed to the plant either from these stockpiles or directly from the pits. Plant feed is loaded in to the feed hopper by a front end loader.

A static grizzly removes any oversize stone or large pieces of clay and the feed is washed in to the scrubber screen feed box by a manually controlled high pressure monitor spray. The slurried feed gravitates in to the scrubber screen and further water sprays remove nominally minus 1.6 mm material. The scrubber screen discharges on to a double deck screen, the upper deck removes the coarse stones and the lower deck the -2 mm particles in a slurry. The drained -25 mm +1.6 mm fraction is further processed in the DMS plant. This plant utilises ferro-silicon (FeSi) for the dense media. The plant incorporates feed screening, feed/media mixing, two dense media cyclones together with the cyclone feed pumps, a dense media handling circuit incorporating magnetic separator for recovery and densification of the FeSi and a split drain and rinse screen for removal of the FeSi media and washing of both the concentrate (heavy fraction) and the reject (lighter fraction).

Concentrate from the DMS plant is transferred to the sizing area by pipeline, and the recovery area accommodates the relevant mechanical recovery processes, including de-watering; drying; cooling; and UV sorting. The sort house area houses manual sorting and classification, as well as physical material grading. This area also houses vaulting and export areas.

3.5.2 Waste and Tailings Management

The current coarse grain size waste management strategy assumes that the majority of waste generated will be backfilled in redundant open pit areas. SRK notes that this is not likely to be feasible due to bulking of the coarse reject material post processing and trucking to the disposal zones. In addition, given the fine grain size of the slimes, it is anticipated that drying in the holding cells is not efficient and that compaction of the partly dried material following re-handling to backfill is not effective.

SRK was specifically requested to consider whether the provisions for tailings (slimes) management, and the associated documentation, comply with those detailed in the disclosure of information request made to mine operators by the Church of England Pensions Board in April 2019 in response to the recent Brazilian tailings dam failures. The Church of England Pensions Board request was made to allow them to consider investment decisions on the basis of whether tailings storage facility designs and operational practices are effective in managing risks.

In this regard, SRK interprets that the disclosure request relates primarily to 'above ground' tailings storage facilities (that is, those which require retention structures or dams that retain waste at higher elevations than surrounding ground/topography; those with significant risk of run-out impacting on downstream receptors and communities). This being the case, SRK notes that no facilities of this type are present at the site where, instead, tailings are initially managed in shallow drying cells before they are re-handled in to the completed open pit voids as backfill. Nevertheless, there are potential risks with the current system including possible overtopping resulting in suspended solid contamination of downstream water courses. SRK notes that the current facilities are designed and are supported by both operational management documentation and emergency action plans. Regular visual inspections are undertaken and it is understood that water quality is monitored both on site and in the immediate downstream environment. In all cases, the documentation is quite limited, but not exceptionally so, given the simplicity of the current tailings scheme and the relatively low associated risks.

SRK considers that 'tipping rules' should be prepared and recommend that the UK Quarry Regulations (1999) has appropriate guidance on their aims and content. SRK also notes that significant changes to the scheme are anticipated in 2020 where new technology will be commissioned to further dewater the tailings slimes which will then be stored as a dry 'cake'. The cake storage areas and management practices will require new designs, design justification calculations, and operational management documentation. This should all be prepared in line with best practice. SRK anticipates different provisions to be required for wet and dry seasons as management of dry cake can be a challenge in periods of high volume and / or intense rain storms.

3.6 Infrastructure

The Project is well served in terms of infrastructure. No significant challenges with regards to the current or planned arrangements are anticipated. The Mine offices and camp are accessed by a 1.2 km gravel road which passes through the village of Namanhumbir. A 4 km gravel road connects the Mine gate with the maintenance area, recovery house, and wash plant. The entire operation is running on power supplied by Electricidade de Moçambique with 3 phase 33 KV line voltage. The communication systems at the operation are closely linked to the security measures. The support infrastructure benefits from a WiFi connection and operatives utilise two-way radio communications.

Water management is the most significant issue to address on an on-going basis. SRK notes that current and planned actions are designed to ensure that infrastructure requirements will not adversely impact on the operations performance.

3.7 Social, Environmental, and Health and Safety

Review of the social, environment, and health and safety aspects of the operation focused on compliance with applicable Mozambique environmental legislation and environmental authorisations; performance relative to GIIP, including the requirements of the London Stock Exchange ESG reporting guidelines; appropriateness of the existing management systems and CSR activities; environmental and social issues of concern; risks and liabilities; the appropriateness of closure planning and cost estimates; and recommendations for improvement to existing management measures and reduce risk. The review builds on previous reviews completed for the Mine by SRK. The update is based on a site visit to MRM by Dr Cathryn McCallum in October 2019, and a desk top review by John Merry.

In February 2012, the Mozambican government granted MRM mining and exploration concessions for the two adjoining mining concessions 4702C and 4703C, which cover an area of approximately 33,600 ha. These were dated 11 November 2011 and valid for 25 years. In December 2015, MRM was granted a consolidated Mining Concession which combined the two concession areas under 4703C (ref 1588/CM/INAMI/2015) valid until 11 November 2036. Article 44 of the Mining Law No 20/2014 states that prior to the beginning of any development and extraction operation in the area covered by the concession, the mining concession holder is required to obtain the following primary environmental approvals:

- an Environmental Licence;
- a Land Use Permit, termed a “DUAT”; and
- an approval for the compensation and resettlement plan (“RAP”).

The Mining Law includes specification on mine closure. The National Institute of Mines (“INAMI”) (Article 26) is responsible for reviewing and approving rehabilitation and closure. MRM was originally granted Environmental Licences by the Ministry of Environment (by the Governor of the Province of Cabo Delgado), for Category B Projects, on 9 March 2012 for mining on the Mining Concessions 4703C and 4702C (Environmental Licenses 006/2012 and 007/2012, respectively). These licenses expired on 28 November 2016. A condition for the renewal of the licences was the completion of an EIA process as the mine was then considered a Category A facility. The EIA report was subsequently approved, and the Company holds a valid environmental licence through to August 2024 for the mine site and a separate licence valid until April 2023 for the unit in the industrial park in Maputo. MRM also holds a valid approval for its RAP.

There is currently no formal stakeholder engagement plan at MRM and, as a result, there are no formal stakeholder records. MRM has engaged consultants and are in the process of establishing an operational stakeholder engagement plan and a grievance mechanism, referred to as the operational grievance mechanism. As with Kagem, MRM assigns 1% of ruby sales annually for CSR activities, managed by a CSR team. MRM’s CSR team is headed up by an assistant CSR manager who is supported by a team of three community liaison officer, three community liaison assistants and a grievance management officer.

MRM has completed a RAP (prepared by Genesis Consultants). Just under 1000 households (984) have been economically displaced, of which 834 have received compensation payments for loss of crops and fruit trees. 105 households in Nthoro Village will be physically and economically displaced by the project. A new settlement is in the final stages of construction for the Nthoro community, in line with government regulations.

As required under Mozambique law, a closure plan and closure cost estimate has been developed as part of the EIA. The costs of on-going rehabilitation for mined out areas are included in the financial model projections for MRM. Based on SRK's experience, the cost estimate included in the EIA is relatively low and does not cover all elements of a comprehensive closure programme such as redundancy payments and retraining costs. As a result, MRM has a more conservative closure provision in the model. This is to cover the cost of removal of all equipment from the site, rehabilitation of all the remaining disturbed areas on site and pay staff retrenchment costs. SRK note that rehabilitation of the open pits concurrent to mining operations is a key closure objective. Improvements have been made in the stripping and storage of topsoil, but topsoil stores can still be improved (the material depth exceeds ideal topsoil storage guidelines and there is no attempt to revegetate the stored soil).

MRM has a site HSE policy that aligns with the Gemfields corporate commitments to the implementation of a management system compliant to ISO 14001 and OSHAS 18001. There is a renewed emphasis on this driven from the Gemfields corporate office. Documentation viewed and discussions with SRK suggest there is still a significant amount of work to be done on the HSE management systems.

Other than consideration of individual human rights in the apprehension of artisanal miners, increasing security and policing the concession area, there is no artisanal and small scale miner ("ASM") management strategy. Recommendations from a 2015 study on ASM do not appear to have been implemented. This means there are no alternative livelihood options for the disadvantaged and increasingly marginalised youth that exist in and around the concession and who appear to make up the majority of illegal artisanal miners.

3.8 Ruby and Corundum Market and Pricing

MRM's ruby production in Madagascar has had a material impact on the global ruby sector, even more so than Kagem's effect on the emerald sector. Gemfields is currently the world's single largest producer of coloured gemstones. Gemfields has estimated that the Montepuez mine should account for around 40% of the world's ruby supply. In 2016, Gemfields reported that up to 10.3 Mct of rubies and sapphires were recovered at Montepuez in a year.

The Montepuez rubies are invaluable to the ruby industry because of the range of sizes, quality and especially the wide range of colour and florescence of the gemstones, alongside providing a controlled and regular supply.

A variety of treatments are applied to rubies to improve their quality. In general, treated rubies are far more available than untreated gemstones and sell into the market at affordable prices. Gemfields understands that the mine production is very vast and includes all grades of rubies, therefor treatments are needed, thus demand all their auction clients to appropriately disclose and value the goods accordingly.

As for emeralds, Gemfields aims to develop and lead a sector that has historically remained unregulated and largely illicit, by showcasing the benefits of a more systematic, modern and transparent approach to coloured gemstone mining so that the industry becomes more responsible and legitimate, providing sustainable long-term social, economic and environmental benefits to both the country and local communities. Gemfields has developed and implemented an innovative grading and auction system for selling its rough gemstones.

Due to its hardness, transparency, rarity and colour, ruby is considered one of the most valuable and expensive of all gemstones. Gemfields categorises its stones into three main categories, namely Premium Ruby, Ruby and Other stones. The market recognition of Mozambique rubies has steadily risen in recent years with the equivalent per-carat values of these gemstones having tripled. Mozambique gemstones are, however, still selling for about half the price of comparable Myanmar rubies. The consensus is that although Mozambican rubies will continue to be available well into the future

Gemfields has seen a significant increase in auctions prices during the last few years. A detailed analysis of the auctions and market prices is presented in the main body of the CPR in Section 3.8. The Premium Ruby and Ruby stones account for the majority of sales revenue. Forecast prices are presented in Table ES 17.

Table ES 17: MRM Forecast Commodity Prices

Commodity Prices (USD/ct)	July 2019+
Average	17.68
Premium	975.6
Ruby	37.9
Other	0.75

3.9 Economic Analysis

SRK has prepared an independent DCF for the mine to assess the economic viability of the LoMp and associated Ore Reserves. The LoMp and its constituents supporting the Ore Reserves is also referred to as the Base Case. to 20.8 Mt with an average recovered grade of 8.95ct/t, resulting in a total contained carats of 185.9 Mct. The DCF is based on TEP provided by the Company and reviewed by SRK. SRK has incorporated adjustments where deemed appropriate, in discussion with the Company. Working capital movements have been modelled. VAT movements have not been deemed material. SRK has compared forecast unit costs to historical costs achieved during the last 3 years.

SRK presents the LoMp production and revenue summary in Table ES 18. The operating and capital costs, and resulting economic outputs, and presented I Table ES 19. The annual figures are detailed in the main body of the CPR, Section 3.9.

Table ES 18: MRM LoMp Production and Revenue Summary

	Units	Total/Ave
Production Mining		
Total Waste	**(kt)**	**76,611**
Mugloto Secondary	(kt)	52,880
Maninge nice Secondary	(kt)	1,470
Maninge nice Primary	(kt)	1,972
Glass Secondary	(kt)	20,289
Total Ore	**(kt)**	**20,768**
Mugloto Secondary	(kt)	12,061
Maninge nice Secondary	(kt)	470
Maninge nice Primary	(kt)	1,084
Glass Secondary	(kt)	6,314
Total Material Moved	**(kt)**	**97,379**
Stripping Ratio	**(t:t)**	**3.69**
Processing		
Plant Capacity	**(kt)**	**56,650**
Total Ore Treated	**(kt)**	**20,768**
Mugloto Secondary	(kt)	12,061
Maninge nice Secondary	(kt)	470
Maninge nice Primary	(kt)	1,084
Glass Secondary	(kt)	6,314

	Units	Total/Ave
Production Mining		
Stockpile	(kt)	840
Total Grade	**(ct/t)**	**8.95**
Mugloto Secondary	(ct/t)	2.70
Maninge nice Secondary	(ct/t)	52.6
Maninge nice Primary	(ct/t)	97.9
Glass Secondary	(ct/t)	2.31
Stockpile	(ct/t)	9.45
Total Content	**(ct 000's)**	**185,894**
Mugloto Secondary	(ct 000's)	32,547
Maninge nice Secondary	(ct 000's)	24,723
Maninge nice Primary	(ct 000's)	106,110
Glass Secondary	(ct 000's)	14,579
Stockpile	(ct 000's)	7,935
Carats Sales Calculated		
Total Sales	**(ct 000's)**	**196,875**
Premium	(ct 000's)	2,827
Ruby	(ct 000's)	15,528
Other	(ct 000's)	178,520
Commodity Prices		
Average Price	**(USD/ct)**	**17.7**
Premium	(USD/ct)	975.6
Ruby	(USD/ct)	37.9
Other	(USD/ct)	0.8
Revenue		
Premium	(USDM)	2,758
Ruby	(USDM)	589
Other	(USDM)	134
Total Revenue	**(USDM)**	**3,481**

Table ES 19: MRM LoMp Costs and Economic Results

	Units	Total/Ave
Unit Operating Costs		
Mining and production costs	(USD/t treated)	22.33
Administrative expenses	(USD/t treated)	4.30
Management and auction fees	(USD/t treated)	20.95
Mineral royalties and production taxes	(USD/t treated)	16.78
Total Operating Costs	**(USD/t treated)**	**64.36**
Operating Costs		
Mining and production costs	(USDM)	464
Administrative expenses	(USDM)	89
Management and auction fees	(USDM)	435
Mineral royalties and production taxes	(USDM)	349
Total Operating Costs	**(USDM)**	**1,337**
Capital Costs		
Engineering and Mining	(USDM)	90.0
Exploration	(USDM)	9.8
Wash Plant & Sort Plant	(USDM)	11.0
Security	(USDM)	0.2
Other & Sustaining	(USDM)	72.2
Closure	(USDM)	8.0
Total Capital	**(USDM)**	**191**
Economics, Real		
Sales Revenue	(USDM)	3,481
Operating Costs	(USDM)	1,337
Operating Profit - EBITDA	(USDM)	2,144
Tax Liability	(USDM)	739
Capital Expenditure	(USDM)	191
Working Capital	(USDM)	-6
Net Free Cash Flow	**(USDM)**	**1,219**
Net Present Value	**8.0%**	**649**
	10.0%	**567**
	12.0%	**498**

SRK considers that the mine has favourable economics and based on the assumed commodity prices is considered robust in terms of the estimated operating margins and return on investment. The NPV at a discount rate of 10% is USD 567 million and annual cash flows are positive for the duration for the life of mine. On this basis SRK confirms the economic viability of the Ore Reserve.

SRK recommends further refinement of capital cost estimates is undertaken in order to optimise profitability; and that the financial model is updated regularly to reflect new information relating to revised mine plans, resource estimates and prices realised at auctions.

3.10 Risks and Opportunities

The MRM is subject to certain inherent risks and opportunities, which apply to some degree to all participants of the international mining industry. These include:

- **Commodity Price Fluctuations:** These many be influenced, inter alia, by commodity demand-supply balances for gemstones, specifically rough and cut rubies and sapphires. In all cases, these are critically dependent on the demand in the primary sales markets in which cut gemstones are consumed, an indication of which is the disposable income as generally reflected by the projected growth in GDP. Furthermore, the sales price varies significantly between both rough and cut gemstones and within the specific grade categories. Historical prices as recorded for the MRM production are largely based on a weighted average price received from auctions. Increased production of rubies and other coloured sapphires has the potential to adversely impact the market price for rough and/or cut rubies and sapphires. Increased production could come from MRM or other parts of the world where gemstones could be mined.
- **Foreign Exchange and CPI Risk:** CPI for each specific country/currency is impacted by the assumed relationship between exchange rates and the differential in inflation between the respective currencies, that is, purchase price parity or non-purchase price parity. Given the low exposure to non USD related expenditures as noted by MRM, the overall foreign exchange risk is however considered immaterial.
- **Country Risk:** Specifically country risk including: political, economic, legal, tax, operational, and security risks.
- **Legislative Risk:** Specifically changes to future legislation (tenure, mining activity, labour, occupational health, safety and environmental) within Mozambique.
- **Mineral Resource and Ore Reserve estimation risk:** The presence of premium quality gemstones may be more erratic than indicated from the bulk sampling and production undertaken to date. It is possible that certain parts of the deposits are richer than others and this has not yet been fully appreciated at this stage of the Project life. In addition, the market for some of the lower quality stones could be overestimated leaving some stones unsold at auction.
- **Poor compliance with EMP:** Based on the recent audit reports provided, MRM are not complying with their obligations under the approved EIA report. This risks potential fines as well as reputational damage.
- **Water resources and water management:** There appears to be a lack of understanding of water availability, water use, and potential vulnerability of the operation to climate change impacts. The risk is that the operation is not prepared for extreme drought or flood conditions leading to production loss or competition for scarce resources.

- **Biodiversity management:** The existence of only basic environmental baseline data and lack of a clear biodiversity management programme is a potential risk when compared to the high-profile Gemfields marketing programme.
- **Youth disengagement and conflict:** There are few alternatives to engaging in illegal artisanal mining activity. Reportedly there are links between illegal mining and the Islamic insurgency in the north of the province, thus presenting a potential conflict risk.
- **Increase in ASM activity:** While there are a series of comprehensive security measures being put in place to reduce incursions onto the concession, unless there are viable livelihood alternatives and proactive engagement, it will remain an uphill battle. A number of similar risks were highlighted in the 2015 report, but SRK understands these are still to be addressed. This presents an ongoing risk associated with artisanal miners as well as the risk of population influx and associated social challenges.
- **Poor stakeholder engagement records:** The absence of a stakeholder engagement strategy, plan and data management process, present a social risk to the operation and makes MRM vulnerable to misinformation, rumours and potentially false allegations.
- **Economic Performance Risk:** The risk that the mine operations become uneconomic is considered relatively low, as demonstrated by the economic and sensitivity analyses. The greatest asset specific risk relating to the NPV is perceived to be future grades being materially lower than estimated.

The principal opportunities with respect to MRM are largely constrained to:

- **Mineral Resource:** Potential increases through completion of successful exploration drilling at the MRM and the broader area within the licence.
  - upgrading of the Inferred Mineral Resources and the unclassified secondary material (approximately 40 Mt) to Indicated through additional exploration. Additional drilling and bulk sampling may also supply additional information regarding the grade trends noted at the mine to date, and potentially help to define the underlying causes.
- **Ore Reserve:** Potential increase through:
  - refining current estimates with further exploration drilling and bulk mining to help to calibrate the estimation process and better define the presence of high value gemstones; and
  - the market for some of the lower quality stones could be under estimated resulting in higher prices for these products than those presented.
- **Biodiversity Management:** Both operations already have a considerable security programme that looks to restrict access to the mine licence areas. This coupled with a comprehensive biodiversity programme that brings in ecosystem services and social provisioning and involves local communities could set Gemfields apart from the sector.

4 SUMMARY OF MINERAL RESOURCE AND ORE RESERVE STATEMENTS

The Mineral Resource and Ore Reserve Statements for the two assets, namely the Kagem emerald and beryl mine, and MRM ruby and corundum mine, are summarised in Table ES19.

Table ES 20: Summary of Mineral Resources and Ore Reserves by Asset

	Gross			Net Attributable		
	Tonnes	Total Beryl and Emerald Grade	Contained Carats	Tonnes	Total Beryl and Emerald Grade	Contained Carats
Category	(kt)	(ct/t)	(Mct)	(kt)	(ct/t)	(Mct)
Kagem						
Ore Reserves						
Proven	681	179	122	511	179	91
Probable	2,940	215	633	2,205	215	475
Total Ore Reserves	**3,621**	**209**	**755**	**2,716**	**209**	**566**
Mineral Resources						
Measured	775	210	163	581	210	122
Indicated	3,840	265	1,015	2,880	265	761
Inferred	1,400	145	201	1,050	145	151
Total Mineral Resources	**6,015**	**229**	**1,379**	**4,511**	**229**	**1,034**
	Tonnes	Total Ruby and Corundum Grade	Contained Carats	Tonnes	Total Ruby and Corundum Grade	Contained Carats
Category	(kt)	(ct/t)	(Mct)	(kt)	(ct/t)	(Mct)
MRM – Primary Mineralisation						
Ore Reserves						
Proven	-	-	-	-	-	-
Probable	1,127	98	110	845	98	83
Total Ore Reserves	**1,127**	**98**	**110**	**845**	**98**	**83**
Mineral Resources						
Measured	-	-	-	-	-	-
Indicated	1,143	96	110	857	96	83
Inferred	240	98	24	180	98	18
Total Mineral Resources	**1,383**	**96**	**133**	**1,037**	**96**	**100**
MRM – Secondary Mineralisation						
Ore Reserves						
Proven	-	-	-	-	-	-
Probable	19,641	4	76	14,731	4	57
Total Ore Reserves	**19,641**	**4**	**76**	**14,731**	**4**	**57**
Mineral Resources						
Measured	-	-	-	-	-	-
Indicated	19,697	3.9	76	14,773	3.9	57
Inferred	39,800	11.3	449	29,850	11.3	336
Total Mineral Resources	**59,497**	**8.8**	**524**	**44,623**	**9**	**393**

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A COMPETENT PERSONS REPORT FOR THE KAGEM EMERALD AND BERYL MINE, ZAMBIA AND THE MONTEPUEZ RUBY AND CORUNDUM MINE, MOZAMBIQUE

1 INTRODUCTION

1.1 Background

SRK Consulting (UK) Limited ("SRK") is an associate company of the international group holding company, SRK Global Limited (the "SRK Group"). SRK has been commissioned by Gemfields Group Limited ("GGL" or "Gemfields"), hereinafter also referred to as the "Company" or the "Client") to undertake an update of the Competent Persons Report ("CPR") for the Kagem emerald and beryl mine in Zambia (known as "Kagem"), and the Montepuez ruby and corundum mine in Mozambique (known as the Montepuez Ruby Mine, or "MRM"). Previously, SRK has produced CPR documents for these assets separately, but for this update, this document covers both assets. The previous CPR documents were produced for Gemfields plc, which was a London listed entity. The operating company for the two assets has remained the same throughout SRK's involvement with the assets.

SRK has been requested to limit the CPR to the Kagem and MRM assets. Kagem Mining Ltd is the Kagem mine operator and Montepuez Ruby Mining Limitada is the MRM mine operator. Both operating companies are 75% owned by Gemfields. A summary table for the relevant assets are included in Table 1-1.

Table 1-1: Summary Table of Assets

Asset	Holder	Interest	Licence Expiry Date	Licence Area (km^2)	Start of Production
Kagem	Kagem Mining Ltd	75%	26 April 2045	42.37	1 November 2007
MRM	Montepuez Ruby Mining Limitada	75%	11 November 2036	349	1 November 2012

This CPR has been prepared to support the reporting of Mineral Resources and Ore Reserve estimates in accordance with JORC Code.

The Competent Person ("CP") with responsibility for the reporting of Mineral Resources is Dr Lucy Roberts, MAusIMM(CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. The CP with responsibility for the reporting of Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the Institute of Material, Minerals and Mining ("IOM3"), a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the operating activities being undertaken to qualify as a Competent Person as defined in the JORC Code.

1.2 Project Description

1.2.1 Location and Access: Kagem

The Kagem emerald and beryl mine ("Kagem") is situated in the Ndola Rural District, Copperbelt Province, Zambia, approximately 260 km north of Lusaka, the capital city of Zambia as presented in Figure 1-1. The site is some 31 km south-southwest of the Copperbelt town of Kitwe and the licence is bisected by the administrative boundary between Ndola Rural District and Luanshya District. The site is accessed along a combination of national (10 km south of Kitwe to Fisenge along the M4) and local (22 km) southwest towards the settlement of Sempala, a total travelled distance of 32 km. Sempala has a population of some 1,225 within a 7 km radius and is located in the northernmost corner of the licence area. The Company also holds additional licences in the region, but these do not form part of this CPR.

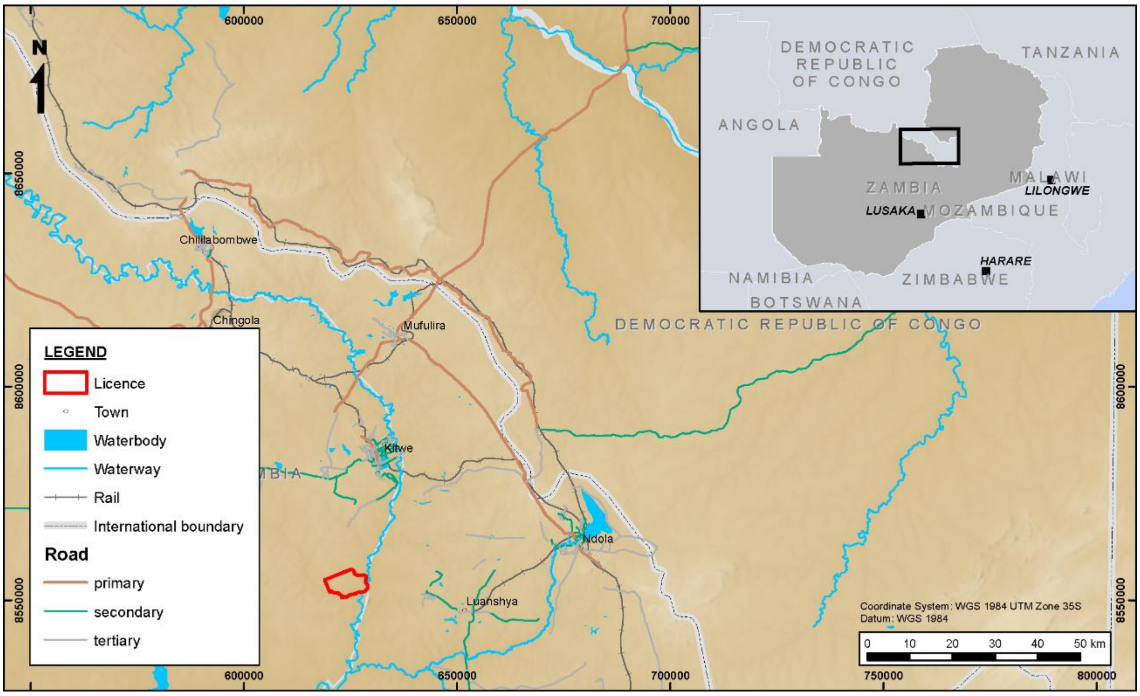


Figure 1-1: Project Location: Kagem

1.2.2 Topography: Kagem

Much of this ecoregion is flat or rolling, with local areas of higher relief. The mine site, however, is fairly flat, gently sloping towards the Kafubu stream in the south. The Kafubu stream forms the southern boundary of the permit area and lies in a wide valley. The biome is Tropical and Subtropical Grasslands, Savannas and Shrublands. The vegetation is dominated by the Central Zambezian Miombo Woodlands which is a densely forested ecoregion that covers much of Central and East Africa. Trees grow to heights of 15 m to 20 m, rising over a broadleaf shrub understorey with grassland underneath.

Animal life is limited by the disturbed nature of the area, with small mammals occurring in the less disturbed areas. Numerous insects, birds and reptiles occur. The aquatic environment is relatively undisturbed, and fishing is common.

The site is located in the catchment of the Kafue river and is drained by the Kafubu which drains into the Kafue. The Kafubu stream, which has its origin some 50 km to the northwest of the permit area, forms the southern boundary. It drains into the Kafue which is a major river and provides water to much of Zambia, including the city of Lusaka. The Kafue river forms the eastern boundary and flows approximately 6.5 km to the east of the project area. Abandoned pits readily fill with water indicating a relatively shallow groundwater table between 8 m and 10 m below the surface.

1.2.3 Climate: Kagem

The climate is classed as temperate humid. The dry season may be as long as 7 months, and 95% of the annual rainfall occurs from November to March, which is the region's summer. The mean annual evapotranspiration is 1,419 mm with monthly values ranging from 90 mm to 165 mm. The mean monthly temperatures range from 16.1°C in June to 23.8°C in October. The monthly temperatures range from a minimum of 6.1°C in July to a maximum of 32.1°C in October. Wind speeds range between 0.7 m/s to 1.5 m/s and are predominantly from the southeast, east and northeast.

1.2.4 Site Description: Kagem

The Kagem Mine comprises the current operating open pit mines at Chama and Fibolele, and the bulk sampling pit at Libwente. The open pits produce emerald and beryl bearing ore for processing at the processing plant. Existing surface infrastructure at the Mine area includes:

- access roads;
- operational wash plant ;
- operational emerald sorting house;
- mine camp, accommodation and offices; and
- equipment maintenance facilities and stores.

The existing workforce consists of approximately 733 personnel including technical and operational employees Figure 1-2 shows the Kagem Mine site layout and location of the operations.

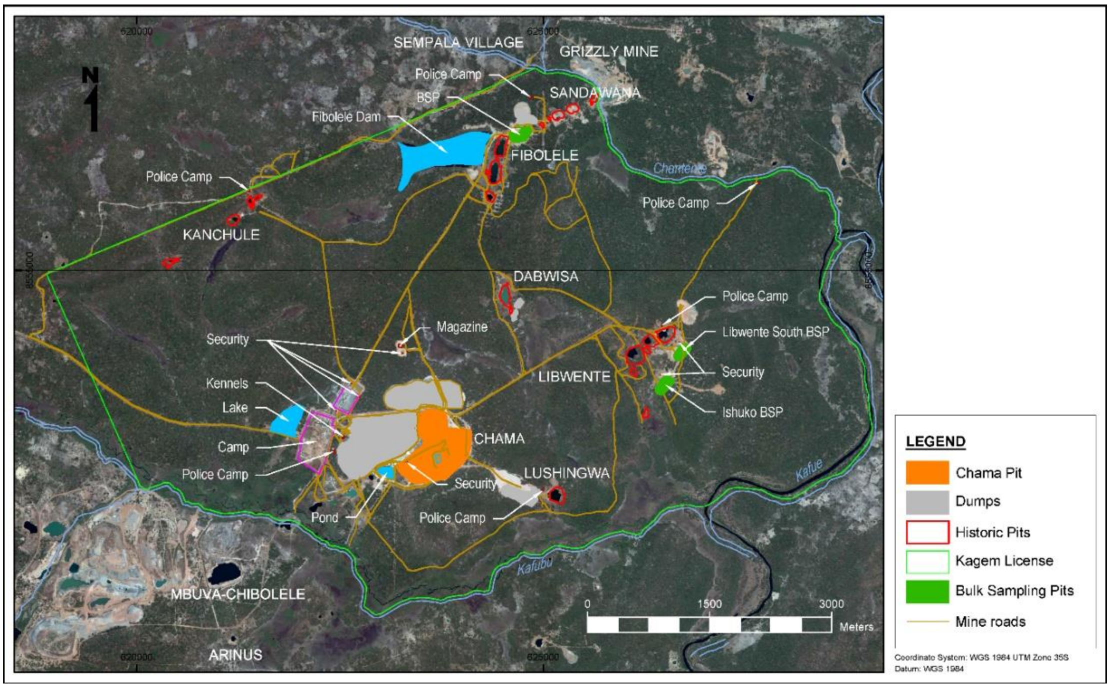


Figure 1-2: Kagem: Site Layout Plan

1.2.5 History: Kagem

Kagem ML was incorporated in 1984 as a joint venture between the Reserved Mineral Corporation (55%, liquidated in 1996) and Hagura Mining Limited (45%). The Government of Republic of Zambia ("GoZ") assumed management control of Kagem in 1990; however, after experiencing operational and financial difficulties and 12 months of frozen production, Hagura UK regained management control in July 1996. In September 2001, Hagura signed an agreement with GoZ to purchase 42% of its 55% share. In June 2005, GoZ entered into a supplemental agreement, whereby Hagura would increase its stake to 75%. In October 2007, a portfolio company of Pallinghurst acquired Hagura, which owned and still owns 75% of Kagem. An expansion and redevelopment plan for Kagem was immediately put in place. To implement this plan, Kagem entered into a management agreement on 8 November 2007 whereby Gemfields was asked to spearhead Kagem's redevelopment plan and expansion. On 8 June 2008, a transaction was completed whereby Gemfields became the owner of Hagura, meaning that it effectively held a 75% interest in Kagem. Gemfields directly manage the mine. Hagura, essentially a shell company, does not receive any management fees or payments.

1.2.6 Location and Access: MRM

The Montepuez ruby and corundum mine ("MRM") is located in Cabo Delgado province in north-eastern Mozambique, approximately 170 km west of Pemba as presented in Figure 1-3 and Figure 1-4. The concession area is 34,996 ha. The nearest village is Namanhumbir less than 1 km from the Project camp and approximately 6.6 km from the mining areas. The main operations offices, stores and accommodation are located at the Namanhumbir camp (Figure 1-4). The camp is accessed from the highway via a 1.2 km long dirt road. The road passes through Namanhumbir from the regional Route 242 which connects Pemba and Montepuez. The road is shared with local traffic for a further 6.6 km up to the mine gate. The Company also holds additional licences in the region, but these do not form part of this CPR.

Figure 1-3: MRM: Project Location

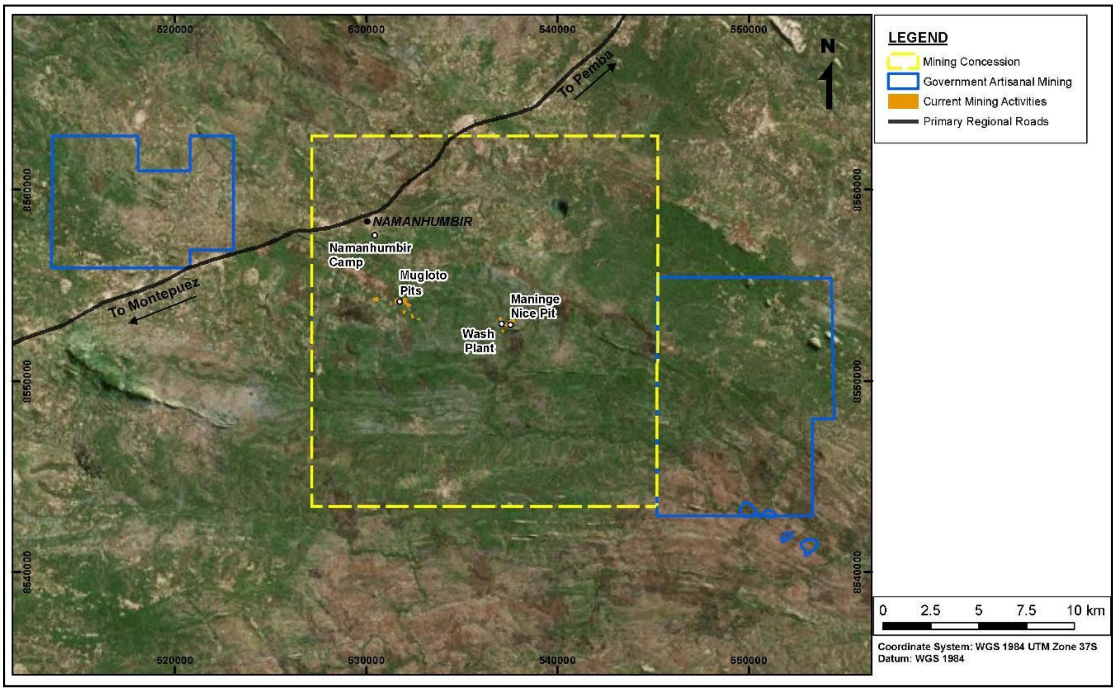


Figure 1-4: MRM: Project Setting Showing Licence

1.2.7 Topography: MRM

MRM's concession areas are located within a relatively flat area: the average elevation is approximately 450 mRL and the highest and lowest points on the concessions are 562 mRL and 366 mRL respectively. A non-perennial tributary, originating south of the Mugloto pits, drains southwards and underlies the illegal mining area south of Mugloto. Six additional tributaries, one of which originates in the Mugloto pits area and five that originate north of the Maninge North mining area drain southwards and run beneath the illegal mining area south of Maninge Nice pits. The non-perennial tributary west of Maninge Nice pit has been dammed to create a reservoir for the wash plant.

Each tributary drains southwards from the illegal mining areas into a perennial stream that originates approximately 1 km southeast of Caraia and drains south easterly across the southern part of Mining Concession 4702C draining into the Rio Megaruma, which flows east and discharges into the Indian Ocean.

1.2.8 Climate: MRM

The climate in the Cabo Delgado is typically hot, humid and tropical with temperatures varying between 22 to 34°C. The District of Montepuez is dominated by a sub-humid and sub-arid climate. Two distinct seasons exist; the rainy season extends from November to April and the dry season from June to September. The annual average temperature is 18°C and the average rainfall is 945 mm/year. The average annual relative humidity and wind speed is 67% and 4.2 km/hour, respectively.

1.2.9 Site Description: MRM

Gemstones are currently mined from a series of shallow open pits within the Mugloto, Glass, and Maninge Nice areas. In addition to the Namanhumbir mine camp, the existing surface infrastructure includes:

- open pit mining areas;
- access roads;
- a gravel washing plant;
- a stockyard for ore and overburden stockpiles;
- an engineering workshop and vehicle maintenance area;
- ruby sorting house (including security barracks);
- warehouse and diesel pump station;
- CCTV control room;
- geology site office and core-shed; and
- the security barracks.

Power is sourced from the national transmission grid to transformers at the camp, mine gate and wash plant. Backup diesel generators are used when the fixed connection is interrupted to ensure operations remain unaffected.

Water supply for the Project is sourced from 7 boreholes on site which provide both potable and process water. The bulk of process water is recycled, with boreholes providing make-up water.

SRK understands the existing workforce as at June 2019 totals 1,184 employees. Figure 1-2 shows the MRM site layout and location of the operations.

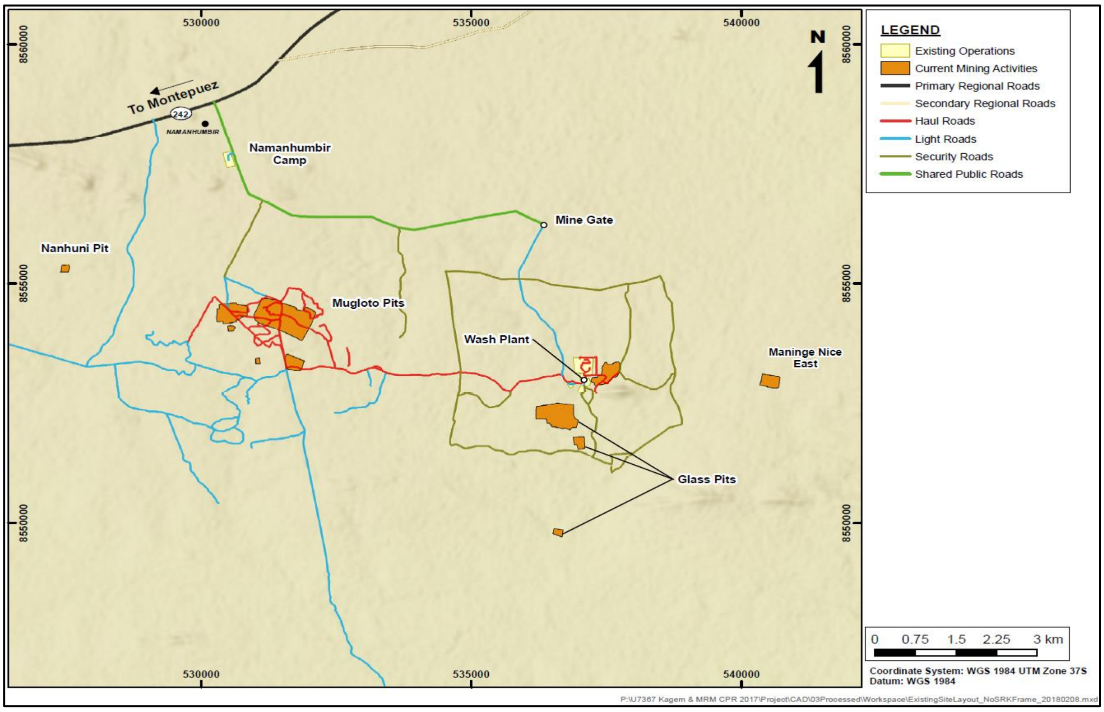


Figure 1-5: MRM: Site Layout Plan

1.2.10 History: MRM

The Montepuez deposits were discovered in 2009 where after there was a large influx of artisanal miners to the area. Gemfields' involvement commenced in June 2011 when a Joint Venture agreement was signed between Gemfields Plc and Mwiriti Lda, the original title holders.

Gemfields subsequently formed Montepuez Ruby Mining Lda during August 2011. In February 2012 mining concessions were issued in the name of MRM, valid for 25 years.

During August 2012, bulk sampling commenced on site with a fleet of equipment purchased by MRM. The initial wash plant and sorting house were both commissioned in November 2012. The initial wash plant has now been decommissioned and a new wash plant has been constructed allowing for treatment of 200 tph and commissioned in December 2016. Following the installation of the new wash plant, MRM constructed a new Sort House and recovery installation incorporating state-of-the-art hands-off sorting equipment.

1.3 Requirement, Structure, and Reporting Standard

1.3.1 Requirement

This CPR has been prepared to support the reporting of Mineral Resources and Ore Reserve estimates in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code" or "JORC"), 2012 Edition.

This CPR has been prepared to support the reporting of Mineral Resources and Ore Reserve estimates in accordance with JORC Code. SRK understands that the CPR forms part of the requirements for a dual-listing on AIM, as the document will be prepared for material assets of the Company, and will be reproduced, in full and without adjustment on the Company's website, and reproduced in part in the announcement to be made by the Company (the "Rule 2 Announcement").

1.3.2 Structure

The CPR is limited to the Kagem and Montepuez operations and the associated licences. Accordingly, this CPR has been structured on an asset and discipline basis where technical sections comprise: Geology; Mineral Resources; Mining Engineering; Mineral Reserves; Mineral Processing; Infrastructure; Environment and Social; Commodity Prices and Macro-Economics; Technical-Economic Parameters; Risks and Opportunities; Financial Analysis; and Conclusions and Recommendations. SRK notes that the Company also holds additional licences in both the Kagem and Montepuez regions, but these do not form part of this CPR.

1.3.3 Compliance

In this CPR, the standard adopted for the reporting of the Mineral Resources and Ore Reserve statements is that defined by the terms and definitions given in the JORC Code. The JORC Code is a recognised reporting code and is acceptable to the London Stock Exchange ("LSE").

This CPR has been prepared under the direction of the Competent Persons as defined by the JORC Code, who assume overall professional responsibility for the Mineral Resource and Ore Reserve statements as presented herein.

Notwithstanding the above, SRK notes the following:

- where any information in the CPR has been sourced from a third party, such information has been accurately reproduced and no facts have been omitted which would render the reproduced information inaccurate or misleading;
- drafts of the CPR were provided to the Company for the purpose of confirming both the accuracy of factual information and the reasonableness of assumptions relied upon in this CPR; and
- this CPR has not undergone regulatory review.

SRK notes that gemstone deposits, owing to the distribution of economic concentrations of reaction zones and alluvial gravel beds are notoriously difficult to sample, estimate, and classify as their thickness and grade are highly variable and their exact location very difficult to predict. Current drilling techniques are inappropriate to provide sufficient data density to enable direct estimation of gravel bed or reaction zone grade. Derivation of Mineral Resources is largely dependent on the availability of the results of bulk samples or equivalent such as historical production statistics.

1.4 Effective Date and Base Technical Information

The effective date (the "Effective Date") of this CPR is deemed to be 01 July 2019 with the Mineral Resources and the Ore Reserves estimated at this date.

The underlying technical, economic and other inputs to the Ore Reserves is relevant at the Effective Date. Subsequent to the Effective Date and the date of the CPR, the Company has informed SRK of the following two key events, which SRK has taken account during the completion of this CPR:

- The 15% export duty on precious gemstones applicable in Zambia has been suspended with effect from 1 January 2020. This has been published in a Supplement to the Republic of Zambia Government Gazette, dated 13 December 2019. As such, the Kagem economic assessment and resulting NPVs only include the 15% export duty for the period 1 July 2019 to 31 December 2019;

- During this period, auctions for Kagem and Montepuez stones were held in Singapore on 18-21 November 2019 and 10-14 December 2019, respectively. The stone categories, sales volumes and prices achieved were in line with that expected and as projected in the Kagem and Montepuez economic assessments. As such, no update of the economic assessment is necessary; and
- The Kagem Large-Scale Mining Licence No.14105 was renewed by 25 years on 10 December 2019. The new licence expiry date is 26 April 2045.

1.5 Verification, Validation and Reliance

This CPR is dependent upon technical, financial and legal input. In respect of the technical information provided, this has been taken in good faith by SRK, and other than where expressly stated, this has not all been independently verified. SRK has, however, conducted a detailed review and assessment of all material technical issues likely to influence the value of both assets, which has included the following.

Kagem:

- inspection visits to the Project in July 2015;
- discussion and enquiry following access to key project technical, head office and managerial personnel from May through August 2015 and September to November 2017;
- an examination of historical information for the Mine;
- generation and reporting of a SAMREC compliant Mineral Resource and Mineral Reserve statements;
- a review and, where considered appropriate by SRK, modification of the latest Life of Mine plans ("LoMp") for the Mine as part of the 2017 CPR; and
- site visits and update of the LoMp, Mineral Resource and Ore Reserve Statements for the 2019 CPR, to support a dual listing on the LSE.

MRM:

- inspection visit to MRM during August 2014 which culminated in a report entitled "*A Review of Resource and Reserve Planning at the Montepuez Mine, Mozambique"* and dated October 2014;
- inspection visits to MRM in April 2015;
- discussion and enquiry following access to key project technical, head office and managerial personnel from April through May 2015;
- an examination of historical information for the Mine;
- generation and reporting of a JORC Code Compliant Mineral Resource and Ore Reserve statements for the 2015 CPR;
- a review, accompanied by further site visits during September 2017 for the production of the LoMp, and Mineral Resource and Mineral Reserve Statements for the Mine as part of the 2018 CPR for a proposed listing on the JSE; and
- review and update of the LoMp, and Mineral Resources and Ore Reserve Statements for the 2019 CPR, to support a dual listing on the LSE.

SRK has also assumed certain macro-economic parameters and commodity prices and relied on these as inputs to determine the potential economic viability of the stated Mineral Resources and Ore Reserves.

Where fundamental base data in support of the Mineral Resource statements has been provided (geological information, assay information, exploration programmes) for the purposes of review, SRK has performed all necessary validation and verification procedures deemed appropriate in order to place an appropriate level of reliance on such information.

1.5.1 Technical Reliance

SRK places reliance on the Company and their respective technical representatives that all technical information, as of 1 July 2019, is accurate.

For Kagem, the technical representative is Mr Anirudh Sharma. Mr Sharma is the Kagem General Manager for the Company and is responsible for all technical matters in respect of this CPR for Kagem. The technical representative for MRM is Mr Hemant Azad, MSc, (Applied Geology). Mr Azad is the Head of Geology at MRM and is responsible for all technical matters in respect of this CPR for MRM.

1.5.2 Financial Reliance

In consideration of all financial aspects relating to the assets, SRK has placed reliance on the Company that the following information as they may relate to Kagem, MRM, and the Company is appropriate as at 1 July 2019:

- operating expenditures as included in Kagem and MRM's LoMp;
- capital expenditures as included in Kagem and MRM's LoMp; and
- all statutory and regulatory payments as may be necessary to execute the LoMp for both assets.

The financial information referred to above has been prepared under the direction of Mr David Lovett, Chartered Accountant (ICAEW), on behalf of the Board of Directors of the Company. Mr Lovett is the Chief Financial Officer of Gemfields and has 12 years' experience in financial operations and management.

1.5.3 Legal Reliance

In consideration of all legal aspects relating to Kagem and MRM, SRK has placed reliance on the representations by the Company that the following are correct as at 1 January 2018:

- the Directors of the Company are not aware of any legal proceedings that may have an influence on the rights to explore or mine for gemstones;
- that the Company and their subsidiaries are the legal owners of all mineral and surface rights relating to the assets; and
- no significant legal issue exists which would affect the likely viability of the assets and/or on the estimation and classification of the Mineral Resources and Ore Reserves as reported herein.

The details of the mining licenses for Kagem and MRM are presented in Table 1-2. SRK understands that the Kagem licence is currently being renewed. The renewal term will be a further 25 years. The licence renewal is considered by the Company to be process before the end of December 2019.

Table 1-2: Kagem and MRM Mining Licence Details

Document Type	License No	Approval Authority	Validity Period
Kagem			
Large Scale Gemstone Mining License	14105-HQ-LGML	Director Mines, Ministry of Mines and Minerals Development, Government of Zambia.	27 April 2010 to 26 April 2020, extended to 26 April 2045
MRM			
Mining Concession	4702C	Ministry of Mineral Resources, Government of Mozambique	11 November 2011 to 11 November 2036
Mining Concession	4703C	Ministry of Mineral Resources, Government of Mozambique	11 November 2011 to 11 November 2036

The Kagem mining licence is valid until April 2020. On 12 December 2019, the licence was extended by 25 years.

1.6 Limitations, Reliance on Information, Declaration, Consent and Copyright

1.6.1 Limitations

SRK is responsible for this CPR and declares that SRK has taken all reasonable care to ensure that the information contained in this report, is to SRK's knowledge having made all reasonable enquiries, in accordance with the facts and contains no omission likely to affect its import.

SRK does not assume any responsibility and will not accept any liability to any other person for any loss suffered by any such other person as a result of, arising out of, or in connection with this CPR or statements contained therein.

The Company has confirmed in writing with SRK that to their knowledge the information provided by them (when provided) was complete and not incorrect or misleading in any material respect. SRK has no reason to believe that any material facts have been withheld. Further, the Company have confirmed in writing to SRK that they believe they have provided all material information.

The achievability of the LoMp for each asset and associated expenditure programme is neither warranted nor guaranteed by SRK. The LoMp and expenditure programme as presented and discussed herein has been proposed by the Company's management, and adjusted where appropriate by SRK, and cannot be assured. The LoMp and expenditure programme are necessarily based on technical and economic assumptions, many of which are beyond the control of the Company. Future cash flows derived from such forecasts are inherently uncertain and accordingly actual results may be significantly more or less favourable.

1.6.2 Reliance on Information

SRK believes that its opinion must be considered as a whole and that selecting portions of the analysis or factors considered by it, without considering all factors and analysis together, could create a misleading view of the process underlying the opinions presented in the CPR. The preparation of a CPR is a complex process and does not lend itself to partial analysis or summary.

SRK's opinion in respect of the Mineral Resources and Ore Reserves declared and the LoMp is effective at 1 July 2019 and is based on information provided by the Company throughout the course of SRK's investigations, which in turn reflect various technical-economic conditions prevailing at the date of this report. Further, SRK has no obligation or undertaking to advise any person of any change in circumstances which comes to its attention after the date of this CPR or to review, revise or update the CPR or opinion.

1.6.3 Declaration

SRK will receive a fee for the preparation of this report in accordance with normal professional consulting practice. This fee is not contingent on the outcome of the CPR and SRK will receive no other benefit for the preparation of this report. SRK does not have any pecuniary or other interests that could reasonably be regarded as capable of affecting its ability to provide an unbiased opinion in relation to the Mineral Resources or Ore Reserve.

Neither SRK, the Competent Persons, nor any of the directors of SRK, have at the date of this report, nor have had within the previous two years, any shareholding or other interest in the Company. Consequently, SRK, the Competent Persons, and the directors of SRK consider themselves to be independent of the Company.

This CPR includes technical information, which requires subsequent calculations to derive subtotals, totals and weighted averages. Such calculations may involve a degree of rounding and consequently introduce an error. Where such errors occur, SRK does not consider them to be material.

1.6.4 Consent

Neither the whole nor any part of this report nor any reference thereto may be included in any other document without the prior written consent of SRK as to the form and context in which it appears.

1.6.5 Copyright

Copyright of all text and other matter in this document, including the manner of presentation, is the exclusive property of SRK. It is an offence to publish this document or any part of the document under a different cover, or to reproduce and/or use, without written consent, any technical procedure and/or technique contained in this document. The intellectual property reflected in the contents resides with SRK and shall not be used for any activity that does not involve SRK, without the written consent of SRK.

1.7 Qualifications of Consultants

The SRK Group comprises over 1,400 staff, offering expertise in a wide range of resource engineering disciplines with 45 offices located on six continents. The SRK Group prides itself on its independence and objectivity in providing clients with resources and advice to assist them in making crucial judgment decisions. For SRK this is assured by the fact that it holds no equity in client companies or mineral assets. SRK has a demonstrated track record in undertaking independent assessments of resources and reserves, project evaluations and audits, Mineral Experts' Reports, Competent Persons' Reports, Mineral Resource and Ore Reserve Compliance Audits, Independent Valuation Reports and independent feasibility evaluations to bankable standards on behalf of exploration and mining companies and financial institutions worldwide. SRK has also worked with a large number of major international mining companies and their projects, providing mining industry consultancy service inputs. SRK also has specific experience in commissions of this nature.

This CPR has been prepared based on a technical and economic review by a team of consultants sourced from the SRK Group's offices in the United Kingdom. These consultants are specialists in the fields of geology, resource and reserve estimation and classification, open-pit mining, mineral processing, tailings management, infrastructure, environmental management and mineral economics.

The individuals who have provided input to this CPR, and are listed in Table 1-3, have extensive experience in gemstones and the mining industry and are members in good standing of appropriate professional institutions.

Table 1-3: Team Members

Responsible Discipline	Consultant	Designation	Registration, Membership, Qualifications	Years' Experience
Project Director	Dr Iestyn Humphreys	Corporate	FIMMM AIME PhD	30
Project Review	Richard Oldcorn	Corporate	FGS CGeol MSc	30
Geology Mineral Resources	Dr Lucy Roberts	Principal	MAusIMM(CP) PhD	20
	James Haythornthwaite	Senior	FGS CGeol, MSc	10
	Martin Pittuck	Corporate	MIMMM CEng FGS CGeol MSc	30
Geotechnical Engineering	Neil Marshall	Corporate	MIMMM MBGA MISRM CEng MSc	40
Mining	Hanno Buys	Senior	MAusIMM(CP) MSc	20
	Francois Taljaard	Senior	SAIMM Pr,Eng BEng	20
Metallurgy	Dr John Willis	Principal	MAusIMM(CP) MAIME PhD	30
	Dr David Pattinson	Corporate	MIMMM CEng PhD	35
Tailings	Richard Martindale	Principal	MIMMM CEng FGS MSc	20
Infrastructure	Colin Chapman	Senior	FGS CGeol MIMMM MBGA MSc	20
Environmental	John Merry	Principal	MPhil	30
Social	Dr Cathryn MacCallum	Principal	FIMMM CEnv CSci PhD	30
	Insiya Salam	Consultant	MSc	10
Financial Model Ore Reserves	Sabine Anderson	Principal	MIMMM CEng MEng	25

The Competent Person with responsibility for the reporting of Mineral Resources is Dr Lucy Roberts, MAusIMM(CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. The CP with responsibility for the reporting of Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the IOM3, a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code

In order to prepare this CPR, the following site visits were undertaken:

Kagem:

- 5 to 15 June 2015: Lucy Roberts and James Haythornthwaite visited site to work on the geological model and to advise on data collection for Resource and Reserve estimation.
- 22 to 26 June 2015: Fraser McQueen, Neil Marshall, Rowena Smuts and John Willis visited site to review the mining, environmental and processing disciplines respectively. The aim of the visit was to collect project information and data, make a visual assessment and understand the current mining and processing operations for the purposes of providing guidance on environmental and social management for the mine.

- 19 to 24 August 2019: Lucy Roberts, Hanno Buys, and John Merry visited site to review the geology, mining, and environmental disciplines, respectively. A further site visit was conducted by Insiya Salam between 7 and 11 October 2019, to review the social aspects of the operation.

MRM:

- 18 to 24 August 2014: SRK visited site in order to advise on data collection for Resource and Reserve estimation.
- 20 to 27 March 2015: James Haythornthwaite visited site to work on the geological model.
- 30 March to 4 April 2015: SRK visited site to review the processing, environmental and infrastructure disciplines. The aim of the visit was to collect project information and data, make a visual assessment and understand the current mining and processing operations for the purposes of providing guidance on environmental and social management for the mine.
- September / October 2017: Hanno Buys, David Pattinson, Lucy Roberts and John Merry visited site for the 2018 CPR update.
- 7 to 12 October 2019: Cathryn MacCallum visited site to review the social aspects of the operation.

2 KAGEM EMERALD AND BERYL MINE, ZAMBIA

2.1 Geology

2.1.1 Introduction

This section details the geology of the Kagem deposit. This forms the basis of the declaration of Mineral Resources, which is further described in Section 2.2.

2.1.2 Regional Geology

The Kagem Mine is located in the Kafubu area of the Copperbelt Province of Zambia, at the centre of the transcontinental Pan-African belts in central-southern Africa, between the Kalahari Craton to the south and the Congo Craton to the north. The oldest units of the Kafubu area comprise Palaeoproterozoic granites, amphibolite ("AMP") gneisses and quartz-biotite schists of the Lufubu Basement Complex, exposed in structurally elevated basement domes. The contact between this basement sequence and the overlying Mesoproterozoic Muva Supergroup is defined by a distinct angular unconformity, marked by a regional ridge of basal quartzites. The Kagem Mine location is shown within the context of the regional geology of Zambia in Figure 2-1. A simplified geology sketch map of the Kafubu emerald area.is shown in Figure 2-2.

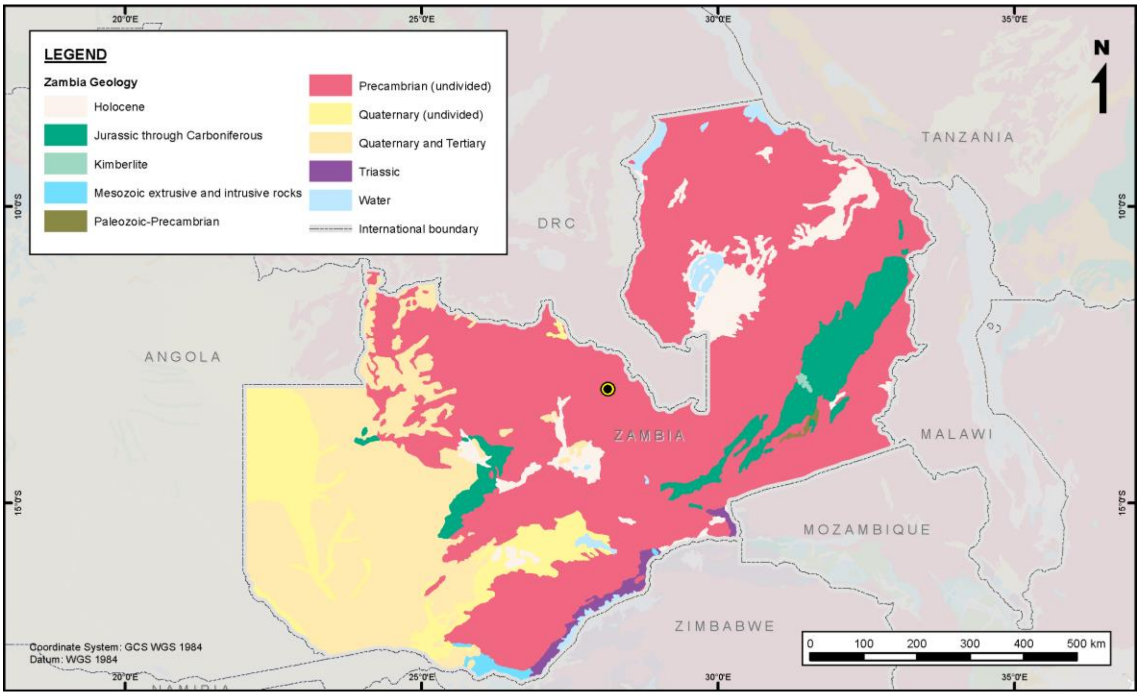


Figure 2-1: Kagem Project Location within the Context of the Regional Geology of Zambia

The Muva Supergroup comprises fine grained quartz-mica schists, medium-coarse grained sugary and friable metaquartzites, and sub-concordant bodies of amphibolitic and ultramafic schists derived from komatiitic sills. The ultramafics, which host the emerald and beryl deposits in the Kafubu area, vary in thickness from 20 m to 140 m and have been altered by metamorphism and hydrothermal activity to talc-chlorite-tremolite ± magnetite schist (locally referred to as TMS) or talc-biotite schist ("TBS"). The AMP have also suffered varying degrees of alteration to biotite–actinolite schists.

The youngest stratigraphic unit of the Kafubu area is the Neoproterozoic Katanga Supergroup, host to the stratiform copper-cobalt deposits of the Central Afrcian Copperbelt in Zambia and the DRC. The Katanga Supergroup consists of a 5 to 10 km thick sequence that, from bottom to top, is divided into siliclastic and dolomitic conglomerates, sandstones and shales of the Roan Group, carbonates and carbon-rich shales of the Nguba Group the youngest, uppermost Kundelungu Group including glacial metasediments and a cap carbonate. The contact between the Katanga Supergroup and the underlying Muva Supergroup appears to be conformable, although isolated areas of discordance suggest that the Muva was deformed prior to deposition of the Katanga units.

The units of the Kafubu area are affected by three main orogenic events: the Ubendian, Irumide and Lufilian (Pan-African) orogenies. The earliest of these, the Ubendian orogeny, dates at c. 1.8 Ba and thus only affects the rocks of the Palaeoproterozoic basement complex. Ubendian deformation is poorly preserved in the Lufubu Complex due to overprinting by later events. The Irumide orogeny occurred between 1.05 Ga and 1.00 Ga, affecting rocks of the basement complex and the Muva Supergroup. The Lufilian was part of the wider Pan-African orogeny, which involved crustal shortening between the Kalahari and Congo Cratons of up to 150 km between 590 and 512 Ma. This compression deformed the Katanga Supergroup into a fold and thrust belt, the Lufilian Arc. The Lufilian orogeny at c. 550 Ma is responsible for the present structural configuration of the Kafubu area and may be broadly described in terms of four deformation phases, which largely overprinted structures relating to earlier deformation events. Of these, the D_3 event, which resulted in extensive isoclinal-open folding, is interpreted to be responsible for axial planar faulting accompanied by pegmatite ("PEG") intrusions, which commonly cut the Kafubu stratigraphic sequence. Throughout the Kafubu area steeply dipping PEG dykes and quartz tourmaline veins typically trend north to south or northwest to southeast. These are accompanied by shallow dipping to flat lying PEG and quartz-tourmaline veins of variable strike.

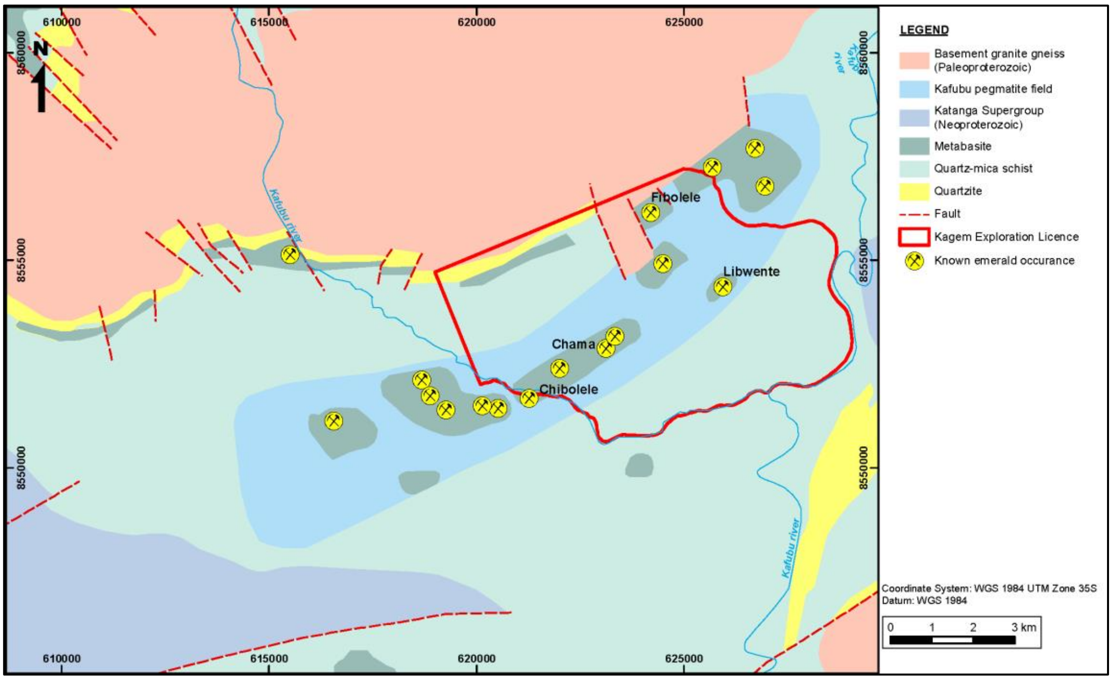


Figure 2-2: Kagem: A Simplified Geology Sketch Map of the Kafubu Emerald Area

2.1.3 Deposit Geology

Stratigraphy

The currently defined emerald and beryl deposits of Kagem are hosted by TMS of the Muva Supergroup. The stratigraphy of the main Chama deposit (from bottom to top) is defined by footwall mica schist, followed by talc-magnetite schist, AMP and quartz-mica schist of the Muva Supergroup and a thin top soil of approximately 3 m (Figure 2-5). The whole sequence is intruded by concordant and steeply dipping discordant quartz-feldspar PEG dykes and quartz-tourmaline veins.

The upper portion of the stratigraphic sequence is usually characterised by at least 200 m of hangingwall quartz-mica schist ("QMS"), dominated by quartz, with variable quantities of muscovite, biotite or phlogopite, albite and chlorite (Figure 2-3a). At Chama, this meta-sedimentary unit often defines a strain gradient from massive, low strain, quartz-rich QMS, to high strain, strongly foliated or sheared, biotite and chlorite rich QMS (Figure 2-3b) near the transitional footwall contact with the AMP unit below.

Representative examples of the following key lithologies are given in Figure 2-3:

a) hangingwall quartz-mica schist;

b) high strain, strongly sheared quartz-mica schist with quartz sigmoid structures, at the footwall of the quartz-mica schist unit adjacent to the AMP contact;

c) high strain AMP at the hangingwall of the AMP unit; and

d) massive AMP.

Figure 2-3: Kagem: Mica-schist and AMP Lithologies

The AMP horizon may be described in terms of two distinct units: a dark, hornblende-rich AMP with lesser actinolite, quartz, feldspar, biotite and tourmaline, or its' alteration equivalent green tremolite-actinolite schist with chlorite, biotite and tourmaline ± epidote and talc. At Chama, this AMP unit generally ranges in thickness from 0 to 30 m, but is most commonly in the range of 8 m to 15 m. Field and drill core observations suggest that the AMP is usually more banded and foliated than the relatively massive talc-magnetite schist. The highest degree of strain appears to be preferentially partitioned into the upper portion of the unit, which is often more intensely foliated and epidote-rich (Figure 2-3c). The contact between the AMP and the underlying talc-magnetite schist is transitional, over which interstitial quartz disappears, and talc and disseminated tourmaline become increasingly common (Figure 2-4a). Magnetite is also present in increasing quantities, but is very fine grained and its existence is only detectable by an increase in Cr content from AMP values of 200 ppm to 300 ppm to values in excess of 700 ppm in the talc-magnetite schist.

The TMS unit (Figure 2-4b) itself contains highly variable quantities of talc, tremolite, actinolite, biotite, magnetite and tourmaline; the latter may be disseminated in quartz veins or as tourmalinite bands. Magnetite occurs as very fine grained disseminations, usually not visible in hand samples, but identified through elemental analyses and magnetic susceptibility tests. Carbonate alteration of the TMS unit is relatively common, often manifest as pseudomorphs of mica agglomerates. At Chama, the TMS unit ranges from 0 to 60 m in thickness, with an average thickness of approximately 18 m. Current interpretations suggest that the TMS and overlying AMP unit were originally intruded into the Muva Supergroup as a single differentiated komatiite sill.

The basal contact of the TMS is relatively sharp, being underlain by a typically strongly foliated quartz-muscovite schist or quartz-sericite-biotite (phlogopite) schist. This felsic schist, is up to at least 120 m thick, and forms part of a wider group of gneisses, AMP, and kyanite-bearing schists in the wider mine area.

Characteristic examples of the following lithologies are given in Figure 2-4:

a) tourmaline rich AMP near the talc-magnetite schist contact;

b) talc-magnetite schist;

c) PEG with feldspar and muscovite; and

d) a quartz-tourmaline vein with massive tourmaline accumulations at the base.

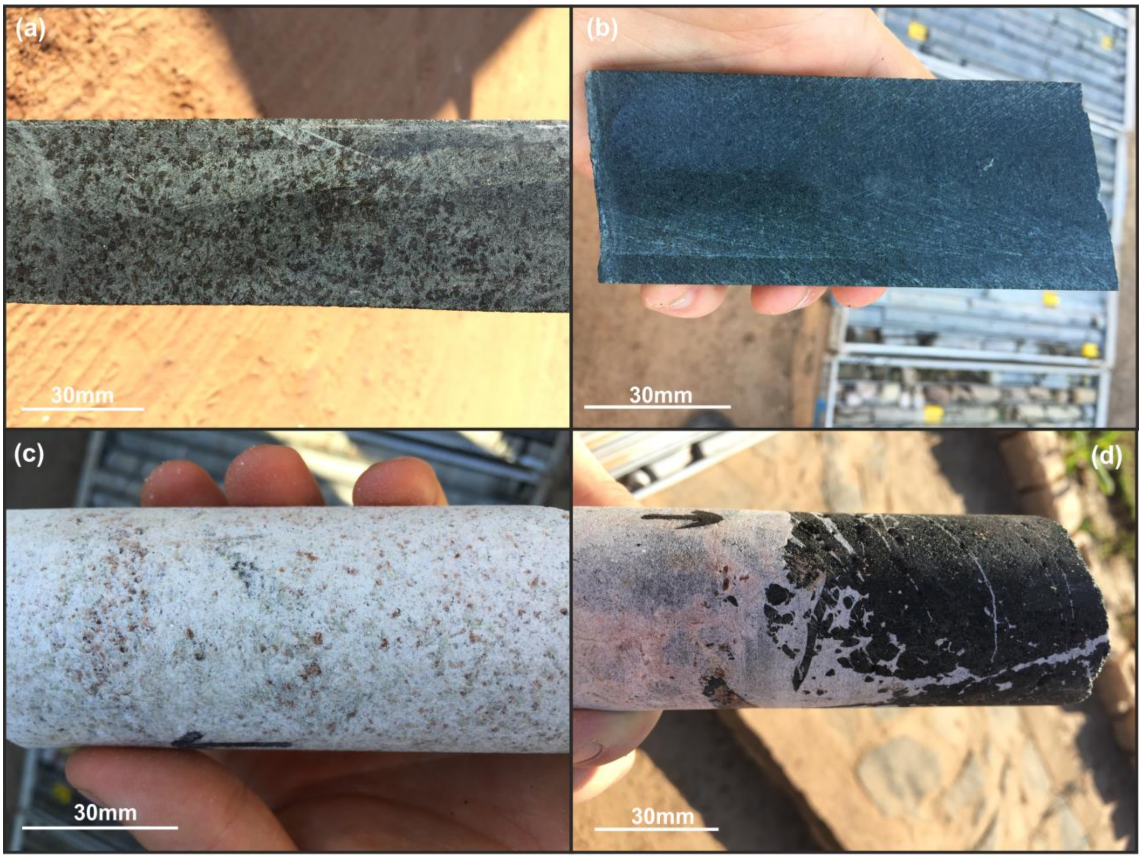


Figure 2-4: Kagem: AMP, TMS, PEG and Quartz-tourmaline Vein Lithologies

The entire stratigraphic sequence described above is intruded by a suite of PEG dykes (Figure 2-4c) and quartz-tourmaline veins (Figure 2-4d), both concordant to the host rock contacts, and as steeply dipping discordant bodies. The mineralogy of the PEG dykes is dominated by quartz and feldspar with lesser muscovite and minor garnet, tourmaline, and beryl. They are usually highly friable and kaolinised near surface. Quartz-tourmaline veins are characterised by increased tourmaline content and decreased feldspar input relative to the coarse grained, and usually wider, PEG dykes. Tourmaline crystals are often observed to radiate from the vein contacts inwards. Cross-cutting relationships between the PEG dykes and quartz-tourmaline veins imply multiple phases of intrusion, but it is broadly considered most likely that the two vein sets were intruded synchronously as part of the same broad intrusive event.

Although there are local differences in the average thickness of individual units, the stratigraphic sequences at both Fibolele and Libwente are largely similar to that described for Chama above. That said, some key distinctions exist, most notably at Fibolele, where the AMP horizon in the hangingwall of the TMS unit is absent.

Although the general stratigraphic sequence at Libwente is similar to that observed at Chama, the distribution of the ultramafic schists is more irregular, with at least two distinct TMS bands, and additional minor satellite bodies with AMP in the hangingwall, footwall or both. It is considered that this is most likely a function of multiple phases of magma emplacement and differentiation in the mafic sill protolith, coupled with localised shearing in the area of the Libwente deposit.

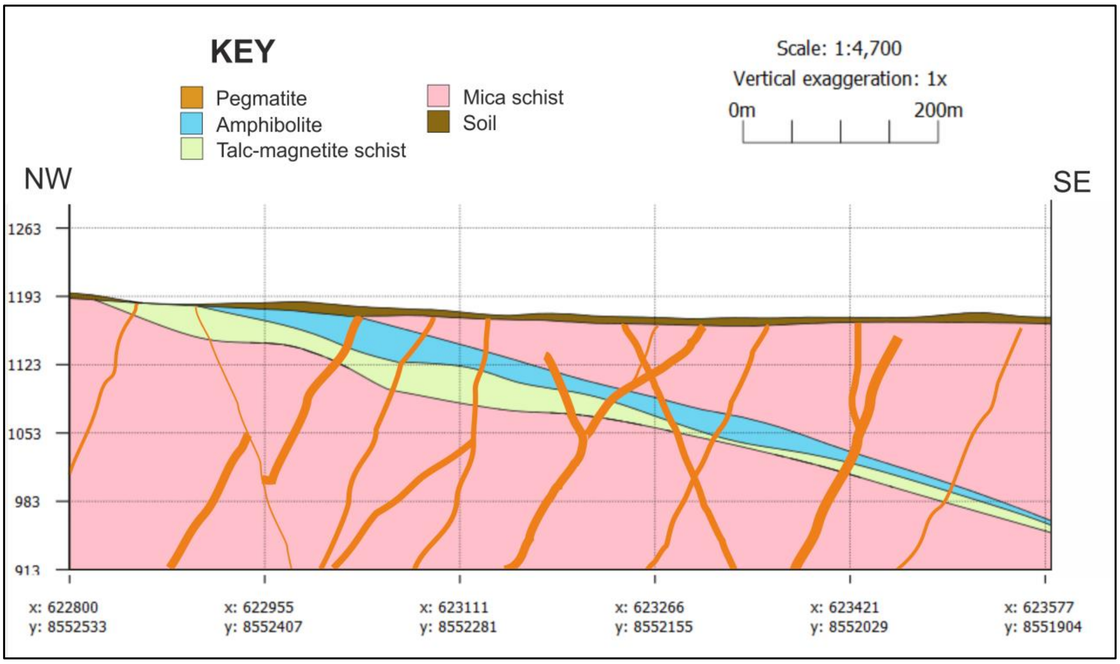


Figure 2-5: Kagem: Schematic Northwest to Southeast Cross Section through the Chama Deposit Displaying the Mica-schist, AMP, TMS Stratigraphy, and Intruding PEG

Structure

The most historically significant and productive TMS belt of the NRERA in central Zambia, is the Pirala Fwaya-Fwaya Belt, which extends roughly 8 km ENE and includes both the Chama and Libwente deposits, in addition to Gemfields' Chibolele deposit. This belt forms part of a semi-regional scale tight-isoclinal fold system which trends east-northeast and is locally offset by a series of predominantly north-northwest striking structures. Interpretation of airborne magnetic survey imagery suggests that the Pirala Fwaya-Fwaya Belt, host to Libwente and Chama, defines a single limb in the south of this fold system, with Fibolele to the north.

At the deposit-scale, the dip and strike of the TMS unit and associated stratigraphy is relatively variable. At Chama, the TMS horizon strikes at roughly 60°, dipping shallowly (10 to 25°) to the south-southeast, and rotating to a more north-easterly strike towards the northeast. Libwente trends broadly east-northeast, dipping very shallowly (<10°) towards the south-southeast in the southeast of the deposit area and to the north-northwest in the northwest of the deposit. The Fibolele stratigraphy is characterised by a broadly north-northeast trend, which rotates to an east-northeast strike towards the north-north-eastern part of the deposit. The dip of the TMS unit at Fibolele is steeper than that described at Chama and Libwente, typically being in the order of 20 to 35° towards the southeast, but can be up to 60° locally. Drilling to date suggests that the dip of the TMS at Fibolele becomes shallower with depth. The TMS is deformed by north to north-northwest trending late folding in the area of the current bulk sampling operation.

The suite of PEG dykes and quartz-tourmaline veins that intrude the stratigraphic succession throughout the Kagem deposits occupy a range of trends, both concordant and discordant to the local stratigraphy. At Chama, the majority of discordant dykes have a N-S to NNW-SSE strike and the dips vary between 50° and 70° towards the E-NE. The discordant dykes and veins at Libwente and Fibolele occupy the same trend set, striking north-northwest, but with a steeper, typically sub-vertical dip. A second, less abundant set of east-west trending, sub-vertically dipping PEG dykes is evident throughout the Kagem licence. In addition, low to moderately dipping PEG dykes are also evident throughout the Kagem Mine area. The PEG dykes and associated quartz-tourmaline veins, which date to around 500 Ma, are parallel to locally developed axial planar cleavage relating to late stage north-south trending folds, such as those observed at Fibolele, and pervasive north to north-northwest trending structures which locally offset the TMS unit.

In addition to the north to north-northwest trending structures which appear to offset the TMS unit at the deposit-scale, it is thought that the stratigraphy may be locally offset by a series of layer sub-parallel post-mineralisation southwest to west-southwest trending shears. This is most evident at Libwente, where there is significant discontinuity in the local stratigraphy, often over relatively short lateral distances.

A review of the drillhole logging conducted by SRK whilst on site in June 2015, suggests that some of the drillhole intersections originally logged as quartz-mica schist may be more accurately described as a highly sheared or mylonitised rock with significant silica influx and overprint. A visual assessment of the spatial distribution of the Libwente QMS intersections highlighted more than one group of QMS intervals that do not conform to the typical stratigraphic sequence and can be connected along a planar southwest or west-southwest trend. It is loosely hypothesized that these planar QMS trends may in fact represent silica-rich shear zones, which locally offset the TMS unit. This is supported by apparent lateral offsets of the TMS unit, which coincide with the planar "QMS" interval trends, in addition to west-southwest trending discrete, though often cryptic, lineaments in the airborne magnetic signature in the Libwente area.

At present, there is insufficient understanding of these structures to incorporate the modelled shear surfaces as explicit domain boundaries in the resource modelling process. SRK strongly recommends that Gemfields commissions a structural review of the Libwente deposit to better understand the local discontinuities in the Libwente stratigraphy and the structural controls on the TMS geometry in this area.

2.1.4 Mineralisation

Emerald and beryl mineralisation in the Kafubu area, including the Kagem deposits, belongs to a group referred to as 'schist-hosted emeralds', in which emeralds occur predominantly in phlogopite or other types of schists. The origin of schist-hosted emerald and beryl deposits is controversial, but is known to require specific geological conditions in which beryllium bearing fluids interact with chromium bearing host rocks. The most established model for emerald and beryl mineralisation in the Kafubu area involves the interaction of Be-bearing fluids relating to pegmatoid dykes or granitic rocks, with Cr-rich mafic and ultramafic schists or un-metamorphosed ultramafic rocks. Other models for schist-hosted emerald and beryl mineralisation propose syn- to post-tectonic growth of beryl in metasomatised ultramafic rock adjacent to Be-bearing PEG during regional metamorphism.

At Kagem, emerald and beryl mineralisation is hosted by an ultramafic talc-magnetite schist unit, which has an elevated average chromium content of approximately 2,120 ppm. Three main styles of mineralisation are recognised within the TMS unit:

- discordant RZ material adjacent to the PEG and quartz-tourmaline vein contacts;
- concordant RZ material concentrated along the footwall and occasionally the hangingwall contacts of the TMS unit (Figure 2-6d); and
- discordant RZ hosted by brittle structures within the TMS unit distal to the PEG and quartz-tourmaline veins.

Typical examples of RZ material, both in drill core and in the open pit environment are given in Figure 2-6, as follows:

a) tourmaline-rich RZ in drill core;

b) mineralised RZ material in drill core;

c) a loose boulder in the Chama Pit containing a quartz-tourmaline vein with RZ material at both the footwall and hangingwall contacts; and

d) concordant footwall RZ in the Chama Pit.

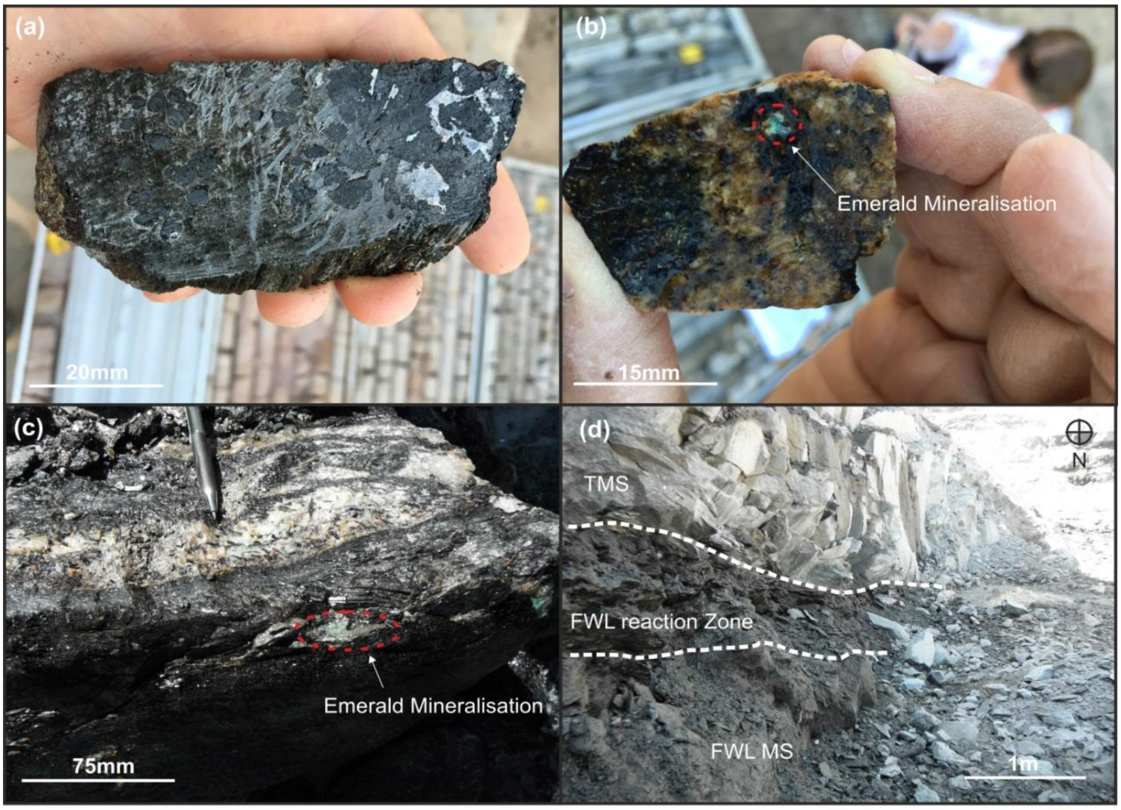


Figure 2-6: Kagem: Reaction Zone Material

Both the concordant and discordant RZ are laterally discontinuous and vary in thickness from a few centimetres to more than 2 m. All three styles of RZ are mineralogically similar, being composed of phlogopite-biotite-tourmaline aggregates (Figure 2-6a), which are highly soft and friable, providing a protective buffer ideal for the preservation of beryl and emerald crystals. The RZ typically contain beryl mineralisation, of which a variable fraction may be emerald, depending on the chemistry of the TMS. Chemical analyses of phlogopite-rich RZs from emerald and beryl deposits throughout the Kafubu area, indicate that the transformation of ultramafic units into phlogopite schist involves a major influx of K, Al, F, Li and Rb, localised enrichment of Be, dilution of Cr and Ni, and removal of Ca and Si.

Within the context of the proposed models for schist-hosted emerald and beryl mineralisation within the wider Kafubu area, emerald formation at Kagem is considered to be the result of the interaction of a Be-rich fluid relating to the PEG dykes and quartz-tourmaline veins, with the TMS unit to form the discordant and concordant RZ adjacent to the PEG and quartz-tourmaline vein contacts. This fluid also utilised fluid pathways along the TMS footwall and hangingwall contacts and internal brittle structures to form the footwall concordant RZ where there is no footwall PEG, and discordant RZ hosted by brittle structures inside the TMS unit.

Where concordant and discordant RZ intersect, tri-junctions are formed, which typically produce wider zones of RZ material, with improved quality and quantity of emerald and beryl mineralisation.

Emeralds are a member of the beryl group of minerals which have the chemical formula $Be_3Al_2(SiO_3)_6$ and which show a strong prismatic habit and an imperfect (0001) cleavage perpendicular to the long axis of the crystal (basal pinacoid). They have a hardness of 7.5 to 8.0 and a specific gravity of 2.65 to 2.80. Emerald is the deep green translucent variety of beryl and results from the substitution of Cr, ferrous iron, and in some cases, traces of V, for Al in the crystal lattice.

Kafubu area beryls are typically white to yellowish to bluish white (Figure 2-7), while the emeralds have a moderate to strong green colouration (Figure 2-7) due to low to moderate levels of Cr_2O_3 in the range 0.11 wt% to 0.77 wt%. Typical compositional ranges reported by for beryl and emerald, are listed in Table 2-1. The Kafubu emeralds are characterised by a wide range of trace element contents, typically with moderate levels of Mg and Na, and a moderate to high Fe content. The gemstones have enriched trace element levels, most notably of Cs and Li, but also of K, Rb, Ti, Sc, Mn, Ni, and Zn. Vanadium content is low.

Table 2-1: Kagem: Key Element Composition Ranges for the Kafubu Emeralds

Oxide	Compositional Range	
	From (%)	To (%)
SiO_2	64.05	66.23
Cr_2O_3	0.11	0.77
Al_2O_3	13.96	15.37
FeO	0.76	1.88
MgO	1.55	2.64
Na_2O	1.72	2.22
BeO	13.36	13.83

The Kafubu emeralds have relatively high specific gravity (2.69 – 2.77) and refractive index values, especially relatively to emeralds from Colombia. Beryl and emerald mineralisation in the Kafubu area typically forms as subhedral to euhedral hexagonal crystals that often grow in aggregates of multiple gemstones. Step-growth crystal surfaces are common. Individual crystals can vary in size from <1 mm to >10 cm in diameter. The Kafubu beryl and emeralds are variably included, most commonly containing multiphase liquid and gas inclusions mostly of rectangular shape, or less commonly with an irregular outline. Solid inclusions are relatively common; most typically comprising platy, subhedral to euhderal phlogopite, as well as rod-like actinolite or tremolite, pyrolusite, tourmaline, chlorite, feldspar, fluoropatite, magnetite, hematite, rutile, and quartz amongst others.

In addition to the phlogopite schist (RZ) mineralisation, the PEG dykes, and particularly the quartz-tourmaline veins at Kagem also contain variable quantities of beryl and emeralds (Figure 2-7d). The emeralds found within the quartz-tourmaline veins typically exhibit a bluish colour and strong habit, and are usually more transparent than the phlogopite schist emeralds. The phlogopite schist emeralds are also typically more included than those in the quartz-tourmaline veins. Despite this, the emeralds contained within the phlogopite schist are, on average, considered to be of a higher quality than those found within the quartz-tourmaline veins. This is primarily because of the greener colour of the phlogopite schist emeralds. The blue colour and increased transparency of the quartz-tourmaline emeralds is attributed to increased Fe content in the beryl crystal lattice.

Images of emerald and beryl mineralisation at the Kagem Mine are displayed in Figure 2-7, as follows:

a) stones recovered from RZ material at the Chama Pit, increasing in quality from low quality beryl on the left, to high quality emerald on the right;

b) a high quality premium emerald;

c) high quality green-ish (left) and blue-ish (right) emeralds; and

d) beryl mineralisation in a quartz-tourmaline vein.

Figure 2-7: KAgem: Emerald and Beryl Mineralisation

2.1.5 Data Quantity and Quality

Exploration

The main exploration methods being employed at the Kagem Mine include diamond drilling, and bulk sampling from trial pits, most of which has been undertaken since 1998. This key data is supplemented by geological mapping of the main operating open pit at Chama and the trial mining pits at Fibolele and Libwente, in addition to some airborne geophysical survey maps.

Diamond drilling is primarily aimed at determining the nature and geometry of the talc-magnetite schist units and PEG dykes / quartz-tourmaline veins at Chama, Fibolele and Libwente. Additional diamond drilling within the Kagem Mine area has been focussed on identifying and defining additional exploration targets outside of the main deposit areas. The main exploration tool used to determine emerald grade and quality is through current open-pit mining operations at Chama, and trial mining at Fibolele and Libwente. The grade of each deposit is determined through recovered emerald quantity and quality data obtained from the sort house. The approximate exploration expenditure completed to date is given in Table 2-2. Since June 2018, no significant exploration has been completed.

Table 2-2: Kagem: Approximate Exploration Expenditure to June 2018

Item	Cost (USD)
Drilling (Diamond)	2,436,220
Geophysics Surveys (Airborne and Ground Based)	7,151
Core Photography	1,000
Handheld XRF/ LIBS and other core analysis (as applicable)	62,265
Consultancy (e.g. thin sections, geophysics, optical sorting etc)	232,000
Total	**2,738,636**

SRK has not been supplied with any specific planned exploration programmes for the three deposits which form the focus of the Kagem Mine. Any further drilling is likely to be operational in nature, and provided for in the sustaining capital provision, and / or operating costs. Furthermore, SRK has not been supplied with any anticipated greenfield exploration programmes which fall outside the confines of the Kagem Mine.

Topography

The highest resolution pre-mining topographic data available for the Kagem Mine area is regional airborne barometric sensing data, at a resolution of 10mX by 10mY. To ensure consistency between the topographic survey and the resource model presented in this report, this surface was projected onto the drillhole collar points, which were surveyed using either total station or differential GPS, and are known to have more accurate elevation values than the topographic survey points. This was achieved through an intelligent interpolation process in ARANZ Leapfrog software, resulting in a topographic surface which honours the more accurate elevation of the collar survey points, whilst retaining the geometry of the original topographic survey between drillholes. Figure 2-8 shows an oblique view (31° towards 342°) of the adjusted pre-mining Kagem topography surface, snapped to collar points (displayed in black) and coloured by elevation (displayed at three times vertical exaggeration).

Geophysical Surveys

Semi-regional airborne geophysical data was captured by New Resolution Geophysics ("NRG") across much of the NRERA area in 2006. Gemfields re-commissioned NRG to conduct more detailed geophysical data capture within the Kagem licence area in 2008. The licence-scale survey was conducted on a section spacing of 40 m, with point spacing on-section at 1 to 2 m. The licence-scale data was interpreted by Vishnu Geophysics to produce a series of geophysical survey maps, including: total magnetic intensity ("TMI"), TMI analytic signal ("TMI AS"), TMI first and second derivatives, apparent susceptibility, calculated digital terrain model, potassium, thorium and uranium amongst others. The 2006 semi-regional geophysical data was interpreted by NRG, Vishnu Geophysics and Tect Geological Consulting to produce TMI, TMI AS, TMI derivatives, Euler 3D and geological interpretation maps.

Ground geophysical data was collected in-house by Gemfields geologists during the first two quarters of 2015, at a 20 m section spacing and 1 m point spacing on section, in targeted areas of the Kagem licence. Vishnu Geophysics was contracted to complete interpretation of the ground geophysics data, which is on-going at the time of writing.

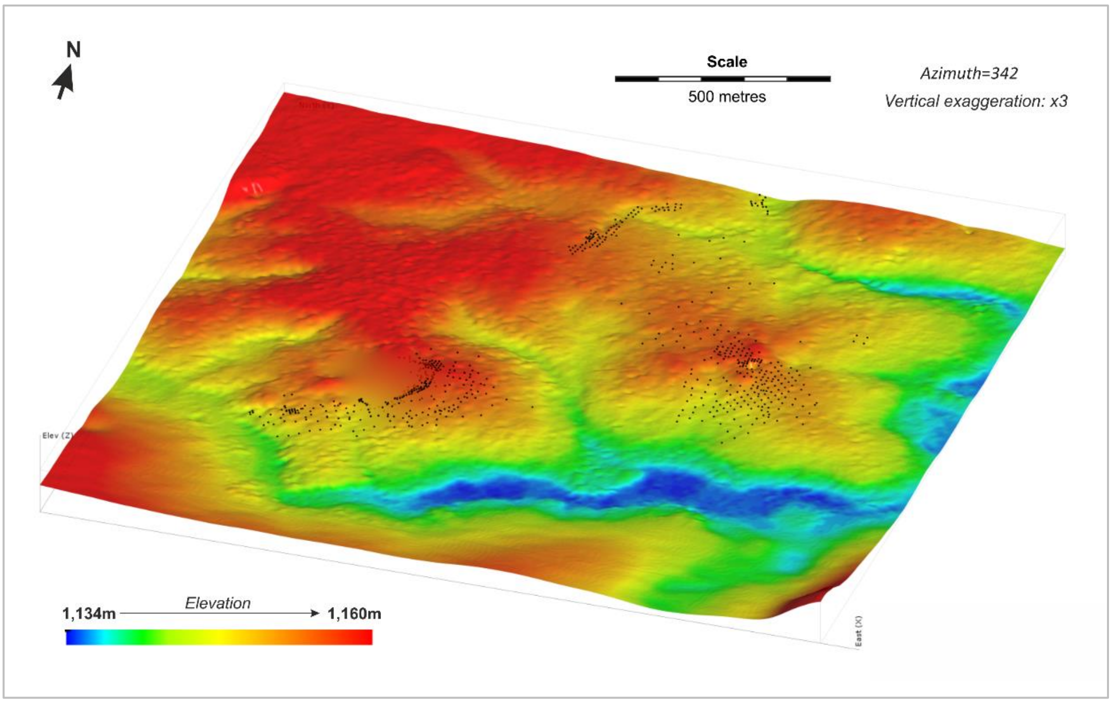


Figure 2-8: Kagem: Adjusted Pre-Mining Topography Surface

2.1.6 Drilling

Summary of Drilling Completed to Date

For the purposes of this study, Gemfields has supplied SRK with a drillhole database for the Chama, Fibolele, and Libwente deposits. Other exploration prospects within the Kagem Mine licence area have not been reviewed by SRK and are specifically excluded from this mandate.

Drilling to date across the three deposit areas in question, (Chama, Fibolele, and Libwente) comprises a total of 707 drillholes for a total meterage of 67,457.60 m. This includes 348 holes for 35,771 m at Chama, 117 holes for 9,875 m at Fibolele, and 242 holes for 21,810 m at Libwente. All drillholes are diamond core holes.

Figure 2-9 shows the pre- and post-2008 Chama collars overlain on the most recent detailed Kagem satellite imagery. Drilling at Chama is on a variably spaced grid broadly defined by close spaced drilling of approximately 25 x 25 m in a northeast trending arc around the surface expression of the TMS unit, with drill spacing decreasing down-dip. Drill spacing down-dip is highly variable but can be loosely described in terms of a 100 x 200 m grid, decreasing to approximately 50 x 50 m in places. The majority of holes at the Chama deposit have been drilled perpendicular to the TMS unit, at an average dip of 70° to the northwest and west. A small number of holes have been drilled to assess the distribution and continuity of PEG veining at the Chama deposit. These holes have been drilled at approximately 55° towards the west-southwest on a rough 200 x 200 m grid.

Figure 2-10 shows the Fibolele collars overlain on the most recent detailed Kagem satellite imagery. Fibolele is drilled on 50 m sections (Figure 2-10), with an on-section collar spacing of 50 m. Most sections comprise two or three holes. Infill drilling has been completed in a small area in the south of the deposit on a 25 x 25 m grid. The majority of holes are drilled perpendicular to the TMS unit dipping at an average dip of 70° towards the west and west-northwest, rotating to a north-northwest azimuth in the north, to reflect the change in strike of the target TMS. A total of 15 additional holes have been completed to date targeting the TMS in an area approximately 600 m northeast of the main Fibolele deposit, locally known as Sandwana. Some 20 vertically dipping exploration holes have also been completed on a relatively sporadic grid in the area between Fibolele and Libwente.

Figure 2-11 shows the Libwente collars overlain on the most recent detailed Kagem satellite imagery. Drilling at Libwente has been completed on a variable grid of 100 x 100 m, 100 x 50 m, or 50 x 50 m, decreasing to 25 x 25 m in places. Collar spacing decreases to roughly 200 x 100 m in the north-western part of the deposit. Almost all of the Libwente holes are drilled vertically to target the shallow dipping TMS unit.

All diamond drilling carried out after January 2011 has been completed in-house by two Gemfields owned Longyear LF 1000 D rigs. Most holes start at HQ core diameter, switching to NQ diameter core once into competent rock. The majority of holes extend approximately 20 m beyond the TMS unit into footwall mica schist before being terminated.

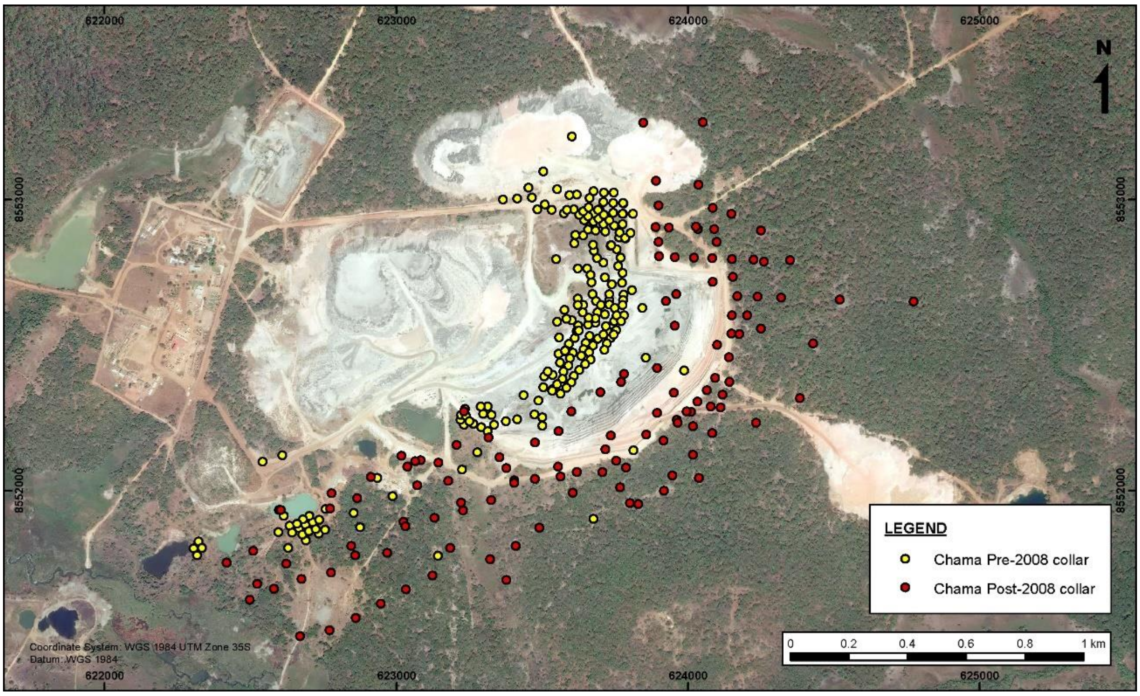


Figure 2-9: Kagem: Chama Collar Locations

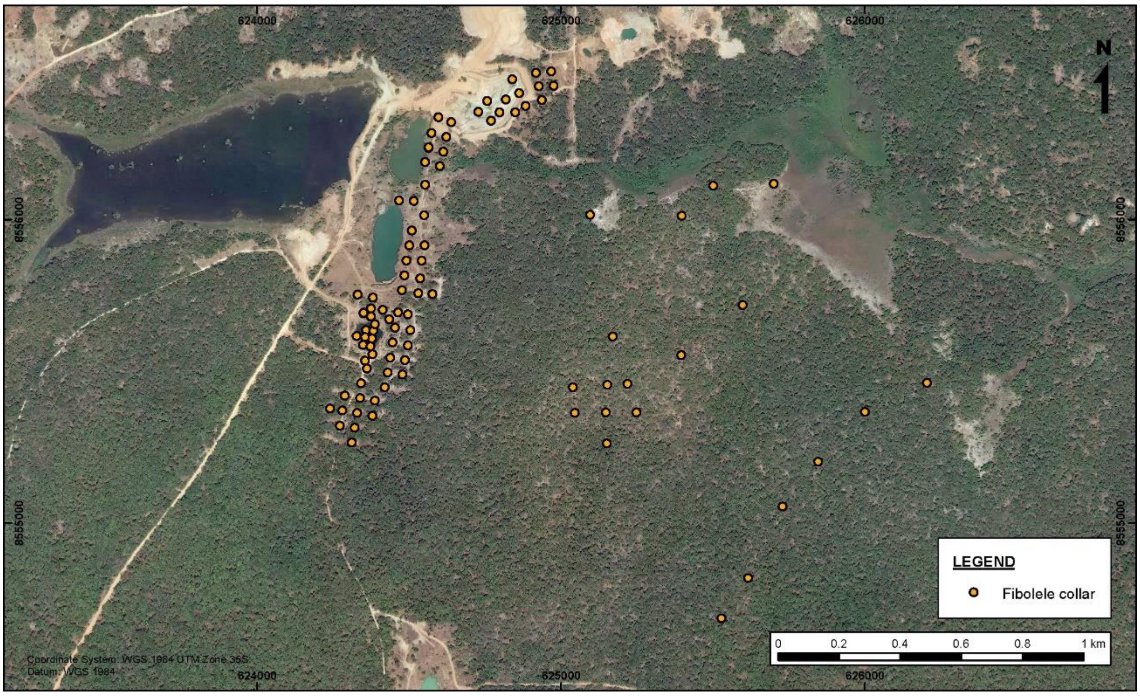


Figure 2-10: Kagem: Fibolele Collar Locations

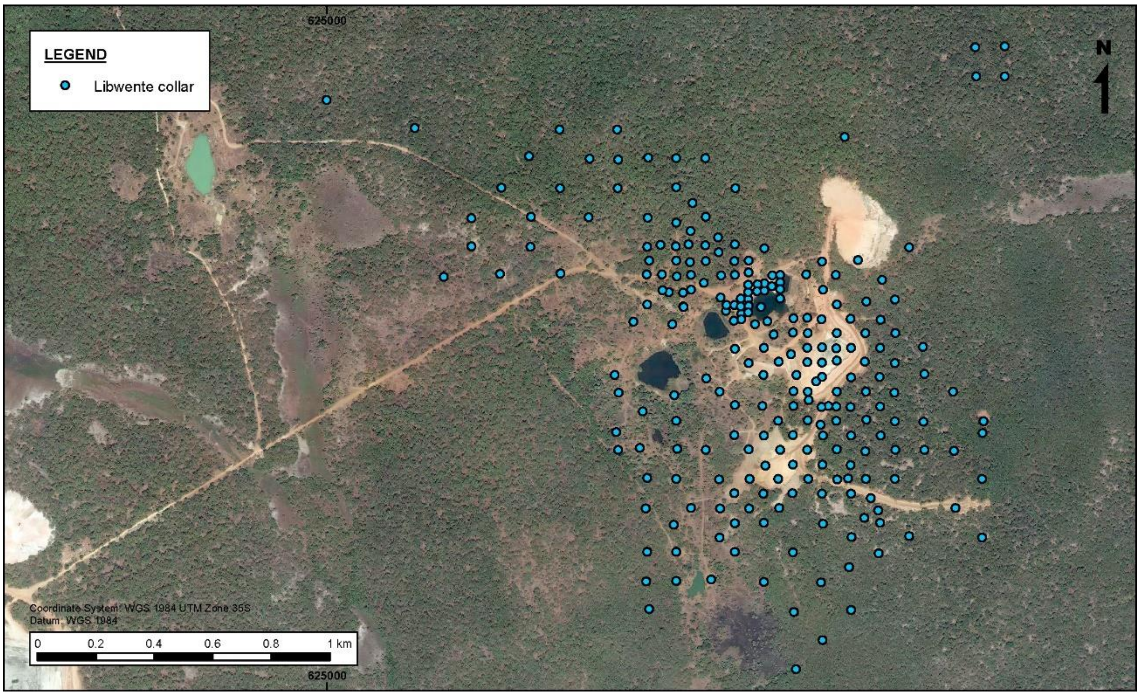


Figure 2-11: Kagem: Libwente Collar Locations

Collar Surveys

The majority of diamond drillhole collars throughout the Kagem Mine licence were surveyed using total station theodolite. The remaining, most recent, collars have been surveyed using differential GPS.

Downhole Surveys and Core Orientation

Downhole survey data exists for a total of 246 holes throughout the Kagem Mine licence, which represents roughly 35% of the total number of holes drilled. On a deposit basis, the percentage of holes for which downhole surveying has been completed is equal to approximately 33% at Chama, 70% at Fibolele, and 20% at Libwente. The holes are surveyed using a REFLEX EZ-Com 2.0.0 tool, at average downhole intervals of approximately 12 m at Chama, Fibolele, and Libwente. None of the holes has been structurally oriented.

Logging and Sampling Procedures

Gemfields has put in place a logical logging and data capture procedure for diamond drilling, to guide the on-site staff through the technical process. This aims to ensure a consistent methodology for the process of capturing data throughout the drilling campaign to allow for subsequent meaningful analysis. All logging is carried out by Gemfields geologists, and SRK considers the methodologies in place to be consistent with normal industry practice for this commodity type. SRK has made a number of recommendations to Gemfields to improve the logging process going forward, in order to ensure that the most relevant data is captured in a consistent and user-friendly format.

The current procedures for core handling, transportation, logging and sampling are:

1. Once removed from the ground, the core is placed into metal core boxes, and length tags inserted at the end of each run. The depth of each run is also marked on the inside of the core box at the position at which the tag is inserted in case any length tags are lost during transportation of the core to the core drill core yard. It is the drillers responsibility to ensure that core in the boxes is in the correct order.
2. After drilling, the core boxes are picked up from the drill site by drilling personnel and taken directly to the drill core storage facilities at camp. The core boxes are stacked and clamped before loading to minimise any disturbance and breakage caused during transportation.
3. Upon receipt at the drill core yard, the core boxes are checked to ensure that the depth tags are still in place, and then stacked as per the index catalogue in the core yard.
4. Prior to logging, the core boxes are laid out on logging tables and checked to ensure that the core is continuous and in the right order in each box. The core boxes are then cleaned to remove any extraneous contaminants such as drill mud or grease.
5. Basic geotechnical data including recovery and rock quality designation ("RQD") is recorded by a geologist. RQD is defined as the core recovery percentage, only incorporating pieces of solid core >10 cm in length measured along the centre line of the core.
6. After recording core recovery, the core boxes and lids are clearly labelled with "from" and "to" depths.
7. Geological data is recorded in a detailed log spread sheet designed to capture key geological information for each interval. This includes rock type, grain size, texture, degree of weathering, colour, intrusive features (such as veining) and major, minor and accessory minerals. A 5 cm minimum logging width applies to ensure that the RZ material, which has an average downhole interval length of approximately 1 m, and is often at the <10 cm scale, is appropriately accounted for in the drillhole database.

8. Handheld Niton XRF analysis is completed from 3 m above the hangingwall of the logged TMS unit to 3 m below the footwall of the TMS. A Niton reading is typically taken every 0.33 m, or at 1 m intervals in places.
9. After geological logging and Niton XRF analysis has been completed, sample positions are marked to conform with changes in lithology / alteration. Sample numbers corresponding to pre-printed sample tags are written on the inside of the core boxes. Sampling is undertaken for the TMS unit, in addition to the immediate hangingwall and footwall formations, and the standard sample length is 1 m.
10. The core axis is marked by red pencil down the centre of the core, and the boxes containing core to be sampled are moved to the cutting area.
11. The core is cut using 'Corster' diamond saw blade cutters.
12. Half core from one side of the cut line is placed into plastic sample bags for each interval. The sample bags are labelled with sample numbers on the outside and sample tags inserted inside. The boxes from which samples have been taken are then marked with red paint marker as "SAMP".
13. Standards are weighed and inserted every 10^{th} sample. Gemfields hold samples for PEG, TMS, mica schist, and AMP, generated from Kagem drill core.
14. The sample bags are closed and secured and then places into large sacks. The sacks are labelled with the sample range and company name, and a laboratory instruction sheet included for each batch.
15. The drill core boxes are returned to the core storage facility at the core yard, and re-stacked as per the core yard index catalogue.

Sample Preparation and Analyses

It is not possible to obtain an accurate emerald carat per tonne assay values from HQ or NQ size core samples. Gemfields has instead conducted geochemical assaying of the drill core, for a suite of elements, which can be used to assist in interpreting the geometry of the TMS unit and RZ host to the emerald and beryl mineralisation. The bulk of geochemical assay data for the Kagem Mine is supplied by handheld Niton XRF analysis, with laboratory assays employed as a validation of the Niton data in selected drillholes. Gemfields has supplied assay data for a total of 715 samples across 72 drillholes.

Samples are sent for crushing, pulverisation, and analysis to either the Alfred H Knight laboratory in Kitwe, Zambia ("AHK"), Shiva Analyticals in Bangalore, India ("Shiva"), or the SGS laboratory in Kalalushi, Zambia ("SGS"). The certification for each laboratory, as at the time of the assaying being completed was as follows:

- The AHK commercial laboratory and sample preparation facility is ISO/IEC 17025:2005* and ISO 9001:2008 compliant. It is a "UKAS" accredited testing laboratory.
- The Shiva laboratory has been assessed and accredited with standard ISO/IEC 17025:2005. The accreditation certificate is awarded by National Accreditation Board for Testing and calibration Laboratories ("NABL"), which is an autonomous body under the Department of Science and Technology, for the Government of India.

The SGS geochemical laboratory is accredited to the ISO/IEC 17025 standard. The accreditation program is monitored by the South African Development Community Accreditation Service ("SADCAS").

For each drillhole sample batch, Quality Assurance and Quality control ("QAQC") samples in the form of an internal blank and internal duplicate are added to monitor analytical precision and potential contamination. The internal blanks were obtained from quartz samples from the Chama Pit that have been crushed, pulped and thoroughly homogenized at the AHK laboratory. External blanks, duplicates, and standards are also inserted at SGS.

The Company's exploration manager is charged with the responsibility of ensuring that all quality control procedures are followed and the results regularly reviewed.

Data Received

SRK was provided with the following list of documents and files to assist with the Mineral Resource Estimate:

- drillhole data:
  - diamond drillhole data for 707 holes including collar and survey files and detailed geological and basic geotechnical logging data;
  - handheld Niton XRF analysis for a suite of 12 elements for 136 holes at Chama and Libwente, and single element (Cr) Niton analysis for 42 holes at Fibolele; and
  - laboratory assay data for a total of 715 samples from the selected sampled holes at Chama, Fibolele and Libwente, in Excel format;
- in situ and drill core density testwork results;
- monthly pit survey wireframes up to May 2015 for the Chama, Fibolele and Libwente deposits in Surpac format;
- detailed monthly (when available) open-pit geology maps for the Chama, Fibolele, Libwente, Ishuko and Sandwana pits in both JPG image format and ArcGIS format;
- detailed production data for the Chama, Fibolele, and Libwente operations, including mined tonnes by rock type, RZ tonnes, stripping ratio and run of mine ("RoM") from both the Mine and the plant, all on a month-by-month basis;
- underground working survey strings in Surpac string format;
- detailed underground geological mapping sections and plans in both JPG image format and Surpac string format;
- semi-regional magnetic and radiometric geophysics interpretation maps;
- licence scale airborne geophysical survey maps including TMI, TMI AS, TMI first and second derivatives and apparent susceptibility and radiometric interpretation maps for potassium, thorium and uranium;
- ground geophysics magnetic and radiometric data interpretation maps for the Ishuko pit area;
- airborne licence-wide 10 x 10 m topography survey data in point format;
- high resolution geo-referenced satellite imagery for the Kagem licence area;

- exploration plan maps including surface geology interpretations for the Chama, Fibolele, and Libwente deposits;
- Kagem Mine licence boundary string (in .dxf format) and associated documentation;
- core photographs for a total of 58 holes throughout the Chama (16 holes), Fibolele (33 holes), and Libwente (9 holes) deposits; and
- in-house Surpac wireframes for the Chama TMS unit.

Quality Assurance and Quality Control - Assays

The bulk of geochemical assay data for the Kagem Mine is supplied by handheld Niton XRF analysis, with laboratory assays employed as a validation of the Niton data in selected drillholes. Gemfields has provided SRK with laboratory assay data for a total of 715 samples from the selected sampled holes at Chama, Fibolele, and Libwente. This includes assay data produced by AHK, Shiva, and SGS. The majority of downhole assay data provided incorporates the TMS unit and a few metres of the footwall and hangingwall waste rock. The laboratories used for analysis are as follows:

- AHK: Alfred H Knight, Kitwe, Zambia;
- Shiva: Shiva Analyticals (India) Private Ltd, Bangalore, India; and
- SGS: SGS Inspection Services, Kalulushi, Zambia.

The Shiva laboratory data includes analysis for a suite of 59 elements for a total of 83 samples from 9 drillholes, including three holes each at Chama, Fibolele, and Libwente. The AHK database includes a total of 160 samples analysed for Cr and V, from a total of 7 drillholes, all at Chama. The SGS dataset is the most comprehensive, including data for 472 samples analysed for a suite of 36 elements across 56 holes, including 15 holes at Chama, 15 holes at Fibolele, and 26 holes at Libwente. The SGS data set also incorporates a total of 39 QAQC samples, including internal blanks, internal duplicates, external blanks, external standards and external duplicates, as documented in Table 2-3.

Table 2-3: Kagem: SGS QAQC Laboratory Assays by QAQC Type and Deposit

QAQC type	*Number of Analyses*		
	Chama	**Fibolele**	**Libwente**
Internal Blank	6	5	11
Internal Duplicate	6	4	10
External Blank	7	6	26
External Standard	13	12	48
External Duplicate	7	6	25

Laboratory assay data has not been used as an explicit control in the resource modelling. SRK considers that it is not necessary to complete a detailed analysis of the laboratory assay QAQC data provided. SRK considers that that the frequency of QAQC sample insertion was appropriate for the QAQC checks at the time of drilling, and the level of resource classification in this report; however, it is noted that the supplied data is relatively limited. Based on QAQC analysis, SRK is satisfied that the quality control procedures indicate no overall bias in the sample preparation and analytical procedure.

In general, SRK considers that the results of the limited number of QAQC analysis display a reasonably good correlation to the original assays and are acceptable. That being said, it is recommended that more stringent compilation and records of QAQC procedures are kept in the future for historical review of data. It is considered possible that with a more comprehensive QAQC program, and assay database size in general, the assay data could be incorporated as an additional control in the resource modelling process, helping to improve overall resource confidence.

QAQC Niton

Gemfields has provided SRK with handheld Niton XRF data for a total of 7,088 samples from 178 holes across Chama, Fibolele, and Libwente. This includes analyses for 22 holes at Chama (approximately 6% of the Chama holes), 41 holes at Fibolele (approximately 35% of the Fibolele holes), and 115 holes at Libwente (approximately 48% of the Libwente holes). The Niton XRF data covers a suite of 12 elements at Chama and Libwente, and one element (Cr) at Fibolele. Niton analysis is typically completed from 3 m above the hangingwall of the logged TMS unit to 3 m below the footwall of the TMS. The majority of Niton intervals are 0.33 m in length, or alternatively 1 m in places.

As a validation check, SRK has completed a high level comparison analysis of the Niton XRF data against the laboratory assays. Weighted average Cr values within the TMS unit for the Niton XRF data, in addition to the laboratory assays from SGS, AHK, and Shiva are presented in Table 2-4.

Table 2-4: Kagem: Weighted Average Cr Values with in the TMS Unit for the Niton and Laboratory Assay Data Sets

Data set	Weighted average TMS Cr value (ppm)	Total length of TMS core analysed (m)
Niton	2,058	112.76
SGS	1,737	2,257.81
AHK	2,664	273.26
Shiva	2,761	26.92

Direct comparison of Niton XRF Cr grades and SGS Cr grades where down-hole crossover between the two data sets exists is presented in Figure 2-12. Similar analysis comparing the Niton XRF grades with Shiva Cr grades is presented in Figure 2-13. No cross-over exists between the Niton XRF and AHK assays. The standard laboratory assay sample length is 1 m, whilst the standard Niton interval length is 0.33 m. For this reason, the Niton XRF grades directly compared with individual SGS and Shiva laboratory assays are length weighted averages of all the Niton samples that cross over with individual laboratory assay sample intervals.

Figure 2-12 demonstrates a large discrepancy between the Niton XRF Cr values and the SGS Cr assays, with a correlation coefficient of about 0.49. This indicates a relative lack of precision in the Niton analysis, the SGS laboratory analysis, or both. In addition, other than core with very low Niton Cr values of <300 ppm, the handheld Niton typically returns higher Cr values than the SGS laboratory data. This is also evident from the weighted average Cr value in the TMS unit from the SGS assays which, at 1,737 ppm, is 321 ppm less than the weighted average value from the Niton data set.

Comparison of the Niton XRF and Shiva laboratory Cr data, also indicates a relatively poor correlation, with a correlation coefficient of about 0.55. Figure 2-13 also highlights that the Niton Cr values are typically higher than the Shiva assay Cr values, although the average Cr value within the TMS is higher for the Shiva assays than the Niton data, resulting from the effect of 1 or 2 anomalous values on the relatively small amount of data from the Shiva laboratory available for comparison.

Although based on a relatively small assay dataset, the results of the QAQC analysis suggest that there is possibly a significant degree of imprecision associated with the handheld Niton XRF Cr values, and that this data should be used with caution when used to assist in geological or resource modelling. The QAQC review also indicates that the Niton XRF may be slightly over-estimating the Cr content. Although a concern, this does not have a significant impact on the resource modelling process, as the average Cr values of the various rock types and derived cut-off values used to adjust the resource model are based on Niton data alone.

At this stage, it is unclear whether the discrepancies between the laboratory assay data and the handheld Niton data are a result of imprecision in the Niton data, the laboratory data, or a combination of both. In addition, the differences in sample length (Niton, 33 cm, and SGS, 1 m), may also be introducing a level of exaggeration

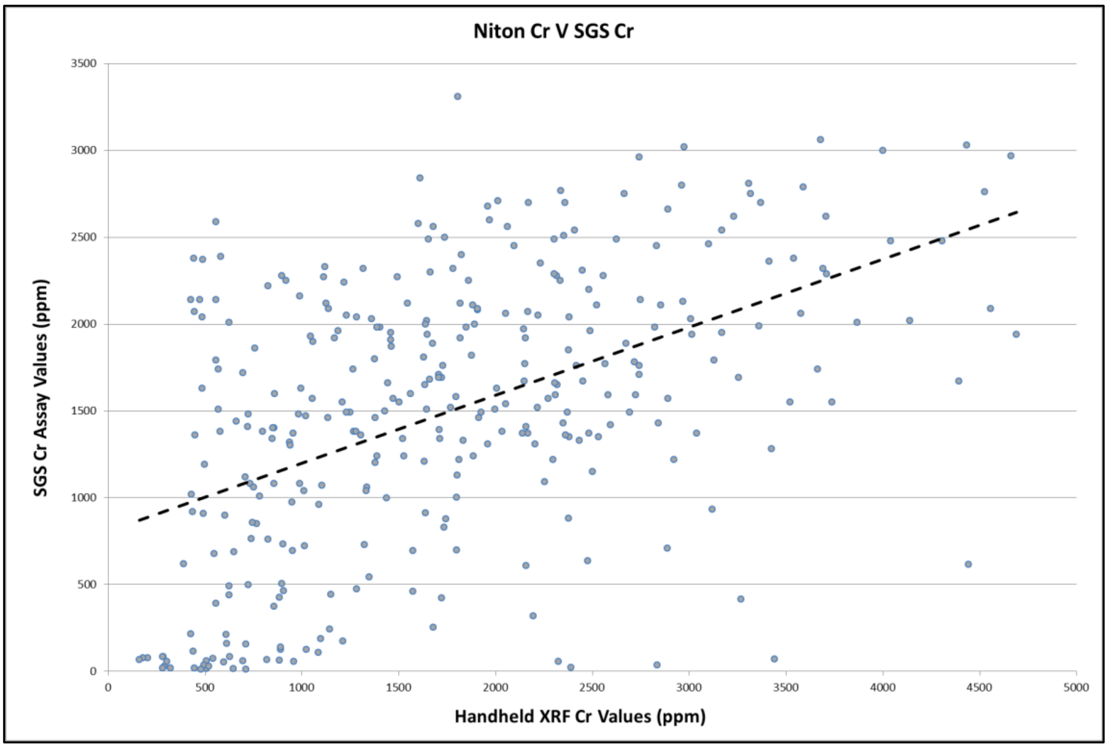


Figure 2-12: Kagem: Direct Comparison of SGS Laboratory Cr Assays and Niton XRF Cr Values

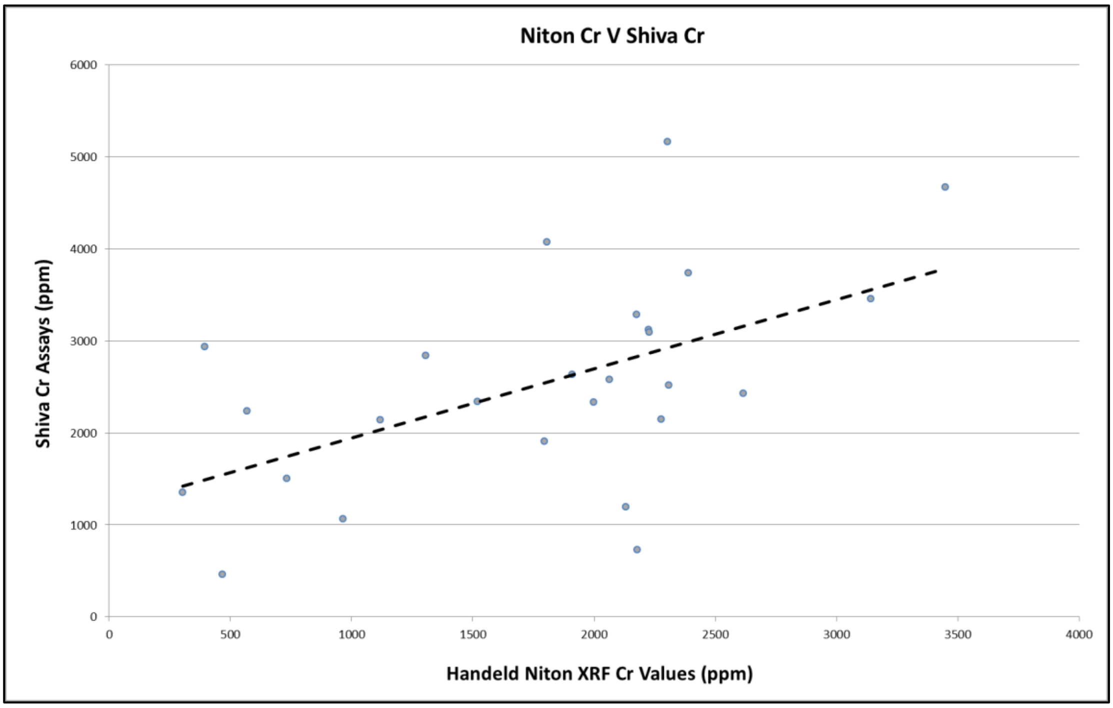


Figure 2-13: Kagem: Direct Comparison of Shiva Laboratory Cr Assays and Niton XRF Cr Values

Lithological Logging Validation

SRK completed a brief review of the drillhole databases for the respective deposits and summary logging of a series of drillholes during the site visit completed in June 2015. SRK's review suggests that the geological information being recorded by Gemfields geologists is of a good quality, lithological identifications are consistent, and downhole contact depths have been captured to an appropriate level of accuracy.

SRK notes that there is a degree of inconsistency between the logging of the older, pre-2008 holes and more recent drilling. Most notably, the logged RZ thickness in the post-2008 holes is 0.76 m, approximately 67% that in the pre-2008 holes of 1.14 m. This is considered to be a function of an improved understanding of the nature of the RZ material over time, rather than any geological difference in RZ thickness in the older drilling relative to the more recent drillholes. In general, the logging and nomenclature used during logging is generally consistent between the pre- and post-2008 holes.

As a form of validation of the lithological logging, and to identify any potential relationships between rock type and geochemical signature that may assist in the resource modelling process, SRK completed a high level analysis of the Niton XRF data with the lithological logging. Average Niton XRF values for the suite of 12 elements analysed split by lithology are presented in Table 2-5.

Table 2-5: Kagem: Average Niton XRF Grades for the Chama, Fibolele and Libwente Deposits, Split by Lithology

	Average Niton XRF grade (ppm)											
Lith	Zn	Mn	Sr	Ca	Ti	Fe	Rb	V	Cr	Nb	K	Cu
AMP	1,306	910	423	29,984	1,918	60,438	118	294	1,075	38	7,399	72
MS	626	493	385	20,301	2,076	47,734	154	270	510	41	11,766	24
TMS	1,208	964	135	22,570	1,402	69,459	96	236	2,125	34	5,710	64
RZ	5,443	1,128	201	17,966	1,802	65,325	530	255	914	59	17,354	71
PEG	1,871	802	221	26,364	1,228	31,900	157	222	797	47	8,568	69
QT	3,854	866	294	19,202	1,957	50,851	220	248	880	59	12,934	38

On this basis, the most notable geochemical differentiator between the AMP and TMS units is a significant increase in Cr content within the TMS, from an average of 1,075 ppm in the logged AMP unit, to an average of 2,125 ppm within the TMS (Figure 2-14). Visual analysis of the Cr grades alongside the downhole lithological logging indicates a sharp increase in Cr grade at the TMS – AMP contact, rather than a gradational change. This increase in chromium content within the TMS unit is considered most likely to be a result of differentiation of chromium within the original komatiite melt into the lower, more ultramafic protolith to the TMS unit, and explains why emerald and beryl mineralisation is only associated with the TMS, and not also the adjacent AMP unit. The contact between the TMS and AMP units is also marked by a pronounced decrease in strontium content from an average of 423 ppm within the AMP, to 135 ppm within the TMS unit (Figure 2-14).

Key geochemical differentiators between the TMS unit and the RZ material are a marked increase in both rubidium and potassium content within the RZ, relating to the influx of K and Rb during the transformation of metabasic rock into phlogopite. Average Rb content in the TMS unit is 96 ppm, which compares to an average Rb content of 530 ppm in the RZ material, whilst average K in the TMS of 5,710 ppm compares to an average RZ K grade of 17,354 ppm (Figure 2-14). RZ material is also characterised by a pronounced increase in zinc grade, from an average of 1,208 ppm within the TMS unit, to 5,443 ppm in the RZ material (Figure 2-14), probably relating to increased tourmaline content within the RZ.

Notably none of the key lithologies, including TMS and RZ material, shows any great variation in vanadium content (Figure 2-14), which suggests that vanadium does not have a significant role to play in the formation of emerald and beryl mineralisation within the tested Kagem deposits.

SRK notes that although this high level review of the Niton XRF data offers a useful insight into the geochemical characteristics of the key lithological units at the Kagem Mine, clearly more detailed data and analysis is required to derive any firm conclusions on the chemical composition of the local units (and particularly RZ material) that can be used as an explicit control for resource modelling. Whilst taking geological continuity into consideration, SRK has carefully utilised certain aspects of the Niton XRF data to assist in constructing the resource model where possible. The Niton XRF grades are not used directly for the estimation of Mineral Resources but are used to provide further comfort regarding the lithological logging completed to date.

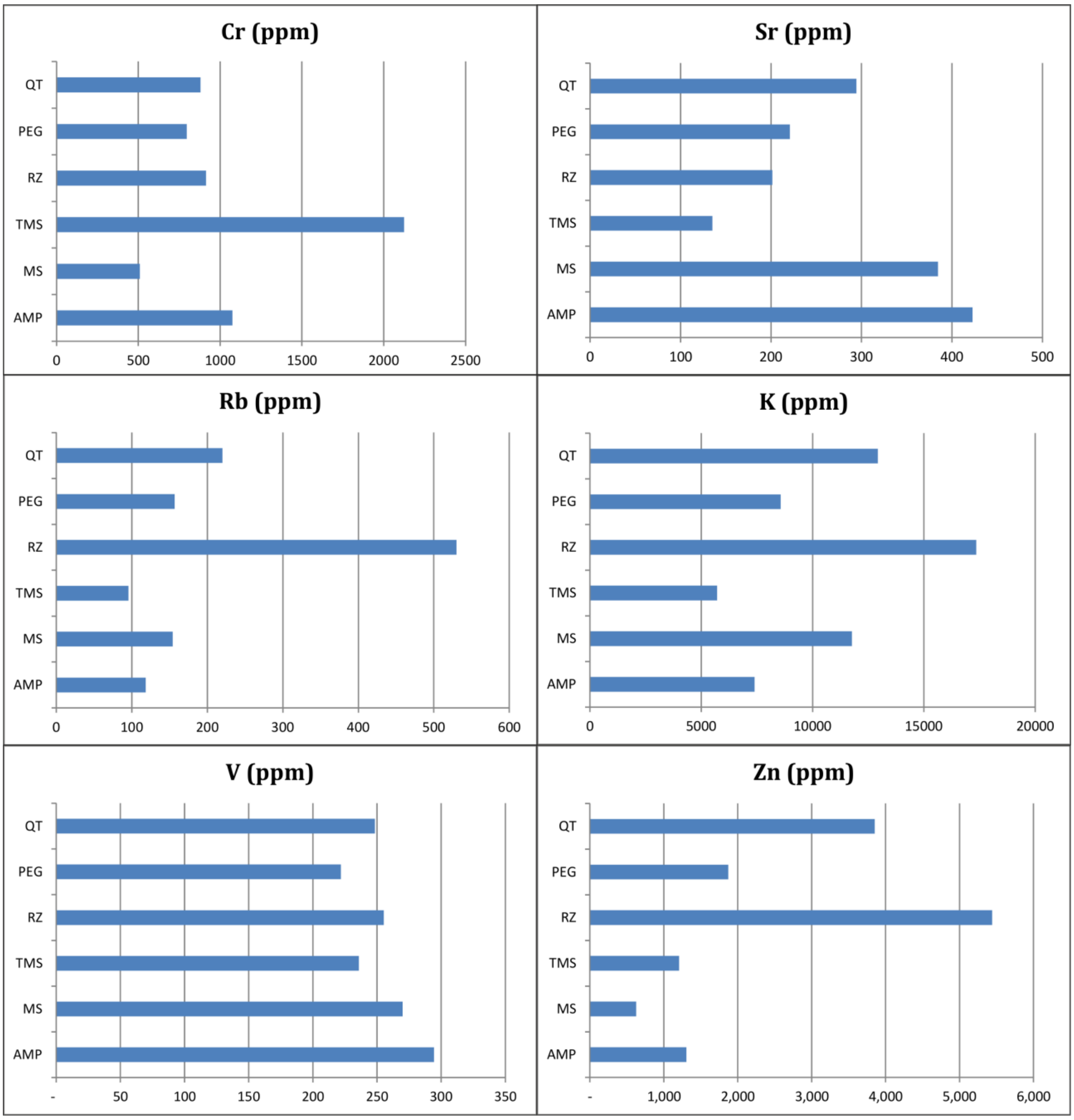


Figure 2-14: Kagem: Average Niton XRF Values for Selected Key Elements Split by Lithology

Core recovery

Core recoveries have been recorded for post 2008 drillholes. Core recoveries in available drillhole data average 80.8%. Recovery in the PEG ranges from 5 to 100% and averages at 82.5%, whilst recovery in the TMS is more consistent, ranging from 8.4% to 100% and averaging at 91.1%. Good core recovery in the PEG and TMS intersections is considered particularly important.

Core recovery was not routinely recorded in the pre-2008 drilling campaigns. Where available, excepting expected low recoveries in the soil horizon, average values range from 57.6% to 98.5% with the latter value being in the TMS unit and the former in kaolinised PEG areas. Reduced recovery in the PEG is a concern as it renders thickness measurements, and assessment as to whether PEG are conformable or discordant, more difficult.

2.1.7 Density

Historically, specific gravity measurements were only available from a 2009 Rocklab report from AMC. Subsequent to the underground Feasibility Study in 2012, Gemfields undertook density testwork from both in situ and core sources. In addition, Gemfields also benchmarked the density testwork results against the production records derived from Kagem.

All the density values used to define the tonnage estimates were determined using a standard emersion technique. Each sample was weighed in air, and in water, and the density determined. If the sample was friable, then the sample was wrapped in plastic before being weighed. The density values and number of samples per lithology are detailed in Table 2-6.

Table 2-6: Kagem: Density Values Derived from Testwork and Production Records, as Applied for Tonnage Estimation

Lithology	Number of Samples	Density (g/cm^3)
TMS	19	2.85
PEG / QT Veins	14	2.60
RZ	19	2.85
Undifferentiated waste, including AMP	35	2.40
Weathered waste rock to a depth of 1,160mRL	7	2.20

2.1.8 Pit Mapping

The on-site geologists complete detailed pit mapping of the operating open pits (namely Chama, Fibolele, Libwente South and Ishuko) on a regular on-going basis. The data from this mapping are regularly imported into ArcGIS software and incorporated with pre-existing mapping data to produce an updated digital geological map of each pit on a monthly basis. Figure 2-15 shows a detailed geological map of the Chama open pit completed by Kagem geologists, sourced from the Gemfields mapping library. The geological pit maps are generated at a scale of 1:1,000 at Chama (production contacts are mapped at a scale of 1:200) and Libwente, and 1:500 at Fibolele. Units incorporated into the final maps include mica schist, AMP, talc-magnetite schist, transitional talc-magnetite schist, footwall mica schist, PEG, quartz-tourmaline veins and RZ. In addition to the current operating pits, Kagem has also de-watered and mapped the two Sandwana pits in the far north of the Fibolele deposit area. Here, mapping is based on a combination of observations made directly from the exposed pit, and the extrapolation of logged TMS in the drill database. The Sandwana pits are mapped at a scale of 1:800.

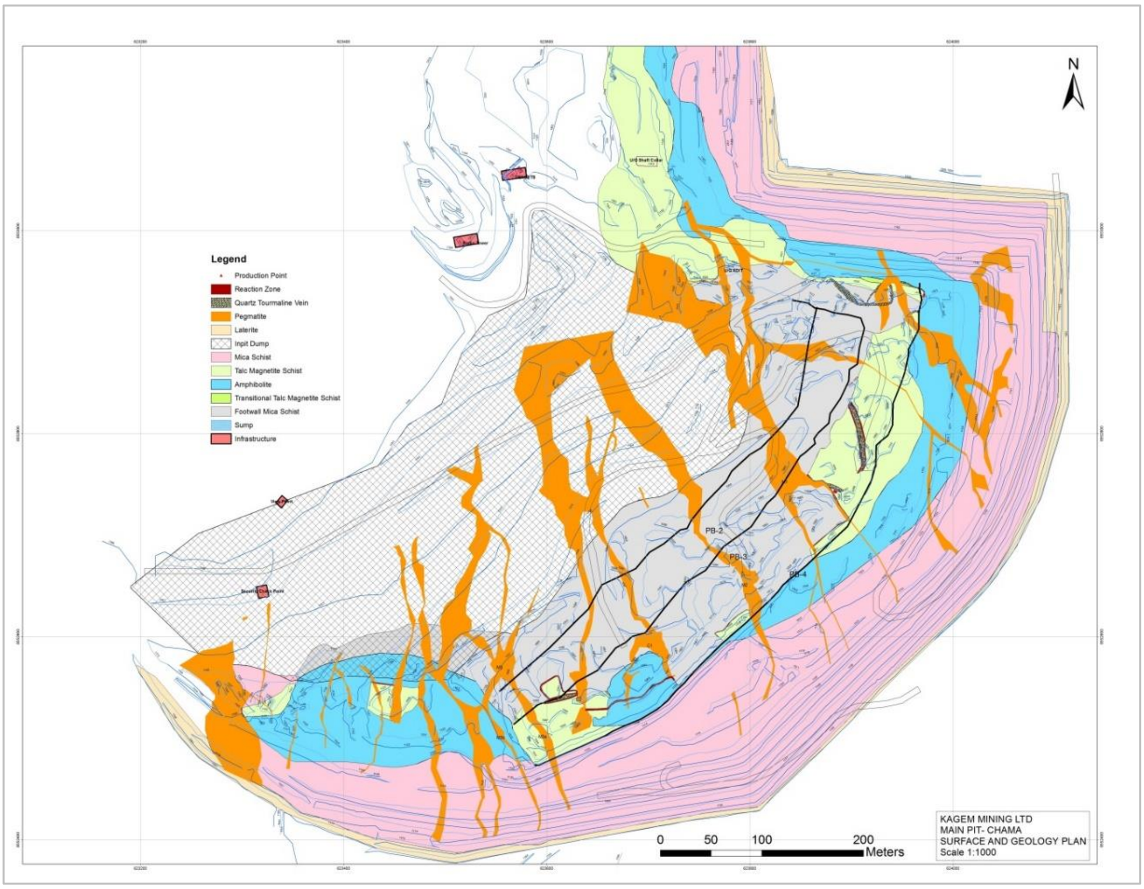


Figure 2-15: Kagem: Detailed Geological Map of the Chama Open Pit

2.1.9 Bulk Sampling and Production Data

The main exploration tool used to determine emerald and beryl grade and quality at the Libwente deposit is through bulk sampling from trial mining pits. Grade and quality data for Chama and Fibolele comes from production data the open-pit mining operations, which have been Gemfields main operational focus. The areas which have been mined, either historically by third parties, or by Gemfields, are illustrated in Figure 2-16.

Available production data for Fibolele comes from an open pit mining operation, in operation since August 2012. To date, more than 5 Mt of material has been removed. The open pit mining operation is run using a similar approach to Chama, with the RZ systematically mapped and surveyed as mining continues.

Two bulk sampling pits were in operation in the Libwente deposit area in 2017, namely Libwente South and Ishuko. Multiple small trial mining pits exist in the area surrounding the two main pits. These are mostly flooded and have no associated production data. Of the two larger pits, production data is only available for Libwente South, from which more than 1.35 Mt of material has been removed.

The material recovered from the bulk sampling pits Libwente and the open pit mining operation at Chama and Fibolele is passed through a wash plant to isolate the gemstones, and subsequently sorted by hand to provide emerald grade and quality values for each pit. The minimum size (bottom cut-off) of stone which can be recovered from the wash plant is 3 mm. Upon receipt at the sort house, the mined material is passed through a tumbler and screens in order to remove any clay material prior to sorting. Any schist or other waste rock still attached to the gemstones is then removed, either by using pliers to remove the host rock in a process known as "cobbing" (Figure 2-17), or by cleaning with a hand-held drill for some of the higher quality gemstones (Figure 2-18).

After cleaning, the gemstones are sorted by hand into four broad quality designations, before being further subdivided (resulting in a total of 181 quality splits) as outlined below:

- **Premium Emerald:** emeralds of a very pleasant green or blue-green colour with a secondary hue of yellow or blue and a medium to dark tone. Saturation is vivid to medium, with even colouring throughout, and very good clarity with very few minor inclusions, such as insignificant fractures. The Premium Emerald gemstones have a bright vitreous lustre and high brilliance, especially when polished, and good to excellent competency with very high carat yield once cut.

  The Premium Emerald gemstones are divided into green and blue-green fractions and then further subdivided into various quality designations (A-E). These are then split into six size categories resulting in a total of 60 Premium grades.

- **Emerald:** the Emerald split designation represents a wide range of emerald qualities. Emerald grade gemstones retain a green or blue-green colour with a secondary hue of green or blue and a light to medium tone. Clarity is variable, ranging from transparent to highly included or opaque. Yield after cutting is also variable, from very low to moderate.

  Similar to the Premium Emerald designation, the Emerald gemstones are divided into green and blue-green fractions and then further subdivided into various quality designations (F-M for green stones and Fc-Nc for blue-green gemstones). These are then split into a number of size categories resulting in a total of 118 Emerald grades.

- **Beryl-1:** gemstones of a bluish colour that range in clarity from translucent to opaque and are generally highly included, giving a low recovery in the cut. The Beryl-1 gemstones are divided into two sizes: -16mm and +16mm.
- **Beryl-2:** greyish or brownish gemstones with no lustre or transparency resulting in a very low yield. The Beryl-2 grade gemstones are not subject to any further sorting.

Gemfields holds three reference sets, which define each quality designation and are held at the sort house at Kagem, in London, and in India. The reference sets were built from production at various locations throughout the main Chama open-pit over a number of years. The use of these reference sets helps to ensure consistent grading of the emerald gemstones over time and as production moves forwards.

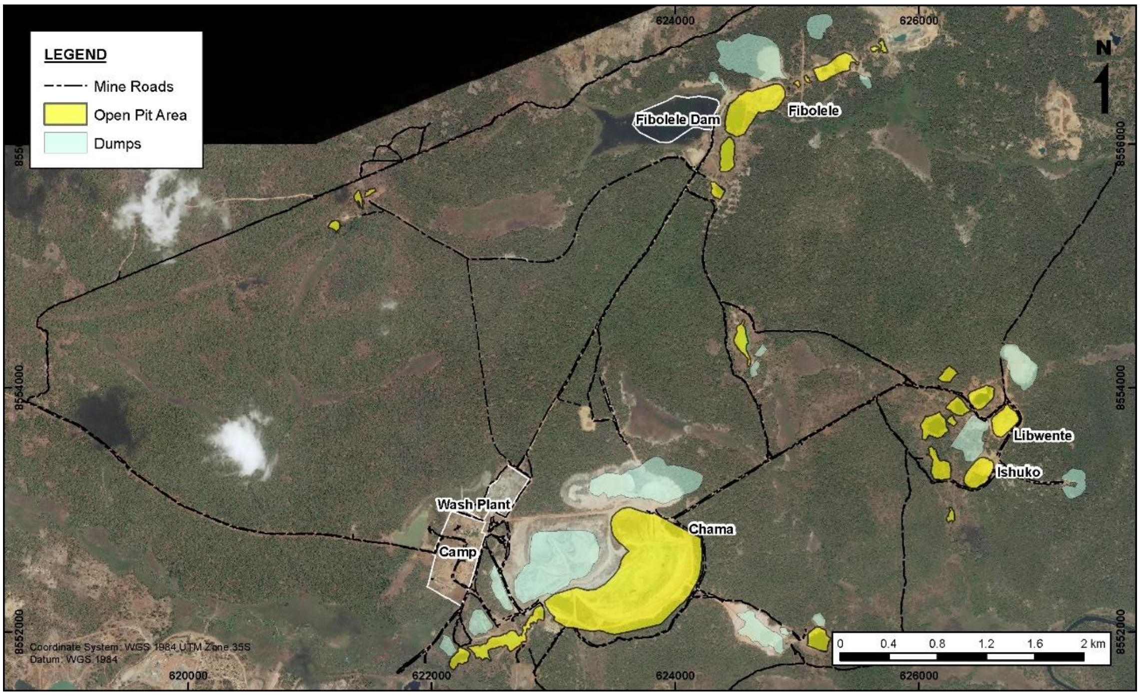


Figure 2-16: Kagem: Location of Operating and Historic Pits at Chama, Fibolele and Libwente

Figure 2-17: Kagem Sort House Worker "Cobbing" Host Rock from Emerald Gemstones

Figure 2-18: Kagem: Sort House Worker Removing Waste Material from a High Quality Emerald

2.2 Mineral Resources

2.2.1 Introduction

Models were constructed, estimated, and classified independently for the Chama, Fibolele, and Libwente areas, using all available data. The following section describes the modelling methodology applied. All geological modelling was undertaken in ARANZ Leapfrog Geo software, with grade and tonnage estimates being completed in either GEMS or Datamine as stated. The geological and grade models produced were used as a basis for the classification and reporting of the Mineral Resource Statement.

2.2.2 Chama Geological Modelling

TMS model

A talc-magnetite schist model (including RZ material) for the Chama deposit was constructed in Leapfrog Geo through sectional polyline interpretations of the TMS footwall and hangingwall. The footwall and hangingwall strings were snapped to drillhole contacts, using the TMS, TBS and RZ logging codes as an explicit control on the model. A 3D TMS solid was then generated below the hangingwall and above the footwall surfaces. The model was subsequently checked against downhole XRF chromium grades, and the contact surfaces modified where appropriate to reflect the chromium distribution. Considering the average downhole XRF grade of the TMS material documented in Section 0, this typically involved adjusting the TMS model to incorporate external material grading at >1,500 ppm Cr adjacent to the modelled TMS contact, or conversely the removal of internal material <1,500 ppm Cr in the contact zone.

Pegmatite model

As the local stratigraphy is intruded by both concordant and discordant pegmatitic dykes, it was necessary to divide the logged PEG intervals into concordant and discordant PEG groups for modelling purposes. This was achieved by visual assessment of all downhole PEG, QV, QF, QT, and TOUR intervals in 3D space, looking down-dip, parallel to the TMS model. Manual selections were then created for any logged PEG forming consistent trends in PEG intervals of similar thickness parallel to the TMS unit. Figure 2-19 shows the concordant dyke selections in the Chama pit area, with key dyke selections labelled and shown relative to a NE-SW section of the TMS model (in green). A total of 37 discrete concordant PEG bodies were identified (the most prominent of which being a relatively continuous PEG dyke at the FWL of the TMS unit) and ranked according to confidence in geological continuity (Table 2-7). The confidence in the geological continuity was based on the number of holes intersected, and the degree to which intersections could be correlated between drillholes. This confidence was purely used to aid coding of the drillholes in defining the pegmatite models.

Table 2-7: Kagem: Confidence Ranking for the Chama Concordant PEG Dyke Units Identified through Visual Assessment and Interval Selection

Dyke No.	Confidence Ranking	Number of holes intersected	Average thickness per hole (m)	Dyke No.	Confidence Ranking	Number of holes intersected	Average thickness per hole (m)
98	1	4	0.93	26	20	16	2.04
99	2	201	2.26	14B	21	9	2.87
23	3	5	4.32	16	22	11	4.84
6	4	7	4.51	18	23	9	6.13
4	5	8	5.13	27	24	7	4.21
22	6	8	5.74	17	25	9	1.04
7	7	17	1.44	9	26	9	3.22
8	8	8	4.16	24	27	11	2.57
29	9	10	2.11	25	28	5	1.57
34	10	8	3.52	32	29	11	6.08
2B	11	15	2.80	13	30	10	3.15
14	12	6	4.98	10	31	14	1.67
20	13	8	4.68	11	32	13	4.14
3	14	9	3.56	31	33	13	3.46
5	15	9	3.89	19	34	18	3.81
35	16	6	3.31	15	35	12	4.43
33	17	10	1.75	21	36	19	3.78
12	18	6	0.96	30	37	10	2.72
28	19	10	4.82	-	-	-	-

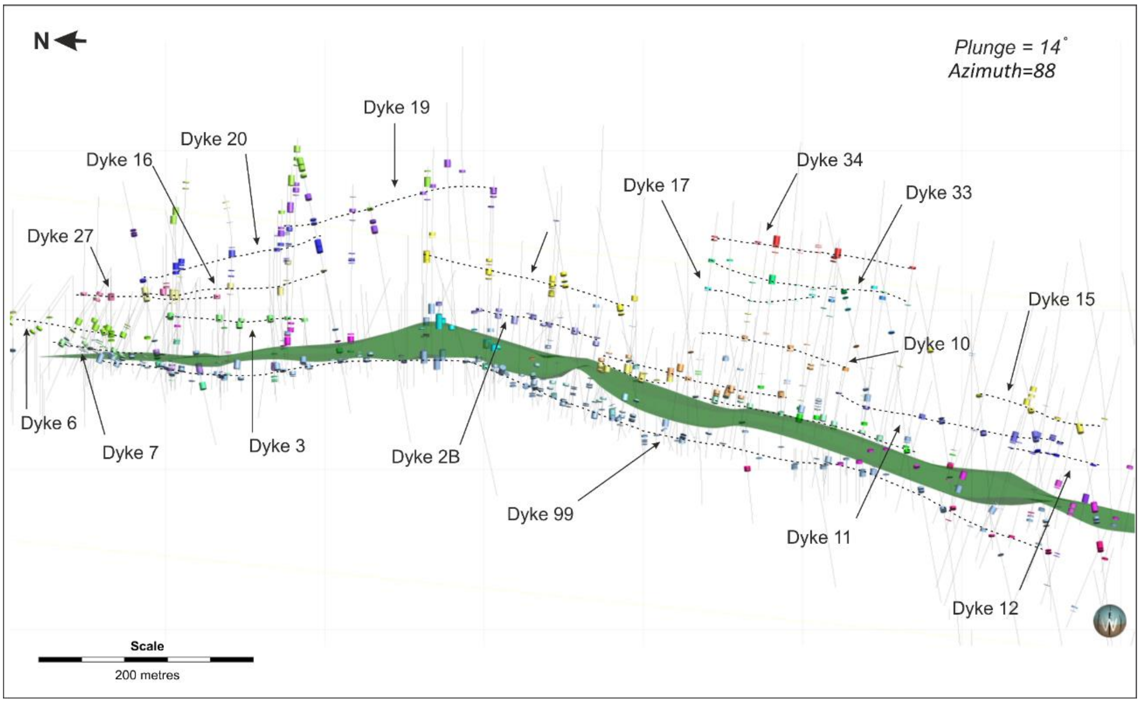


Figure 2-19: Kagem: Key Concordant Dyke Interval Selections at Chama (drillhole intersections are coloured by individual PEG dyke)

After completing the concordant PEG interval selection, all remaining PEG, QV, QT, QF and TOUR intersections were coded as discordant PEG intervals. A discordant PEG model was then generated using a Leapfrog Geo indicator interpolation. The Leapfrog indicator interpolation uses a radial basis function, similar to dual Kriging, to define a volume that encloses values likely to be above a given cut-off. In this instance, all discordant PEG intervals were assigned a value of 1, and all other intervals (including the concordant PEG interval selections) assigned a value of 0.01. The PEG model is based on a cut-off iso-value of 0.5.

Figure 2-20 shows the PEG trend surfaces (in grey) based on the discordant PEG selections and PEG (in orange) mapped in the open pit (shown behind the slice plane). The indicator interpolation was guided by a structural trend, which defines a search anisotropy that varies in direction according to a series of defined surfaces. The structural trend applied in this instance was defined by surfaces generated on the basis of mapped PEG in the Chama open pit, and outside of the pit by visual trends in the downhole discordant PEG intervals. This allowed the interpolation to honour the multiple discordant PEG trends observed and recorded in the Chama Pit. In order to fully encapsulate the mapped PEG in the Chama Pit into the PEG model, the indicator interpolation was edited using contour polylines digitised along the centre of the mapped PEG in the open-pit map. These contour polylines are assigned a value of 1, and added to the downhole data used to derive the indicator interpolant. In this sense, the mapped PEG are not only used as a trend to guide the interpolation, but also as an explicit control on the model geometry.

The resulting PEG model was domained within the modelled TMS volume and subsequently used to cut the TMS to produce a post-PEG TMS model. Figure 2-21 shows the Chama PEG model domained within the TMS model, relative to the downhole discordant PEG intersections and pit mapping.

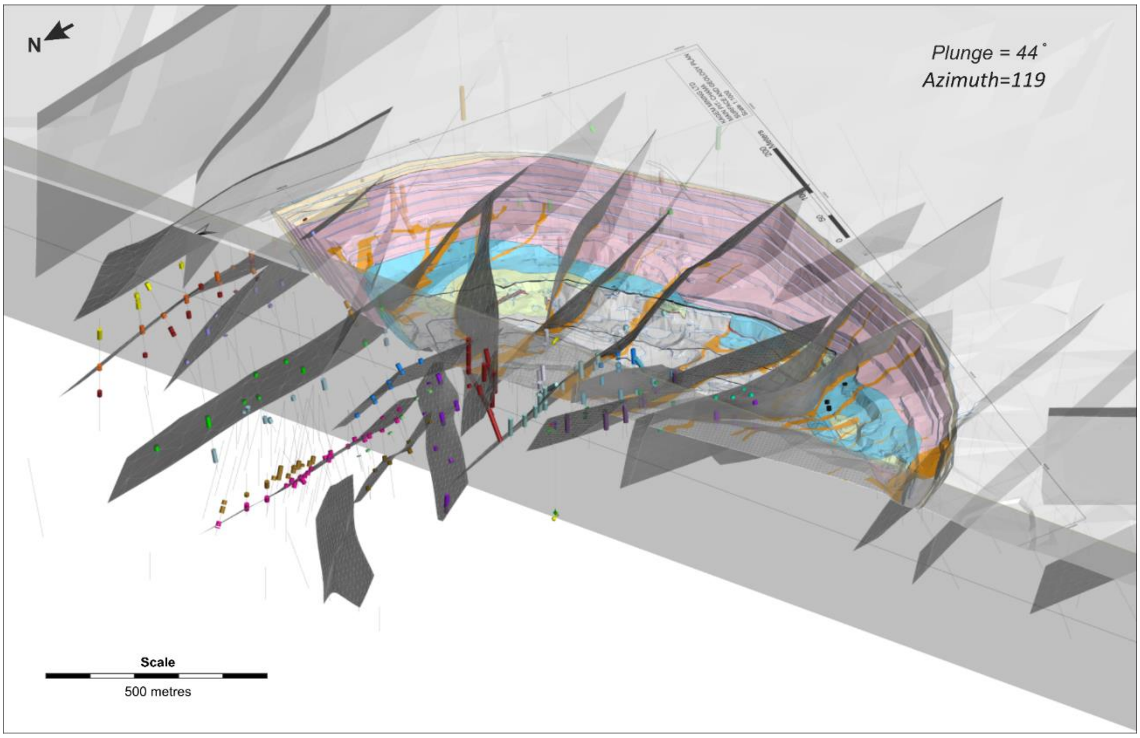


Figure 2-20: Kagem: Discordant PEG Selections and Trends in the Chama Pit Area. (see Figure 2-15 for legend)

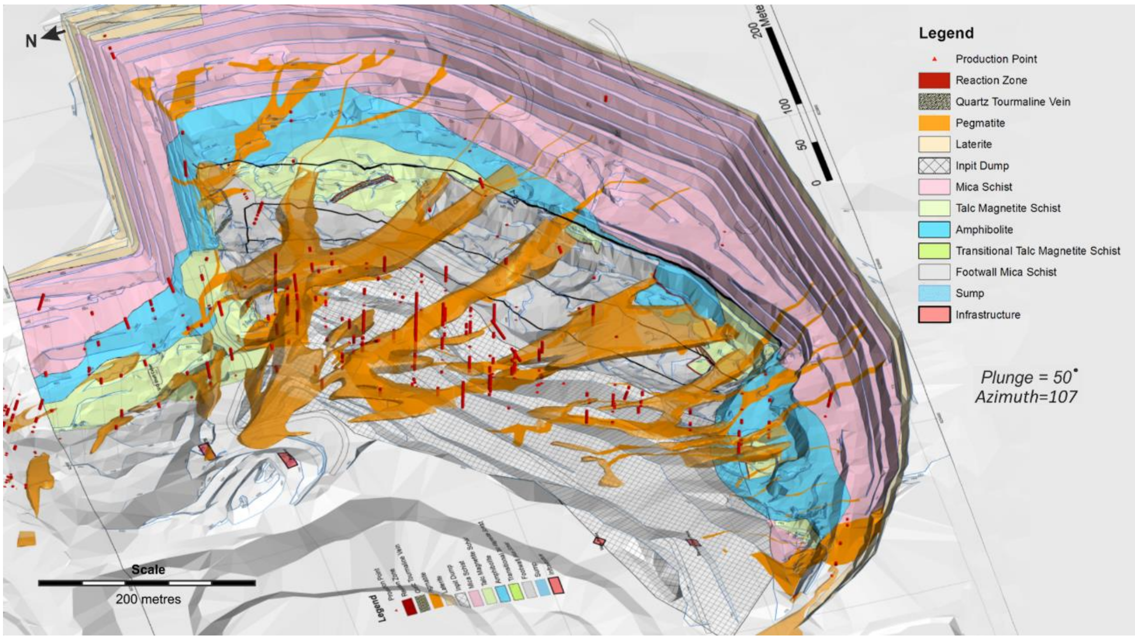


Figure 2-21: Kagem: Chama PEG Model

Reaction zone model

Three main styles of mineralisation are recognised within the TMS unit, namely concordant RZ along the footwall (and occasionally the hangingwall) of the TMS, discordant RZ at the contacts between PEG dykes / QT veins and the TMS unit, and along brittle structures within the TMS. High level analysis of the downhole logging indicates that approximately 90% of the logged RZ material is located either on the TMS footwall (and occasionally hangingwall) contacts, or is in contact with a PEG dyke or quartz-tourmaline vein. For this reason, and to avoid over-complication of the RZ resource model, two RZ domains were constructed: one to define the TMS footwall RZ; and another based on areas where the PEG model is in contact with the TMS model.

To define the basis for the footwall RZ model, all logged RZ (RZ and BPS) intervals at the base of the Chama TMS model were manually selected and assigned a footwall RZ code. This was supplemented by CBS, BS and QT intervals at the base of the TMS model where RZ is not logged, but where adjacent drillholes all include logged footwall RZ.

Analysis of downhole Niton XRF data indicates a significant spike in average rubidium grade within core logged as RZ. Therefore, where available, the downhole Niton rubidium grades were checked against the footwall RZ interval selection, which was edited to include Rubidium spikes >300 ppm at the TMS footwall where no RZ is logged, but adjacent drillholes include logged footwall RZ. In such instances, the downhole log was edited to include a footwall RZ interval of the average thickness (0.81 m) of the intersections in the footwall RZ interval selection.

Comparison of the average footwall RZ thickness (0.81 m) in holes drilled after 2008, with those drilled before this date (1.58 m) indicates that the logged footwall RZ thickness in the earlier holes is on average approximately 1.95 times the average thickness logged in more recent drilling programmes. This is considered to be a reflection of an improved understanding of the deposit, and specifically the nature and characteristics of the RZ material, by the on-site geology team with time, rather than any actual difference in RZ thickness in the older drilling relative to the more recent drillholes. For this reason, the footwall RZ interval selections in the pre-2008 drillholes were altered to reflect the average thickness (0.81 m) of the footwall RZ material in the post-2008 drillholes.

A RZ hangingwall surface was generated from the hangingwall points of the footwall RZ interval selection, using the TMS footwall surface as a framework to guide the trend of the model. A 3D solid was then generated below the modelled RZ hangingwall surface and below the TMS footwall surface to define a footwall RZ volume. Figure 2-22 shows a plan view looking up at the base of the Chama footwall RZ (in red) and TMS unit (in green), both cut by the PEG model. The model was manipulated to pinch pit to a zero thickness at holes with no RZ at the TMS footwall (excluding where the TMS footwall is marked by discordant PEG).

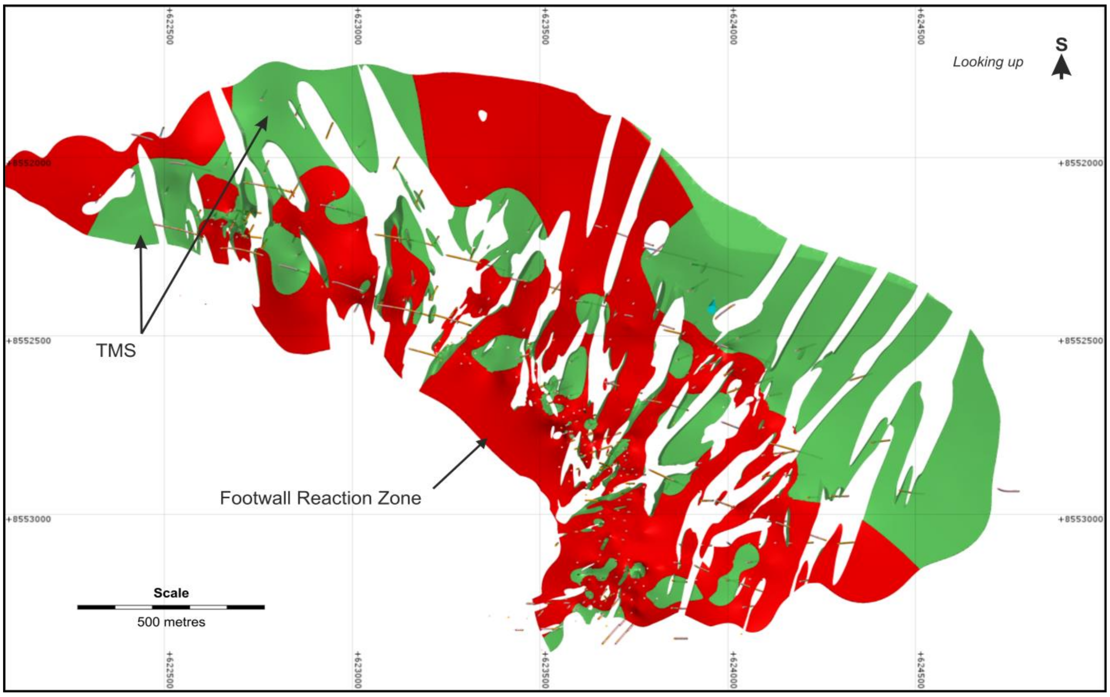


Figure 2-22: Kagem: Chama Footwall RZ and TMS Models

Gemfields' production analysis data from the Chama Pit to date indicates that RZ material is equal to 12.9% of the tonnage of the mined waste TMS. To reflect this, but also to account for dilution of the RZ material during the mining process, the RZ model equates to 10.5% of the modelled waste TMS above the May 2015 pit survey wireframe. Above this pit survey wireframe, the modelled footwall RZ volume equates to 3.4% of the total modelled waste TMS volume. A discordant RZ model was generated to account for the remaining 7.1% (as a proportion of the modelled waste TMS) of RZ material. The ratio of reaction zone to waste has been defined from the production achieved to date. The proportion remains relatively consistent over time, and is associated with the number of pegmatites within the TMS unit.

The discordant RZ model was created by re-running the PEG indicator interpolation at a series of cut-off iso-values. The resulting iso-surfaces were cut within the TMS unit and outside of the PEG model, to generate a "skin" around the outside of the PEG. This was repeated at various cut-off values until, through an iterative process, a cut-off value was established which resulted in a PEG "skin" volume equal to 7.1% of the waste TMS model volume above the pit survey wireframe (resulting in a combined concordant and discordant RZ volume equating to 10.5% of the TMS waste above the open pit wireframe). The final indicator interpolation cut-off iso-value is 0.43, which compares to a cut-off of 0.5 used to generate the PEG model. The geological model completed for Chama is illustrated in Figure 2-23 and Figure 2-24.

Figure 2-23 shows a plan view of the Chama footwall RZ, discordant RZ, TMS unit, and PEG domained within the TMS unit model. Figure 2-24 shows the Chama PEG model relative to the TMS model, with enlarged views of the PEG and discordant RZ model in the open pit area.

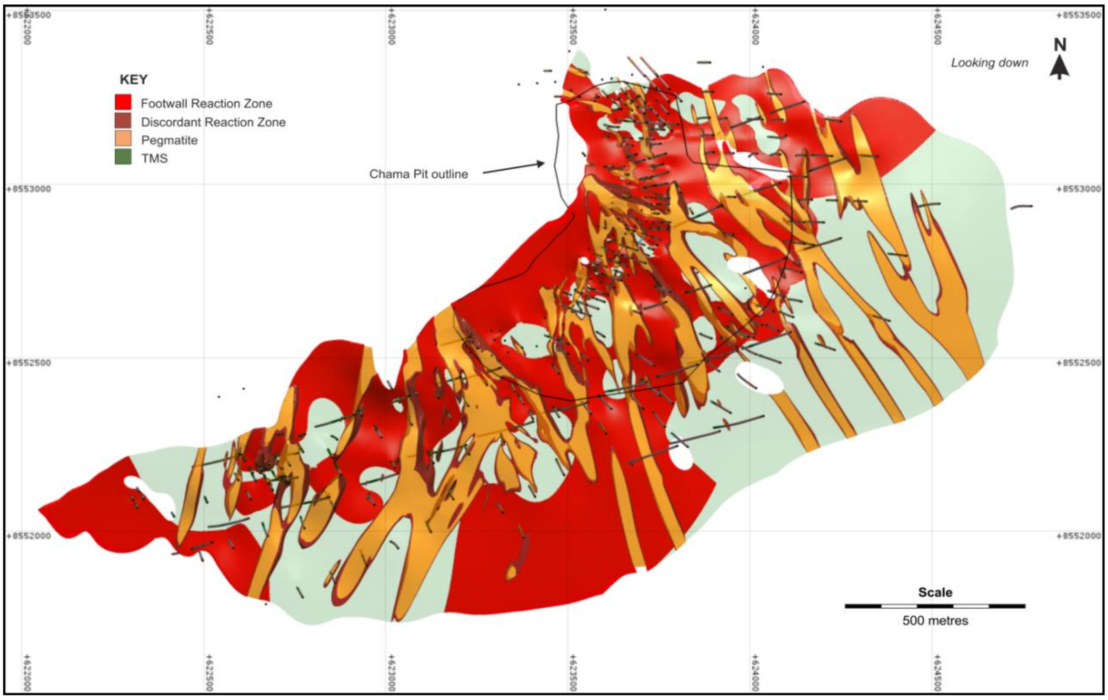


Figure 2-23: Kagem: Chama TMS, PEG and RZ Models

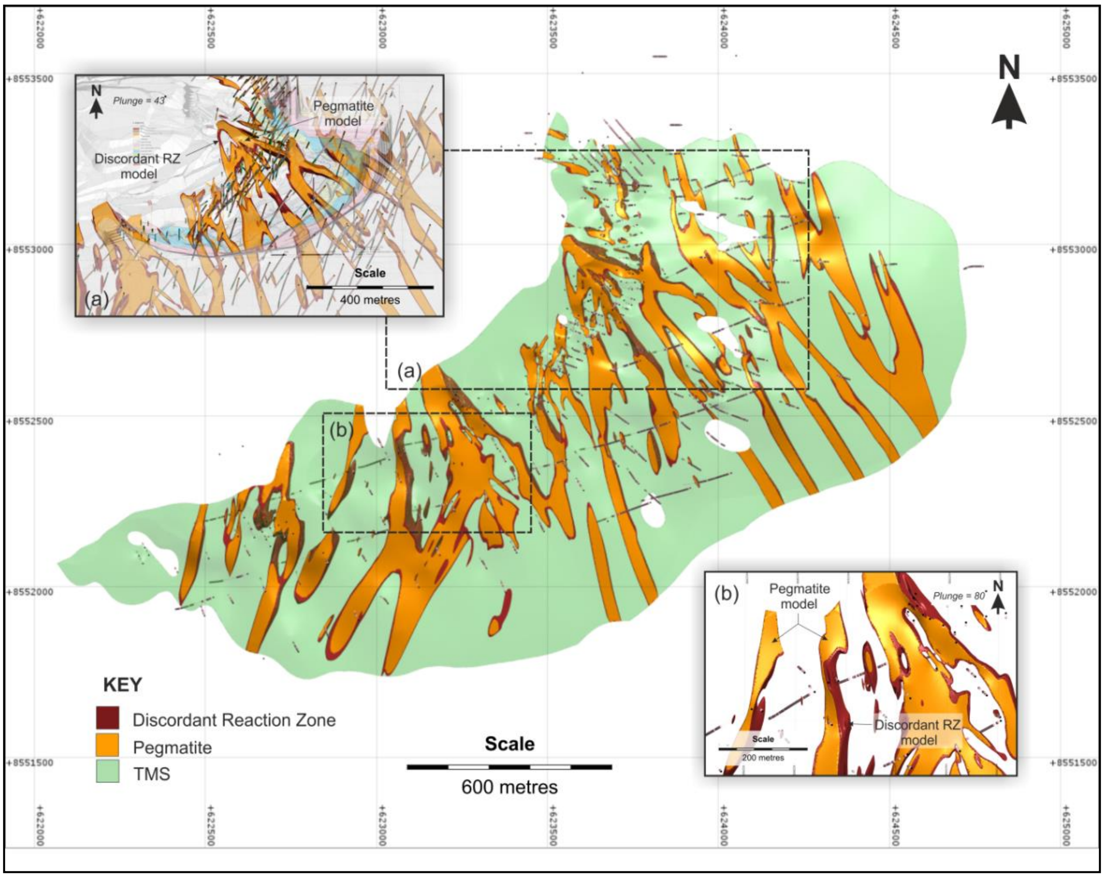


Figure 2-24: Kagem: Chama TMS, PEG and Discordant RZ Models

2.2.3 Chama Grade and Tonnage Estimation

The RZ model, whether discordant and related to the modelled PEG, or the footwall RZ, were used as the basis for the grade and tonnage estimation. SRK has used a block model to quantify the volume, tonnage, and grade of the modelled RZ, as this could also be used as a basis for the subsequent mine planning exercise. As grade cannot be estimated from the drillholes directly, the grades coded into the block model are based on production history alone. The block model used is defined in Table 2-8.

Table 2-8: Kagem: Chama Block Model Parameters

Coordinate	Minimum	Maximum	Block Size (m)	Number of Blocks
X	**621,500**	**625,500**	**20**	200
Y	**8,551,250**	**8,553,850**	**20**	130
Z	**800**	**1275**	**5**	95

The volumes of the discordant and concordant RZ were defined from the geological model. The tonnage was estimated using an average density value of 2.85 g/cm^3 (Section 2.1.7).

SRK has assumed that all emerald and beryl mineralisation is hosted by the modelled RZ, although SRK notes that the model has been adjusted to reflect the historical production. Geologically, beryl and emerald mineralisation is associated with the cross cutting pegmatite features, which have been modelled from the drilling. The tonnage estimate is based on a model of the volume of RZ which reflects the historical production, giving confidence that the geological model is a good representation of the in-situ mineralisation. The grade estimates are expressed as beryl and emerald combined ("B&E"), as this reflects the mine planning, and data captured historically by the mine. PE&E refers to Premium Emerald+Emerald only; that is, excluding Beryl-1 and Beryl-2.

The anticipated grade of emerald and beryl and their relative proportions is based on the extrapolation of the recovery of these minerals from the tonnage of RZ processed during the period covered by the historical mining production statistics. The variation in ratio between beryl and emerald is shown in **Table 2-9** and Table 2-10. This includes mineral obtained from in-pit chiselling as well as that obtained from the processing plant. Due to the nature of the mining method used, emerald and beryl breakage is not considered to be a concern, as the larger stones are recovered from the pit directly.

Given the complexity associated with estimate of individual RZ tonnage as well as the concentration of emerald and beryl within such RZ, the current Mineral Resource estimate is based on what are effectively large-scale bulk samples combined with the geological interpretation of the TMS, PEG, and RZ lithological units as described above.

The Company has collected production data on a sector basis, which indicates the difference in grade distribution within the pit. The production data has been used to predict how the grade is likely to vary in the future. Direct estimates of grade or quality cannot be determined, but the logical gathering of detailed production data provides a sound basis for future trends. The sectors used to gather the production data are shown in Figure 2-25.

The grade distribution from the production zones, as collected since 2012 on a yearly basis, is summarised in Table 2-9 and Table 2-10, and illustrated in Figure 2-26. Over time, the B&E grade has varied significantly. For the F10, Junction, and Chama sectors, the grade has generally decreased. Mboyanga has a short production history, but there is a noticeable decrease in grade over the time when mining has occurred.

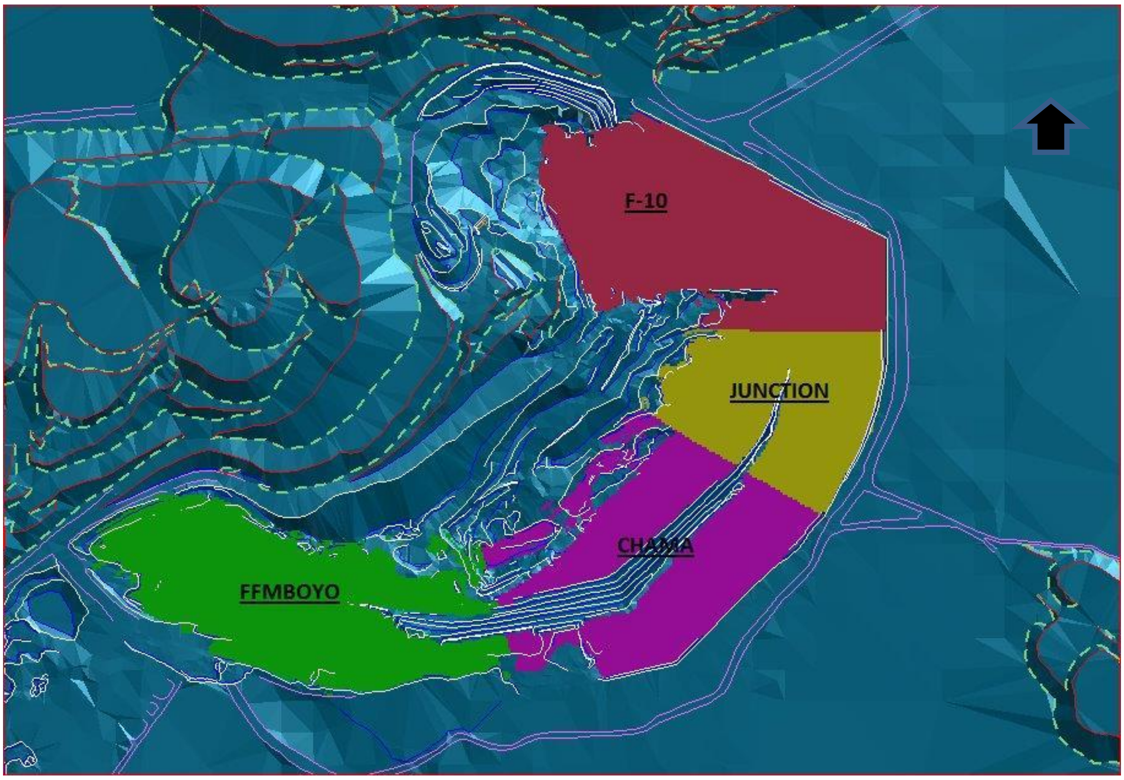


Figure 2-25: Kagem: Production sectors within the Chama pit

Table 2-9: Kagem: Chama Historical Production Data

Statistic	Unit	2012	2013	2014	2015	2016	2017	2018	2019	All
Mining										
RZ Mined	(kt)	106.0	75.3	85.4	107.8	95.2	120.0	162.2	66.5	818.3
Waste TMS	(kt)	836.2	887.0	687.6	855.3	1,139.7	1,292.7	766.3	242.9	6,707.6
Waste non-TMS	(kt)	8,032.4	7,237.5	8,340.8	10,193.8	8,245.1	8,373.8	10,450.6	5,675.5	66,549.5
Total Rock	(kt)	8,974.6	8,199.8	9,113.7	11,156.9	9,480.0	9,786.5	11,379.1	5,984.8	74,075.5
RZ:WST TMS%	(%)	12.7%	8.5%	12.4%	12.6%	8.4%	9.3%	21.2%	27.4%	12.2%
Gemstones Recovered										
Premium Emerald	(kg)	44.7	27.1	11.8	31.86	12.8	13.2	44.1	16.16	201.6
Emerald	(kg)	1,471	1,551	1,046	1,740	1,459	989	1,909	811	10,975
Beryl-1	(kg)	2,318	2,081	1,462	2,582	1,857	1,390	2,154	990	14,834
Beryl-2	(kg)	1,507	1,348	1,442	1,885	1,370	1,411	2,196	904	12,062
Premium Emerald + Emerald	(kg)	1,516	1,578	1,058	1,772	1,471	1,002	1,953	827	11,176
B&E	(kg)	5,341	5,007	3,961	6,239	4,698	3,803	6,303	2,721	38,072
Premium Emerald + Emerald	(kct)	7,578	7,890	5,288	8,858	7,357	5,011	9,764	4,134	55,881
B&E	(kct)	26,705	25,035	19,805	31,195	23,490	19,016	31,514	13,603	190,362
Grade										
Premium Emerald + Emerald	(g/t)	14.3	21.0	12.4	16.4	15.5	8.4	12.0	12.4	14
B&E	(g/t)	50.4	66.5	46.4	57.9	49.3	31.7	38.9	40.9	47
Premium Emerald + Emerald	(ct/t)	71.5	104.8	61.9	82.2	77.3	41.8	60.2	62.2	68
B&E	(ct/t)	252.0	332.4	232.0	289.5	246.7	158.5	194.3	204.6	233

Table 2-10: Kagem: Chama Historical Production Data, Grade by Sector

Statistic	Unit	Total	2012	2013	2014	2015	2016	2017				2018				2019	
								Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
RZ Tonnage Mined																	
F10	(kt)	**636**	51.2	48.3	85.0	93.3	73.5	23.3	11.5	14.8	37.9	33.4	41.4	33.8	26.8	33.9	28.0
Junction	(kt)	**106**	35.6	16.2	19.8	1.1	5.8	2.1	6.3	9.8			1.2	5.1	2.5		
Chama	(kt)	**30**	5.1	11.2	2.3	1.2	0.6	3.8	3.9	1.4			0.2				
FF_Mboyanga	(kt)	**53**					11.4	1.1	5.3	4.6	8.3	7.7	5.3	3.5	1.4	1.7	2.9
Total	(kt)	**824**	92	76	107	96	91	30	27	31	46	41	48	42	31	36	31
RZ B&E Grade																	
F10	(c/t)	**229**	300	247	254	281	196	98	143	95	193	232	179	234	264	179	257
Junction	(c/t)	**236**	328	273	268	362	233	100	75	111							
Chama	(c/t)	**354**	412	331	391	372	590	289	289	444			863				
FF_Mboyanga	(c/t)	**61**					84	176	35	139	49	58	57	3	1	19	20
Total	(c/t)	**224**	317	265	260	283	187	125	127	123	167	199	164	187	230	171	235

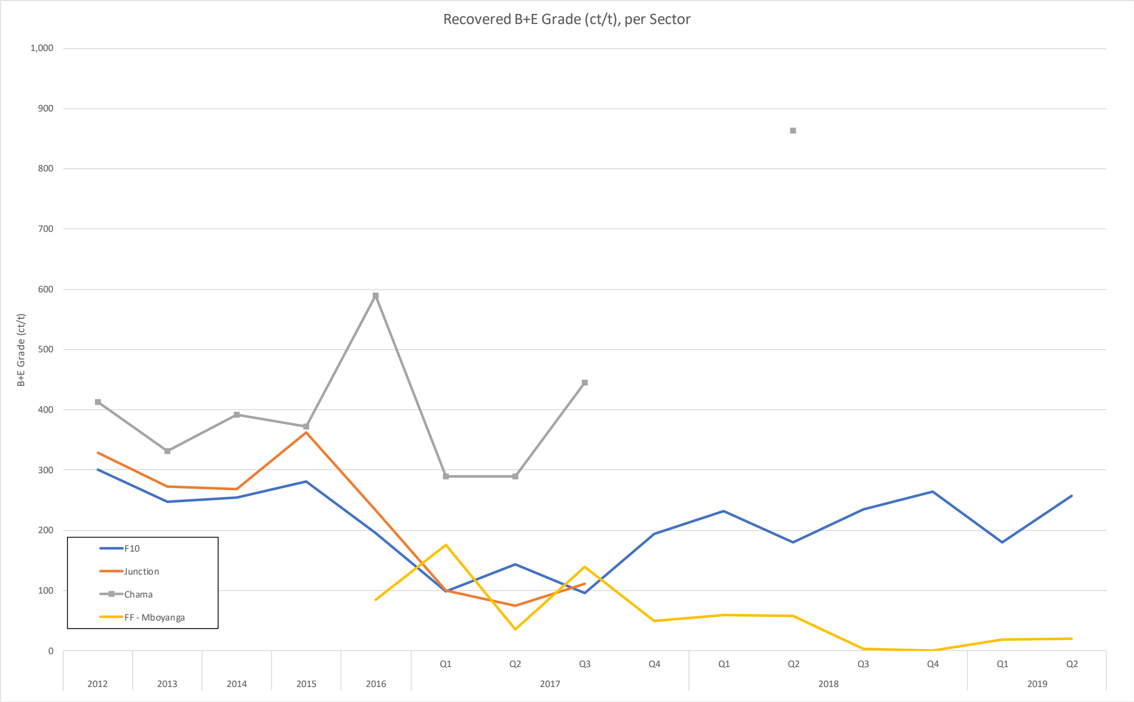


Figure 2-26: Kagem: Variability of Production Grade from sectors within the Chama pit, on a Quarterly Basis

In order to account for anticipated dilution when mining the RZ material, a recovered grade has been determined. Gemfields reports that approximately 15% dilution is planned, and this is reflected in the recovered grades applied to the RZ model. The grades determined for each sector are illustrated in Table 2-11.

SRK notes that in 2018 and 2019, Gemfields reports that a significant stockpile of material was developed, due to an increase in RZ material being recovered, and a bottleneck in processing capacity. The production tonnes recorded in Table 2-10 are tonnage mined, as opposed to tonnages processed. Due to this, the reported carats do not reflect material which has been mined, but stockpiled, with grades being calculated from mined tonnes, rather than processed tonnes. As such, SRK has made an adjustment to the sector grades for F10 and FF Mboyanga to reflect this. The adjusted grades are illustrated in Table 2-11.

The recovered grade of B&E is considered to be relatively consistent, although slowly decreasing with time, with variations due to operational and geological reasons noted. The production data gathered to date (Table 2-9) notes that the ratio between Premium Emerald+Emerald and total gemstones recovered remains relatively constant, between 26% in 2017, with a maximum of 32% in 2013. Since then, the ratio is consistent around 30%. This indicates that the variability of the proportion of Premium Emerald+Emerald recovered over time is relatively stable, indicating that it is unlikely to change as production continues. This provides a significant measure of comfort for predicting both the overall grade of the E&B, and the proportion of the Premium Emerald+Emerald.

The grade distribution (carat content) within Chama is well understood. The presence of emerald and beryl is largely related to metasomatism and alteration, the degree of crystallisation at the TMS / PEG contact, the degree of deformation at the TMS / PEG contact, and the presence of quartz-tourmaline veining. All of these aspects control the degree to which the biotite phlogopite schists are developed, and so the presence of emerald and beryl crystals. These factors are known to vary along the strike length of the area currently in production.

These factors have also been to observe along the dip extend of the TMS unit. Where a contact is exposed, which is considered to be well defined, the B&E grade can be as high as 450 ct/t, whereas in less well-defined areas, the grade can decrease to 20 ct/t. These grade variations are reflected in the sector and factored grade approach used to define the Mineral Resources.

Within a contact, the proportion of emerald to beryl can also vary, but typically, the grade (carats per tonne) is generally consistent. The sizes of individual stones recovered can also vary, with occasional very large stones (for example, 8 kg) have been recovered during the hand chiselling. The size of the stone is thought to be related to the fluid trap where the crystal starts to grow, and with subsequent deformation. For all recovered grades presented, the minimum crystal size regarded is 3 mm. Stones of a smaller size are recovered, but these are not included in any grades stated, or production reported. As of 30 June 2019, Gemfields report that approximately 59.17 Mct of fines (less than 3mm) have been recovered.

Although the factors which influence both the grade and size distribution of the recovered stones are known, the B&E grade is typically consistent within the sectors described. Furthermore, the grades recovered have shown good reconciliation for what was predicted previously. This provides a good degree of comfort for the anticipated grade of B&E in both the declared Mineral Resources, and the subsequent mine planning exercises.

Factors have been used to reflect the decreasing or stable grades in the individual sectors. In the deeper parts of the FF-Mboyanga sector, the historically achieved average grade for the mine has been applied, factored to reflect that grade is changing over time.

Table 2-11: Kagem: Chama Derivation of Grade for sectors

Statistic	Unit	Value
F10		
Average production B&E grade (including stockpile adjustment)	(ct/t)	241
Factor applied to average grade to reflect decreasing grade	(%)	0
Factored production grade	(ct/t)	241
Anticipated dilution	(%)	15%
B&E grade (including rounding)	(ct/t)	280
Junction		
Average production B&E grade	(ct/t)	236
Factor applied to average grade to reflect decreasing grade	(%)	0
Factored production grade	(ct/t)	236
Anticipated dilution	(%)	15%
B&E grade (including rounding)	(ct/t)	270
Chama		
Average production B&E grade	(ct/t)	354
Factor applied to average grade to reflect decreasing grade	(%)	9
Factored production grade	(ct/t)	323
Anticipated dilution	(%)	15
B&E grade (including rounding)	(ct/t)	370
FF - Mboyanga (1)		
Average production B&E grade (including stockpile adjustment)	(ct/t)	64
Factor applied to average grade to reflect increasing grade	(%)	20
Factored production grade	(ct/t)	76
Anticipated dilution	(%)	15
B&E grade (including rounding)	(ct/t)	90

Statistic	Unit	Value
FF - Mboyanga (2)		
Average production B&E grade (including stockpile adjustment)	(ct/t)	233
Factor applied to average grade to reflect decreasing grade	(%)	20
Factored production grade	(ct/t)	280
Anticipated dilution	(%)	15
B&E grade (including rounding)	(ct/t)	320

The B&E grade shown in Table 2-11 was used coded into the block model, and also forms the basis of the Mineral Resource estimate. As production grades are recorded by Kagem as a combination of beryl and emerald, SRK has used the same approach for the predicted grade, and so has not differentiated between beryl and emerald in the block model. SRK and Gemfields both consider this to be a suitable method for estimating the predicted grades of the mineralisation as the B&E grade reflects the overall mineralising system, and reflects the in situ nature of the gemstone deposits.

2.2.4 Fibolele Geological Modelling

The controls on emerald and beryl mineralisation at the Chama, Fibolele, and Libwente deposits are largely the same, and, for this reason, a similar modelling approach was taken for all three deposits. This section includes a description of the methodology as applied to the Fibolele deposit.

TMS model

Similar to the Chama modelling, the Fibolele talc-magnetite schist model was constructed through sectional polyline interpretations of the hangingwall and footwall, using the TMS, TBS and RZ logging codes as an explicit control on model geometry. A 3D TMS solid was then generated below the hangingwall and above the footwall surfaces. The model was checked against downhole XRF chromium grades, and modified to remove any material <1,500 ppm Cr and incorporate any material >1,500 ppm Cr at the TMS contact.

In addition to the main Fibolele TMS unit, an additional TMS body, potentially representing continuation of the Fibolele TMS trend was modelled based on a total of 11 drillholes (five with TMS intersections), and pit mapping of two historic pits in the Sandwana area, extending approximately 800 m ENE of the main Fibolele Pit.

Consistent with the other deposits, and most notably Chama, Fibolele is characterised by both concordant and discordant vein populations. At Fibolele, the majority of these intrusions are logged as quartz-tourmaline veins, being characterised by increased tourmaline content, and decreased feldspar input relative to the coarser PEG intersected at the other deposits at the Kagem Mine. These quartz-tourmaline veins are also generally narrower than the Chama PEG.

Visual analysis of logged vein intervals at Fibolele in 3D suggests that the most prominent and continuous concordant quartz-tourmaline veins are intruded along the immediate hangingwall and footwall of the TMS unit. An interval selection was generated for both the hangingwall and footwall veins (Table 2-12), based on all QT, TOUR, QV, PEG, and QF intervals at the TMS contacts.

Table 2-12: Kagem: Number of Intervals and Average Thickness of the Fibolele Concordant Veins

Vein	Number of holes intersected	Average thickness per hole (m)	% of TMS holes with vein at contact
TMS FWL Vein	34	0.62	47%
TMS HWL Vein	18	0.95	25%

After completing the concordant vein interval selection, all remaining vein intersections were coded as discordant. These were then modelled manually, using the Leapfrog vein modelling tool. A total of 25 discrete discordant QT veins were modelled at the Fibolele deposit (Table 2-13). The modelled veins are mostly sub-vertical, striking broadly N-S, consistent with the trend of the veins mapped in the open pit, and also with limited surface structural data. The 2017 Fibolele open pit geology map was also used as an explicit control on the discordant QT vein model where appropriate. Veins mapped in the open pit between drill sections where no drilling data is available were modelled based on mapping alone. Figure 2-27 shows the Fibolele TMS (in green) and quartz-tourmaline vein (in orange) models shown relative to the Fibolele Pit survey wireframe.

Table 2-13: Kagem: Dip, Azimuth and Basis for Modelling the Fibolele Discordant QT Veins

Vein	Average Dip (°)	Average Dip Azimuth (°)	Basis for Modeling	Vein	Average Dip (°)	Average Dip Azimuth (°)	Basis for Modeling
QT1	85	83	Drill Data	QT14	85	85	Drill Data
QT2	82	82	Drill Data	QT15	85	87	Drill Data
QT3	89	262	Drill Data	QT16	85	85	Drill Data
QT4	66	261	Drill Data	QT17	85	82	Drill Data
QT5	82	251	Drill Data	QT18	80	282	Pit Mapping & Drill Data
QT6	87	252	Drill Data	QT19	67	281	Drill Data
QT7	84	157	Pit Mapping & Drill Data	QT20	66	275	Drill Data
QT8	86	158	Drill Data	QT21	84	290	Drill Data
QT9	81	280	Pit Mapping & Drill Data	QT22	64	263	Pit Mapping & Drill Data
QT10	77	244	Drill Data	QT23	81	269	Pit Mapping
QT11	88	289	Pit Mapping & Drill Data	QT24	82	293	Pit Mapping
QT12	80	79	Drill Data	QT25	81	256	Pit Mapping
QT13	87	86	Drill Data	-	-	-	-

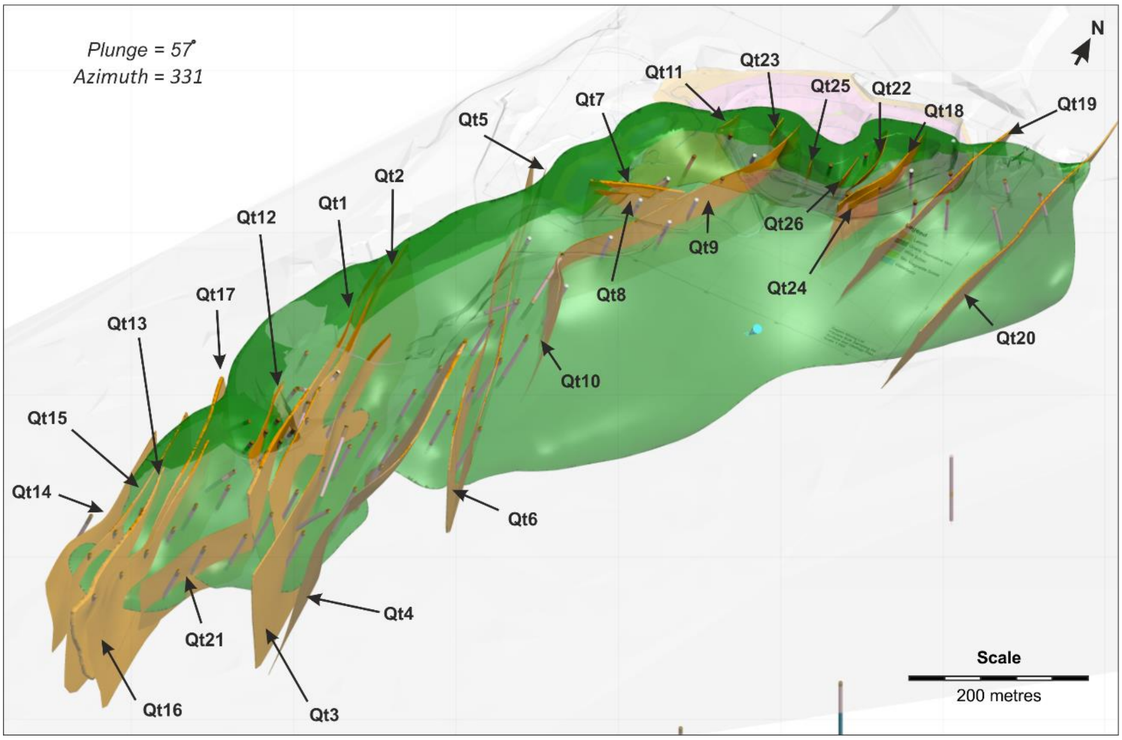


Figure 2-27: Kagem: Fibolele TMS and Quartz-Tourmaline Vein Models

Reaction zone model

Both the footwall and hangingwall TMS contacts at Fibolele are marked by discontinuous horizons of RZ material. The footwall RZ is intersected by 42 holes, whilst the hangingwall RZ is intersected by 28 holes, which represents 57% and 39%, respectively, of the total number of holes that intersect the main Fibolele TMS unit.

Both the footwall and hangingwall RZ models are based on RZ and BPS intervals at the TMS contacts. This was supplemented by CBS, BS, and QT intervals where RZ is not logged, but where adjacent drillholes all include logged RZ at the TMS footwall or hangingwall respectively.

Figure 2-28 shows a plan view of the hangingwall RZ (top image) and upwards facing plan view of the footwall RZ (bottom image) shown relative to the TMS unit (in green) and cut by the modelled QT veins. The footwall RZ model was generated by running a surface interpolation on the footwall RZ hangingwall points, using the modelled TMS footwall as a trend surface to guide the interpolation. A solid wireframe was then generated below the RZ surface and above the TMS footwall surface. The model was manipulated to pinch out to a zero thickness at holes with no RZ at the TMS footwall. This process was repeated for the hangingwall RZ model.

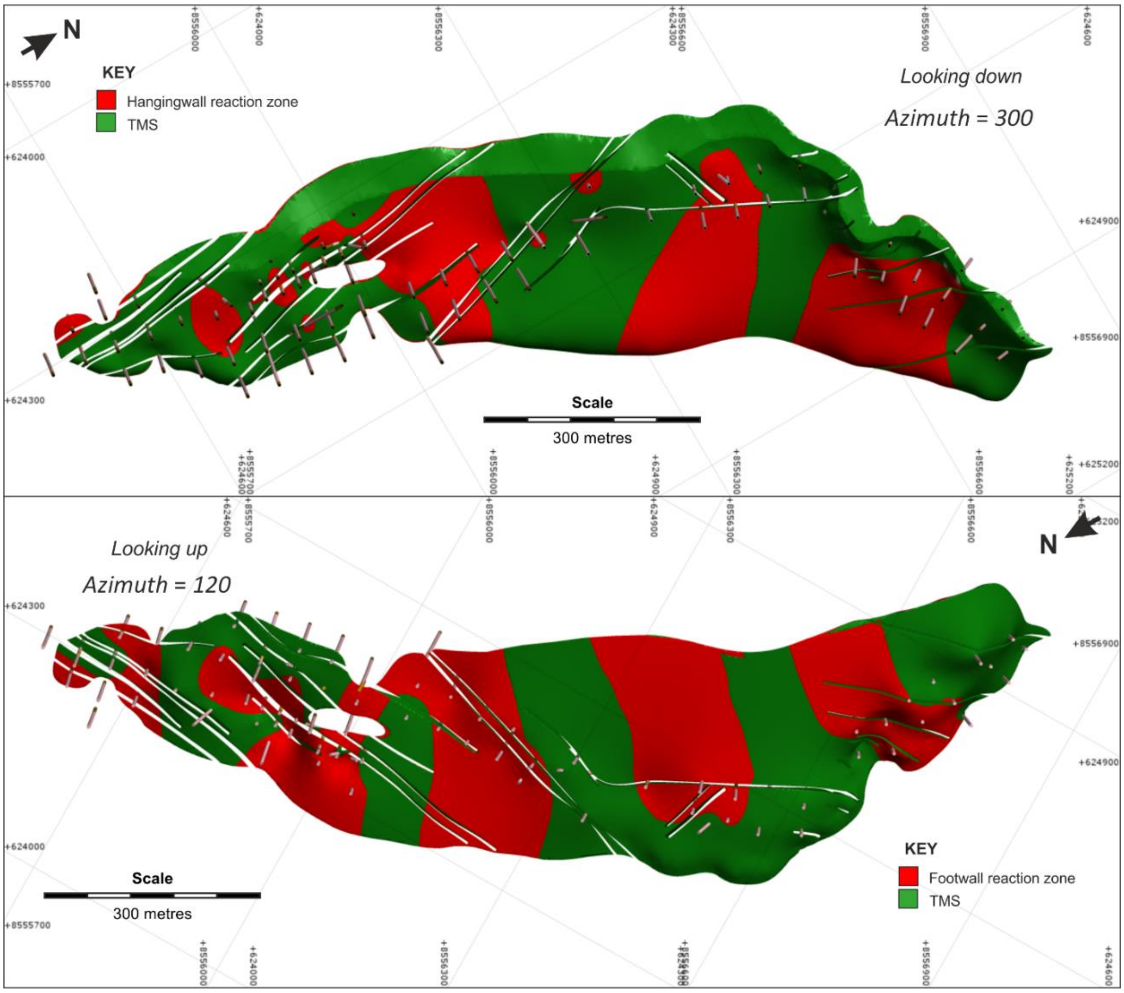


Figure 2-28: Fibolele Hangingwall and Footwall RZ Models

Up to 2017, RZ material equated to 8.1% of the waste TMS removed from the Fibolele Pit, according to Gemfields production analysis. Comparison of the modelled footwall and hangingwall RZ volumes with the modelled waste TMS volume above the most recent pit survey wireframe indicates that, above the pit, the footwall and hangingwall RZ models are equal to 1.56% and 0.44% of the waste TMS model volume respectively. A discordant RZ model was generated to account for the remaining RZ material, at a ratio of 5.87% relative to the modelled waste TMS above the open pit wireframe.

Figure 2-29 shows the Fibolele concordant and discordant RZ models displayed alongside the modelled QT veins and TMS unit. The discordant RZ model was generated by running a series of distance buffers and various distances around the quartz-tourmaline vein model. These were then cut outside the quartz-tourmaline model and inside the TMS model to generate a “skin” around the veins at various thickness values. These “skin” wireframes were then evaluated above the pit to calculate volume. This iterative process was repeated until a vein buffer distance (1.715 m) was established which resulted in a vein “skin” volume equal to 5.87% of the waste TMS model volume above the pit survey wireframe.

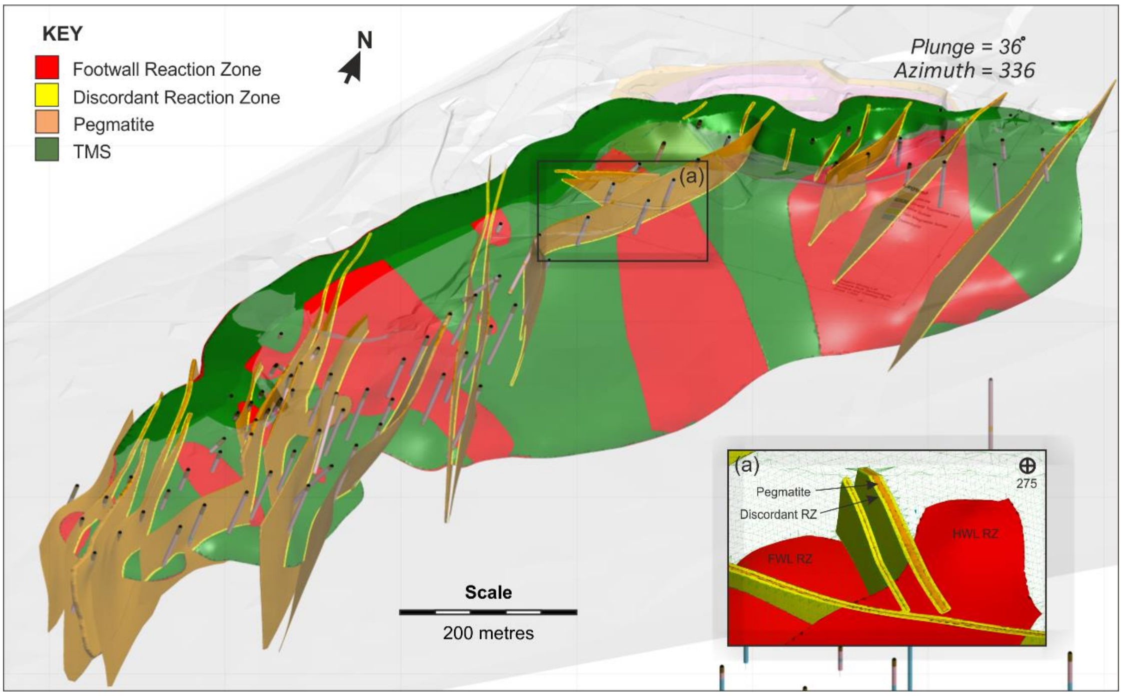


Figure 2-29: Kagem : Fibolele TMS, Quartz-Tourmaline Vein and Concordant and Discordant RZ Models

2.2.5 Fibolele Grade and Tonnage Estimation

As with Chama, SRK has produced a block model, based on the modelled RZs. The block model was used in the subsequent pit optimisation exercise. The block model parameters are included in Table 2-14. As with Chama, the density value applied was 2.85 g/cm^3 (Section 2.1.7).

Table 2-14: Kagem: Fibolele Block Model Parameters

Coordinate	Minimum	Maximum	Block Size (m)	Number of Blocks
X	623,500	625,500	20	100
Y	8,555,000	8,557,260	20	113
Z	900	1,250	5	70

All B&E mineralisation is assumed to be hosted by the modelled RZs. As at Chama, the amount of RZ in the geological model reflects the amount of RZ recorded during the bulk sampling operation, up to 2017. The production data to date is summarised in Table 2-15. Due to the nature of the mining method used, emerald and beryl breakage is not considered to be a concern, as the larger stones are recovered from the pit directly.

The recovered grade at Fibolele is based on both the in-pit recovery, and from the wash plant. A recovered grade has been determined, which takes into account the anticipated dilution. A dilution factor of 15% is assumed, which is consistent with that at Chama. The derivation of the modelled grade is shown in Table 2-16.

The B&E grade shown in Table 2-16 was used coded into the block model, and also forms the basis of the Mineral Resource estimate. As production grades are recorded by Gemfields as a combination of beryl and emerald, the grade in the block model is assigned on this same basis.

Table 2-15: Kagem: Fibolele Production Data

Statistic	Unit	2012	2013	2014	2015	2016	2017	2018	2019	All
Mining										
RZ	(kt)	3.6	12.0	13.1	13.7	21.2	23.5	11.7	6.4	105.2
Waste TMS	(kt)	59.4	129.6	150.5	169.0	368.7	230.5	182.0	142.6	1,432.3
Waste non-TMS	(kt)	175.6	299.5	407.5	1,376.5	722.5	584.1	243.4	43.9	3,852.9
Total Rock	(kt)	238.7	441.1	571.1	1,559.1	1,112.4	838.1	437.1	192.9	5,390.4
RZ:WST TMS%	(%)	6.1%	9.3%	8.7%	8.1%	5.7%	10.2%	6.5%	4.5%	7.3%
Gemstones Recovered										
Premium Emerald	(kg)	-	0.1	0.1	0.05	0.9	0.1	0.8	0.02	2.0
Emerald	(kg)	3	36	87	76	64	81	261	83	691
Beryl-1	(kg)	7	60	179	160	76	152	261	138	1,033
Beryl-2	(kg)	5	51	141	234	103	177	289	172	1,174
Premium Emerald + Emerald	(kg)	3	37	87	76	64	81	262	83	693
B&E	(kg)	15	148	408	470	244	410	812	393	2,900
Premium Emerald + Emerald	(kct)	15	183	435	381	322	404	1,310	416	3,467
B&E	(kct)	75	739	2,038	2,350	1,218	2,051	4,062	1,967	14,502
Grade										
Premium Emerald + Emerald	(g/t)	0.9	3.0	6.6	5.6	3.0	3.4	22.3	13.0	7
B&E	(g/t)	4.2	12.3	31.1	34.4	11.5	17.5	69.2	61.5	28
Premium Emerald + Emerald	(ct/t)	4.3	15.2	33.1	27.9	15.2	17.2	111.6	65.1	33
B&E	(ct/t)	20.8	61.6	155.4	172.2	57.5	87.4	346.0	307.4	138

Table 2-16: Kagem: Fibolele Derivation of Modelled Grade

Statistic	Unit	Value
Average production B&E grade	(Ct/t)	138
Anticipated dilution	(%)	15%
B&E grade	(Ct/t)	160

2.2.6 Libwente Geological Modelling

The Libwente geological model, block model, grade and tonnage estimate s, and accompanying Mineral Resource Statement is consistent with the 2017 CPR. As such, SRK has not reproduced the geological modelling sections here, as the model remains unchanged.

2.2.7 Libwente Grade and Tonnage Estimation

As with Chama and Fibolele, a block model was produced. As with the geological model, this remains unchanged from the 2017 CPR, and has not been reproduced here. The Mineral Resource Statement is also unchanged, as there has been no mining or other depletion in the Libwente area.

2.2.8 Mineral Resource Classification

Introduction

SRK notes that the exploration and production activities completed by Gemfields since 2008 have significantly improved the geological knowledge and understanding of the deposits; however, the derivation of Mineral Resources is largely dependent on the availability of the results of bulk samples or equivalent such as historical production statistics, as gathered and supplied by the mine. This provides the confidence in the grade of the individual deposit, and therefore the contained gemstones in the estimate.

This section describes the data analysis and considerations taken into account when deriving the classification of the Mineral Resources at each of the deposits.

Classification strategy and assumptions

SRK has made a series of assumptions with the mineralising system at all of the deposits. SRK has assumed that characteristics of the TMS unit remain constant to extents of the modelled unit with no changes in geology or mineralogy. Similarly, it is assumed that there is no changing in the mineralising system with depth and no change due to weathering with depth. The PEG were modelled using a combination of the regional scale interpretation, in-pit mapping, and available drillhole intersections. The RZ were modelled either directly (footwall / hangingwall) or from the intersection of the modelled PEG with the TMS unit. In the case of the discordant zones, the morphology of the RZ was derived from the modelled PEG, with the assumed thicknesses based on the percentage of RZ mined, in relation to the TMS.

Grade data is sourced from historical production data so no direct grade estimate can be undertaken. Grade estimates are therefore entirely dependent on historical data for validation. The actual historical RZ grade has been applied on a sectional basis to the RZ in the model. The RZ tonnage per block varies locally according to the wireframe models. The level to which the grade is extrapolated is related to the way that the data is gathered and assigned to the geological model. The degree of extrapolation is tightly controlled by referencing geological model and subsequent tonnage estimate to the production achieved since mining commenced.

In order to develop a classification scheme for the Mineral Resources at Kagem, SRK has taken the following factors into account. These factors were refined into guidelines for each Mineral Resource classification:

1. Quantity and quality of the underlying data, the level of geological understanding for each deposit, and across the property as a whole.
2. Confidence in the geological continuity of the TMS, PEG, and RZ.
3. Confidence in the grades, as derived from the production/bulk sampling and the understanding of the grade variation at a given production scale.
4. The stage of development for each deposit (such as exploration, production, care and maintenance, etc).
5. The perceived level of risk associated with deviations from the assumptions made in defining and classifying the Mineral Resources. In particular, the definition of a Measured or Indicated Mineral Resource specifically requires there to be sufficient confidence for the subsequent application of modifying factors, and so the risk in classifying as such needs to be understood.

Classification guidelines

In order to classify the Mineral Resources at Kagem, SRK has used the following broad guidelines.

Measured Mineral Resources

1. Extremely high quality mapping of all available outcrop, along with drilling, logging, sampling and analysis of all available drillhole data. Excellent understanding of the location of the TMS, the spatial distribution of RZ within the TMS, and of the orientation of PEGe. Drillhole spacing and orientation is sufficient to accurately predict the TMS, PEG, and RZ where relevant. Drillhole spacing in the zone defined as Measured Mineral Resources at Chama varies between approximately 20 m to 80 m, depending on the orientation of the drillholes. Some drillholes are targeted at intersecting the TMS, and some at intersecting the PEG, and so the orientations vary. In addition to the drilling, the geological models are supported by detailed geological mapping of all available outcrop. Development and demonstration of suitability through testing of a conceptual mineralising model which underpins the ability to predict the location, geometry and tenor of the RZ.
2. A high degree of confidence in the continuity of the TMS, PEG, discordant and footwall and hangingwall RZ. Individual PEG can be easily traced between multiple drillholes, indicating a high degree of confidence of the discordant RZ, which are dependent on the PEG locations. The footwall and hangingwall RZ should be easily traced between drillholes, with consistency in the geometry and spatial location. The confidence in the geological and grade continuity is based extrapolation of the knowledge of the deposit from known areas, to unknown areas, with a maximum distance based on the length down-dip that mineralisation has already been exposed, and successfully mined. The distance of extrapolation is based on the amount of material already mined from the individual deposit, as well as incorporating other factors (for example, grade continuity, modelling approach, etc.). The level of extrapolation was derived for each deposit individually. At Chama, the maximum extrapolation distance of 150 m, although some areas are less, in region of 30 to 50 m. This extrapolation distance compares to the down-dip extension already exposed during mining of approximately 400 m. In addition, all geological modelling must reflect the trends observed in the geological mapping, including the scale, morphology, and location of the PEG and RZ.
3. A high degree of confidence in the global grade of the RZ. This is demonstrated through the ability to predict, plan, and reconcile grade estimates to within 15% error, at a 90% confidence limit on an annual basis. This needs to be consistent over a prolonged period of time, analogous to the anticipated mine plan. This provides a level of understanding as to the level of variability in the grade estimates, and how these are likely to change in the short term, as required for short term mine planning.
4. The project needs to be at an advanced stage of development, with appropriate production procedures in place for the deposit in question. The stage of development of the project needs to be accounted for, as this determines the level of confidence in the data available to support the Mineral Resource estimate and subsequent classification. The procedures need to be shown to be suitable and to be gathering the relevant information over a reasonable period of time. A high confidence that all conditions necessary to form beryl and emeralds during the mineralising process were present, achieved by extrapolating confidence a relatively short distance from the known emerald bearing parts of the deposit.

5. In order for a Mineral Resource to be classified as Measured, the economic viability of the project also needs to be highly insensitive to changing parameters, such as selling price, grade, strip ratio, and as such, supports the application of any subsequent modifying factors, for the definition of a Mineral Reserve.

Indicated Mineral Resources

1. High quality mapping, drilling, logging, sampling and analysis of available drillhole data. Understanding of the location of the TMS, the spatial distribution of RZ within the TMS, and of the orientation of PEG. Drillhole spacing and orientation is sufficient to accurately predict the TMS, PEG, and RZ were relevant. Drillhole spacing in the area defined as Indicated Mineral Resources at Chama is between approximately 50 m increasing to a maximum of 100 m.
2. A high to reasonable degree of confidence in the continuity of the TMS, PEG, discordant and footwall/hangingwall RZ. Individual PEG can be easily traced between drillholes, indicating a high to reasonable degree of confidence of the discordant RZ, which are dependent on the PEG locations. The footwall and hangingwall RZ should be easily traced between drillholes, with consistency in the geometry and spatial location. In addition, all geological modelling must reflect the trends observed in the geological mapping, including the scale, morphology, and location of the PEG and RZ. This differs from a Measured Mineral Resource as there is less confidence in the geological, grade, and quality continuity, as defined by a more distant extrapolation of data from known areas to unknown. Indicated Mineral Resources are either defined as being beyond the area defined as Measured Indicated Mineral Resources (in the case of Chama) or in well drilled and defined areas (as found in Fibolele).
3. High to reasonable degree of confidence in the grade of the RZ. This is demonstrated through the ability to predict, plan, and reconcile grade estimates to within 15% error, at a 90% confidence limit on an annual basis. This provides a level of understanding as to the level of variability in the grade estimates, and how these are likely to change in the short to medium term, as required for medium to long term mine planning. The grade and quality of the deposit is generally well understood, and so notes that there is only a minor difference between defining Measured and Indicated Mineral Resources for this point alone.
4. The project needs to be at an advanced stage of development, with appropriate production procedures in place for the deposit in question. The stage of development of the project needs to be accounted for, as this determines the level of confidence in the data available to support the Mineral Resource estimate and subsequent classification. The procedures need to be shown to be suitable and to be gathering the relevant information over a reasonable period of time.
5. In order for a Mineral Resource to be classified as Indicated, the economic viability of the project also needs to be highly insensitive to changing parameters, such as selling price, grade, strip ratio, and as such, supports the application of any subsequent modifying factors, for the definition of a Mineral Reserve.

Inferred Mineral Resources

1. High quality mapping, drilling, logging, sampling and analysis of available drillhole data. Understanding of the location of the TMS, the spatial distribution of RZ within the TMS, and of the orientation of PEG. Drillhole spacing and orientation is sufficient to infer the spatial location of the TMS, PEG, and RZ were relevant.
2. A reasonable to low degree of confidence in the continuity of the TMS, PEG, discordant and footwall/hangingwall RZ. Individual PEG can be inferred between drillholes, indicating a reasonable to low degree of confidence of the discordant RZ, which are dependent on the PEG locations. The footwall and hangingwall RZ should be inferred to occur between drillholes.
3. Reasonable to low degree of confidence in the grade of the RZ. There is a high degree of uncertainty regarding the ability to predict, plan, and reconcile the grade.
4. The project needs to be at an advanced stage of development, with appropriate production procedures in place for the deposit in question. Alternatively, the deposit should have been subjected to a systematic and tightly controlled period of bulk sampling. The methods and data gathered need to be shown to be suitable for the deposit in question.

When classifying the individual deposits within Kagem, these broad criteria will be considered as a whole. The classification applied to the block model for the deposits, in relation to the pit shells used for Mineral Resource reporting (see Section 2.2.9), are illustrated in Figure 2-30 to Figure 2-32. For all figures, Measured Mineral Resources are coloured red, Indicated Mineral Resources, green, and Inferred Mineral Resources, blue. Material which has been modelled, but falls outside of the reported Mineral Resources, are coloured grey. The figures also show the drillholes used to define the geological models.

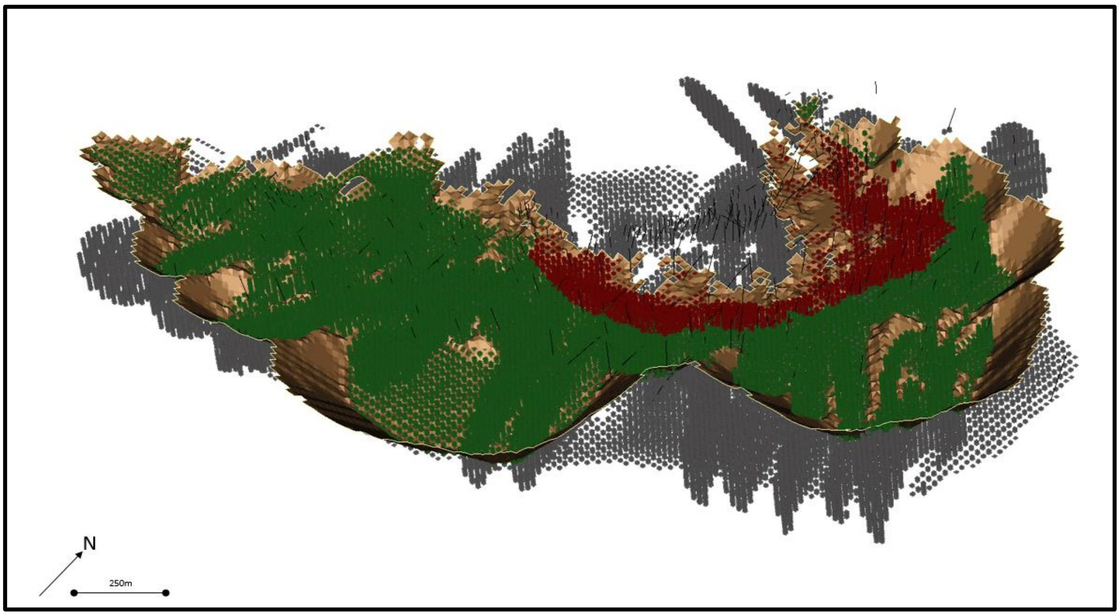


Figure 2-30: Kagem: Mineral Resource classification at Chama, shown in relation to resource shell used to limit Mineral Resource reporting

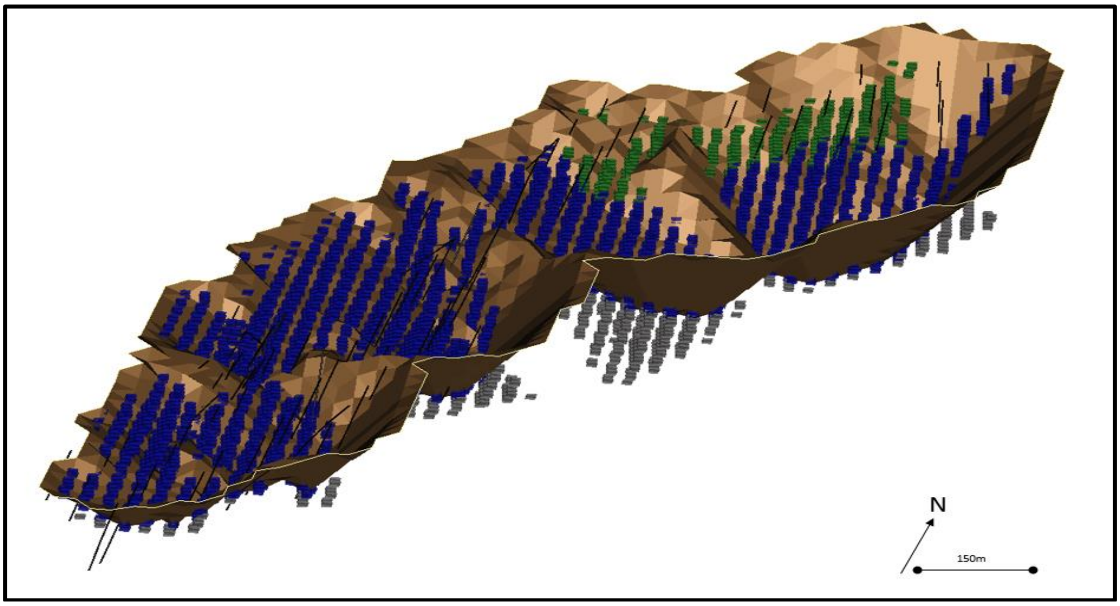


Figure 2-31: Kagem: Mineral Resource classification at Fibolele, shown in relation to resource shell used to limit Mineral Resource reporting

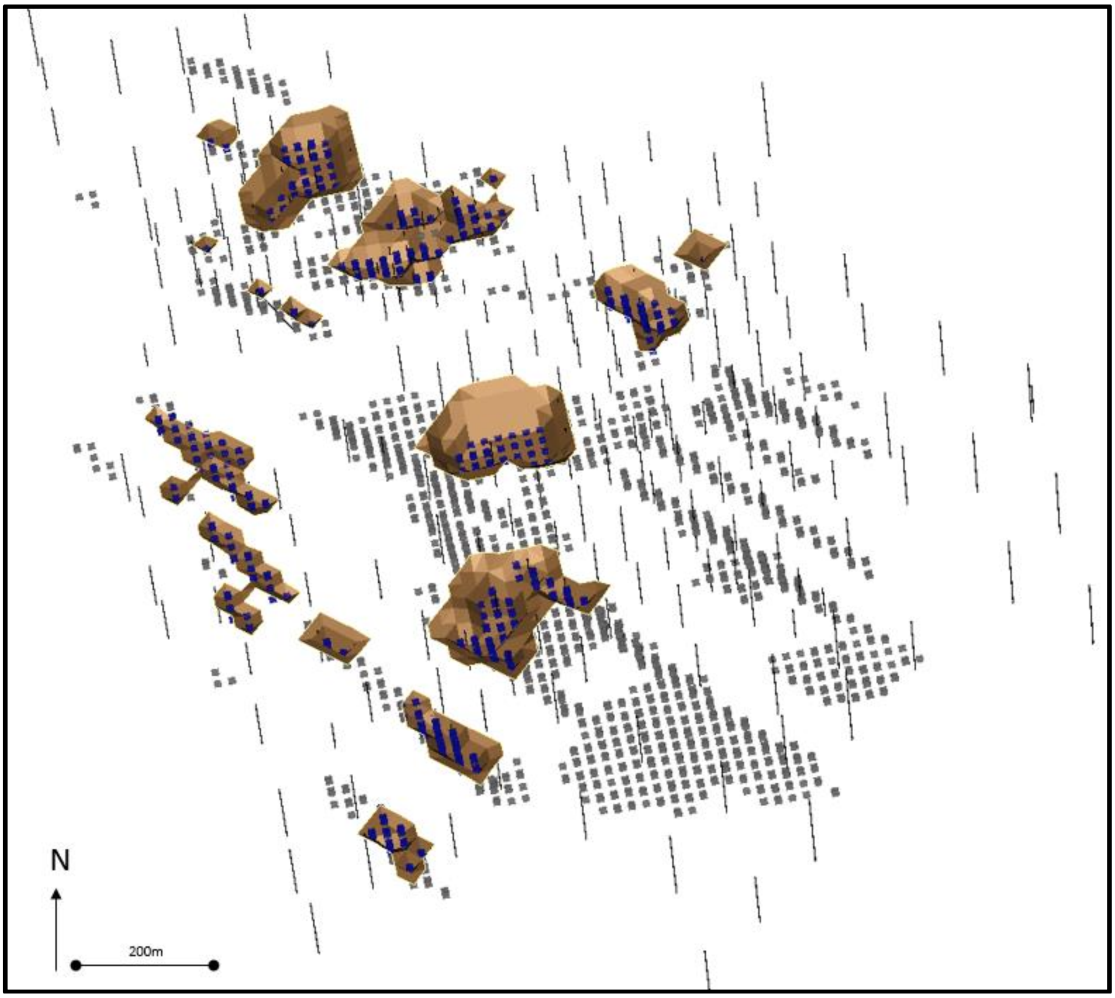


Figure 2-32: Kagem: Mineral Resource classification at Libwente, shown in relation to resource shell used to limit Mineral Resource reporting

2.2.9 Mineral Resource Reporting

In order to derive the proportions of the modelled deposits which fulfil the "…reasonable prospects for eventual economic extraction" criteria required for reporting Mineral Resources in accordance with the JORC Code, SRK has completed a pit optimisation exercise.

The optimised pits were based on the same parameters used for the mining study, except with a 30% mark up on the anticipated price, to reflect an optimistic view. The pit shells were derived from the block models discussed previously, and the classification coded into the block model. The resultant shells were used to report the tonnage and grade for each deposit.

SRK has been provided copies of written approval of the large-scale gemstone mining licence currently in place at the Kagem Mine and is valid for 10 years commencing on 27 April 2010. All reported Mineral Resources are contained within the extent of the Kagem Licence boundary. In addition, copies of the current operating permits and annual area charge invoices were supplied for review.

2.2.10 Mineral Resource Statements

The Mineral Resource Statements for Chama, Fibolele, and Libwente are included in Table 2-17. The Competent Person with overall responsibility for reporting of the Mineral Resource is Dr Lucy Roberts, MAusIMM(CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. SRK considers that the Mineral Resource Statements, as presented in Table 2-17 are reported in accordance with the JORC Code.

Table 2-17: Kagem: Mineral Resource Statements, as of 1 July 2019, for the Chama, Fibolele and Libwente Beryl and Emerald Deposits

Deposit	Classification	Tonnage (kt)	PE&E Grade (ct/t)	Beryl Grade (ct/t)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Measured Mineral Resources	480	73	177	250	122
	Indicated Mineral Resources	3,710	79	191	270	994
	Inferred Mineral Resources					
	Measured + Indicated	**4,190**	**79**	**191**	**270**	**1,117**
Fibolele	Measured Mineral Resources					
	Indicated Mineral Resources	130	38	122	160	20
	Inferred Mineral Resources	1,200			160	192
	Measured + Indicated	**130**	**38**	**122**	**160**	**20**
Libwente	Measured Mineral Resources					
	Indicated Mineral Resources					
	Inferred Mineral Resources	200	-	-	46	9
	Measured + Indicated	**-**	**-**	**-**	**-**	**-**
Stockpiles	Measured Mineral Resources	295	41	98	138	41
	Indicated Mineral Resources					
	Inferred Mineral Resources					
	Measured + Indicated	**295**	**41**	**98**	**138**	**41**
Total	Measured Mineral Resources	775	60	150	210	163
	Indicated Mineral Resources	3,840	75	190	265	1,015
	Inferred Mineral Resources	1,400			145	201
	Measured + Indicated	**4,615**	**75**	**180**	**260**	**1,178**

In reporting the Mineral Resources for the Kagem area, SRK notes the following:

- The average value of the beryl and emerald, as reported in the Mineral Resource Statement is USD 5.92 /ct. The value of the different product splits, are as follows:
  - Premium Emerald and Emerald: USD 20.87 /ct; and
  - Beryl (Beryl 1 and Beryl 2): USD 0.075 /ct.

- Mineral Resources are quoted at appropriate economic cut-off grades which satisfy the requirement of 'potentially economically mineable' for open-pit mining; furthermore, the commodity prices incorporated into the cut-off grade calculations for derivation of optimised shells are those as stated previously, with a 30% mark up, to reflect an optimistic view.
- In addition, SRK has also completed a pit optimisation exercise which quantifies the amount of material which is likely to be mined using open pit methods. The optimised pits were derived using the same input parameters as those in the mining study (Section 2.4), but with a commodity price which reflects an optimistic view.
- Mineral Resources are quoted with a bottom cut-off size of 3 mm, which is consistent with what can be recovered in the plant and picked by hand from the belts.
- All Mineral Resources are quoted at 100%, and derivation of attributable Mineral Resources would necessitate application of the Company's 75% equity interest (see Section 4).
- All total grades quoted reflect beryl and emerald combined, expressed as carats per tonne. For the Measured and Indicated Mineral Resources, the product splits are consistent with those determined historically. "PE&E" is Premium Emerald and Emerald combined, "Beryl" is Beryl-1 and Beryl-2 combined, and "B&E" is beryl and emerald. One carat is defined as 0.2 g. Conversely, this equates to a conversion factor of 5 carats per gram.
- Mineral Resources are reported inclusive of Ore Reserves
- Mineral Resources are reported inclusive of Ore Reserves

As at 1July 2019, SRK notes that the Chama beryl and emerald deposit has Measured Mineral Resources, of 480 kt of RZ material, grading at 250 ct/t B&E, and an Indicated Mineral Resource of 3,710 kt of RZ material, grading at 270 ct/t B&E. There are no Inferred Mineral Resources reported at Chama, as mineralisation with lower confidence occurs below the reporting shell used to define the Mineral Resources. At Fibolele, the declared Mineral Resources comprise 130 kt of RZ material, grading at 160 ct/t B&E, classified as Indicated, and 1,200 kt of RZ material, grading at 160 ct/t B&E, classified as Inferred Mineral Resources. At Libwente, the Inferred Mineral Resources consist of 200 kt of RZ material, grading at 46 ct/t B&E. Furthermore, a Measured Mineral Resource, comprising stockpiles, of 295 kt of RZ material, grading at 138 ct/t B&E is reported.

The geographical locations of the respective deposits included in the Mineral Resource Statement are indicated in Figure 1-2. Fibolele and Libwente are considered satellite deposits to the main Chama operation.

2.2.11 Comparison with Previous Mineral Resource estimates

The previous Mineral Resource estimate for the Kagem Mine was declared as of 31 December 2017 and covered the Chama, Fibolele, and Libwente deposits. At that time, no Exploration Targets were specifically declared. The Mineral Resource Statement, as of 31 December 2017 is given in Table 2-18.

Table 2-18: Kagem: Mineral Resource Statements, as of 31 December 2017, for the Chama, Fibolele and Libwente Beryl and Emerald Deposits

Deposit	Classification	Tonnage (kt)	PE+E Grade (ct/t)	Beryl Grade (ct/t)	B&E Grade (ct/t)	Contained Carats (ct ,000)
Chama	Measured Mineral Resources	700	83	200	283	198,000
	Indicated Mineral Resources	3,700	89	215	304	1,124,000
	Inferred Mineral Resources	-	-	-	-	-
	Measured + Indicated	**4,400**	**88**	**213**	**300**	**1,322,000**
Fibolele	Measured Mineral Resources	-	-	-	-	-
	Indicated Mineral Resources	140	25	94	119	16,500
	Inferred Mineral Resources	1,420	0	0	119	169,400
	Measured + Indicated	**140**	**25**	**94**	**119**	**16,500**
Libwente	Measured Mineral Resources	-	-	-	-	
	Indicated Mineral Resources	-	-	-	-	-
	Inferred Mineral Resources	200	-	-	46	9,100
	Measured + Indicated	**-**	-	-	**-**	**-**
Total	Measured Mineral Resources	700	83	200	283	198,000
	Indicated Mineral Resources	3,840	87	210	297	1,140,500
	Inferred Mineral Resources	1,620	-	-	110	178,500
	Measured + Indicated	**4,540**	**86**	**209**	**295**	**1,338,500**

Since the completion of the 2017 Mineral Resource estimate, the following aspects have influenced the changes reported:

- production from Chama and Fibolele; no production has been completed at Libwente
- no change to the underlying geological model;
- a decrease in the B&E grade at Chama, related to production achieved between 2012 and 1 July 2019; and
- the development of a significant RoM stockpile, which has not been the case previously.

2.2.12 Conclusions

SRK has generated a Mineral Resource estimate for the Chama, Fibolele, and Libwente deposits of the Kagem Mine, using all available and valid data as at 1July 2019.

SRK considers that adequate work has been undertaken at the Project to report Measured, Indicated and Inferred Mineral Resources in accordance with the JORC Code. The open pit mining, trial mining, drilling, sampling, logging and other data gathering methods used by Gemfields are appropriate and have yielded suitable data for use in the subsequent geological and grade modelling.

As at 1July 2019, SRK notes that the Chama beryl and emerald deposit has Measured Mineral Resources, of 480 kt of RZ material, grading at 250 ct/t B&E, and an Indicated Mineral Resource of 3,710 kt of RZ material, grading at 270 ct/t B&E. There are no Inferred Mineral Resources reported at Chama, as mineralisation with lower confidence occurs below the reporting shell used to define the Mineral Resources. At Fibolele, the declared Mineral Resources comprise 130 kt of RZ material, grading at 160 ct/t B&E, classified as Indicated, and 1,200 kt of RZ material, grading at 160 ct/t B&E, classified as Inferred Mineral Resources. At Libwente, the Inferred Mineral Resources consist of 200 kt of RZ material, grading at 46 ct/t B&E. Furthermore, a Measured Mineral Resource, comprising stockpiles, of 295kt of RZ material, grading at 138 ct/t B&E is reported.

The Mineral Resource Statement is reported within an optimised shell representing a price of with a 30% mark up on the average price of USD5.92 /ct. The value of the different product splits, are as follows:

- Premium Emerald and Emerald: USD20.87 /ct; and
- Beryl (Beryl 1 and Beryl 2): USD0.075 /ct;

This represents the material within the block models, which is considered to have reasonable prospects for eventual economic extraction, as required to report a Mineral Resource in accordance with the JORC Code.

2.2.13 Recommendations

SRK recommends the following, in order to provide data that will assist in improving the geological understanding and confidence in any future MRE updates:

- Complete a programme of drilling at both Fibolele and Libwente perpendicular to the main PEG / quartz-tourmaline vein trend to target the felsic intrusives. Targeted PEG / QT vein drilling is of equal importance to drilling focussed on the TMS unit, as the felsic intrusives are known to be a key control on the discordant RZ geometries.
- Complete additional drilling at Fibolele to test the down-dip extent of the TMS unit in the central and northern areas of the currently defined TMS model, where little drillhole data is available at depth.
- Routinely complete downhole surveying on all future diamond drillholes.
- Structurally orientate any future diamond drillholes to allow for the capture of key downhole structural data to provide a more robust basis for the interpretation of the TMS unit, and particularly the PEG and quartz-tourmaline veins, which are of variable orientation.
- Once sufficient oriented diamond drilling has been completed, commission a structural geology review, with particular emphasis on the Libwente deposit, which at present is the least well understood and potentially most structurally complex of the three main Kagem deposits.
- Routinely take thickness measurements and structural readings from all PEG dykes and quartz-tourmaline veins as part of the existing open pit mapping procedure.
- Where possible, de-water and conduct geological mapping of historical pits.
- Complete Niton XRF analysis on the entire length of drillholes, rather than just the TMS unit and 3 m into the hangingwall and footwall waste. This is essentially “free” data which, when coupled with sound geological logging and understanding, can help to provide a highly roust basis for geological interpretations.
- Where and when possible, complete handheld Niton XRF analysis along the entire length of historic holes to add to the Niton database.
- Routinely complete core photography on all new drillholes. Photographs should be taken as soon as the drill core arrives at the core facility, with depth markers clearly displayed. The core should be photographed wet and dry, ideally using a purpose-built frame that allows a constant angle and distance from the camera.

- Lithological logging data should be input into a fixed data input system that only allows the input of the agreed upon codes into the logging database. This should avoid the input of erroneous codes into the drillhole database and negate the need for time consuming database clean-up prior to use for modelling or analysis purposes.
- There is currently a degree of discrepancy between the geo-location of the open pit survey wireframes and the geo-referenced satellite imagery. This should be checked and rectified as soon as possible to ensure the spatial consistency and accuracy of all data sources.

2.3 Geotechnical Studies

2.3.1 General

SRK carried out a detailed geotechnical assessment for the current and anticipated mining areas, previously termed “Pushback 5”, of the Chama Pit in 2015. This work, which was detailed in both the 2015 and 2017 CPR documents, comprised the following work:

- Detailed geotechnical and discontinuity mapping of the rock masses forming the Chama Pushback 4 hangingwall slopes.
- Detailed geotechnical logging of a selection of resource boreholes drilled between the crest of the Pushback 4 hangingwall slope and the design crest position of the Pushback 5 hangingwall slope.
- Compilation and review of all rock strength data derived from various programmes of laboratory rock strength testing carried out between 2008 and 2015.
- From the geotechnical data collected, detailed deterministic and probabilistic kinematic (joint controlled) stability analyses were carried out to determine appropriate bench face angles and berm widths.
- Deterministic and probabilistic rock mass stability analyses were also carried out on an overall slope profiles to ensure that the overall slope design met appropriate international slope design criteria for factor of safety and probability of failure.

Based on these analyses, Kagem engineered the pit with a 53º overall slope angle for the 140 m high hangingwall slope in all pit sectors. This overall slope angle was achieved using 10 m high benches cut at a bench face angle of 65º, separated by 3 m wide catch berms.

2.3.2 Current Geotechnical Status

As at June 2019, the Pushback 5 hangingwall slope had been formed to a vertical height of about 62 m. The achieved slope profile was slightly shallower than design at 48º rather than 53º. From the survey drawings provided, this appears to be due to bench face angles being mined at 55º rather than to the design bench face angle of 65º.

No geotechnical work has been commissioned by Kagem since SRK carried out its last study in 2015. The results of the 2015 geotechnical study remain valid for the current pit as the pit has not been mined beyond the Pushback 5 position.

Figure 2-33 are photographs comparing the condition of the hangingwall slope in 2015 and 2019. The images show stable wall conditions and similar rock mass conditions for the Pushback 4 slope (2015) and the Pushback 5 slope (2019).

Pushback 4 HW – 26 June 2015

Pushback 5 HW – 29 September 2019

Figure 2-33: Kagem: Chama Pit HW Slope Comparison

2.3.3 Pit Slope Monitoring

Although no geotechnical work has been done for a number of years, Kagem has implemented a slope stability monitoring programme. A number of survey prisms have been installed at the crest of the Pushback 5 pit. The monitoring layout is shown in Figure 2-34. The first readings were taken in April 1918 and the monitoring prisms are read monthly.

SRK has analysed the monitoring data provided and can confirm that the monitoring network is not identifying any unstable movement trends at the pit crest. Prism velocity, measured in mm/day, is in the range of 0.3 to 3.0 mm/day and velocity values are reducing with time. The direction of prism movement is generally sub-parallel to the slope crest and not into the pit. Both of these trends are indicative of a stable pit slope.

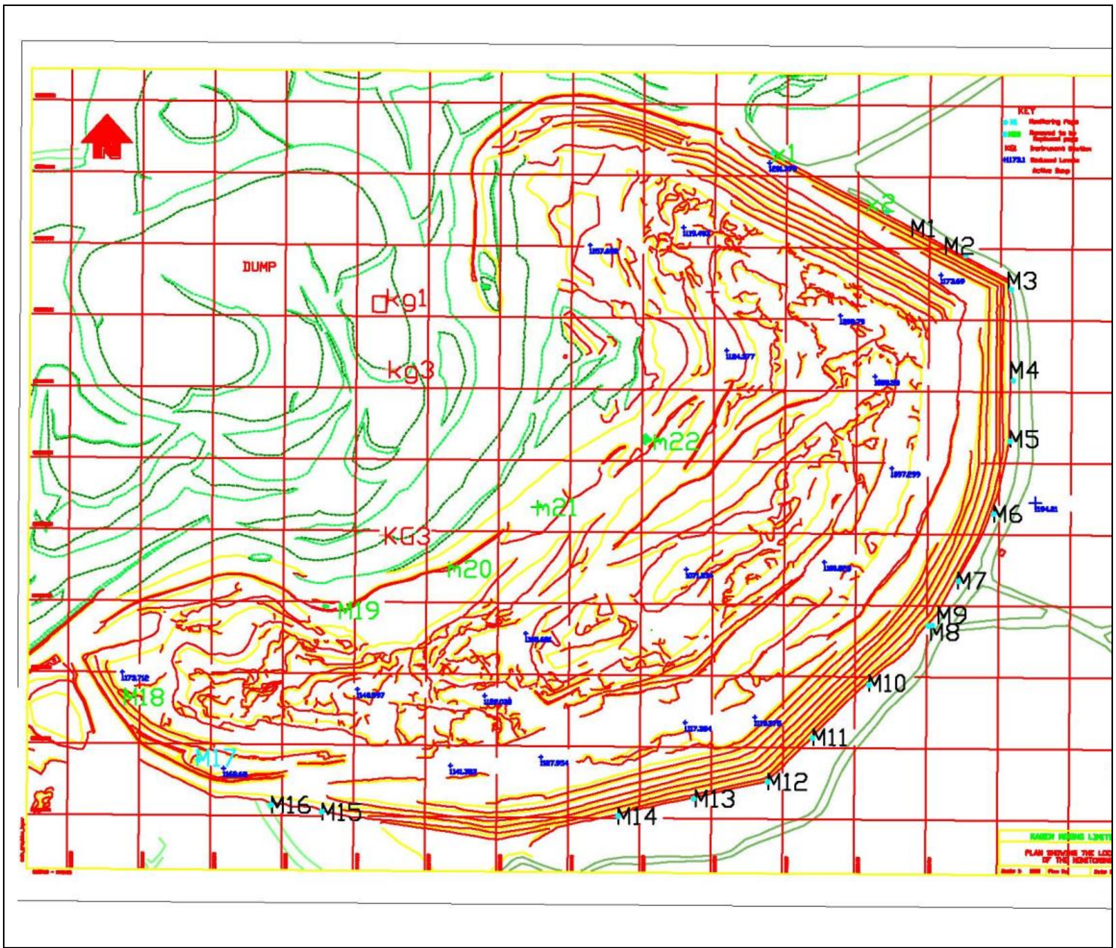


Figure 2-34: Kagem: Chama Pit Slope Monitoring Layout

2.3.4 SRK Comments

SRK is satisfied that the Chama pit slopes are stable, and the pit slopes are performing as designed. Kagem could work on improving berm definition to ensure that design berms are achieved. Whilst the geotechnical design criteria developed in 2015 for Pushback 5 are appropriate, if a Pushback 6 is planned, a geotechnical review is recommended prior to the design being finalised.

2.4 Open Pit Mining

2.4.1 Introduction

The following section includes discussion and comment on the mining engineering related aspects of the Mine. Accordingly, focus is in respect of the historical mining operations, open-pit optimisation analysis; mining methods; mine design, production scheduling, equipment selection, operating expenditure, and capital expenditure.

2.4.2 Historical Mining Operating Statistics

Historical Production Statistics

The historical open pit and underground total material movement per month is shown in Figure 2-35 and historical reaction zone (ore) in Figure 2-36. The historical mining on an annual basis is shown in. The key findings from the historic production are summarised below:

- Historical stripping ratios ("SR") are high (see rolling average SR in Figure 2-35) and would justify underground mining; however, open pit mining was chosen since it enables the mine to identify complex geological structures through face mapping. Open pit mining is also preferred as it enables stricter security measures to be implemented against emerald theft (as opposed to underground mining).
- Underground mining was trialled at Kagem for a few years and ceased in 2014 largely due to security concerns and the complex nature of the orebody which made it difficult to interpret and follow the reaction zones.
- Monthly and yearly production totals are quite erratic due to the variability of the orebody and the need for highly selective mining. The mine has achieved the following maximum production rates:
  - Maximum material movement per month = 1.37 Mt (July 2015);
  - Maximum material movement per annum = 11.4 Mt (2018);
  - Maximum ore (Reaction zone) per month = 18 kt (June 2018); and
  - Maximum ore (Reaction zone) per annum = 162 kt (2018).
- When considering the historic production data from Q1 2008 to date, the rolling mean grade of the RZ ore has been gradually decreasing (see monthly RZ tonnages in **Figure 2-36**).
- The emerald types recovered from the ore are relatively consistent, and the following general trends are noted:
  - a slight decrease in the proportion of recovered Premium Emeralds since 2008 can be seen (Figure 2-37), with the proportion remaining relatively stable from 2012 to date, (2019 YTD comprising 0.5% of total product);
  - a general increase in the proportion of recovered Emerald can be seen since Q1 2010, and has remained relatively stable from 2012 to date, at approximately 28% of total product;
  - 2018 has seen the highest amount of emeralds recovered at 9.5 Mct, with 2019 well on track to achieve the same totals (4.05 Mct 2019H1)); and

  - the proportions of recovered Beryl-1 and Beryl-2 have remained relatively stable from 2012 to date, at 41% and 30%, respectively YTD.

- Annual production totals are on track when compared with the LoMp compiled by SRK in 2017, with 162 kt of RZ ore achieved in 2018 (120 kt planned). Total material mined in 2018 was 10.4 Mt (11 Mt planned). 2019 YTD totals shows that Kagem is on track to achieve the budgeted production target.

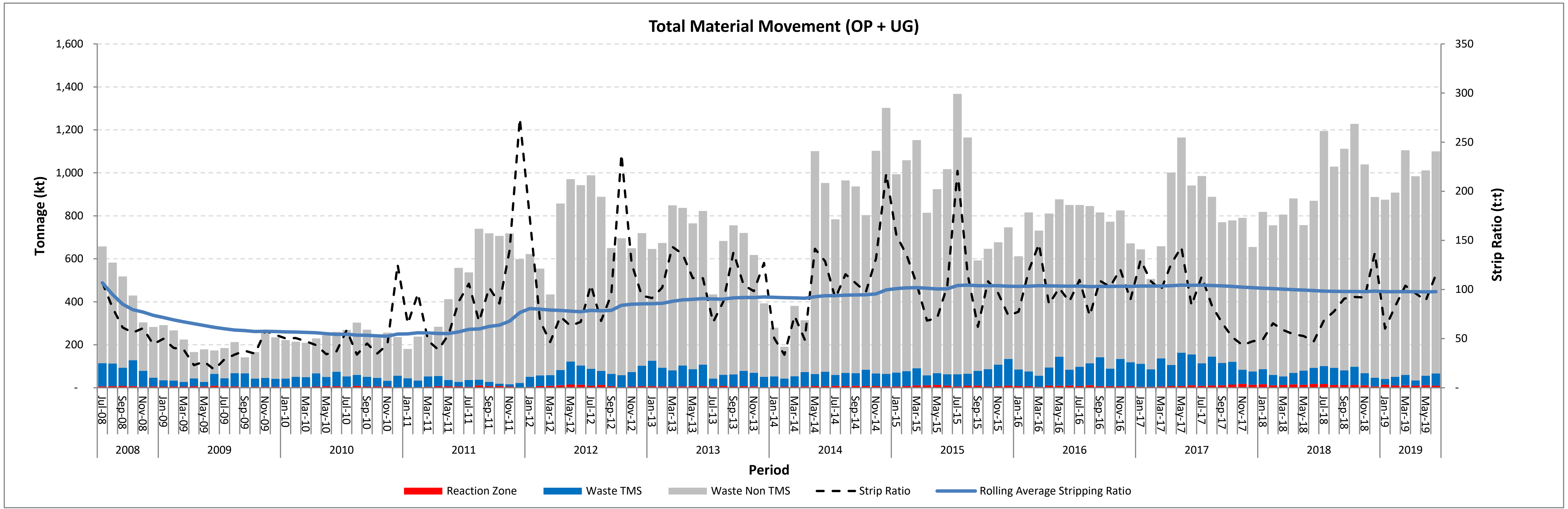


Figure 2-35: Kagem - Historical Total Material movement (OP+UG)

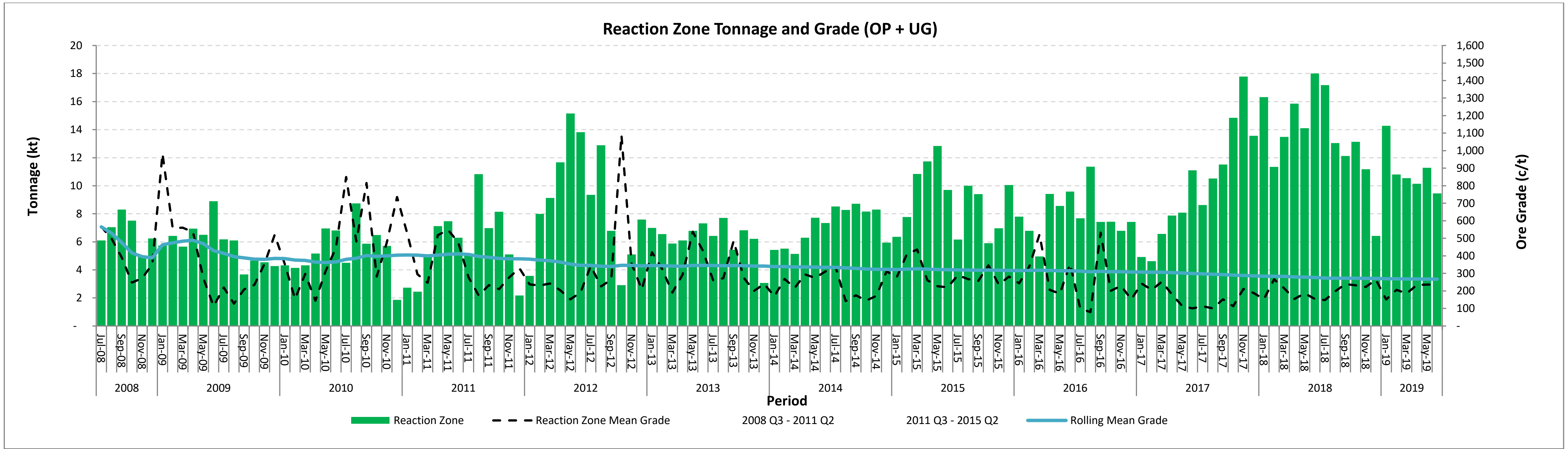
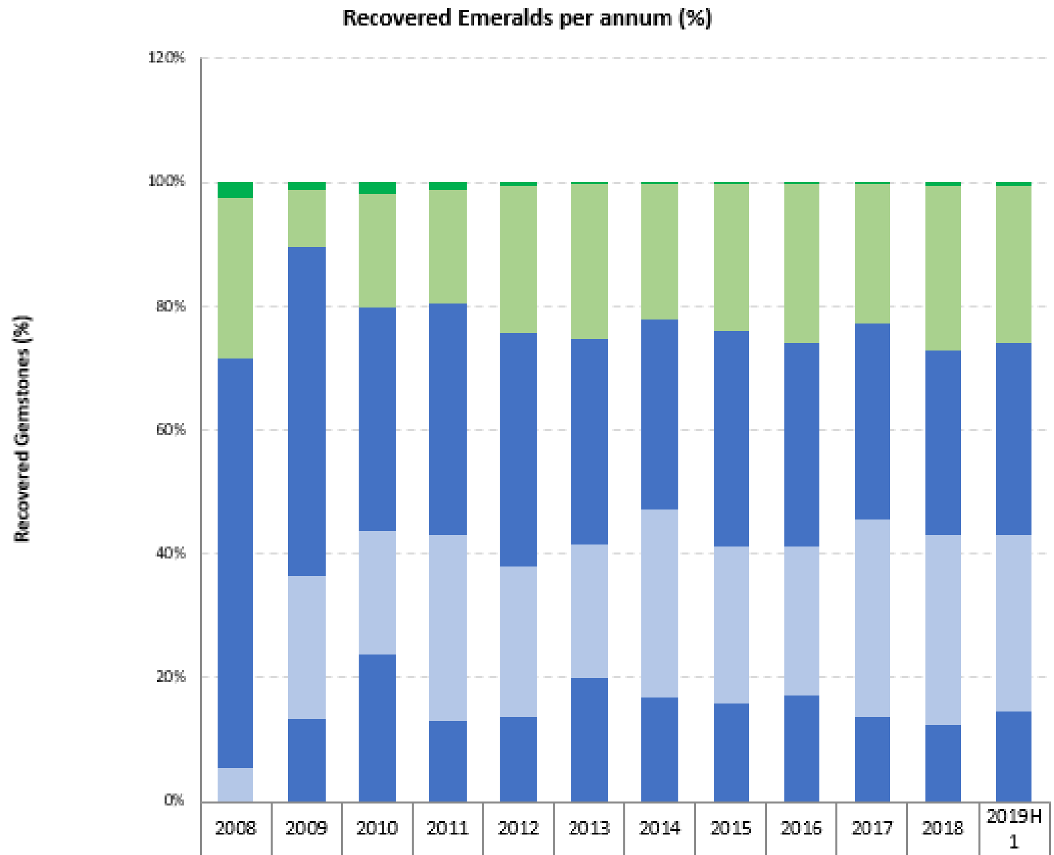
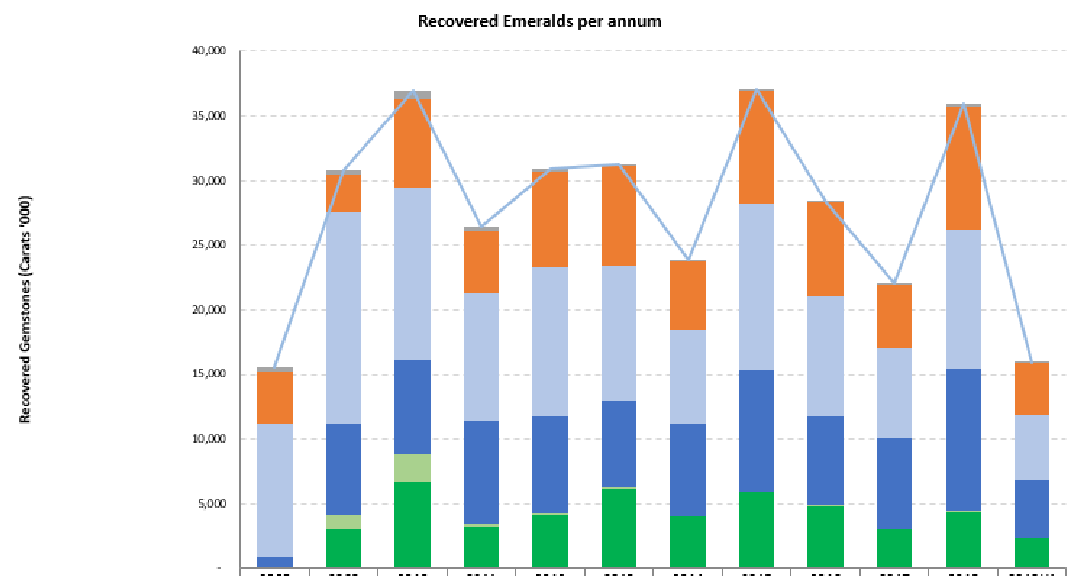


Figure 2-36: Kagem - Historical Reaction zone mined (OP+UG)



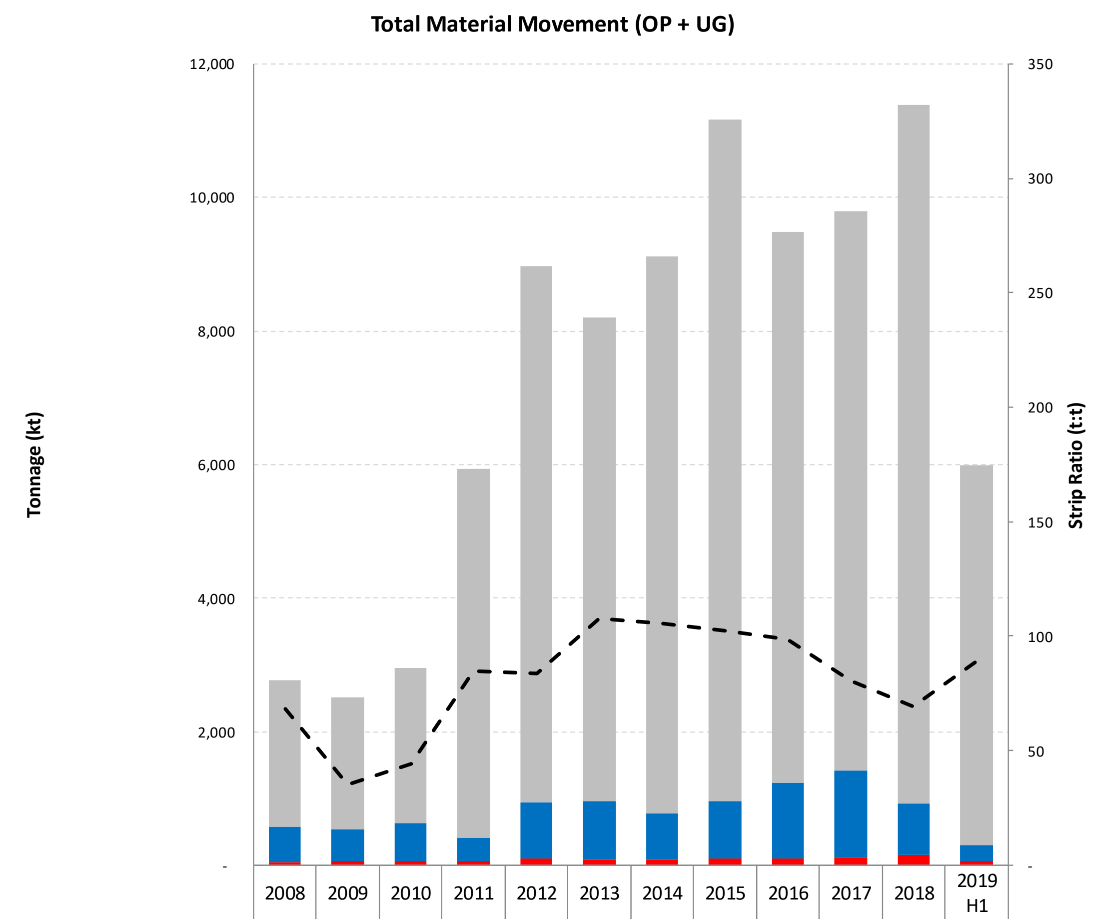
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019H1
Premium Emerald	2.6%	1.3%	2.0%	1.1%	0.7%	0.4%	0.2%	0.4%	0.2%	0.3%	0.6%	0.5%
Emerald	26%	9%	18%	18%	24%	25%	22%	23%	26%	22%	27%	25%
Beryl-I	66%	53%	36%	37%	37%	33%	31%	35%	33%	32%	30%	31%
Beryl-II	6%	23%	20%	30%	24%	22%	30%	25%	24%	32%	31%	28%
Other	0%	13%	24%	13%	14%	20%	17%	16%	17%	14%	12%	15%

Figure 2-37: Kagem: Historical Material movement, Reaction Zone tonnage and RoM Processing



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019H1
Premium Emerald	405	389	731	296	223	135	59	159	64	66	221	81
Emerald	4,039	2,818	6,807	4,848	7,354	7,755	5,229	8,699	7,293	4,946	9,544	4,054
Beryl-I	10,291	16,415	13,331	9,846	11,591	10,406	7,309	12,910	9,284	6,951	10,770	4,949
Beryl-II	860	7,102	7,288	7,949	7,537	6,738	7,208	9,427	6,848	7,054	10,980	4,519
Specimen	-	1,029	2,177	164	129	85	3	4	9	-	108	-
Fines	-	3,060	6,679	3,299	4,094	6,135	4,007	5,905	4,870	3,033	4,360	2,351
Total Recovered Gemstones	15,595	30,814	37,014	26,403	30,927	31,254	23,815	37,104	28,369	22,049	35,981	15,954

Figure 2-38: Kagem: Total Recovered Gemstones Summary



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019 H1
Waste Non TMS	2,198	1,969	2,311	5,531	8,032	7,238	8,341	10,194	8,245	8,374	10,451	5,675
Waste TMS	535	471	571	336	836	887	688	855	1,140	1,293	766	243
Reaction Zone Ore	40	70	65	69	106	75	85	108	95	120	162	67
Strip Ratio	68	35	44	85	84	108	106	103	99	81	69	89

Figure 2-39: Kagem: Annual production totals

2.4.3 Current Mining Operations

Site Layout and Mining Locations

The mining operations at Kagem comprise a number of historically mined open-pits as well as the current open-pit operations situated mainly in the Chama area, and Fibolele located approximately 4 km north of Chama. (Figure 2-40). The various sectors of the Chama pit are shown in Figure 2-41.

FF/Mboyanga was previously the main mining area due to the RZ occurring at shallow depths and lower stripping ratios. The quality of gemstones found in this region was less favourable than in F10 however, and since 2017, production has shifted to the F10 sector.

Equally, though the stripping ratio for Fibolele is also much lower than for Chama, the quality emeralds are also lower with a much lower proportion of Premium Emeralds found in Fibolele (0.069% of total carats mined since 2008). Production totals for Fibolele were therefore much lower than Chama since 2017. Continual bulk sampling is seeking to upgrade the resource at Fibolele.

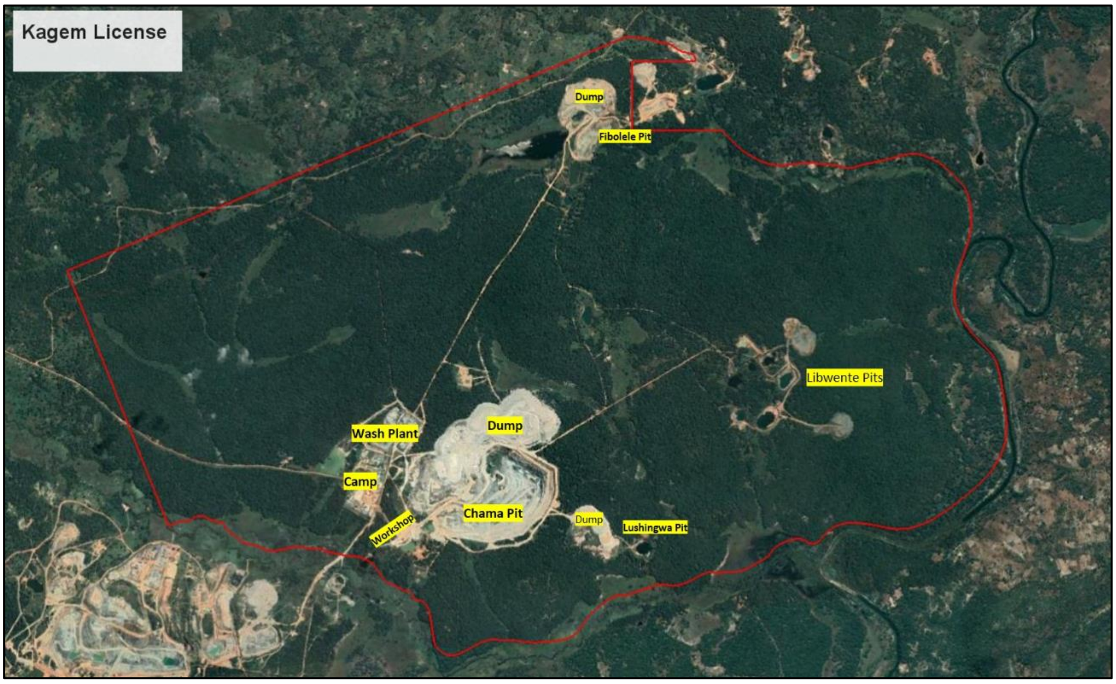


Figure 2-40: Kagem Site layout

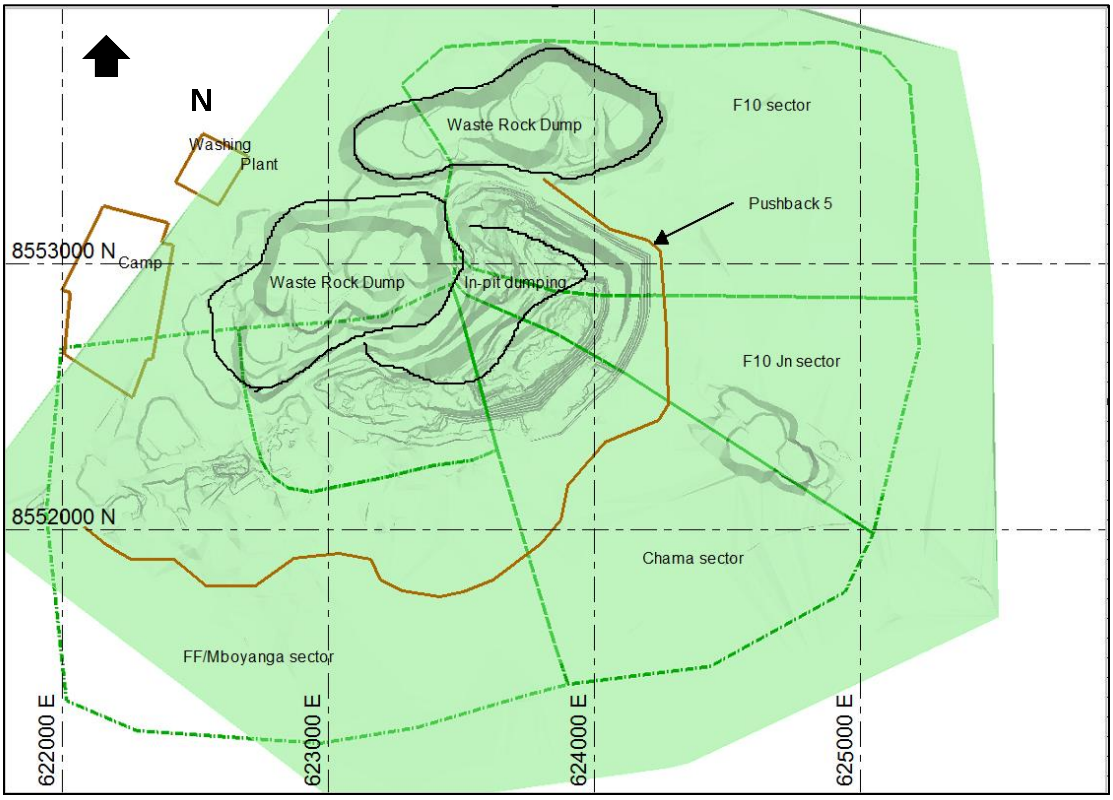


Figure 2-41: Current Chama Pit Layout

2.4.4 Mining Method

The mining method comprises conventional open-pit operations: drill and blast, excavate and load and haul to in-pit backfill, waste rock dump locations and the various ex-pit stockpiles and a stockpile at the wash plant facility. Free dig techniques are employed in the weathered zones at the Mine. Free dig techniques are possible in the upper 20 to 30 m where weathering is present. Since September 2015, the open pit mining activities are undertaken by the in-house mining fleet. No significant changes to the current mining method are planned for the LoMp developed as part of this CPR.

Figure 2-42 shows a schematic overview of the open pit mining activities, described below:

- The top 30 m of material is stripped. The majority of this material is free-dig, with the remaining overburden requiring drilling and blasting.
- Waste material consisting of mica schist and amphibolite (also termed bulk waste) is mined from this level down to the top of the TMS, the majority of which requires drilling and blasting. Bulk waste haulage occurs via haul ramps on the hanging wall side of the pit.
- From the top of the TMS to 2 m below the base of the TMS, mining takes place at a slow rate, with the use of hand-held drills and hydraulic equipment to recover as much RZ material as practical. Mining of the TMS requires drilling and blasting, and care is taken to not damage the RZ during blasting.
- Once the RZ are exposed, manual labour is used to remove the gemstones by hand directly from the in situ ore, and also from machine excavated material. Mining at a single exposed RZ is referred to as a production point. The number of simultaneously operating production points is limited to three to four for production rate and security purposes.

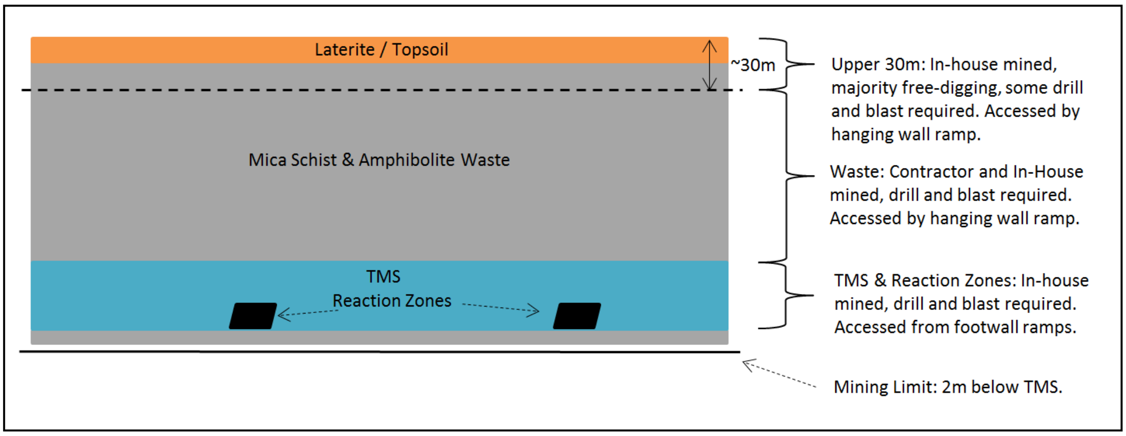


Figure 2-42: Mining Activity Overview

Grade Control

Grade control is practically constrained to visual inspection. Mining of the mineralised zones is only undertaken during daylight hours. Historical and current practice in respect of reconciliation is to record production on a mined, washed, and recovered basis on a pit by pit and sector basis.

Where blasting is required adjacent to or within the ore, hand-held drilling is employed to limit the potential damage to gemstones. The steeply dipping RZ are mined using manually intensive methods using picks and shovels with the assistance of hydraulic excavators under close supervision. Mining of RZ is only undertaken in daylight hours under constant security supervision with material mined and loaded into trucks accompanied by additional security vehicles on their journey to the Kagem Plant. All large and high grade emeralds that are hand sorted at the mining face are placed in a drop safe type container which is numbered, tagged, and closed with security controlled locks.

Drill and Blast

Drilling and blasting is undertaken by track mounted drill rigs, drilling 89 mm production holes on 3 m to 6 m benches, and uses emulsion-based explosives. The drill patterns are 4 x 4 m and 3 x 3 m with powder factors of 0.26 kg/m^3 to 0.60 kg/m^3, depending on rock type. Blasting is generally undertaken most days.

Excavatability

Based on discussions with Kagem staff and observations made at site, the top 20 to 30 m of weathered material from surface is free-dig and does not require blasting. Below the upper 20 to 30 m the waste rock becomes more competent (fresh) and requires drilling and blasting.

The RZ material is generally quite soft and able to be excavated using mechanical backhoe excavators or by hand with picks. The TMS material in the immediate vicinity of the RZ is more competent, and is drilled by hand held pneumatic drills and blasted with cartridge explosives. This blasting method provides relatively ‘light’ blasting of the RZ which enables easier excavation, whilst preventing excessive damage to the RZ and gemstones.

Waste Rock Dumps

External waste dumps are used for the majority of the upper 30 m and non-TMS waste; however, the majority of the TMS waste rock is dumped in-pit on the footwall side of the pit.

Backfilling of the Chama pit is only possible in mined out areas which do not prohibit the mining operations. Use of external waste rock dumps will be required.

Laterite and PEG material is stockpiled at multiple locations near the pit crest for use as road construction material. Topsoil material is stockpiled at specific dumps separate from other waste rock, to be used for rehabilitation.

Ore Stockpiles

Current operational practices include an ore stockpiling strategy, where ore is stockpiled near the wash plant facility to manage the expected variability in the gemstone grading distribution and the impacts of the wet season on productivity.

The current ore stockpile comprises of 3-months’ of ore processing feed (390 kt) and ore is stockpiled separately per pit and per sector for Chama. Ore stockpile tonnages is based on truck loads and reconciled using drone surveys.

Open Pit Dewatering

Ground water and rainfall contribute to the water in-flow to the Chama pit, with high rainfall levels in the wet season. Areas at the pit bottom are utilised as sumps, mostly during the wet season, where the water is collected and pumped ex-pit.

SRK notes that as the pit increases in size, the quantity of ground and surface water run-off into the pit is likely to increase. Appropriate operational planning for in-pit sumps and surface waste diversion will therefore be required to achieve effective pit water management.

Trafficability

Based on discussions with Kagem staff and observations at site, the haul road and pit floor trafficability is generally good during the dry and wet season. The use of articulated dump trucks mitigates some of the issues related to operating in wet conditions, which could otherwise significantly reduce productivity of larger rigid body trucks.

The mining rate is not significantly affected during the wet season; however, mining activities do cease during heavy downpours.

Below the upper 20 to 30 m, the in situ rock mass is generally of high strength and acts as good quality sub-grade material. In-pit haul roads are constructed from pit-run waste rock, with the PEG historically being especially good for haul road construction. Laterite material mined as part of the waste stripping is stockpiled at various locations near the pit crest and used for haul road construction and maintenance.

Based on the abundant availability of hard rock and laterite as pit-run material, sufficient road construction material is available for the in-pit and ex-pit haul roads. Kagem currently operates a number of graders and water trucks for road maintenance. The current approach for haul road construction and maintenance is envisaged to be suitable for future Kagem operations.

Mining Equipment

The in-house mining fleet consist of a waste mining and production fleet. The waste mining fleet mines only waste rock and the production fleet mines RZ ore and some of the waste rock when required. The fleets consist of diesel hydraulic backhoe excavators (2.4 m^3 to 6 m^3 buckets) and are used in conjunction with a fleet of 45 t, 40 t and 30 t capacity articulated dump trucks (“ADT”).

The in-house owner mining fleet as of June 2019 is given in Table 2-19. Although Kagem has a large fleet of ADT trucks, SRK notes that 32 of the 49 have been in production for five or more years. SRK also notes that Kagem purchased 13 new Bell B45E ADT in 2018.

The current mining fleet is supported by a number of ancillary equipment including wheel loader, track dozers, graders and water trucks. The current rock handling rate is approximately 1000 kt per month.

Table 2-19: Current In-House Chama Open Pit Equipment Fleet

Equipment Type	Make/Model	Number of Units (#)
Excavator	CAT 336D/336D2L/336DL	10
Excavator	CAT 340D2L	3
Excavator	CAT 374D	3
Excavator	CAT 390F	3
Excavator	BELL HD820E	2
ADT	CAT 730 / 730C	22
ADT	CAT 740B	1
ADT	BELL B45	17
ADT	BELL B40	9
Ancillary		
Dozer	CAT D10T	1
Dozer	CAT D9R	3
Dozer	Komatsu D375A-6A	1
Drill	Atlas Copco ROC D7-11	3
Drill	Atlas Copco ROC T35-11	2
Drill	Atlas Copco ROC D60 T3	1
Drill	Atlas Copco CS 1000P/ CS1000O4 Core Drill	2
Backhoe Loader	CAT 428F	1
FEL	CAT 950H	1
Grader	CAT 140H/140K	2
Water Truck	CAT 740	1
Water Truck	BELL B40D	2
Water Truck	BELL B45E	1
Service Truck	CAT 725	2

Fleet Management

A contractor currently provides labour for the mining fleet. Equipment is supervised and maintained by Kagem.

For security purposes, no more than four RZ production points are simultaneously exposed and operational. Waste mining is coordinated to maintain enough ore exposure for the appropriate number of production points.

To retain a high degree of selectivity for RZ, mining production rates are increasingly variable when mining of the TMS approaches the RZ. This is reflected in low historical equipment utilisation (40.2% for 2019 YTD) shown in Table 2-20. Whilst SRK understands that a high degree of selectivity will inevitably imply variable utilisation of mining equipment, it is recommended that improved fleet management practices are implemented. SRK believes the mine would benefit from periodic haulage analysis as part of short-term planning to ensure that equipment efficiency is optimal.

Table 2-20: Historical Owner Operator Equipment Fleet Efficiency

	UoM	2017	2018	2019YTD
Loading				
Scheduled time	Hrs	45,408	143,208	82,080
Breakdown time	Hrs	12,090	34,631	21,985
Available time	Hrs	33,318	108,577	60,095
Working time	Hrs	11,839	40,411	24,160
Availability	%	73.4%	75.8%	73.2%
Utilization	%	35.5%	37.2%	40.2%
Time loss	%	26.1%	28.2%	29.4%
Speed loss	%	95.1%	100.0%	83.5%
Quality rate	%	100.0%	100.0%	100.0%
Overall equipment efficiency	%	24.8%	28.2%	24.6%
Hauling				
Scheduled time	Hrs	131,760	412,500	209,064
Breakdown time	Hrs	29,947	103,196	51,308
Available time	Hrs	101,813	309,304	157,756
Working time	Hrs	44,509	155,234	89,844
Availability	%	77.3%	75.0%	75.5%
Utilization	%	43.7%	50.2%	57.0%
Time loss	%	33.8%	37.6%	43.0%
Speed loss	%	95.1%	100.0%	83.5%
Quality rate	%	100.0%	100.0%	100.0%
Overall equipment efficiency	%	**32.1%**	**37.6%**	**35.9%**
Haulage cycle time				
Trips	#	120,366	456,005	213,365
Cycle time	mins/ trip	22.2	20.4	25.3
Target Cycle time	mins/ trip	21.1	21.1	21.1
Speed loss	%	95.1%	100.0%	83.5%

2.4.5 Open Pit Optimisation

SRK has undertaken an open pit optimisation exercise for the Chama and Fibolele deposits, in the Geovia's Whittle software suite. This assessment includes consideration of the following technical and economic factors:

- forecast emerald prices;
- deductions including royalties, production taxes and management fees;
- operating expenditures; and
- modifying factors.

The key objectives of the open pit optimisations was to develop a practical and economic ultimate pit shells to form the basis of the mine design and production scheduling for the Kagem LoMp. A further purpose of the pit optimisation study was to provide an economic limit for reporting the Mineral Resource.

Mining Block Model

The inventory contained within the mining model used for pit optimisation is given in Table 2-21. Two separate block models were used for Chama and for Fibolele. SRK notes that all mineralisation within the mining block model is classified as either Measured or Indicated Mineral Resource, and therefore the pit optimisation for reserves included all mineralisation.

Table 2-21: Kagem: Mining Model Inventory for Chama

Mining Model "Chama_v01_ms5"	Volume MBCM	Density t/BCM	Tonnage Mt	Ore Grade ct/t	Contained Product Mct
Total Rock	4,940	2.4	11,654		
Waste	4,938	2.4	11,648		
Waste Assoc with Ore	18.0	2.6	46.9		
Bulk Waste	4,920	2.4	11,602		
RZ Ore (Diluted & Recovered)	1.8	2.8	5.2	233.2	1,207

Table 2-22: Kagem: Mining Model Inventory for Fibolele

Mining Model "fb_v01_msv3.mdl"	Volume MBCM	Density t/BCM	Tonnage Mt	Ore Grade ct/t	Contained Product Mct
Total Rock	1581.9	2.4	3799.8		
Waste	1581.9	2.4	3799.7		
Waste Assoc with Ore	7.5	2.6	19.7		
Bulk Waste	1574.3	2.4	3779.9		
RZ Ore (Diluted & Recovered)	0.05	2.8	0.15	139.1	20.4

Pit Optimisation Parameters

The pit optimisation parameters are given in Table 2-23. The general and administration unit cost ("G&A") has been included as a mining costs since the costs relates more towards the mining operation.

Optimisation included a more detailed consideration for high quality and low-quality auctions. High quality auctions comprise of premium emerald and approximately 18% of the emerald mined historically. Low quality auctions comprise of the remaining emerald and Beryl. The weighted average prices of the last 5 years for low- and high-quality auctions was used in the pit optimisation. The grade (B&E) in the mining model was multiplied by the historical percentage quality split per sector shown in Table 2-23 to distinguish between high- and low-quality emeralds modelled.

This approach has been taken to ensure that the pit optimisation software can provide improved strategic phases which reflect what is being experienced on site. Sectors with a historical abundant proportion of high-quality emeralds would then be favoured by the pit optimisation software.

Based on discussions with Kagem staff, the geotechnical parameters used in determining the ultimate pit extents are suitable for mine closure, with the appropriate pit slopes for long term stability and rehabilitation.

Whereas mining in the past were undertaken by a combination of contractor and in-house fleets, current (2019) mining is fully owner operated, with the contractor only providing labour for the fleet.

Table 2-23: Pit Optimisation Parameters

Parameters	Units	2019	Basis
Production			
Production Rate - RZ Ore	(tpa)	132,000	Site visit discussions - 2019
Production Rate – Waste	(Mtpa)	12.66	Site visit discussions - 2019
Geotechnical			
Overall Slope Angle	(Deg)	46-50	SRK geotech review, closure slope angle.
Mining Factors			
Dilution	(%)	15.0	Historic reconciliation of RZ to TMS %
Recovery	(%)	100.0	Highly controlled selective mining.
Processing			
Recovery	(%)	100.0	Grade in Resource model is recovered grade.
Operating Costs			
Mining Cost Applied	(USD/t_{rock})	3.06	
Mining Cost	(USD/t_{rock})	2.67	18 month historic mining & processing costs.
G&A (mining)	(USD/t_{rock})	0.39	18 month historic G&A Costs and other expenses.
Processing Cost	(USD/t_{ore})	4.5	18 month historic other mining and processing costs.
Mineral Royalties	(%)	9.0	Government royalty on gemstone sales revenue
Management & Auction Fees	(%)	12.5	12.5% revenues
Marketing & Advertising	(USD/carat)	N/A	2014-2015 Historic Marketing & Advertising Costs.
Product Price			
P+E (HQA)	(USD/ct)	65.42	5-year average from auction results (Higher Quality)
E (LQA)	(USD/ct)	4.05	5-year average from auction results (Lower Quality)
E % reporting to HQA	(%)	18	Gemfields provided data based on historical results
Other			
Discount Rate	(%)	10	

SRK notes that the cash flow model prepared subsequent to the pit optimisation exercise incorporates a few changes, which have not been taken into account during the optimisation run and include:

- a revised mineral royalty rate from 9% to 6%; and
- revised sales prices, reflecting the recent upward trend which is projected to continue for a few years (see the Marketing section for further detail).

Table 2-24: Quality split per sector and pit

Sector	Higher Quality Ct's (% P+E)	Lower Quality Ct's (% E)	Lower Quality Ct's (% B)*	Source
F10 Sector	6.05%	23.6%	70.4%	Gemfields historic data.
Chama Sector	7.03%	26.5%	66.5%	Gemfields historic data.
FF-Mboyanga	5.03%	21.0%	74.0%	Gemfields historic data.
Total Chama	**6.04%**	**23.7%**	**70.3%**	**Gemfields historic data.**
Fibolele	**4.36%**	**9.00%**	**76.1%**	**Gemfields historic data.**

** Only one Carat/t (Premium + Emerald + Beryl) modelled in the Resource model*

Pit Optimisation Footprint Constraint

A portion of the mining lease was lost towards the east of the previously modelled Fibolele. Although the mining model continues beyond the boundary line, a limitation has been set on the lease boundary to 10 m from the mining boundary.

Pit Optimisation Results

The calculation of a Whittle NPV, the usual criteria for selecting an optimal pit, is largely dependent on the discount rate and the high-level scheduling methodology applied in Whittle. Whittle produces nested pit shells with a relative discounted cashflow models ("DCF") for each nested pit. Three relative DCF are presented based on three different scheduling methodologies applied by Whittle:

- *Best:* The best cash flow is achieved when each of the nested pit shells are mined in sequence. Such a sequence, although optimal for cash flow, is mostly impractical since nested pit shells are often closely layered (like the layers of an onion) and would imply that thin pushbacks could be mined.
- *Specified:* The specified cash flow is based on the mining engineer pre-selecting some of the nested pit shells which would represent practical pushbacks in the mining sequence. A scheduling algorithm then determines optimal mining rates for each nested pushback.
- *Worst:* The worst cash flow is achieved when the selected final pit shell is mined from top to bottom without any consideration for nested pit shells or pushbacks. This is undoubtedly would be practical but usually presents the lowest economic scheduling option.

The nested pit shell graphs resulting from the pit optimisation for Chama is presented in Figure 2-43. A closer look at the nested pit shells are shown in Figure 2-44 and Figure 2-45 in a skin analysis for the final pit selection. The final chosen pit shell results are shown in Table 2-25. The key results of the pit optimisation are summarised below:

For Chama:

- The ultimate pit shell selection was driven by the optimal economic viability of the open pit, which considers the NPV in conjunction with the overall stripping ratio.
- The discounted open pit value for each nested pit shows that the Best and Specified scheduling options start to plateau at pit 10.
- As the nested pit shells increase towards the right of the graph, the stripping ratio increase with minimal improvement of the NPV.
- Beyond Pit 7 on the graph, the "Worst" scheduling option show a sharp decrease in value, highlighting that beyond this point, the NPV would be increasingly sensitive to mining pushbacks in a phased approach.
- The skin analysis for Chama show 99% of the maximum NPV can be achieved by at pit 10, at which point the stripping increase with no significant increase in NPV.
- Pit 10 was chosen as the final optimal pit shell, which will deliver 3.2 Mt of RZ ore (diluted) at a Whittle stripping ratio (excluding ramps and bench geometry) of 73 (t:t).

For Fibolele:

- Due to its relatively small size Fibolele will practically be mined as a single pushback.
- The optimal pit for Fibolele was chosen where the maximum NPV occurs at pit 6. This pit contains 0.12 Mt ore and 2.3 Mt Waste (Figure 2-26).

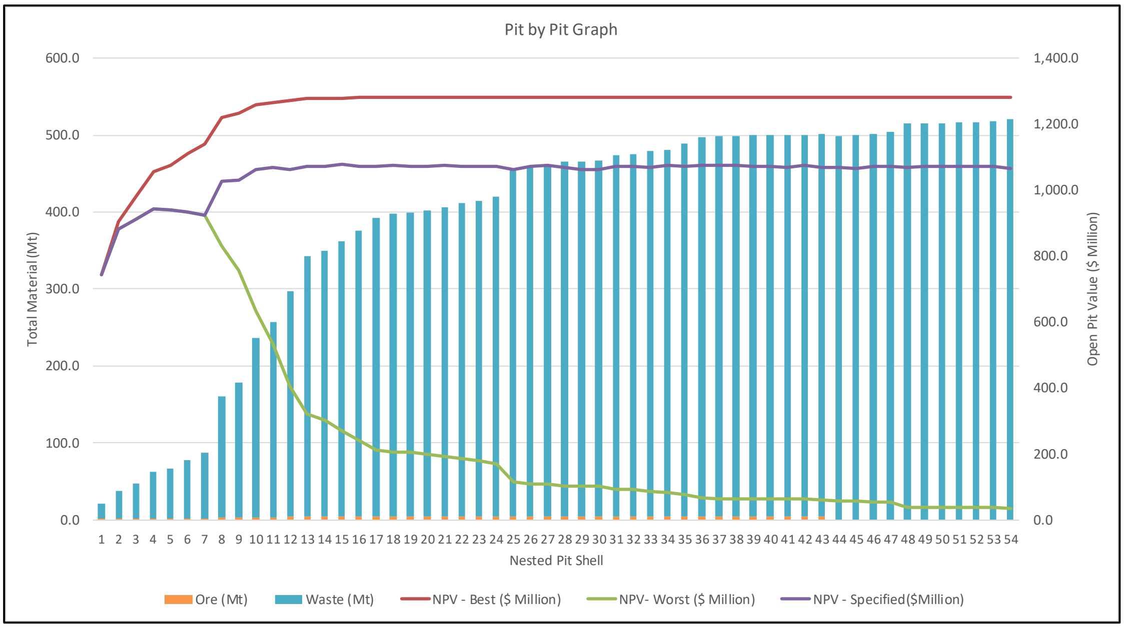
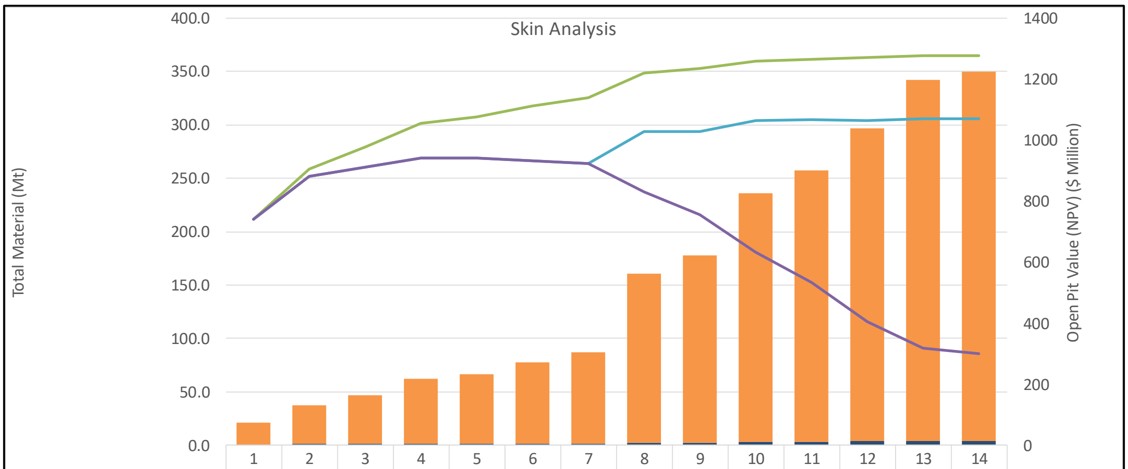


Figure 2-43: Kagem: Pit Optimisation Nested Pit Shells for Chama



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Waste (Mt)	20	36	46	61	65	76	86	158	175	232	254	293	338	346
Ore (Mt)	0.8	1.1	1.4	1.5	1.6	1.7	1.9	2.5	2.7	3.2	3.4	3.7	4.0	4.1
SR (t:t)	25.7	31.5	33.7	39.6	40.8	43.8	46.2	64.5	63.9	72.5	74.7	79.1	84.3	84.6
% of Max NPV	69%	82%	85%	87%	87%	87%	86%	95%	96%	99%	99%	99%	99%	99%
NPV - Best ($ Million)	742	904	977	1056	1076	1111	1139	1221	1234	1259	1265	1272	1277	1278
NPV - Specified($Million)	742	882	912	942	941	933	922	1027	1028	1063	1068	1064	1071	1071
NPV- Worst ($ Million)	742	882	912	942	941	933	922	830	755	632	535	405	320	302

Figure 2-44: Kagem: Pit optimisation nested pit shell skin analysis for Chama

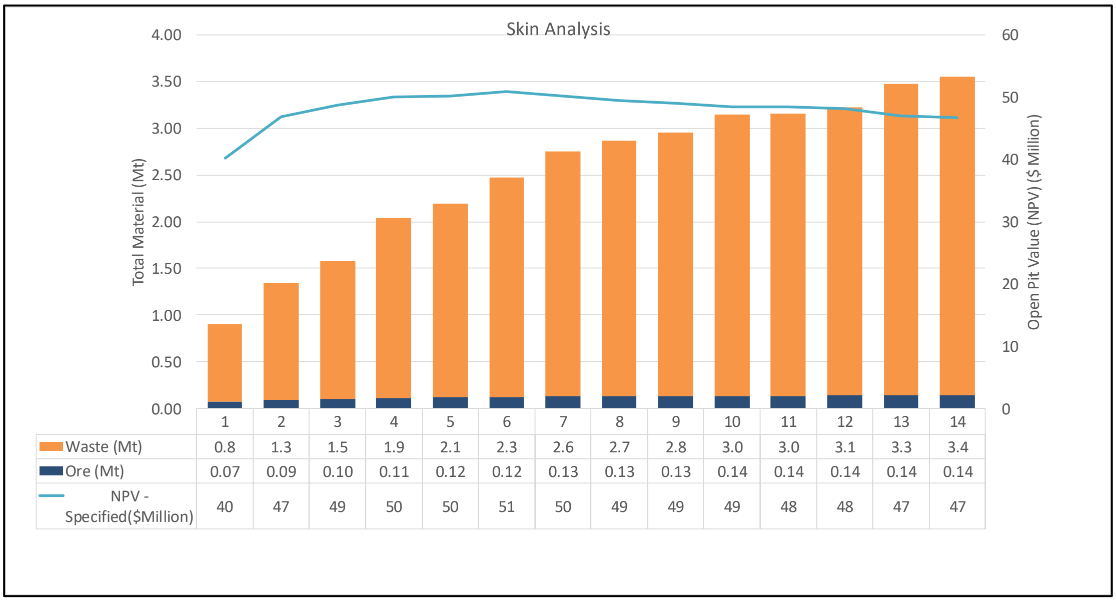


Figure 2-45: Kagem: Pit optimisation nested pit shell skin analysis for Fibolele

Table 2-25: Kagem: Pit Optimisation Results

Final Pit shell contents	Tonnage Mt	Ore Grade ct/t	Contained Product Mct	Stripping Ratio (t:t)
Chama				
Total Rock	248.9			
Waste	245.6			
RZ Ore (Diluted & Recovered)	3.29	235.7	776.4	
Stripping ratio				75
Fibolele				
Total Rock	2.42			
Waste	2.34			
RZ Ore (Diluted & Recovered)	0.12	139.1	17.3	
Stripping ratio				20

2.4.6 Strategic Assessment

Based on discussions with Gemfields, SRK has developed a strategic cutback for Kagem. SRK notes that due to the variability in grade and product type through the mineralisation, a key strategic driver for Kagem is to provide sequential cutbacks which provide a balance of high strip ratio – higher confidence ore, with lower strip ratio – lower confidence ore. The cutback strategy is based on the following key objectives:

- develop multiple simultaneously operating cutbacks which provides flexibility in the mining locations;
- the initial cutbacks should target the higher strip ratio - higher confidence zone immediately behind the current hanging wall, alongside a lower strip ratio – lower confidence zone to the south west of the current pit area;
- allow a minimum width between cutbacks of 80 m to 100 m; and
- provide a cutback sequence with increasing strip ratio.

Based on the ultimate pit geometry and the strategic objectives, SRK has developed five conceptual cutback shells within the ultimate pit which, as shown in Figure 2-46

The size and orientation of the Fibolele selected shell lends itself to be mined as a single pit, and therefore no intermediate cutbacks have been planned. This approach is aligned with Kagem's current plan for Fibolele.

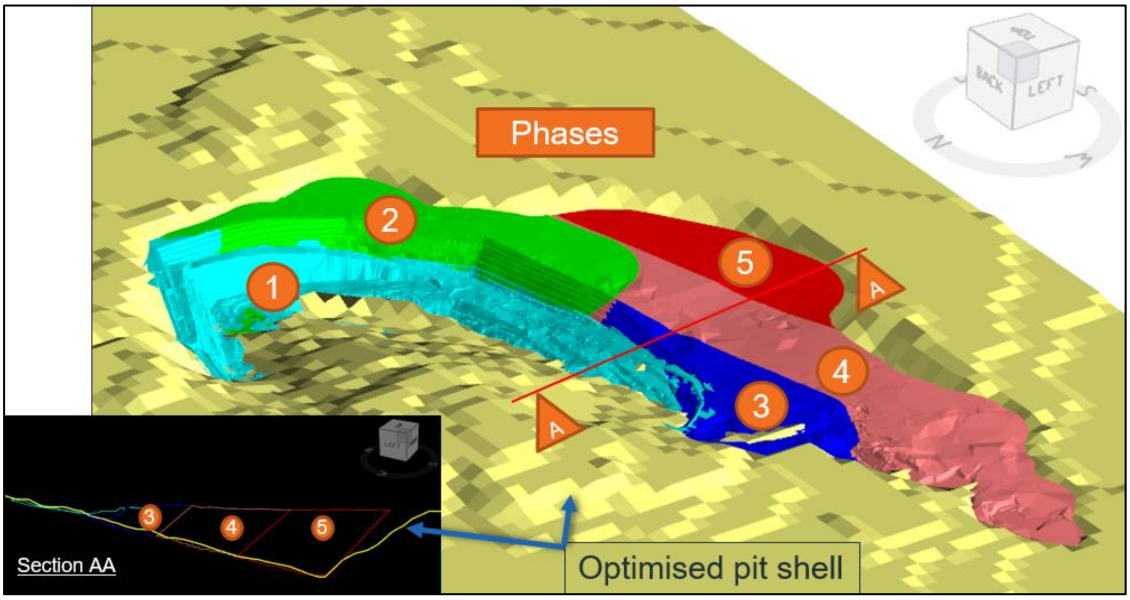


Figure 2-46: Kagem: Strategic Cutback Sequence for Chama

2.4.7 Mine Design

Design Parameters

SRK has undertaken engineered pit design for the Chama pit.

The geotechnical and operational pit design parameters for the Chama pit design are given in Table 2-26 and Table 2-27 respectively.

SRK notes that based on an iterative process of pit design and geotechnical analysis, it was determined that the berm widths could be reduced from 7 m (as was used in the pit optimisation) to 5.5 m whilst still maintaining an appropriate slope factor of safety ("FoS"). This has allowed for some reduction in waste material in the hanging wall when moving from the optimised pit design to the engineered pit design.

SRK notes that the operational design parameters are based on the use of CAT 777 class rigid dump trucks, which are currently not being operated at the mine; however, Kagem requested for the design to have the flexibility to accommodate larger mining equipment if desired in the future. Studies undertaken indicate that rigid frame 777 trucks, or equivalent, are a more cost-effective option for Kagem and it is recommended that a more detailed study should be undertaken.

Table 2-26: Kagem: Geotechnical Open Pit Design Parameters

Parameter	Unit		Basis
Slope Configuration			
Weathered Rock (0 to 30m depth)			
Bench Height	(m)	10	Current bench height.
Batter Angle	(deg)	70	SRK geotech recommendations.
Berm Width	(m)	5.5	Access width for berm at closure.
Fresh Rock (below 30m depth)			
Bench Height	(m)	10	Current bench height.
Batter Angle	(deg)	75	SRK geotech recommendations.
Berm Width	(m)	5.5	Access width for berm at closure.

Table 2-27: Kagem: Operational Open Pit Design Parameters

Parameter	Unit		Basis
Truck Width	(m)	6.7	Cat 777 Truck Specs
Dual Lane Multiplier	(-)	3.5	Cat Operating Handbook
Bund Wall Width	(m)	3.0	SRK Estimate
Toe Drain Width	(m)	3.0	SRK Estimate
Ramp Width - Dual Lane	(m)	29	Ramp width including safety bund & toe drain.
Single Lane Multiplier	(-)	2.0	SRK Estimate
Ramp Width - Single Lane	(m)	19	Ramp width including safety bund & toe drain.
Switchback Diameter	(m)	29	Turning Circle Clearance Diameter for CAT 777.
Minimum Mining Width	(m)	40	SRK Estimate

It is current operational practice to mine out the final hangingwall ramp and, based on discussions with site staff, this is planned to continue in future cutbacks. The ultimate pit design therefore does not have a final hangingwall ramp.

Currently, access to the pit floor and ore mining areas is provided by temporary ramps on the footwall side of the pit, constructed from waste rock. These footwall access ramps change location over time and are planned to move as the in-pit waste backfill develops.

SRK has undertaken reasonable checks on potential hangingwall and footwall ramp locations at a 10% ramp gradient within each cutback stage and is satisfied that practical ramps can be located within the cutbacks and ultimate pit to allow waste stripping and ore production.

Engineered Pit Design

The engineered ultimate pit is shown in Figure 2-47. The ultimate pit design inventory and inventories within the conceptual Chama cutbacks and Fibolele are given in Table 2-28.

The final Chama design consists of a single open pit, with an approximate total strike length of 2.4 km, pit crest perimeter of 8.2 km and a maximum depth of 200 m (975 mRL).

Table 2-28: Kagem: Ultimate Pit Design and Cutback In situ and Diluted Inventories (June 2019 topo)

	Units	Total	Cb1	Cb2	Cb3	Cb4	Cb5	Fib
Total Rock	**(Mt)**	**255.5**	26.5	56.6	23.6	88.1	55.6	5.1
Waste	**(Mt)**	**252.2**	26.0	56.2	23.2	86.7	55.1	5.0
Waste Assoc with Ore	**(Mt)**	**27.9**	3.6	3.7	5.1	11.4	2.9	1.1
Bulk Waste	**(Mt)**	**224.3**	22.4	52.4	18.0	75.4	52.1	3.9
RZ Ore (Diluted)	**(Mt)**	**3.3**	0.4	0.4	0.5	1.4	0.5	0.10
RZ Ore Grade (Diluted)	**(ct/t)**	**214.7**	173.3	291.4	95.5	224.0	283.8	139.1
Contained Product (Diluted)	**(Mct)**	**714.3**	76.8	130.2	43.9	311.8	137.7	13.9
	(kg)	**142,855**	15,359	26,049	8,773	62,361	27,535	2,778
Strip Ratio	**(t_{waste}:t_{ore})**	**75.8**	58.8	125.7	50.4	62.3	113.6	50.1

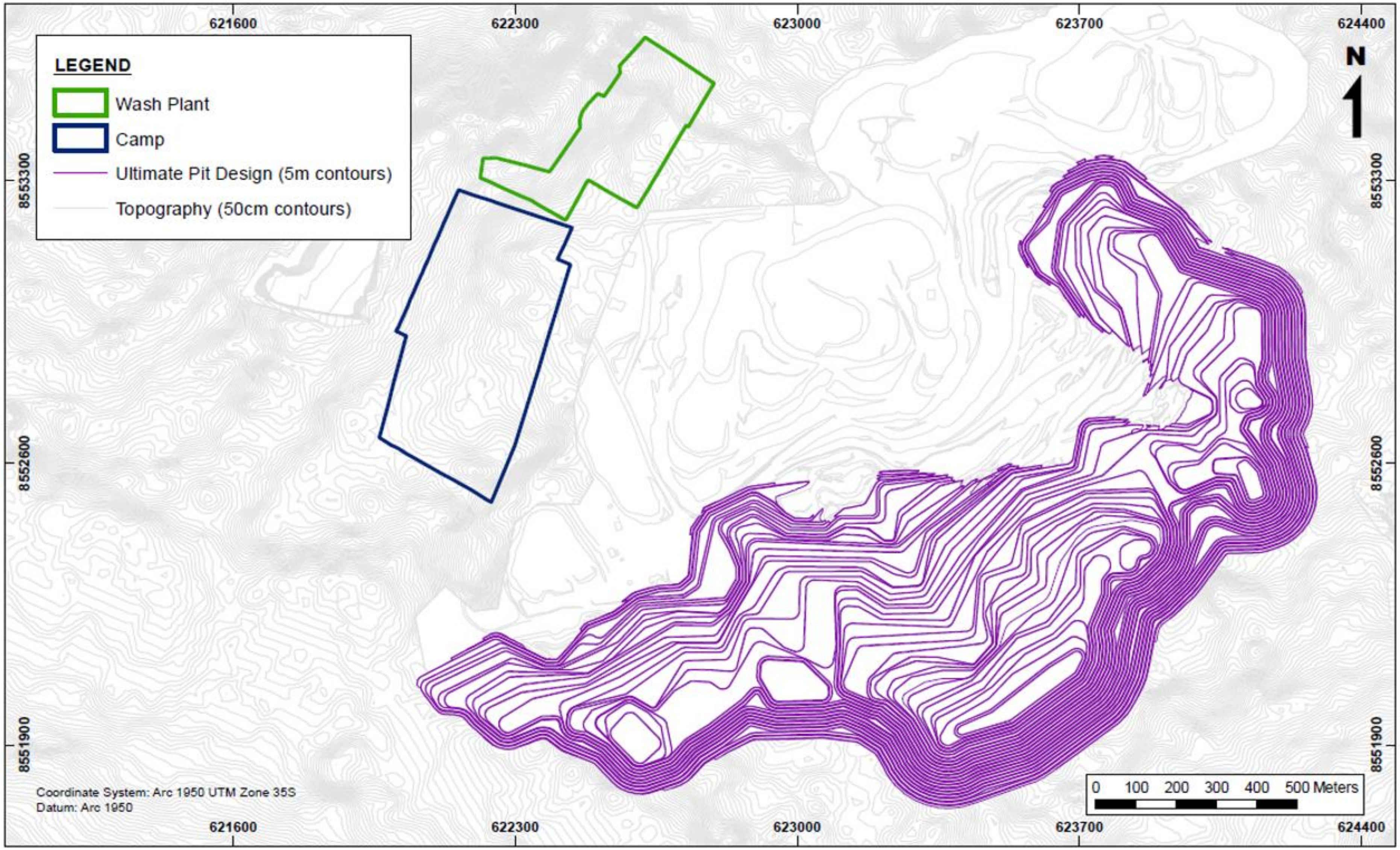


Figure 2-47: Kagem: Chama Ultimate Pit Design

2.4.8 Waste Rock Dump Design

The current ex-pit waste rock dump locations are planned to be extended to accept waste rock from the Chama pit. In addition, existing and future in-pit waste dumping capacity is planned to be utilised predominantly for the TMS waste material, which should provide a shorter haul distance for this material compared to dumping at the ex-pit waste dumps. SRK has undertaken preliminary designs for extending the current ex-pit and in-pit waste dumps at Chama. These need further geotechnical work to ensure their long-term stability.

SRK has not undertaken engineered waste dump designs for Fibolele; however, Gemfields has confirmed that sufficient space and capacity will be available on site. SRK recommends that engineered waste dump designs are developed for Fibolele as part of future work.

Design Parameters

Kagem is planning to construct the waste rock dumps with pit closure in mind, which is in line with the 2014 Kagem Environmental Management Plan. The EMP states that reclamation of waste rock dumps will be achieved by combining good construction practice according to engineering design and progressive re-vegetation of dump slopes and upper surfaces.

The design approach assumes that the waste dumps will be constructed at an operational slope configuration during the operational phase of the Mine, and most of the slope re-contouring will be undertaken during the mine life.

The slope configuration and operational waste rock dump design parameters are given in Table 2-29, and schematic cross sections of the ex-pit waste dump slope operational and closure slope configurations are shown in Figure 2-48 and Figure 2-49 respectively.

Based on the relatively high strength characteristics of the waste rock and low proposed overall slope angle, SRK does not envisage geotechnical stability to be an issue for the waste rock dumps however recommends that further work and monitoring are done to confirm this.

Table 2-29: Kagem: Waste Rock Dump Design Parameters

	Unit	Operational Slope	Closure Slope	Basis
Geotechnical Parameters				
Maximum Dump Height	(m)	120	120	Discussion with Kagem.
Overall Slope Angle	(Deg)	22	20	Appropriate operational and closure overall slope angle.
Inter-Berm Slope Angle	(Deg)	35	24	Angle of rill and practical closure inter-berm slope angle.
Berm Width	(m)	40	10	Operational berm and erosion control and closure.
Lift Height	(m)	30	30	Current practical lift heights.
Operating Parameters				
Ramp Width	(m)	29	29	Ramp width including safety bund & toe drain.

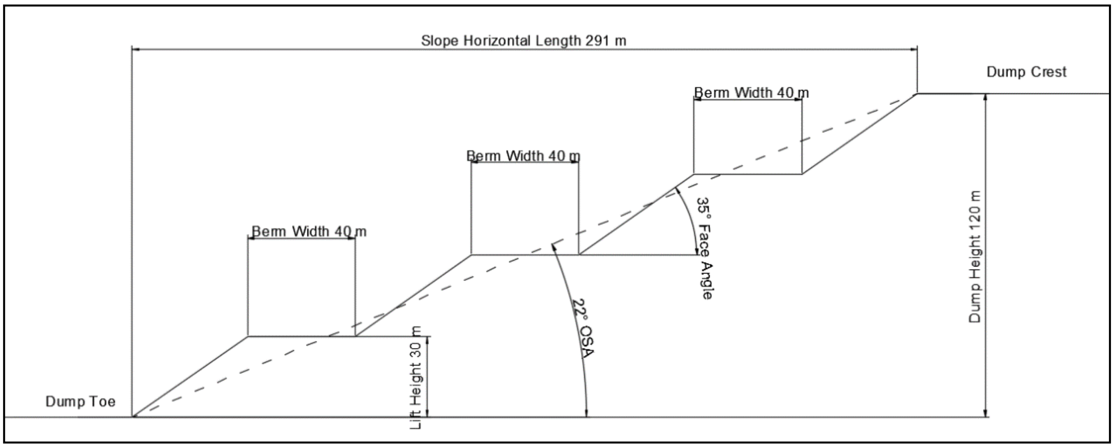


Figure 2-48: Kagem: Waste Rock Dump Operational Slope Configuration Schematic

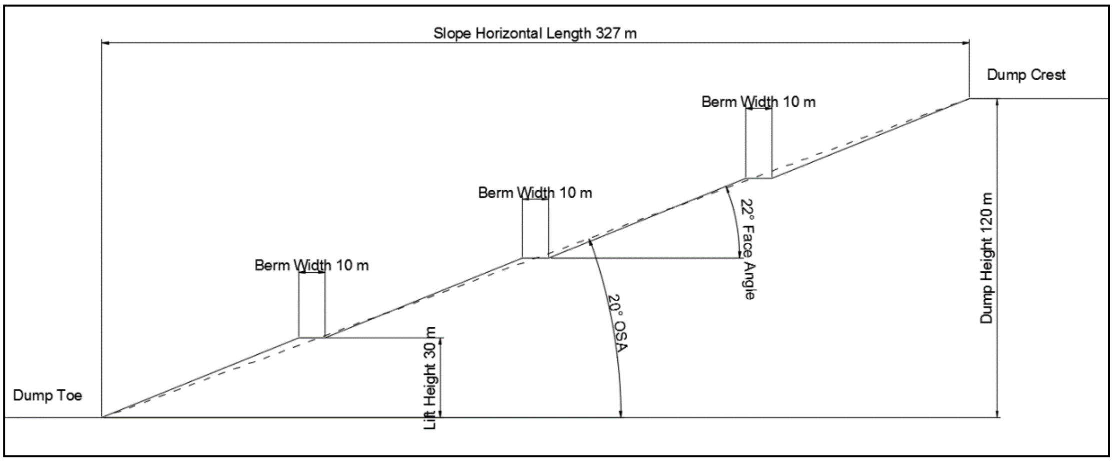


Figure 2-49: Kagem: Waste Rock Dump Closure Slope Configuration Schematic

Engineered Waste Rock Dump Design

SRK has undertaken the waste rock dump designs using the closure slope configuration, as this provides the best representation of the ultimate footprint and dump profile at the end of the mine life. Based on discussion with Kagem, the current swell factor achieved at site is in the region of 15-20%. In order to estimate the required waste dump capacities, SRK has assumed a swell factor of 20% for the waste material.

The engineered ex-pit and in-pit waste rock designs are shown in Figure 2-50 and design capacities in Table 2-30. SRK notes that sufficient ex-pit and in-pit dumping capacity is available at Kagem for the Chama pit.

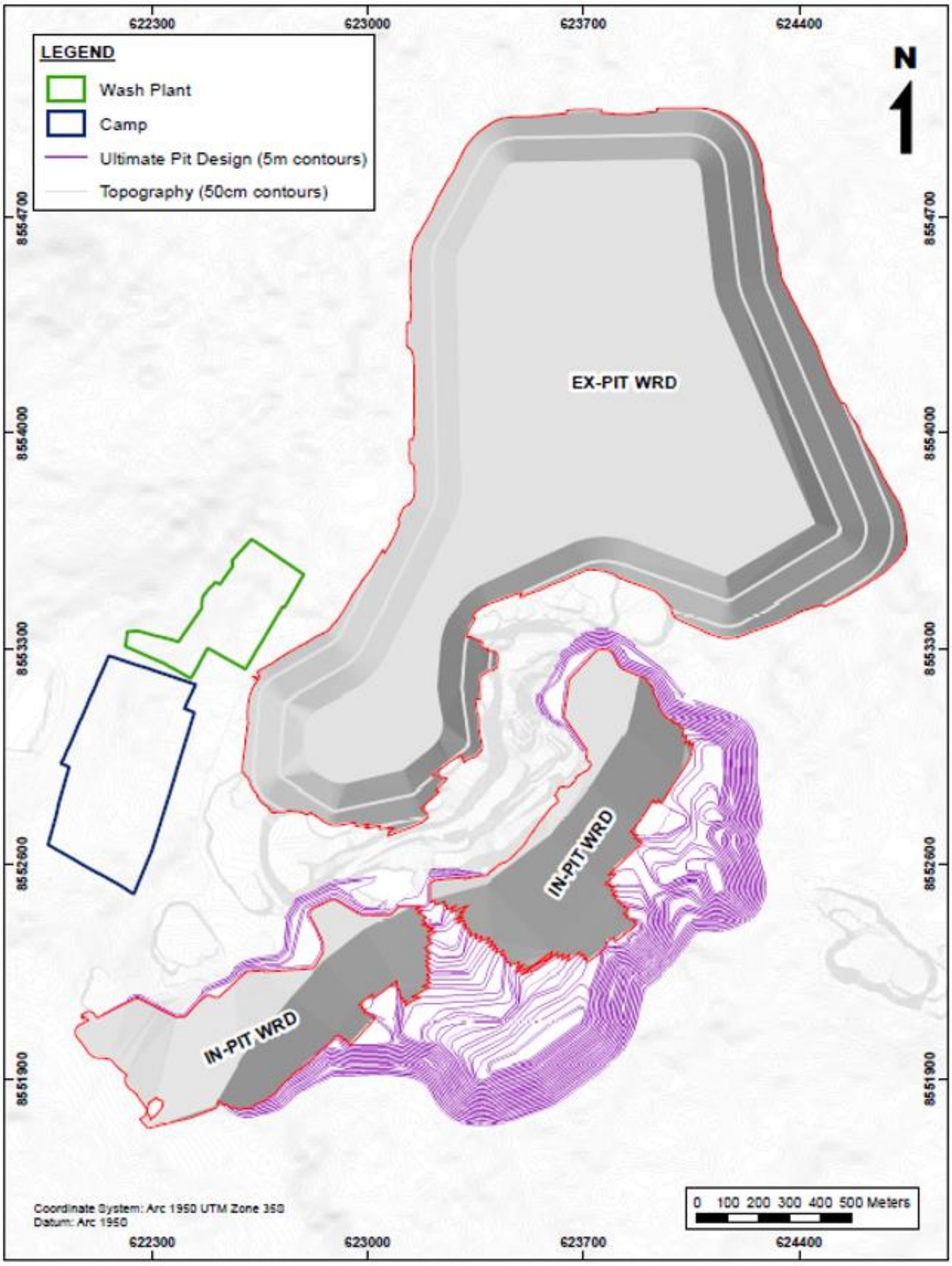


Figure 2-50: Kagem: Ultimate Waste Rock Dump Design

Table 2-30: Kagem: Ultimate Waste Rock Dump Design Capacity for Chama

	Unit	Ex-Pit Waste Dump	In-Pit Waste Dump
Design Capacity	**(MLCM)**	117.7	17.4
Required Capacity	**(MLCM)**	108.4	12.2
Difference	**(MLCM)**	14.5	2.3
	(%)	8	30

2.4.9 Production Scheduling

Mine Production Schedule Targets

SRK has developed production schedules for the Chama and Fibolele pits as per the LoMp production targets summarised in Table 2-31.

Table 2-31: Kagem: LoMp production targets

Sector	Tonnes Per Month	Tonnes Per Annum	Source
Chama			
Chama pit RZ	10,000	120,000	Site visit discussions
Chama pit Waste	1,000,000	12,000,000	Site visit discussions
Sub Total	**1,010,000**	**12,120,000**	
Fibolele			
Fibolele pit TMS	15,000	180,000	Site visit discussions
Fibolele pit RZ	1,000	12,000	Site visit discussions
Fibolele pit Waste	40,000	480,000	Site visit discussions
Sub Total	**56,000**	**672,000**	

SRK has undertaken the LoMp production scheduling in Minesched software and has used the ultimate pit design and cutback shell inventories as the basis for the scheduling for Chama. The mine schedule for Fibolele was incorporated in the production schedule in Minesched.

Material Movement

Figure 2-51 and Figure 2-52 show the total material movement (“TMM”), ex-pit by rock by cutback and ore production by cutback for Chama and Fibolele, respectively. Details of the mining production schedules are summarised below:

- the LoMp achieved a 23-year mine life with TMM between 12-12.5 Mtpa from 2020 for the majority of the mine life (Figure 2-51);
- the annual stripping ratio is quite variable, between 50 and 250 over the life of the operation, with an average stripping ratio of 75 (Figure 2-51);
- variable annual reaction zone ore tonnages are mined, between 40 – 300 ktpa (Figure 2-52), and the mine will require stockpiles between 80 – 400 kt (Figure 2-53) to achieve a constant yearly plant feed; and
- a balanced split between high quality emeralds and lower quality emeralds was achieved in the processing plant feed:

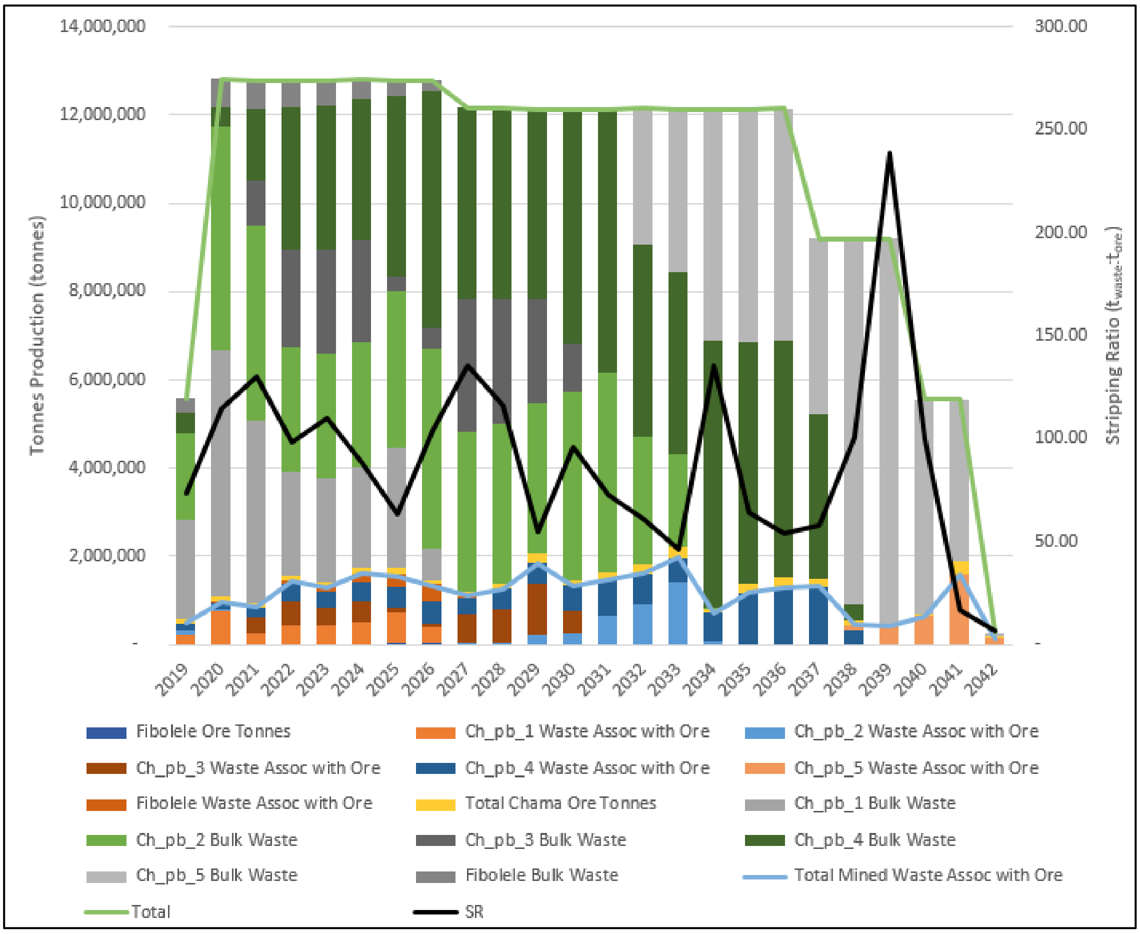


Figure 2-51: Kagem production profile per sector

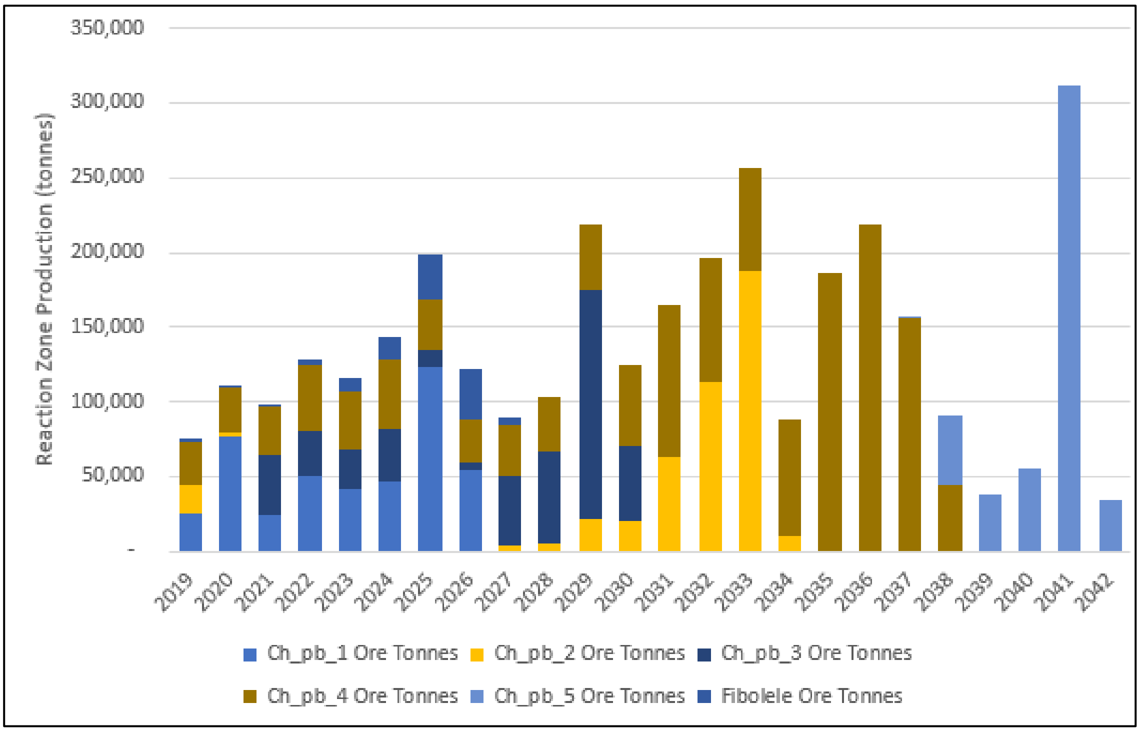


Figure 2-52: Kagem Reaction Zone mined per section

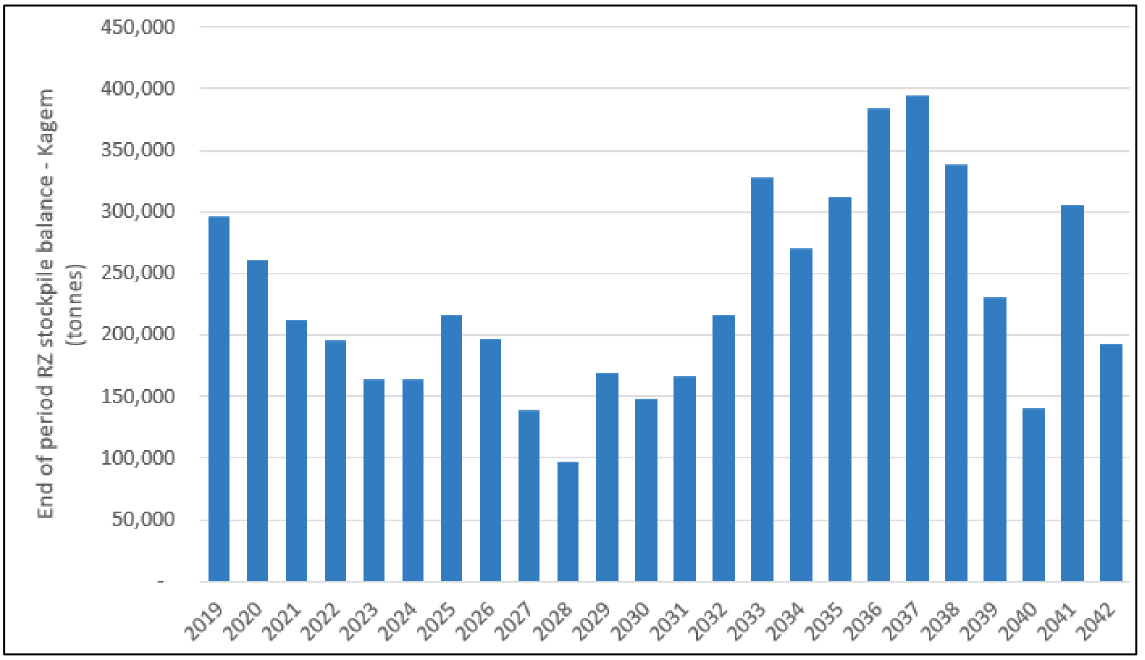
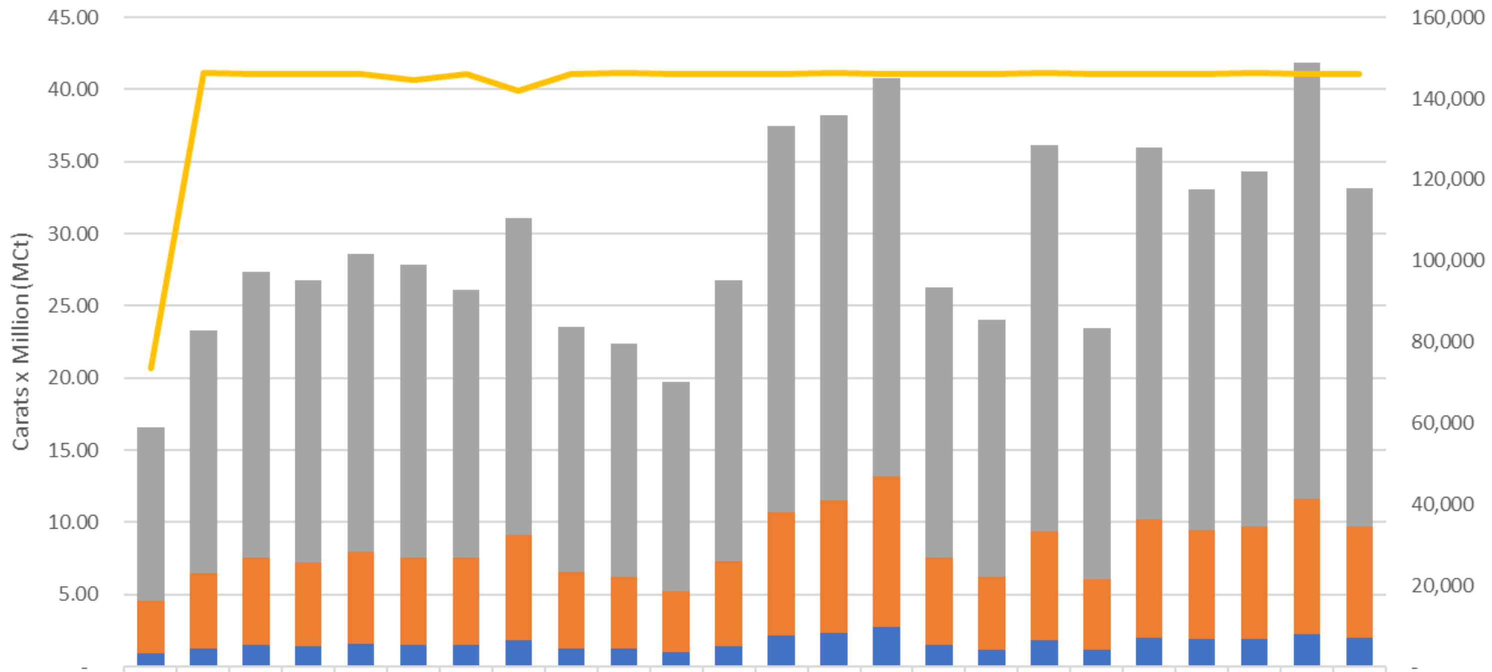


Figure 2-53: Kagem Overall stockpile balance per annum



	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Total Lower Quality Ct's (B)	12.0	16.8	19.8	19.5	20.6	20.3	18.5	21.9	17.0	16.0	14.4	19.5	26.7	26.6	27.5	18.6	17.8	26.7	17.3	25.7	23.5	24.6	30.2	23.3
Total Lower Quality Ct's (E)	3.67	5.16	6.08	5.78	6.40	6.10	6.04	7.27	5.24	5.02	4.23	5.84	8.57	9.17	10.4	6.04	5.05	7.59	4.92	8.16	7.59	7.76	9.29	7.78
Total Higher Quality Ct's (P+E)	0.91	1.27	1.50	1.41	1.59	1.49	1.51	1.83	1.29	1.24	1.03	1.43	2.15	2.35	2.75	1.51	1.21	1.82	1.18	2.03	1.90	1.93	2.29	1.97
Plant feed (kt)	73,6	146,	146,	146,	146,	144,	146,	141,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,	146,

Figure 2-54: Kagem Processing feed per annum

2.4.10 Equipment Requirements

The mining equipment fleet requirements were calculated based on the mine production schedules, existing fleet and equipment productivities and haulage travel times. It assumes that sufficient ancillary equipment will be available across the site to provide operational support. SRK notes that the current equipment on site is sufficient for the next four years, beyond which point additional equipment will need to be acquired.

Haulage Travel Time Estimate

The haulage travel times for ore and waste are based on the haulage estimate which SRK has estimated and is sufficient for the planned production rate. The haulage travel time estimate has been used to calculate equipment estimates, as discussed in the Section 2.4.10

The travel time estimate is based on the bench schedule, 1 in 10 ramp gradient, estimated haul speeds and estimated haul route distances. The assumed haul speeds are given in Table 2-32

Table 2-32: Kagem: Haul Speeds

	Units		Basis
Loaded Speeds			
In-pit, Flat Loaded	(km/h)	15	On-bench haul speed.
Ramp Up-hill, Loaded	(km/h)	12	13% TRR CAT 740 Rimpull Curve.
Pit Crest to Destination, Flat Loaded	(km/h)	25	Practical assumed haul speed.
Haulage at Destination, Flat Loaded	(km/h)	20	Practical assumed haul speed.
Empty Speeds			
Haulage at Destination, Flat Empty	(km/h)	25	Practical assumed haul speed.
Destination to Pit Crest, Flat Empty	(km/h)	30	Practical assumed haul speed.
Ramp Down-hill, Empty	(km/h)	25	Practical assumed haul speed.
In-pit, Flat Empty	(km/h)	20	On-bench haul speed.

Equipment Operating Time

The operation is assumed to operate 351 days per year, based on 7 days a week operation with 14 days per year national holidays. The waste mining fleet operates three shifts of 8 hours over 24 hours a day, and the ore production fleet operates a single 12-hour shift which includes a lunch break during the day. Based on information provided by Kagem, most of the mining equipment is scheduled to operate approximately 4,220 effective direct operating hours per year, and the production excavators and trucks will operate approximately 1,900 effective direct operating hours per year. These estimates are based on the scheduled operating hours, 90% mechanical availability and 85% use of availability provided by Kagem.

Equipment Capital and Operating Costs

The equipment capital purchase cost and machine life used are based on information provided by Gemfields and the SRK's internal estimates and are provided in Table 2-33. The equipment requirements for Kagem are shown in Figure 2-55. Operating costs included in the financial section are based on historical operating costs.

Table 2-33: Kagem: Equipment Capital Purchase Costs and Machine Life

Equipment	Description	Make	Model	Machine Life (h)	Purchase (USD)
Primary Excavator	4.6 m^3 Diesel hydraulic backhoe	CAT	374D	30,000	1,200,000
Secondary Excavator	2.4 m^3 Diesel hydraulic backhoe	CAT	336D	30,000	450,000
Tertiary Excavator	6.0 m^3 Diesel hydraulic backhoe	CAT	390F	30,000	1,500,000
Primary Loader	3.0 m^3 Diesel Wheel Loader	CAT	950	30,000	450,000
Primary Truck	40t ADT	BELL	B40	30,000	550,000
Secondary Truck	30t ADT	CAT	730	30,000	425,000
Tertiary Truck	45t ADT	BELL	B45	30,000	625,000
Primary Drill	Production Drill Rig	Atlas Copco	ROC	30,000	600,000
Primary Track Dozer	D10 Dozer	CAT	D10	30,000	1,500,000
Secondary Track Dozer	D9 Dozer	CAT	D9	30,000	1,150,000
Primary Grader	14M Grader	CAT	14M	30,000	500,000
Water Truck	Water Truck & Service ADT	CAT	730 Water Truck	30,000	800,000
Fuel Truck	Mobile Field fuel/lube truck			30,000	85,800
Explosives Truck	Explosives Truck	Explosives Truck	Explosives Truck	30,000	90,000
Tire Handler	Tire Handler			30,000	425,000
Lighting Plant	Lighting Plant			30,000	25,000
Light Vehicle	Light Vehicle			35,000	50,000
Pumps	Dewatering Pump	Primax	Primax	35,000	250,000

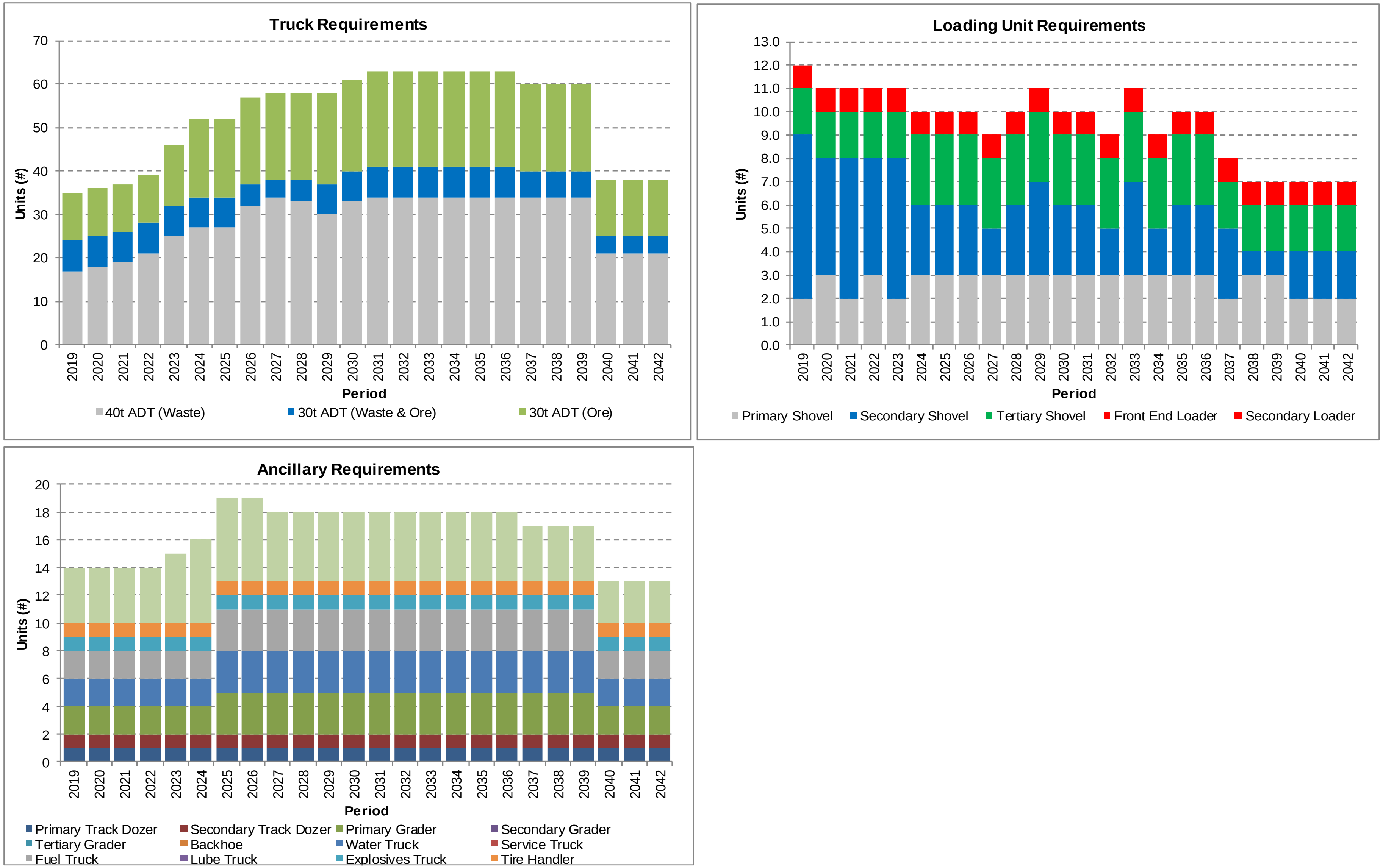


Figure 2-55: Kagem LoM Pit Equipment Requirements (Chama and Fibolele)

2.5 Conclusions and Recommendations

SRK has undertaken an update of the open pit optimisation for the Chama and Fibolele deposit on ore classified as Measured and Indicated, using the relative mining models. Based on the optimisation results and strategic objectives, SRK has selected optimum pit shells for Chama and Fibolele.

Pushbacks has been selected to optimise stripping and provide optimal discounted cashflow and NPV whilst providing the flexibility of multiple simultaneous cutbacks providing a balance between stripping ratio and quality of emeralds mined. The pushbacks also provide mining practicality incorporating a minimum mining width of 100 m from the current operating pushback.

The waste dump design provides for sufficient capacity for the material within the pit after a swelling factor of 20% is applied.

The production scheduling of the Chama and Fibolele pits and pushbacks achieved a LoMp of 23 years.

The variable occurrence of reaction zone in the production schedule will require sufficient stockpiling of ore to take place. Stockpiling capacity of 400 kt is required next to the wash plant.

The current equipment totals are sufficient for the next four years in the LoMp.

SRK notes that the LoMp is achievable and that no major risks are foreseen for mining production.

SRK recommends the following work is undertaken in due course:

- periodic (annual) review of the selected ultimate pit shell to ensure it is suitable given the market conditions;
- undertake further pit optimisations when additional geological information is gathered;
- detailed dump design for Fibolele; and
- periodical update of the haulage analysis to ensure that equipment utilisation is optimal at Kagem.

2.6 Ore Reserves

2.6.1 Introduction

SRK has prepared the Ore Reserve Statement for the Kagem operation in accordance with the JORC code. Details used in deriving the Ore Reserve Statements are included in this section.

2.6.2 Modifying Factors

The Modifying Factors applicable to the derivation of Ore Reserves comprise estimates for the selective mining unit and its impact on dilution and losses.

Dilution

In the 2017 CPR, the dilution for Kagem were based on the following:

- The historical reconciliation for Kagem (2008-2017) showed that the diluted RZ ore is consistently 11-12% of the TMS by tonnage, whereas the 2015 SRK Chama Resource Model in situ tonnages show the RZ to be 9.5% of the TMS by tonnage.
- To cater for the proportional increase in RZ tonnes, a 15% “operational” dilution modifying factor was applied to increases the 2015 Resource Model in situ tonnages (9.5% of TMS) to close to the historic diluted RZ to TMS proportions of 11-12%. Dilution was therefore applied in such a way so as to ensure that future RZ tonnes (ore) tonnages are not underestimated as it relates to operations.
- It is assumed that RZ tonnes is diluted by TMS material which bears zero grade.

From 2017-2019, a further increase in the RZ/TMS can be seen from historical production, approaching 18-20%. The ratio increase, however, could either be from an increase in RZ tonnes or a decrease in the of TMS tonnes compared to what was modelled.

In SRK’s opinion, the historical increase/decrease of either RZ or TMS could also be further attributed to the improved production geology practices with increased face mapping of the pit and an improved understanding of the geology.

The improved understanding of the geology, backed by historical production results, calls for an update to the geological model (TMS, PEG, RZ) to better account for TMS and RZ tonnes.

SRK also recommends that the future work would include dilution estimated by a geo-spatial “dilution skin” (as is the practice at MRM) encapsulating the RZ and quantified in the model rather than using a global estimate.

In summary, the current Mineral Resource model assumes a ratio of 11-12% (RZ/TMS) with a 15% dilution is applied as a global estimate. It is expected that the future RZ/TMS ratio might increase, but this would need to be confirmed by an update to the resource model.

Losses

A 0% operational (mining) losses has been applied for Kagem, as a result of the meticulous face mapping and improved production geology practices witnessed at Kagem since 2015.

As mining production approaches the TMS, production drilling (with drill rigs) switch over to hand held drills which ensures that minimal overbreak occurs into the reaction zone during blasting. Mining of the RZ takes place by hand-held hydraulic hammers and hand held picks and hammers, to ensure that none of the emeralds are broken by accident. Continual visual inspection dictates whether small backhoe excavators are used to send RZ to the stockpiles / sort house or whether barricaded and subjected to hand-picking.

In summary, mining of the reaction zone and all areas surrounding is highly selective. Due to the relatively large amount of dilution applied, backed by meticulous production geology practices, it is assumed that all of the RZ is removed and therefore a 0% mining loss has been applied.

2.6.3 Emerald and Beryl Prices

Premium Emerald and Emeralds account for 99% of revenue; where High Quality Auctions account for 83%, and the Low Quality Auctions for 16%; leaving Beryl accounting for 1% of revenue only, as shown in Table 2-34.

Table 2-34: Kagem: Commodity Prices

Commodity Prices (USD/ct)	2019	2020	2021	2022	2023	2024	2025	2026
Average	4.96	5.10	5.26	5.22	5.64	5.62	6.24	6.33
High Quality Auctions	72	74	77	80	83	86	89	89
Low Quality Auctions	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
Other	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075

2.6.4 Ore Reserve Statement

The Ore Reserve statement presented in As at 1 July 2019, SRK notes that the Kagem beryl and emerald deposit, has Ore Reserves of 3,621 kt of grading at 209 ct/t beryl and emerald, including the stockpiles.

Table 2-35 has been derived from the Mineral Resource described in Section 2.2.

As at 1 July 2019, SRK notes that the Kagem beryl and emerald deposit, has Ore Reserves of 3,621 kt of grading at 209 ct/t beryl and emerald, including the stockpiles.

Table 2-35: Kagem: Ore Reserve Statement, as at 1 July 2019, for the Emerald and Beryl Deposit

Deposit	Classification	Tonnage (kt)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Proved Ore Reserve	386	210	81
	Probable Ore Reserve	2,840	218	620
	Proved + Probable	**3,226**	**217**	**700**
Fibolele	Proved Ore Reserve	-	-	-
	Probable Ore Reserve	100	139	14
	Proved + Probable	**100**	**139**	**14**
Stockpiles	Proved Ore Reserve	295	139	41
	Probable Ore Reserve	-	-	-
	Proved + Probable	**295**	**139**	**41**
Total	Proved Ore Reserve	681	179	122
	Probable Ore Reserve	2,940	215	633
	Proven + Probable	**3,621**	**209**	**755**

SRK makes the following comments in relation to the Ore Reserve declaration:

- The Ore Reserve is presented on a 100% attributable basis. SRK notes that Gemfields shareholding in Kagem is 75% (see Section 4).
- The Mineral Resource grades are quoted with a bottom cut-off stone size of 3 mm.
- The reported grades are recovered grades, as opposed to in-situ grades, due to the nature of the type of mineralisation and operation.
- A Probable Ore Reserve has been derived from the reported Indicated Mineral Resource, and a Proved Ore Reserve has been derived from the Measured Mineral Resource.
- No material classified as Inferred Mineral Resources has been converted to Ore Reserves.
- The mining production plan has been revised and updated by SRK and deemed achievable. The mining method and equipment is considered suitable for the style of mineralisation. The Ore Reserves has been constrained and optimised applying relevant economic criteria.

- The mining operation at Kagem is an efficient, low-cost conventional mining operation which is not expected to present any major technical or logistical challenges in the future.
- A discounted cashflow model has been prepared to evaluate and demonstrate Kagem's economic viability.
- The relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties and capital costs have also been included.
- The average commodity prices applied in the discounted cashflow model vary between USD 4.96/ct in 2019 and USD 6.33/ct in 2026. This covers High Quality Auctions, Low Quality Auctions, and other sales.
- Premium Emerald and Emeralds account for 99% of revenue; where High Quality Auctions account for 83% and the Low Quality Auctions for 16%. This leaves Beryl accounting for 1% of revenue only.
- 100% of sales revenue from Kagem stones is attributed to the mine.
- The economic evaluation has resulted in an NPV of USD 600 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM.
- SRK has relied upon the Company to confirm that the required permits and licences are in good standing, and expected to remain so for the duration of the LoMp.
- SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve.
- SRK highlights that the key risk to the forecast production and revenue presented in the LoMp, is the nature of the mineralisation leading to difficulty in estimating grades; and the split between stone quality.

SRK recommends that the projected prices and volumes for the sale of beryl and emerald products from the Mine are verified on an ongoing basis to update the financial projections in the LoMp.

The CP responsible for reporting Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the IOM3, a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code. Mrs Anderson has review and relied on:

- The mining technical evaluation and mine plan authored by Mr Hanno Buys Pr.Eng MEng MSAIMM, a Senior Consultant (Mining Engineering) with SRK.
- The review of the mineral processing undertaken by Dr John Willis, MAusIMM(CP) MAIME PhD a Principal Consultant (Minerals Processing and Metallurgy) with SRK.
- The review of the environmental and social aspects by Mr John Merry, a Principal Consultant (Environmental and Social Management), Dr Cathryn MacCallum FIMMM CEnv CSci, a Principal Consultant (Social Development and Management), and Ms Insiya Salam, MSc, a Consultant (Social Development and Management), all with SRK.

2.7 Processing and Washing

2.7.1 General Description

The washing plant at the Kagem Mine consists of a series of comminution, screening, washing and sorting facilities which are located close to the current mining activities in the Fwaya-Fwaya area. No changes have occurred at the processing and washing facilities since the 2017 CPR. The plant currently in operation was commissioned in 2006 and has an operating capacity of approximately 330 ktpa of ore. A schematic of the wash plant flowsheet is shown in Figure 2-56.

RZ ore is fed into the feed bin using an excavator or small wheel loader. The bin has a grizzly that removes +300 mm material, which is stored to the north of the RoM pad (see Figure 2-57). A further grizzly allows -100 mm material to by-pass the primary (jaw) crusher. At the double deck vibrating screen, the +60 mm oversize material is directed to the secondary crusher operating in open circuit. The double deck screen operates wet, and the -3 mm fines from the double deck vibrating screen (approximately 35% of the feed mass) are directed to the fines storage area in the valley to the west of the plant (see Figure 2-57). The product from the double deck screen (+3 mm, -60 mm) is fed to a triple deck screen that separates the material into three product streams for hand picking: +3 mm -6 mm, +6 mm -30 mm, and +30 mm to 60 mm. Each stream is directed to individual picking belts; the +30 mm is split to feed two belts. The prospective emerald and beryl gemstones are picked off of the belt by hand and dropped in a drop safe type box similar to that used at the mining faces. The nominal capacity of the washing plant is 70 tph.

Figure 2-57 shows an aerial view of the washing plant and its surroundings. RoM ore is stored to the east of the plant ahead of processing, and +300 mm oversize is stockpiled to the north of the RoM pad. The -3 mm fines are sent to a storage area in the valley to the west of the plant, and sorting rejects are stockpiled to the south of the plant. Prior to 2014, both the fines and sorting rejects were re-handled and disposed of in the mine waste dumps; however, Kagems' intention is to make the current storage locations permanent facilities. For the sorting rejects, this storage area will expand to the south and the west, and Kagem is considering installing a conveyor system to place these rejects rather than the current practice of transferring them by loader. The fines will be progressively spread out over the valley, where decant water will return to the process via the lake as shown. An intermediate barrage has been constructed to assist with fines settling in this recycle stream.

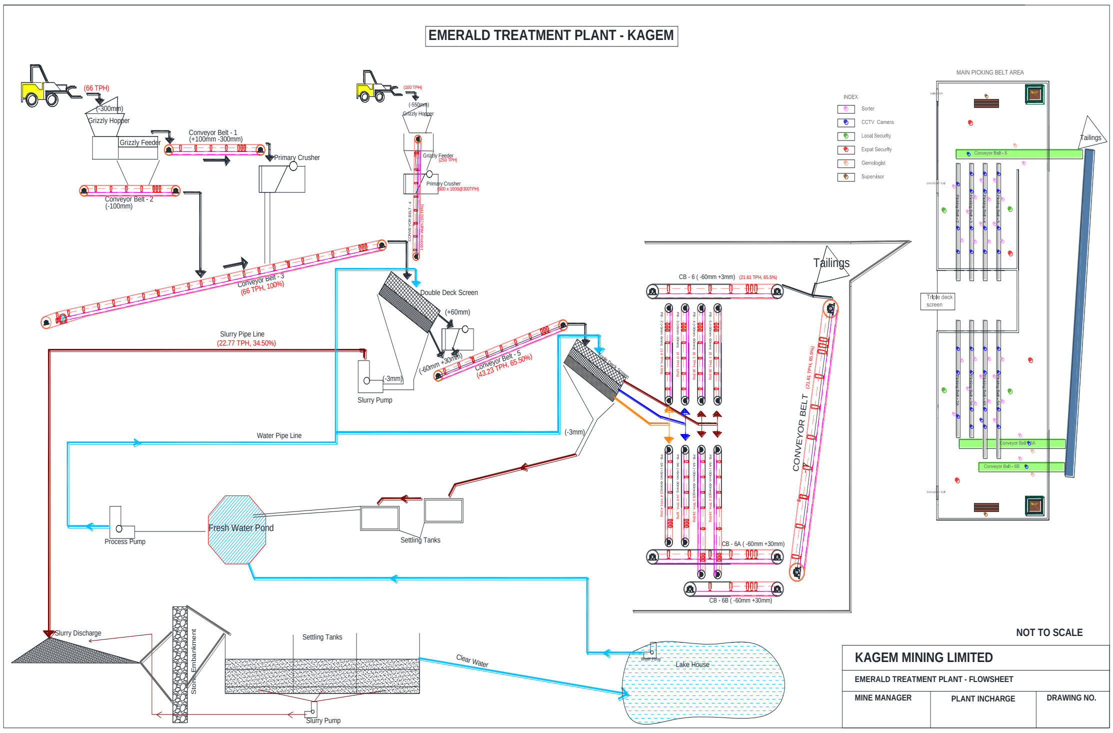


Figure 2-56: Kagem: Washing Plant Schematic Flowsheet

Figure 2-57: Kagem: Washing Plant Aerial View

The washing plant products, together with the high quality product directly recovered from the mine known on site as RoM, are sent to the secure sort house facility. The prospective beryl and emerald gemstones are sorted and upgraded using manual methods. The sorting house is a high security area and access is controlled. The drop safe type boxes from the mine and the plant are opened and emeralds are picked out from the remaining material which is washed and tumbled. Products from this are also picked and the fines and waste separated. Where necessary, the product is chipped to upgrade the gemstone and further lightly tumbled and cleaned. The product gemstones from this process are sized into six size classes, then sorted in to the following categories: premium emerald; (standard) emerald; beryl-1; and beryl-2. The two emerald products are further graded, these and the beryl-1 product are then dried, dressed with oil, weighed, catalogued and stored for evaluation and subsequent export to Lusaka (or otherwise) for auction.

Gemstones sourced directly from the mining operations account for approximately half of the volume of gemstones recovered, but account for approximately 70% of the recovered value. Premium emeralds account for 1% or less of the recovered gemstones, with emeralds accounting for 25-35%, with the remaining being the beryl categories, of which beryl-2 carries little value.

Kagem has doubled the potential capacity of the wash plant, by duplicating the picking belts. The circuit upstream of the picking belts has been assessed as being capable of handling the additional capacity, although conveyor 3 (see Figure 2-56) is upgraded with a wider belt and larger motor, and the raw water supply line has been upgraded.

This upgrade has sufficient capacity at the Kagem wash plant to handle the on-going production from the Chama pit (approximately 100 to 120 ktpa), as well as the ongoing production at Fibolele, and bulk sampling at others. The maximum capacity of the upgraded plant is expected to be 330 ktpa. This expansion requires 90 operational and supervisory staff.

The expansion cost is USD1.02M.

Kagem is also investigating the potential for mechanising the emerald picking process. As there is no density difference between emeralds, beryl and the host rock, there is no potential for gravity separation (unlike with rubies and sapphires). Kagem is currently investigating optical sorting, with testwork being completed. Results to date are encouraging; however, multi tests will be conducted, based on Kagem style of crystal, to conclude the design.

2.7.2 Conclusions

Based upon the work undertaken to date, SRK notes the following:

- The Kagem washing plant is relatively simple in its configuration, and appears to work effectively.
- Current security measures appear to be adequate.
- The emerald recovery process is entirely dependent on hand picking of gemstones, and given the lack of clear distinction between the emeralds and the host rock, particularly with regard to density, there is little potential for automation other than the possibility of optical sorting which is currently under review.

- The plant is capable of handling the current feed rate, and the on-going plant expansion will provide sufficient capacity for potential additional increase in production volumes. It also seems likely that the plant will be able to handle any increase that will arise from the re-processing of current and stockpiled oversize material.

2.7.3 Recommendations

Based upon the work undertaken to date, SRK recommends the following:

- While the storage areas identified for both washed fines and sorting rejects adjacent to the plant area appear adequate for the medium term, and will save on rehandle costs, it is unclear whether the areas identified will have sufficient capacity for the expanded production rate for the expected life of the operation. It may be necessary to move some of this material to the waste rock dumps.
- A more comprehensive assessment should be made of the available area for tailings disposal such that an estimate of the need to eventually rehandle tailings can be made.

2.8 Infrastructure

2.8.1 Introduction

Figure 1-2 presents the existing mine layout and shows the roads and the primary operational and infrastructure areas.

2.8.2 Mine Roads

The mine offices and camp are situated close together, and are connected to the Chama pit and Fibolele and Libwente bulk sampling operations by gravel roads within the Kagem Mine site boundary. Gravel haul roads 25 m wide connect the wash plant with the Chama and Fibolele pits, and the bulk sampling areas which are shared by both light and heavy vehicles. For security reasons, ore and waste haul trucks generally use separate roads, and security posts are positioned at several locations on the mine roads.

2.8.3 Accommodation and Administration

The main mine offices, stores, and accommodation are located at the Kagem camp and comprises predominantly prefabricated and block work structures within a fenced compound.

The accommodation at the camp is used by the management and operational staff, which consists of a mixture of expatriate and local personnel.

A portion of the operation work force stay at the mine camp during their roster, and buses are used to transport the majority of the operational work force to and from their local town on the off-days.

2.8.4 Mobile Equipment Maintenance

All light and heavy mobile equipment is currently maintained in a common maintenance area comprising a triple bay heavy workshop, light vehicle workshop, parts stores, wash pad and lay down area. The existing workshop presented is of steel construction.

2.8.5 Power

The Kagem site is supplied with a 33 kV ZESCO supply, which is stepped down to 11 kV at a main substation at site, which then stepped down to 400 V and supplies the washing plant and camp transformers. A 400 V supply is provided for the camp, offices, mess and washing plant electrical power requirements. There are two standby gensets (600 KVA and 400 KVA capacity) available for the camp area and washing plant.

Construction of a medium voltage electrical overhead line around the camp has been completed, and extends to the river pump and field canteen at Chama, which also provides the security lights around the camp area.

2.8.6 Water Supply

River water is pumped to the camp (accommodation, offices, mess, and ablution blocks) and washing plant for non-drinking water usage. Drinking water is provided by ground water treated at a water treatment plant and supplied to the senior mess, junior mess, washing plant, and offices. There are no major changes planned for the site water supply.

2.8.7 Communications

The main communication network within the camp comprises of fibre links connecting various buildings and CAT 6 cable connecting office data points, terminating at Cisco gigabit switches and managed by a Unified Threat Management System (FortiGate firewall) as gateway to the internet. Wireless (Wi-Fi and Point to Point); comprising of Ubiquity Unifi Access Points and Ligowave Radios provides wireless access to the network. This is managed by a Wi-Fi Gateway/Controller which connects to the main network.

Internal and external voice communication using Siemens Open Scape Business PBX, running on a separate network from the data system, are in place. The PBX system is licensed for 65 IP phones, 46 Analogue, and four trunks.

Two-way communication for the pits and security operations is provided using Motorola radio system. Mobile phone networks (MTN, Airtel, and Zamtel) for voice communications are available at site.

2.8.8 Conclusions

SRK notes the following:

- The mine is well served with infrastructure and the site is accessed by good quality gravel roads which connect to the main highway.
- Power is sourced from the national transmission grid to transformers at the camp and wash plant and backup diesel generators are used when the fixed connection is interrupted to ensure operations remain unaffected.
- Process and non-potable water is sourced from river water, and potable water is provided by treated ground water,
- The site has appropriate communication systems in place.

2.9 Social, Environment, and Health and Safety

2.9.1 Introduction

This chapter focuses on the compliance of Kagem with:

- applicable Zambian environmental legislation and environmental authorisations;
- performance relative to good international industry practice ("GIIP", including the requirements of the London Stock Exchange ESG reporting guidelines.);
- appropriateness of the existing management systems and corporate social responsibility ("CSR") activities;
- environmental and social issues of concern;
- risks and liabilities;
- the appropriateness of closure planning and cost estimates; and
- recommendations for improvement to existing management measures and reduce risk.

This section of the report builds on the original report produced following a site visit in 2015. The update is based on a further site visits to Kagem by John Merry in August 2019 and Insiya Salam in October 2019. The update includes a review of legislation pertinent to mining and environmental management in Zambia and a study of documents provided by Kagem, including policy and strategy documents, audit reports, correspondence with the Zambian Environmental Management Agency ("ZEMA") and Mine Safety Department ("MSD"), permits and licences, environmental project briefs ("EPB"), the 2016 environmental impact assessment; environmental management plans ("EMP") and monitoring data.

2.9.2 Environmental and Social Setting

The mine's concession covers an area of approximately 41 km^2 within the central part of the 750 km^2 NRERA, Zambia. The Mine is located south west of Kitwe in a relatively remote part of the Zambian Copperbelt. There are no formal settlements allowed within the concession area, other than the mine camp.

The Kagem operation is located in a gently undulating area at elevations of between 1,180 to 1,220 m amsl. Based on weather data from Ndola, the area experiences approximately 1,250 mm of rainfall per annum divided into three seasons: a cool dry season (April to July); a hot dry season (August to October); and a hot wet/rainy season (November to March). The maximum calculated rainfall in a 24-hour period is 126 mm for a 30-year return and 149 mm for a 100-year return. Flooding during heavy storms, with which most rainfall is associated, is localised and temporary. Evaporation in the area exceeds precipitation for eight months of the year. Prevailing winds are from the north-east and south-east, but strong westerly winds are not uncommon during the rainy season (averaging 7.4 m/s at this time). Wind speeds between April and October average at 10 m/s. Temperatures vary from a minimum of 7.5ºC (average cold season) to a maximum of 31ºC (average hot season).

The emerald and beryl deposits are found within the Muva Supergroup, which is made up of folded quartzites and schists. The emerald and beryls are found associated with the contact between the pegmatite intrusions into the ultramafic schist. Soil sampling done in 2008, as part of the study for the original environmental permitting, indicates soils are generally sandy with some clay minerals present. The major clay mineral is kaolinite. Glysol soils dominate the dambo areas. Soil erosion is observed where surfaces have been disturbed by mining related activities.

Lufwanyama District, where the mine is located, has a population of ~85,000 and is the least developed in the province and most people lack access to infrastructure such as housing, health, education, transport and telecommunications. The lack of infrastructure is a compromising factor for both education and health in the district. Poor quality of education and associated low literacy levels are exacerbated by the long distances to schools and availability of resources. Lufwanyama District has one of the lowest Zambian literacy rates with 47.5% of the population literate. The district has 11 health centres and four health posts but no district hospital. The communities that Kagem engage with outside of their concession fall under the Chiefdoms of Nkana and Lumpuma.

When the NRERA was formed, most of the local population were relocated by the government. Today, Pirala, located 5 km from the mine, is the only village remaining within the restricted area. It is an informal settlement with a transient population that serves as a hub for illegal miners and a trading point for the sale of illegal emeralds. Few people are in formal employment and the local communities depend on small scale agriculture, charcoal, other non-timber forest products (“NTFP”), and illegal mining for their livelihoods and income. The presence of illegal miners and middlemen has generated significant income for the residents of Pirala who are able to sell goods and services to them.

Based on a survey by the Zambian Forestry Department, the principal vegetation present on the Kagem property and its surrounding area is typical of that found in the Kafue headwaters. Sparse miombo woodland is the most extensive vegetation type in the Kagem license area. Miombo woodland is economically important in the region for the supply of timber, poles, firewood and charcoal. It is also the source of many non-wood forest products such as honey, mushrooms, caterpillars, and other edible insects. Vegetation has been disturbed within the area by historical mining activities, charcoal burning, forest fires, road works and soil/wind erosion; however, residential and agricultural activities are restricted within the NRERA resulting in less visible disturbance to the miombo woodland than seen elsewhere in the Copperbelt.

The property is bounded on two sides by the Kafue River and its tributary the Chantete Stream (to the east) and the Kafubu (to the south). The Kafubu River forms a wide (up to 2 km) low lying swampy drainage plain on the southern boundary of the license. Dambo (wetland) and swampy areas in the central part of the license area form a natural discharge point for one of the tributaries draining the site, which runs southwards into the Kafubu River. The immediate area in and around the main Kagem Chama pit is drained via two small (ephemeral) streams that flow into the Kafubu River. The Kafue River drains much of the Zambian Copperbelt before heading south towards Lusaka and the Kariba Dam. The river is used for irrigation, washing, domestic supply (particularly in the larger towns where it receives some treatment) and for recreational purposes. These rivers are known to host a relatively rich fish population dominated by different species of bream and tilapia, both important species for human consumption. A variety of frogs, lizards and snakes also occur within the area.

2.9.3 Mineral Rights and Environmental and Social Approvals

Mining Licences

The Kagem mining licence is valid until April 2020. On 12 December 2019, the licence was extended by 25 years.

Environmental and Social Approvals

Environmental legislation relevant to activities at Kagem Mine includes the Environmental Management Act (No 12 of 2011) and the Mines and Minerals Development Act (No 11 of 2015, and also the Water Resources Management Act (No 21 of 2011). The statutory bodies enforcing these laws are ZEMA, the Ministry of Mines through the MSD and Water Resources Management Authority.

The Act provides for integrated environmental management and the protection and conservation of the environment through sustainable management and use of natural resources.

Environmental Approvals

The environmental approvals in place for Kagem Mine and the new developments on the site are summarised in Table 2-36. The submissions made to obtain these approvals are also identified in the table.

Environmental Impact Assessment

An EPB for Kagem was prepared in July 2008 by African Mining Consultants. This has since been superseded by the EIA undertaken in 2016 following the application to expand the Fibolele pit. The environmental impact statement ("EIS") documenting the EIA includes an EMP and closure cost estimate. Since 2008, the EMP has been updated annually.

A full EIA is not generally required for small projects with limited environmental impacts, though it is at the discretion of ZEMA whether a project developer is required to submit an EPB or an EIS. The expansion into the Fibolele Pit was deemed significant enough for a full EIA. The EIA was submitted in July 2016 and approved in November 2016. The approval letter includes 26 conditions in addition to the requirements of the EMP. Kagem has 36 months from the start of the project within which time it must commission an audit of the operation.

Kagem has obtained the necessary environmental licences in terms of the Environmental Management Regulations (SI 112 of 2013). Bi-annual reports on these environmental licences are required to be submitted to ZEMA on or before the 15 July and 15 January of each year. Kagem submitted the bi-annual report for the period ending June 2019 to ZEMA on 15 July 2019. The report provides information on noise and water monitoring as well as tracking waste management.

Table 2-36: Kagem: Environmental Approvals Obtained for Kagem Emerald Mine and Developments on the Mine Site

Document Type		License No.; Serial No.	Approval	
Type, date – subject			Authority	Validity Period
Approval and conditions of the Environmental Impact Statement, 2016		ZEMA/EA/EIS/506	ZEMA	11 November 2016 (Note - this is the date of issuance of the Approval and it remains valid for as long as the mine is in operation)
Environmental Licences				
The mine has three environmental licences in terms of the Environmental Management Act No. 12 of 2011 and Environmental Management (Licensing) Regulations (SI 112 of 2013).				
Waste Management License, 2017 (For operation of waste disposal sites and transportation of general and industrial waste and operation of Lunshingwa overburden dump (53C) and operation of Fwayafwaya Waste Rock Dump)		NDL/WM/00515/Z09/2014/1; Seral no. 00125	ZEMA	Valid from 2014. Extension issued 1 January 2017 – 31 December 2019
Hazardous Waste Management License, 2017 (For generation, transportation and storage of hazardous waste including used oil, waste batteries, waste oil filters and waste fluorescent tubes)		NDL/LHWM/00515/Z09/2014/1; Serial no.000118	ZEMA	Valid from 2014. Extension issued 1 January 2017 – 31 December 2019
Emissions License, 2017 (For emission or discharge of pollutants/contaminants into the environment for the Healthcare Waste Incinerator Stack) and for effluent discharge of water from the pits.		NDL/EMM/00515/Z09/2014; Serial no.000066	ZEMA	Valid from 2014. Extension issued 1 January 2017 – 31 December 2019
•Permits for water abstraction and use for industrial purposes		These have been applied for and the fees paid but the permits are yet to be issued	Water resource management authority	
EMP updates and EPF Audit Reports				
2018	Audit report confirming Category 1 classification	August 2018	GP Environmental Consultants	
2015/16	Audit report classified the Kagem operation as Category 1		Ecowise Solutions 2015 – 2016	
2013	Letter from MSD classifying mine as category 2.	MSD/20/1/17	MSD, dated 16/06/204	

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Closure

The Mining Law includes specifications for mine closure. Kagem does not have an in-house life of mine closure plan or detailed cost estimate; however, the annual Kagem EMP and audit include a section on closure costs. This primarily relates to infrastructure demolition and rehabilitation of current levels of disturbance. This cost estimate is required as part of the Environmental Protection Fund ("EPF") Audit to assess the cash contribution Kagem needs to pay to the EPF (as per the Mines and Minerals Act) on an annual basis.

The contributions to the Fund that Gemfields will have to make are based on the environmental management performance (as provided for in the Mines and Minerals (Environmental) Regulations No.66) and subsequent EPF categorisation. The Fund contributions are calculated using the mine closure costs prepared specifically for financial assurance.

Kagem commissions regular independent Environmental Protection Fund audits to determine the degree of compliance of the operation to the EMP. This is then used to determine the value that has to be paid annually to the Government environmental protection fund. If the operation is deemed to be largely compliant with its obligations, they receive a 95% discount on the full value of the calculated liability. Kagem has been deemed compliant and therefore only contribute 5% of the fund value in any one year. The current calculated closure cost is just over USD 1 million. Based on SRK's experience of other mine closures and given Gemfields commitment to GIIP, SRK considers this figure to be low. SRK considers a more realistic cost to be in the range of USD 6 to 10 million. This estimate also takes into account an estimate for redundancy and retraining costs. A more conservative figure has historically been used in the financial model.

2.9.4 Approach to Environmental, Social, Labour and Health & Safety Management

Gemfields and Kagem Policies and Systems

Gemfields' mission statement is: *"To innovate and inspire through sustainable exploration, mining, supply and promotion of coloured gemstones".*

The company has publicly committed their operations to implementing environment, social and health and safety ("ESHS") management systems compliant with ISO 14001 and OSHAS 18001.

Gemfields has a group Sustainability, Policy and Risk Director who has overall responsibility for the groups sustainability, human rights and community, and health and safety programme. The Company has also employed a Continuous Improvement Manager ("CIM") who is working on operationalising the group level policies at both MRM and Kagem, as well as working with Heads of Departments and senior management teams to put in place Standard Operating Procedures.

Gemfields has adopted a global risk management process to ensure that risk across the business is assessed regularly and effectively mitigated. The Gemfields management team have recently drafted a suite of corporate policies covering all aspects of corporate governance. There are separate policies for human rights, environment, health and safety, and community engagement and livelihoods. At the time of the site visits, these policies were still to be rolled out to the operating sites.

In 2019, Gemfields started using G-Trac an online system for tracking elements of the ESHS management system at group and operations levels (at Kagem and MRM). Policies and procedures are uploaded onto G-Trac for final review and sign-off. There is also a policy and procedure action tracker which produces alerts when a policy is due for review. G-Trac is also used to record ESHS incidents at the operations, including security incidents. It can also be used to upload photographs and videos, such as those captured by security guards. Community grievances are not currently logged on G-Trac and it is understood that they will be logged using a new Operational Grievance Mechanism ("OGM"), which is being established at MRM.

The CIM is in the process of implementing internal audits of ESHS performance. The findings of the audits and recommendations for improvement are shared with the Gemfields Board. The Board takes decisions on actions to be implemented to improve performance.

During the Kagem site visit it was obvious there had been a drive to raise awareness around bribery and corruption. The Gemfields Anti-Bribery and Corruption policy was prominently displayed on noticeboards across the site. This contrasted with the lack of any other ESHS related policy documentation.

Health and Safety and Environmental Management

The Safety, Health, and Environment ("SHE") team at Kagem consists of a Safety, Health, Environment, and Quality ("SHEQ") Manager and four technical SHE staff. The staff are focused on day-to-day management of SHE issues and do not appear to have capacity to take on the development of systems, policy and operating procedures. The Kagem management team made the point that their objective is to make SHE part of the line management function. This approach is supported by SRK, however, given the requirement to implement the newly drafted Gemfields policies and their stated goal of being ISO 14001, 45001 and 9001 compliant by the first quarter of 2020, the team is likely to require additional resources. At the time of the site visit the SHEQ manager was in the process of acquiring support for the implementation of the management systems from an external contactor.

The current focus of the environmental programme is compliance with the requirements of the site EMP. Theoretically the Government of Zambia should carry out EMP verification audits annually however the last audit was in 2015. Kagem produces biannual reports that are submitted to the government. These reports are focused on the key monitoring requirements for waste, air and water quality. Also described in the same section is the use G-Trac which Gemfields has implemented as an internal document and incident management system. This provides a systematic approach to incident management and reporting.

Organisational review meetings are held every week with all heads of departments and senior managers/managers attended. Each department reviews their performance for the week and any problems encountered. Accidents, incidents, and near-misses for each department are also discussed together with actions taken.

Kagem has recently developed an Emergency Preparedness Plan. The plan lays out emergency contacts, incident/accident management and fatality reporting procedures. The plan is still in draft and will need to be approved by site management and a training programme developed to raise awareness of the correct responses to emergency situations.

Kagem has an on-site medical facility that deals with regular employee medical examinations and is on call to respond to emergencies or to treat any work-related injuries. The clinic also tracks HIV and malaria incident rates in the workforce.

CSR/Community development initiatives

Kagem's interaction with the community is led by the CSR team currently comprising of two members of staff. The department is headed by the CSR Manager who is supported by a Community Liaison Officer. The CSR team's work is directed by the Kagem Sustainability Strategy (2016-2019) which sets out the key community development areas to be prioritised in order to mitigate the socio-economic risks highlighted in the socio-economic assessment report (2012) for the Kagem site.

A socio-economic background of the area formed part of the 2016 EIS, for the Kagem expansion. There is a Group level Community Engagement & Livelihoods (2017) policy in place; an operational level policy for community engagement has not been prepared.

Stakeholder engagement

A Stakeholder Engagement Plan ("SEP") has not been developed at Kagem and, although community grievances are received, addressed and filed, a community grievance mechanism is not currently in place. There was no evidence to suggest that a social monitoring and reporting plan is in place to monitor, review and report on progress against identified social risks.

Engagement with traditional Chiefs is key as they play a prominent role in mining due to customary land ownership and the strong political lobbying position they hold as traditional rulers. SRK understands that meeting minutes are not documented for meetings held with the cooperatives or the Chiefs.

Minutes for disclosure meetings minutes held with community members in 2019 for the proposed mine expansions have been reviewed by SRK. These meetings provided the opportunity for local community members to raise any concerns which included limited local employment opportunities. The meeting minutes also highlighted the benefits that the proposed mines could bring to local communities in terms of direct employment. It was minuted that unskilled job opportunities at the proposed mines would only go to the local communities and that equal opportunity for women would be promoted. Increased demand for local farming produce and further development initiatives including infrastructure improvements were also discussed.

The Kagem Sustainability Strategy (2016-2019) focuses on health, education and agriculture as the key areas for interventions which were decided on, as described in the strategy, following stakeholder consultations at various levels.

Kagem has invested in community agriculture, school and health projects in the nearby communities. According to the CSR Manager, CSR activities based on the current strategy have been successful. This success is primarily measured by the projects delivered against the strategy however a formal monitoring process is not in place. For the cooperatives, success is measured based on the pride of the communities and quantifiable changes such as the standard of living including the quality of housing, and the number of children going to school.

Grievance Process

As per the Kagem Human Rights Risk Assessment 2018, community members have expressed confidence in reporting grievances either directly to or through their Chiefs and heads of community groups. Although a formal grievance process or grievance log is not in place, it is understood that the CSR team regularly visits the community to establish if there are any complaints. The Chiefs also hold meetings with communities where they receive grievances from village head men. Disclosure meeting minutes from June 2019 highlight the concerns raised by the communities with regards to increased dust level by the proposed mine expansions and limited local employment opportunities. Dust levels have been raised as a concern in the human rights risk assessment as well.

2.9.5 Approach to Security at Kagem

Security at Kagem is taken seriously with clear evidence of strict implementation of formal and spot searches, applied to all persons on site and at all times. Security teams are assisted by CCTV at various locations around the site and infrared cameras at the pits. There are also dog patrols. As per the most recent ‘Manpower by Department’ (2019) there are 187 security personnel employed at Kagem with a further 38 contractors from Startech and ArmSecure involved in CCTV and other surveillance activities.

Kagem has a license to issue firearms on site, but it is understood that the mine security personnel are not routinely armed. Public security forces operating at Kagem and in surrounding areas are made up of Zambian police who work on a rotating basis. The human rights risk assessment (2018) for Kagem does note that Zambian police have the right to shoot thieves and trespassers.

The security personnel at Kagem are vetted prior to their recruitment and have received training and refresher training on the company code of conduct, human rights, conflict resolution, and rules for the use of force. Human rights training, which is delivered by Anuera, is also provided to the police operating at the mine and a training record is kept by both Anuera and the Human Resources department at Kagem.

Historically people detained by the Kagem security were held at site for a period of time but this practice was discontinued and the standard operating procedure is that if an illegal miner is caught they are immediately handed over to the Zambian police. In most instances they are simply escorted off-site. In response to the numerous incursions, Kagem has formed a rapid intervention team to respond to these and other incidents. This team wears body cameras to help protect against false accusations by both security personnel and illegal miners. They can also be used to help with prosecutions if required.

SRK observed a number of randomly selected CCTV records of artisanal miner incursions onto the Kagem licence. In all cases the security personnel reacted in a very calm and measured manner and were seen ushering the intruders back off the site. The Kagem team did explain artisanal groups have sometimes been aggressive. The team did note that in the past patrol dogs had been used off the leash. This had led to complaints by the local community.

All security incidents and encounters with artisanal miners are logged on G-Trac together with supporting documents.

Both Kagem security personnel and private security personnel are contractually subject to immediate dismissal for any type of human rights violation. Furthermore, Kagem and Gemfields has the right to request immediate removal and replacement of any private security personnel who have been found to be in violation of any company policy and procedure, and to immediately terminate an entire private security company contract for human rights violations.

2.9.6 Risk Management

Kagem has a risk champion on site, who is the SHEQ Manager, to oversee risks at an operational level. For each department, the head of department is the risk owner who works together with the risk champion to identify and feed into the overall operational risk assessment spreadsheet every quarter. Reportedly, CSR incidents, including community health and safety, that occur or are identified are reported to SHEQ by submitting an Incident form. It is understood that this risk register is sent to Gemfields/Group for their information and in preparation for their board meetings.

Corruption and Whistleblowing

With regards to corruption and human rights violations Kagem has been developing a way to deal with complaints internally and externally. Employee Complaint boxes have been in place since 2018 and, as reported, an employee hotline should be available this year. Reportedly a committee will be set up to address any complaints that come in via the boxes.

Anti-Bribery and Corruption

Anti-bribery and corruption training is provided to staff online by Thomas Reuters; the category of people to be trained has been identified by Gemfields.

2.9.7 Environmental and Social Risks

Key Environmental Risks

With the exception of the mine footprint itself, the operation has relatively minor environmental impacts and the on-site mitigation measures being implemented respond to the key risks.

Risks still to be addressed are:

1. **Reputational risk: Management systems**. There is a potential reputation risk (also addressed at the Gemfields Group level) associated with the, currently poorly developed, management systems on site. Given the mine has been in operation for a number of years and given the high-profile marketing campaign, the relatively informal approach to some elements of the environmental programme could attract criticism. SRK has noted the new initiatives to address this issue.

2. **Reputational risk: Biodiversity management**. Gemfields has made some very strong statements about being an industry leader in the areas of sustainability. A number of commitments have been made to implement a more formal approach to biodiversity management. This is yet to be actioned.

3. **Habitat modification** and tree clearance as a result of uncontrolled in migration by job seekers and artisanal and illegal miners. This is linked to the biodiversity risk in that the lack of a comprehensive biodiversity assessment means the significance of the impact is difficult to measure. Readily available satellite imagery spanning decades means the impacts of mines on the surrounding landscape can be tracked by any third parties or regulatory bodies who may want to criticise the mine's environmental record.

Key Social Risks

- **Lack of a social management system:** The work of the CSR team is directed by the existing community development (sustainability) strategy for Kagem which is heavily focused on delivery of outputs through CSR activities. The socioeconomic and cultural impacts identified in the EIS are not being fully addressed through the mitigation measures identified.
- **No stakeholder engagement process, plan or grievance mechanism:** Stakeholders have not been mapped and there is no formal system for stakeholder engagement, consultation and participation, and recording of stakeholder meetings. Although it is noted that incidents are logged with the SHEQ department and that respective departments deal with community complaints, there is no centralised system to log community grievances which details how the grievance was raised, the date, the department/person responsible and how it was resolved. This does not reflect the global policy commitments on community engagement and livelihoods which include development of an engagement strategy and grievance mechanism.
- **Limited primary socioeconomic data for the targeted communities:** Currently, other than the visual process used, there is no clear baseline against which to measure how standards of living are improving in the communities.
- **Lack of proactive engagement with illegal/artisanal miners:** There does not appear to be an assessment or study carried out to fully understand the dynamics of the illegal/artisanal mining presence in the area. This, together with the apparent lack of proactive engagement and dialogue with this group leaves the operation open to the potential risks posed by the illegal miners. In-migration linked to the influx of illegal/artisanal miners and the associated socioeconomic impacts is also a risk.
- **Limited social monitoring plans:** Gemfields' overall approach is aligned with the broader strategic aims of the Sustainable Development Goal (SDG). Without effective social monitoring plans and systems in place there is little evidence of the effectiveness and impact of community interventions to be able to report on the contributions made towards the SDG.
- **Injury to artisanal miners:** The Kagem security team is very aware of the challenges associated with the task of managing illegal incursions onto the property. They have identified that a key risk is the potential for an intruder to be injured as a result of falling or dislodging large rocks on the waste rock dump.
- **Historic challenges:** Historically, the security team did allow guard dogs to be released from their leads and to chase illegal miners. This has resulted in complaints in the past. In the same way historic behaviours has been used against the company at MRM, old practices could pose a risk if this issue is exploited by compensation seekers.

2.9.8 Recommendations

Gemfields: Governance

The public and progressive commitments to sustainability, ethical and responsible mining should be visible across corporate and operational activities. These commitments made by Gemfields will require visible leadership from the corporate offices being formally managed and actively pursued at the operation level.

At the operating sites, sustainability will require the development of effective systems for the operationalisation of the corporate commitments. This would typically involve the development of ESHS management systems for the site that draw on the corporate commitment and policies. SRK understand this is the core task of the Continuous Improvement Manager.

Gemfields has an opportunity to deliver on its commitment to go "*over and above*" and set "*new benchmarks around sustainability"* for the sector. Both operations already have a considerable security programme that looks to restrict access to the mine licence areas. This coupled with a comprehensive biodiversity programme that brings in ecosystem services and social provisioning and involves local communities could set Gemfields apart from the sector.

Kagem: Environmental

The scope of the planned biodiversity study should be assessed against GIIP for biodiversity management. The study should build on the existing data and include a comprehensive assessment of species cumulation curves, seasonal data collection, habitat distribution across the site and assessment of land and ecological resource use. There are a number of biodiversity guidance documents that can be used to check the comprehensiveness of the current scope. The appointed consultant should be made aware of Gemfields' commitments to biodiversity and sustainability in order to assist the company to develop a series of concrete actions to proactively manage biodiversity aspects of the mine licence area.

With respect to the implementation of ESHS management systems, Kagem needs to set a realistic timetable for the implementation of an integrated management system. The initiative needs to be driven by Gemfields and the senior site management team. If the process is left solely to the SHE team on site, the system will not add value and will not be maintained.

If implemented effectively, the management system will identify where Kagem should focus the most resources based on a structured approach to risk.

The operation should carry out a review of its closure liabilities based on a full life of mine plan and incorporating agreed post-closure land use objectives.

Kagem: Social

SRK recommends that an updated socioeconomic baseline is carried out prior to developing the new community development strategy. This can provide a baseline to measure the effectiveness and impact of community interventions against and improve transparency in reporting against international standards (for example, the SDG) at a corporate level.

Develop the CSR team's capacity and capability by supporting their involvement in the preparation of the social management system. Expand the role of the CSR team to play a larger role in social issues beyond the implementation of CSR activities. This can include a larger focus on public engagement and consultation, information sharing from local leaders to the wider communities, and a more proactive role in dealing with community complaints and community health and safety incidents and issues.

Ensure that social risks, including community health and safety and grievances are recorded on the ESHS risk and incidents' register to avoid social risks being dealt with on a reactive basis. SRK recommends a consolidated community/social risk register is prepared that clearly identifies mitigation actions and how they will be monitored and evaluated.

The grievance mechanism should be managed centrally so that external grievances addressed by any of the departments are documented and manged. All grievances received should be recorded by a designated person and shared with all departments at weekly meetings. The process should be recorded, and the resolution process tracked by a designated person with input from the various departments as and when required.

Social Governance

SRK understands that the CIM is working towards operationalising Group level policies and procedures at Kagem. SRK recommends that Kagem prioritises the development of a social management system that comprises of policies and plans that reflect the global sustainability and corporate responsibility polices, with a social team that has the capacity and capability to implement this management system with the aim of continuous improvement.

The social management policies recommended for Kagem include:

- A community engagement and livelihoods policy.
- A community health and safety policy (unless incorporated into a SHEQ policy).

The social management plans recommended include:

- A Stakeholder Engagement Plan and Grievance Mechanism that identifies and classifies all potential stakeholders, that is, individuals and entities that have an interest in the mine, may be affected by or influence the mine operation, and how they will be engaged with. Transparency in the SEP and GM to allow accessibility for all stakeholders, including illegal miners.
- An updated sustainability and corporate responsibility (community development) strategy that addresses the social impacts identified in the EIS, is aligned with regional development strategies and looks beyond the life of the mine in order to offer long-term livelihood opportunities to communities and minimise dependency.
- A community health and safety plan.
- A socioeconomic monitoring and reporting plan to monitor, review and report on progress against the social risks and impacts identified in the EIS through improved data collection. This can also improve stakeholder communication regarding implemented and planned community interventions, improved transparency regarding project activities and manage community expectations.

2.10 Emerald and beryl market and pricing

2.10.1 Introduction

Emerald is the green variety of the beryl mineral family. Other varieties include aquamarine (light blue), morganite (pink), heliodor (yellow). Pure beryl is colourless and mainly formed by beryllium (14%) and a number of impurities in the crystal structure contributes to the different colours: iron, chromium and vanadium are responsible for the green colour in emeralds.

The ideal colour in emeralds is bluish green to green, with strong to vivid saturation and medium to medium-dark tone; the colour should be evenly distributed within the stone with no eye visible colour zoning. Generally, the higher the chromium or vanadium content, the more intense the green colour. As iron content increases, so does emerald's degree of blue.

Zambian emeralds tend to have a rather high iron content when compared to their Colombian counterparts, displaying a stronger bluish green body colour. Colombian emeralds are generally coloured by vanadium, which is lacking in Zambia. The positive side of having iron in the crystal structure, is that gemstones tend to have a more compact crystal structure with less fractures, resulting in a lower weight loss during the cutting process.

On the Mohs scale of hardness, beryl is classified as 7.5 to 8. The crystal form and high likelihood of fracturing can make the mineral fragile in certain directions.

Emeralds are classified in gemmology as "type 3" gemstones: this group of gemstones is characterised for their brittle structure, which is directly linked to the amount of inclusions they often feature. Inclusions tell the story of where the gem comes from. They are a unique fingerprint within the gem and most importantly, help gemmologists to identify their country of origin, formation etc.

Some inclusions commonly found in emeralds are crystals, fractures, needles, fingerprints, growth tubes, liquid inclusions, and two- or three-phase inclusions. These are associated with the formation of the crystal in its environment.

2.10.2 History

Historians estimate that the Egyptians mined emeralds as early as 3500 BC. Egypt was the major source of emeralds until the sixteenth century. Spanish explorers then discovered abundant emerald occurrences in South America, in what is now Colombia.

Emeralds have been mined in Colombia, Russia, Afghanistan, and Brazil. Colombia has been the largest supplier in US Dollar terms for the past five hundred years or so, but conflict and low investment have resulted in outdated mining techniques and significantly reduced export values in recent years. The easily accessible deposits within the mainstay mines of Muzo, Coscuez and Chivor have largely become depleted in recent years The Colombian hard rock ground presents its own challenges since mines in Colombia are located on mountainous areas, making underground mining the only technique possible. Nevertheless, Colombian gemstones continue to fetch the highest per carat prices.

Brazilian gemstones have a typical yellowish green appearance and largely feed the US market, to respond to the needs of lower quality material for commercial value goods. Zambian emeralds, which tend to shine with their iron tinted bluish-green body colour, have benefited from the investments of Gemfields into the mining sector and the marketing of the gems. Gemfields acquired the Kagem mine concession in 2008 and since then, has improved operating practices thereby changing the gemstone mining sector. This benefits the operator and has an important benefit and impact on the country. Mine sites in Zambia are open pit, allowing careful mining techniques for the recovery of larger and more intact rough material. Today Zambian emeralds have gained an important position in the market, becoming the best option and alternative to Colombian emeralds.

2.10.3 Formation and Mining

Emeralds from Zambia can be of the same quality as their counterparts from other world-famous sources like Colombia, but they formed in different mineralising systems. Unlike Colombian emeralds, emeralds from Zambia are rich in iron and have higher refractive index and specific gravity. Emerald deposits in the Kafubu area occur within rocks of the Mesoproterozoic Muva Supergroup (1800-1100 Ma), composed of both metavolcanic and metasedimentary rocks.

A rare combination of uncommon geological and geochemical conditions is required for the formation of emeralds. According to the classical model, beryllium, essential for crystallization of beryl, is one of the rarest elements in the earth’s crust and must be carried up to the surface by pegmatites, which in turn contact chromium and vanadium bearing (ultramafic) rocks to attain the desired colour. Notably, not all pegmatites are beryllium bearing and even fewer are emplaced within country rocks with adequate chromium. These, coupled with even more specific temperature, pressure and fluid content requirements for its formation, makes emeralds extremely rare and remarkably erratic in distribution.

Zambian emeralds are found in primary deposits. An advantage of open-pit mining is that it makes emeralds more accessible and extractable. Underground operations require leaving walls, ceilings, and pillars intact for shafts and tunnels, limiting or eliminating access to the emeralds in those areas. Formation and mining are generally unique to the geology of each country: Colombia, Brazil and Afghanistan are not geologically suitable for open pit operations, they are mined as underground hard rock mines.

2.10.4 Global Emerald Occurrences

Colombian Dominance

Colombia has traditionally been the principal producer of fine quality emerald for centuries; however, Colombia’s output and share of global production has decreased considerably in recent years (Table 2-37). The primary reason for this drop is believed to be the very limited amount of formal investment and lack of professional mining techniques. For the first time in the history of Colombia, a foreign company, Fura (Dubai based, Toronto listed company) has acquired the Cosquez mine, although production is not available to the market yet. Traditionally, the three main mining districts were Muzo, Coscuez and Chivor. Their formation is mainly due to hydrothermal processes where the fluids are intruding in sedimentary rocks and solidify over a long period of time to crystallise into emeralds, should the right conditions exist. Due to their formation and their crystal structure, Colombian emeralds are also more prone to fractures, making them more brittle. This results in a larger use of treatments. Whilst all qualities are produced, fine and extra fine quality gemstones are scarce.

Table 2-37: Kagem: Historical Emerald Production from Colombia

Year	Emerald Production (kg)
1996	2,100
1998	2,500
2000	2,200
2002	1,600
2004	2,500
2006	1,146
2008	424
2010	1,040
2012	240
2013	520
2014	393
2015	433
2016	477

(Source USGS and Ministry for Mining and Energy, Colombia)

Brazil

Emeralds were discovered in Brazil in the seventeenth century, with more recent deposits being found in the 1980s, making Brazil one of the most significant suppliers in the world, alongside Colombia and Zambia. Deposits are located in the state of Bahia, in a mica schist horizon near Salininha as well as deposits at Carnaiba in mica schists. It is the largest supplier of the low grade emeralds. The country continues to export rough as well as cut and polished emeralds.

Zambia

Zambia is a geologically rich and diverse country and an important source to the international emerald trade. Emeralds are produced at numerous locations along Zambia's copper belt; however, production is most active at Kagem.

Gemfields' Kagem mine is the largest coloured stone mine in the world, covering an area of 41 km^2 and provides around 30% of emeralds in the world.

Efficient mining and distribution practices and coordinated marketing efforts by Gemfields have been crucial to the development of the Zambian market, as Gemfields' Kagem Mine still accounts for roughly 70% of Zambian emerald production by value. According to Gemfields' estimations, Colombia and Zambia are the main global producers, closely followed by Brazil.

Other Significant Emerald Deposits

Emeralds are also found in the Panshir valley of Afghanistan and the Swat region of Pakistan. The colour of these emeralds has been said to be similar to the colour of Colombian gemstones; however, the gemstones are almost always small and this limits their market value. Other emerald deposits have been discovered in Australia (Emmaville), South Africa (Leysdorp), Zimbabwe (Belingwe), India (Rajasthan), Tanzania (Gregory Rift Valley), Nigeria (Plateau), Madagascar (Kianjavato), Norway (Akerhus), USA (Hiddenite), Mozambique (Morrua), and, most recently, Ethiopia.

2.10.5 Treatment of Emeralds

Emeralds tend to be among the most included of all natural gemstones. The inclusions are tolerated because the finest emeralds display a vivid bluish-green colour that is unique in the gems world. It has long been known that emeralds can be oiled to improve their appearance. Because most emeralds have tiny fissures that reach the surface of the gem, it is possible to fill internal inclusions by forcing oil through the surface-reaching fissures. The result is improved clarity since the light performance of the filled cracks is similar to that of natural emerald.

Cedarwood oil is most commonly used, as it is colourless and has a refractive index close to emerald. The oil can dry out and emeralds have to be re-oiled from time to time to keep them looking their best.

Emerald producers have searched for a more permanent solution. The Brazilians were the first to begin using a synthetic resin known as Opticon in the 1980s and were followed in this practice by the Colombians in the 1990's. Opticon, an epoxy prepolymer, has better stability than cedarwood oil, and a refractive index almost identical to emerald. Since emeralds may be enhanced to a greater or lesser degree with these fillers, gemological reports usually indicate the level of clarity enhancement for emerald, ranging from None to Insignificant, Minor, Moderate and Significant.

Transparency and adequate disclosure of any kind of treatment applied to gemstones in fundamental in the trade, notably as typically only a gemmological laboratory would have the tools and the knowledge to detect and identify them. Kagem's mine production consist of a vast range of emerald grades, therefor requiring some treatments. Gemfields ensures that all treatment is disclosed and that its auction clients to appropriately informed.

2.10.6 Emerald Market Mechanisms

The wholesale market of rough emeralds, just like that of all coloured gemstones, although unlike diamonds, has always operated following century old practices, which often appear unregulated and artisanal in their method of conduct. Traditionally, the major trading centres for coloured gemstones are India and Thailand, as well as mine sites, when dealers are able to travel to the fields to procure directly from the source.

Cut and polished gemstones, manufactured in the main trading hubs (Thailand and India), have been sold to the wholesale market globally during international trade shows, or by appointment at the factories. Procurement and sourcing have always been dependant on the connections and the ability to travel for most of clients, coupled by the uncertainty of production coming from artisanal scale mines. This has meant that jewellery houses could not plan a production around a certain quality of emeralds only, as no stable or consistent supply have ever been possible.

Gemfields aims to develop and lead a sector that has historically remained unregulated and largely illicit, by showcasing the benefits of a more systematic, modern and transparent approach to coloured gemstone mining so that the industry becomes more responsible and legitimate, providing sustainable long-term social, economic and environmental benefits to both the country and local communities.

Gemfields has developed and implemented an innovative grading and auction system for selling its rough gemstones. The auctions are held in secure locations with the material separated into homogenous lots and certified as having been produced by Gemfields. The world's leading rough gemstone buyers submit sealed bids for individual lots. A sale occurs if the highest bid received exceeds a pre-determined, but undisclosed, reserve price. The auctions have brought a level of professionalism and transparency previously not seen in the industry. It is important to note that the reserve price is generally calculated according to the previous bids received on a particular grade, so it comes from the clients and their knowledge of the market, not from Gemfields calculations.

In the absence of an industry standard for evaluating rough coloured gemstones, Gemfields established its own grading system to assess each gem according to its individual characteristics (size, colour, shape and clarity). This approach has been instrumental in providing buyers with confidence in the consistent quality of the material on offer. Gemfields uses this grading system to develop two auction classes, one offering higher quality gemstones and the other for the larger volume of lower quality gems.

International companies, mainly from India and Israel, buy rough Zambian emeralds at Gemfields private auctions, process their parcel according to their market needs. Most of the production is handled and cut directly by these companies, with a portion of them acting as brokers and selling the rough spare of any processing into the open market. Two distinct routes to market exist. One is through international tradeshows such as the annual Tucson (USA) Gem Fair, others include the international Hong Kong and Bangkok gem shows. Several new trade shows are organised throughout the year in all main international hubs, like Switzerland (Basel and GemGeneva) Shanghai, Shenzhen.

The second route is another common method observed in the coloured gemstone market. This involves Zambian emerald buyers visiting the cutting centres in Jaipur, India and Ramat Gan and Tel Aviv, Israel to purchase rough directly from the cutters and private brokers and dealers.

It is noted that Zambian emeralds have an important niche place in the global gemstone market, mainly due to their quality and size achieving attractive prices.

Gemfields has set a new benchmark for the quality of African mines. It has also demonstrated the quality of supply the Kagem Project can provide. An exceptional 5,655 grams rough emerald, names the Inkalamu (Lion in native language), Figure 2-58, was unearthed in October 2018 and sold at the following auction in Singapore that same year.


Figure 2-58: Kagem: The Inkalamu Emerald (left) and Premium Emeralds (right)

Distribution Network for Zambian Emeralds

In 2004, the UK public-listed Gemfields Resources PLC started systematic exploration near the Pirala mine, south of the Ndola River, and made some important discoveries. Mining began in 2005. By 2007, Gemfields had already acquired 100% ownership of two mines in the area. In June 2008, Gemfields formed a collaboration with the Zambian government, establishing a 75/25 ownership of the Kagem emerald mine. When Gemfields acquired control of the mine in 2008, the main open pit yielded almost no minable ore. The company invested a large capital and upgraded the operating conditions. By the time the fiscal year ended on June 30, 2009, Kagem had produced 27.6 million carats of emerald at an operating cost of approximately 40 cents per carat (data from Gemfields PLC operational updates, August, 2009).

Gemfields has successfully implemented a turnaround strategy and transformed Kagem into the world’s single largest producing emerald mine, responsible for roughly 20% of global emerald supply (by volume and value combined). A large reason for this success is Gemfields’ move to providing the international markets with consistent access to graded rough which has significantly developed the entire downstream global emerald market. Further development as well as the transition to mechanized mining has supported increased production and improved operational efficiency. In 2007, Kagem produced 9.4 Mct, which has increased to 21 Mct in the year ending June 2017, and 35.5 Mct in the year ending June 2018.

Gemfields sells its production through its auction platform rather than through a private dealer network. In 2014, Gemfields also paid its first dividend of USD16 million, with USD3.2 million going to the Zambian government in addition to mineral royalties and corporate income taxes.

Gemfields expects its production in Zambia to continue to grow as current demand increases in the major gemstone markets. Investment in further exploration should result in the development of more sources in the future. Prices for finished emeralds from all three major producing nations have increased since 2004. Higher prices have held firm due to increased demand in the USA, India and China.

Gemstone Market Size

Coloured gemstones continue to outperform the wider jewellery market (Knight Frank report, Q1 2019) primarily due to the major economies’ recovery and growth, combined with a fashion trend which has shifted towards responsibly sourced coloured gemstones. Gemfields ability to transparently supply a consistent production of quality gemstones to the downstream markets and its intensive global marketing and communications efforts, are being relied upon by the International clientele looking to adhere to best standards in the industry. According to the United Nations Commodity Trade Statistics Database, the international coloured gemstone industry has been growing at a Compound Annual Growth Rate (“CAGR”) of 19% for the last five years (2012 to 2016) and currently stands at USD 8.6 billion. The emerald, ruby and sapphire market make up 87% of the coloured gemstone market and currently stands at USD 7.5 billion, with 22% CAGR over the period, 2012 to 2016. The information is still largely lacking but it is estimated that rubies and sapphires make up for 50% of the world’s coloured gemstone market with the largest demand for rubies originating from Asia.

The gemstone industry is highly fragmented. Small to medium scale miners produce a large amount of the gemstones and do not declare their data. The world's top gemstone manufacturing hubs, India and Thailand, experienced steady growth in their exports of emeralds, rubies and sapphires in 2016 of 9% and 8% respectively. Meanwhile, exports from Hong Kong, the main trading hub, more than doubled reaching USD 2 billion (2015: USD 1.3 billion). Asian markets and the USA regained momentum and showed extremely encouraging results with China, Japan and India growing by 92% (USD 2.3 billion), 11% (USD 1.4 billion) and 19% (USD 0.08 billion) respectively, and the USA imports increasing by 8% (USD 1.3 billion).

2.10.7 Emerald Value

Emerald is considered one of the "big three" gemstones, the other two being rubies and sapphires. It has a long history of appreciation, from Cleopatra, who used the gemstone mined in Egypt for her royal adornments, to the Incas and thru to the Spanish, who on the contrary treasured gold and silver over gemstones, so they traded emeralds from Colombia into Europe for precious metals.

Due to its luscious colour, long history and rarity, emerald is only second to rubies in the world record of gemstones sold at auctions. Emeralds from Colombia still command the highest prices. The "Colombia brand" is entrenched in the emerald market, even though the Zambian emeralds are comparable in colour and possibly superior in quality.

For example, the world record for emeralds at auction was gained by the "Rockefeller Emerald", an 18.04 ct Colombian emerald of mesmerising colour and impeccable clarity. It was once owned by the Rockefeller family. The gem was set in a ring by Raymond C. Yard and Harry Winston bought it at Christies NY auction in June 2017 for USD 5.5 million.

There is currently no example of record-breaking values for other emerald origins at auction, not due to a reduced interest or lack of material, rather a matter of the rarity of gems with strong historic meaning and provenance.

When considering a market interest in responsible sourcing, Zambian emeralds could overtake Colombian in desirability in time. It is currently an important topic for consumer to prioritize the well-being of the communities involved in the sourcing of such precious gemstones.

Whereas Colombia still commands with prices 3 times higher than Zambian, the latter have shown a steady growth year on year, both at rough level and cut and polish level.

The Coloured Gemstone Market

The coloured gemstone market is in a constant phase of fast growth, primarily due to the major economies' recovery and growth combined with a fashion trend which has shifted towards coloured gemstones supported by Gemfields ability to ensure a consistent supply of quality gemstones to the downstream markets and its intensive global marketing and communications efforts.

It is also becoming common for investment funds to offer coloured gemstones and diamonds along with financial assets, thus treating natural gems as commodities. Only the rarest specimens are suitable for investment purposes and are said to have more chances to guarantee a monetary return over time, although as this is a recent concept, actual figures are yet to be published.

Between 2012 and 2016, prices have increased 17% for rubies, 8% for sapphires and a staggering 100% for emeralds, in contrast to slight negative trend observed for diamonds, according to GemVal and Rapnet. The sustainability of price increases remains to be seen, but demand growth remains strong at present. The trajectory of received emerald prices at Gemfields' auctions has broadly followed the Polished Prices Diamond Index.

Emerald grading

Kagem is a primary deposit. Emeralds are almost always found in primary deposit due to their fragile and brittle nature; they would not survive the action of water for a secondary found. Emeralds from Kagem are graded according to Gemfields' proprietary grading system, which includes around 250 different grades of rough.

Historical Emerald Prices

Since 2014, emerald prices have been increasing, reaching a peak in 2015, and continuing on an upward trend till today (Figure 2-59 and Table 2-38). Professional marketing efforts by Gemfields have had an important influence in driving demand for emeralds up and increasing desirability of the gemstones among younger generations, turning them into a very modern choice. A key point to note about emeralds and other coloured gemstones is that they offer the retail jeweller a much more attractive profit margin compared to the slim margins more recently seen in diamonds. This makes them appealing products to stock and promote. Emeralds already possess a strong brand with consumers. Emeralds are one of the earliest gems used in jewellery and have been held in high regard dating back many centuries.

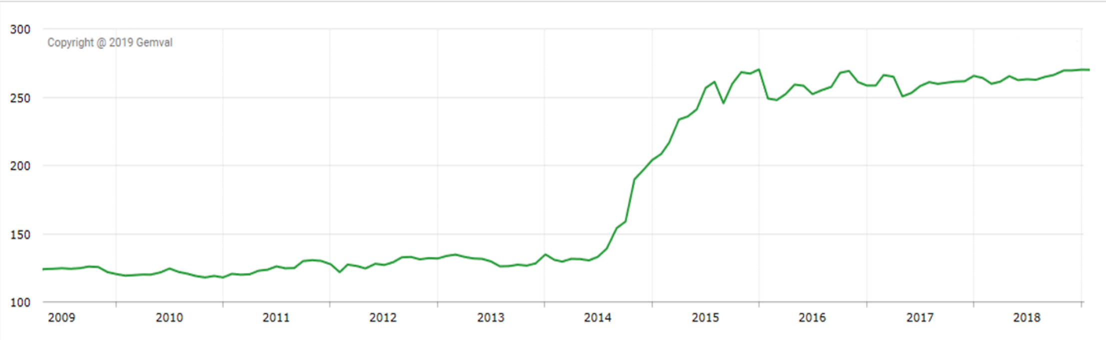


Figure 2-59: Kagem: Emerald Historical Values (Gemval 2019)

Table 2-38: Kagem: Cut Emerald Prices USD/ct (only available until 2016)

Period	Commercial	Good	Fine	Extra Fine
2016	**110**	**1420**	**4500**	**7200**
2015	**110**	**1420**	**4000**	**6200**
2014	**110**	1420	4000	6200
2013	**110**	1420	4400	6500
2012	**110**	1420	4400	6500
2011	**110**	1420	4400	6500
2010	**110**	1350	4000	6500
2009	**110**	1350	4000	6500

Source: 'The Gem Guide'

Historically, a key constraint to the sale of coloured gemstones has been the limited quantities and erratic nature of the supply. With the bulk of world production coming from small scale miners, the downstream supply chain has not had access to a consistent supply of rough. This has constrained certain product lines or the ability to support these with the necessary marketing campaigns. Since Gemfields entering the market, cutters can purchase large parcels of consistent grade emerald product at auction. This enables retailers and manufacturers to plan larger production runs of jewellery that rely on consistent supply, stable pricing and the reliable grading of the rough and they can in turn support this with an increased level of consumer focussed marketing. The result of this is the opportunity to grow the size of the market and broaden the appeal of the products while keeping prices stable or increasing.

Auction Results

Gemfields' auction results, in prices per carat, for both lower and higher quality grades from 2009 until 2019, are presented in Table 2-39 to Table 2-43 and Figure 2-60. The high quality auction consists of all premium emeralds and 18% of emeralds. The low quality auction is the remaining 82% of emeralds. No beryl is included in these auction results. It can be noted that there is a typically upward trend (Figure 2-60). This is considered most likely due to increased consumer confidence in Gemfields' product as a result of the proprietary grading, marketing and sales platform developed by the Company, as well as a general increase in consumer demand for coloured gemstones.

Table 2-39: Kagem: Higher Quality Auction Results

Details	Jul `09	Nov `09	Jul `10	Dec `10	Jul `11	Mar `12	Nov `12
Location	London	Jhb	London	Jhb	Singapore	Singapore	Singapore
Carats offered (million)	1.36	1.12	0.85	0.87	1.07	0.77	0.93
Carats sold (million)	1.36	1.09	0.8	0.75	0.74	0.69	0.9
No. of companies placing bids	23	19	37	32	38	29	35
Average no. of bids per lot	10	13	18	16	16	11	11
No. of lots offered	27	19	27	19	25	23	19
No. of lots sold	26	14	24	18	18	20	16
Percentage of lots sold	96%	74%	89%	95%	72%	87%	84%
Percentage of lots sold by weight	99.8%	97%	94%	86%	69%	89%	98%
Percentage of lots sold by value	82%	76%	87%	99%	91%	94%	90%
Sales realised at auction (USD million)	5.9	5.6	7.5	19.6	31.6	26.2	26.8
Average carat sales value(USD/ct)	4.40	5.10	9.35	26.20	42.71	38.25	29.71

Table 2-40: Kagem: Higher Quality Auction Results Cont.

Details	Jul `13	Feb '14	Nov `14	Sep '15	Apr '16
Location	Lusaka	Lusaka	Lusaka	Singapore	Lusaka
Carats offered (million)	0.58	0.84	0.6	0.6	0.56
Carats sold (million)	0.58	0.62	0.53	0.59	0.47
No. of companies placing bids	36	34	34	37	33
Average no. of bids per lot	8	13	12	11	9
No. of lots offered	18	17	17	19	18
No. of lots sold	18	15	16	18	16
Percentage of lots sold	100%	88%	94%	95%	89%
Percentage of lots sold by weight	100%	74%	89%	98%	84%
Percentage of lots sold by value	100%	86%	89%	88%	94%
Sales realised at auction (USD million)	31.5	36.5	34.9	34.7	33.1
Average carat sales value (USD/ct)	54.00	59.31	65.89	58.42	70.68

Table 2-41: Kagem: Higher Quality Auction Results Cont.

Details	Feb' 17	Oct '17	May '19	Nov '18	May '19
Location	Lusaka	Lusaka	Lusaka	Singapore	Singapore
Carats offered (million)	0.42	0.32	HQ	HQ	HQ
Carats sold (million)	0.35	0.32	0.31	0.57	0.43
No. of companies placing bids	33	36	0.17	0.42	0.31
Average no. of bids per lot	7	11	31	40	45
No. of lots offered	19	18	8	8	8
No. of lots sold	17	18	17	26	35
Percentage of lots sold	89%	100%	10	20	28
Percentage of lots sold by weight	84%	100%	59%	77%	80%
Percentage of lots sold by value	95%	100%	56%	74%	72%
Sales realised at auction (USD million)	22.3	21.5	10.3	28.4	22.4
Average carat sales value (USD/ct)	63.61	66.21	59.55	68.03	71.85

Table 2-42: Kagem: Lower Quality Auction Results

Details	Mar \`09	Mar \`11	Nov \`11	Jun \`12	Apr \`13	Nov \`13
Location	Jaipur	Jaipur	Jaipur	Jaipur	Lusaka	Lusaka
Carats offered*	28.90	16.83	10.83	10.85	17.34	5.62
Carats sold (million)	22.8	12.98	9.82	3.47	6.3	4.94
No. of companies placing bids	25	44	27	20	25	20
Average no. of bids per lot	8	14	9	3	6	7
No. of lots offered	56	35	26	33	28	21
No. of lots sold	49	34	19	17	23	19
Percentage of lots sold	88%	97%	73%	52%	82%	90%
Percentage of lots sold by weight	79%	77%	91%	32%	36%	88%
Percentage of lots sold by value	89%	76%	87%	99%	91%	91%
Sales realised at auction (USD million)	7.2	10	11	9	15.2	16.4
Average carat sales value (USD/ct)	0.31	0.77	1.12	2.61	2.42	3.32

Table 2-43: Kagem: Lower Quality Auction Results Cont.

Details	Aug '14	Feb '15	Nov '15	May '16	Sep '16	May '17
Location	Lusaka	Lusaka	Jaipur	Jaipur	Jaipur	Jaipur
Carats offered (million)*	12.11	10.10	5.07	3.67	4.05	3.10
Carats sold (million)	11.58	3.9	4.45	2.78	3.27	3.10
No. of companies placing bids	21	21	29	26	30	33
Average no. of bids per lot	7	5	6	7	7	9
No. of lots offered	21	26	23	18	19	23
No. of lots sold	17	19	18	14	15	23
Percentage of lots sold	81%	73%	78%	78%	7900%	100%
Percentage of lots sold by weight	96%	39%	88%	76%	8100%	100%
Percentage of lots sold by value	88%	88%	95%	79%	8200%	100%
Sales realised at auction (USD million)	15.5	14.5	19.2	14.3	10.7	14.5
Average carat sales value (USD/ct)	1.34	3.72	4.32	5.1	3.28	4.68

Table 2-44: Kagem: Lower Quality Auction Results Cont.

Details	Feb 2018	Jul 2018	Feb 2019
Location	Jaipur	Lusaka	Lusaka
Carats offered (million)	3.73	2.89	4.15
Carats sold (million)	3.55	2.59	2.46
Number of companies placing bids	31	22	24
Average number of bids per lot	8	6	5
Number of lots offered	21	21	23
Number of lots sold	19	17	16
Percentage of lots sold	90%	81%	70%
Percentage of lots sold by weight	95%	90%	59%
Sales realised at auction (USD million)	10.8	10.9	10.8
Average carat sales value (USD/ct)	3.05	4.21	4.39

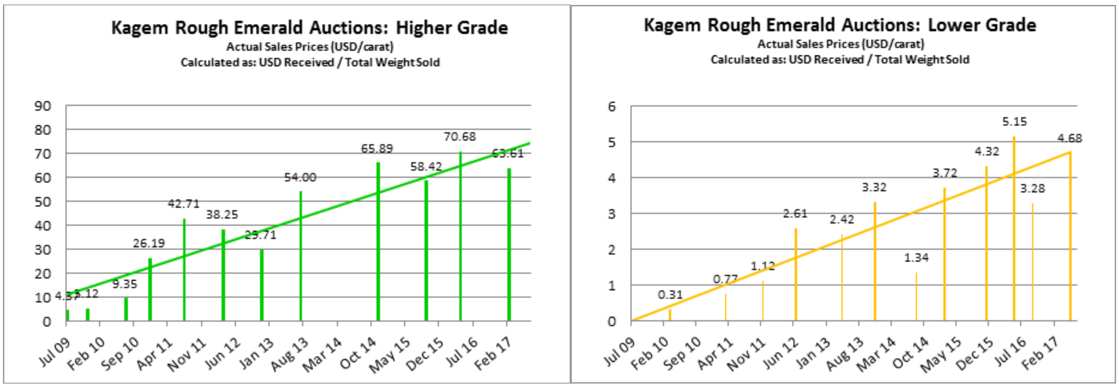


Figure 2-60: Kagem: Auction Results (2009 to 2017)

2.10.8 Gemstone Marketing Strategy

The global market has recently witnessed a significant rise in demand for coloured gemstones. This was primarily linked to the general trends in the fashion industry towards revealing the significance of colour, the growing economies of the developing world, increasing importance of ethics and transparency in business and realising the investment value of coloured gemstones.

Gemfields has significantly invested in marketing an industry that has never seen formalised and coordinated marketing efforts in the past, thereby revealing the value of the Zambian emeralds both to the trade and consumer.

To be able to market effectively, Gemfields had to be able to guarantee constant supply of these gemstones to the global market and ensure that Zambian emeralds are available on the market in the key geographies. In order to achieve this, Gemfields keeps roughly one year's rough production available as a stock balance at any given point in time and manages its inventory to meet growing market demands. Through its auction platform and cut and polished sales department, Gemfields is able to reach directly to its customers. Kagem has a 24-year life of mine at the current production rate with a capacity to provide sustainable supply to the market throughout this period.

Gemfields initial marketing efforts for Zambian emeralds were focused on trade participants. Starting from 2010 Gemfields began targeted trade advertising campaigns through trade publications and presence at the major trade shows to create awareness and demand for its emeralds. Gemfields created two advertising campaigns and two 'Emeralds for Elephants' campaigns in 2010 and 2011 where renowned international jewellers created emerald pieces to promote the gemstones. Global launch of its brand ambassador Mila Kunis in 2013 featured emerald, ruby and amethyst jewellery. Gemfields Emerald Book launched in 2013 aimed at telling the story of emeralds to the end consumer and was very successful.

Currently, Gemfields continue to market Zambian emeralds as an exclusive gemstone in collaboration with jewellers, artists and designers. The target customer focus is at the end consumer as firm foundations are created in the trade community.

To conclude, Gemfields directs a high level of attention to doing business in a responsible, transparent and ethical way. From responsible environmental, labour and social policies, to safe mining operations, transparent auction process, accountable government engagement and through to the final customers Gemfields aims to be a leader within its segment, is increasingly looking to be on par with global best practices and believes that integrity is a key demand driver for its product. By continuing to recognise and address major social, environmental, health & safety, transparency issues Gemfields believes it can satisfy its stakeholders' expectations and maximise value as a business. Notwithstanding the limitations in respect of a historical and forecast supply-demand-price analysis, the Company's continued supply into the market is expected to continue successfully.

2.10.9 Future Prices

Emerald was one of the top selling gemstones in the international market during the mid to late 1980s through till today. Driven by demand, emerald prices hit record highs during this period. Increased demand by Japanese and European buyers helped trigger pricing volatility, with demand outpacing supply, especially in high grade gemstones, prices remain volatile, on an upward trend

Consensus market forecasts are not available for coloured gemstones and accordingly reliance for future price scenarios are generally linked to those achieved historically (Section 2.10.7).

Stones are split into three main categories, namely Premium Emerald, Emerald, and Beryl. Stones are sold at higher and lower quality auctions. All Premium Emerald and 18% of Emerald are sold at the higher quality auctions. The average price achieved at the higher quality auctions for the period 2015 to 2019 has been USD 65.42/ct (USD 68.67/ct inflated into 2019 money terms). The average price achieved at the lower quality auctions for the same period has been USD 4.05/ct (USD 4.49/ct inflated into 2019 money terms). Note that Beryl products are not sold at these auctions. Price forecast for Beryl is USD 0.0065/ct as estimated by Gemfields. SRK considers the Premium Emerald and Emerald product forecasts based on historical average prices achieved to be acceptable for these products. With forecast revenue from Beryl products amounting to 1% of LoM revenue SRK considers there to be negligible risk from Gemfields beryl price forecasts and consider them acceptable.

SRK notes that both emerald and ruby forecast prices are based on a historical mean (weighted average), where a discount is applied to ruby prices and not to emerald prices. The discount applied to the ruby prices is as a result of the evolving nature of the ruby market. Gemfields ruby production and position in the market has influence prices resulting in a substantial increase. This increase has been maintained for the last six years, with some volatility to be expected until a natural equilibrium is reached. The emerald market is a larger and mature market with an expected reduced volatility. Gemfields mine to market approach and awareness programs aimed at the jewellers and end customers. In the higher quality auctions (dominated by Premium Emeralds) this has resulted in a real price increase over the last few years, a trend which has been continued in the Kagem financial model for near to medium term (for five years).

The prices achieved at higher and lower quality auctions on an annual basis, is presented in Figure 2-61 and Figure 2-62. Forecast prices for the various products are presented in Table 2-46.

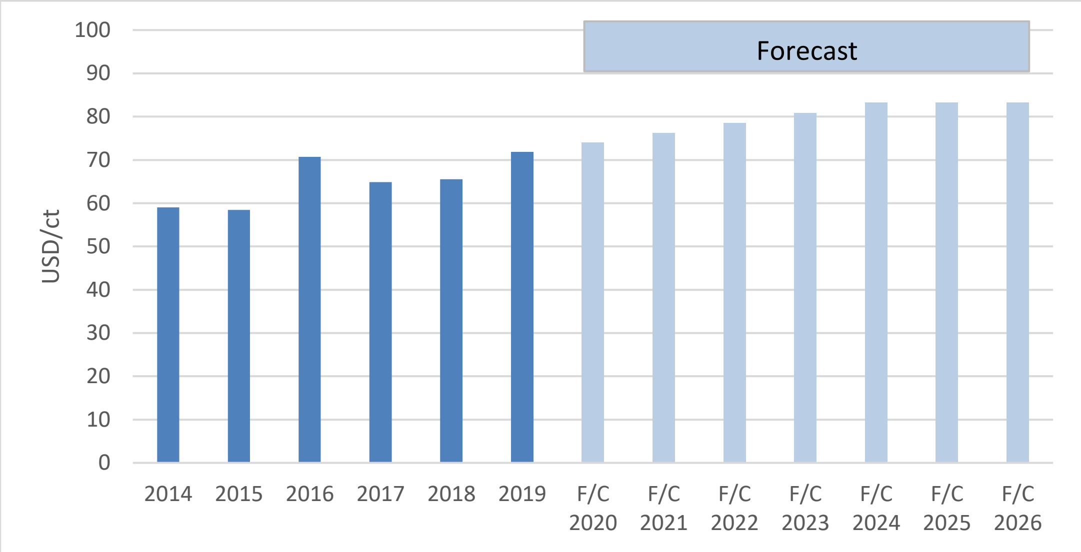


Figure 2-61: Kagem: Historical and Forecast Prices for Higher Quality Auctions

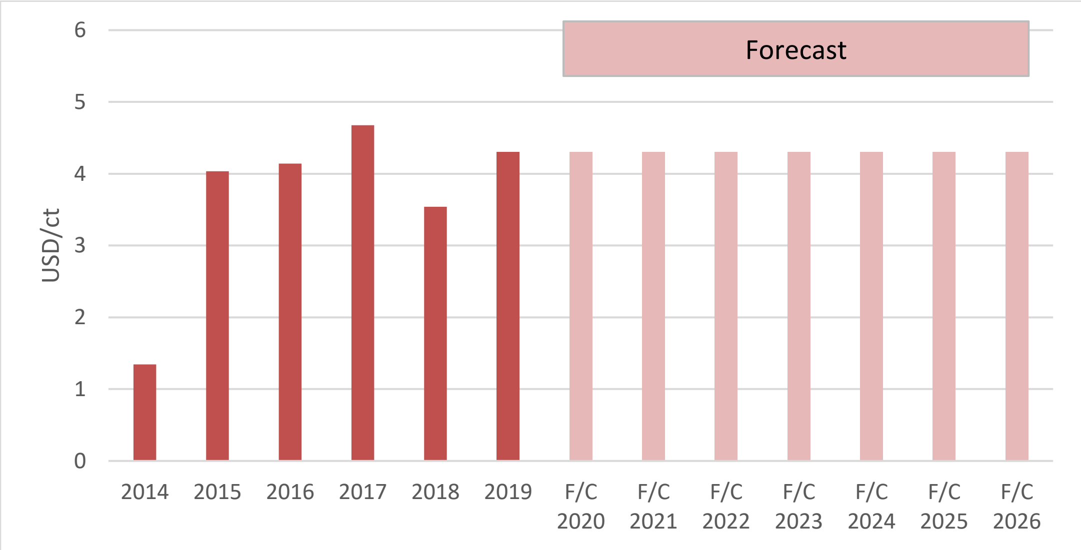


Figure 2-62: Kagem: Historical and Forecast Prices for Lower Quality Auctions

Table 2-45: Kagem: Commodity Prices

Commodity Prices (USD/ct)	2019	2020	2021	2022	2023	2024	2025	2026
Average	4.96	5.10	5.26	5.22	5.64	5.62	6.24	6.33
High Quality Auctions	72	74	77	80	83	86	89	89
Low Quality Auctions	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
Other	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075

2.10.10 SRK Comments

While Colombian emeralds continue to dominate the higher quality and value spectrum of global emerald supply, its production is significantly down, meaning that Zambian and other sources now supply a substantial proportion of the global market. In turn, Gemfields contributes a significant proportion of total Zambian production, making it one of the most important sources of emerald in the world. Due to the success of Gemfields' proprietary grading, marketing and sales platform, and increased production efficiency, it has become a major driver in the continued growth of global emerald prices in the last few years. This has increased consumer confidence and demand for emeralds. This achievement is especially notable given the relatively poor performance of the diamond industry over the same period. SRK considers that the projected prices presented in this CPR as a basis for Ore Reserves estimates are reasonable and are supported by the historical prices achieved.

2.11 Economic analysis

2.11.1 Introduction

SRK has prepared an independent DCF for the mine to assess the economic viability of the LoMp and associated Ore Reserves. The LoMp and its constituents supporting the Ore Reserves is also referred to as the Base Case. The Ore Reserves are reported in Section 2.5, and amount to 3,621 Mt with an average recovered grade of 208.5 ct/t, resulting in a total contained carats of 755 Mct.

This section presents the DCF for the Kagem asset on a post-tax pre-finance basis, in real, US Dollar money terms. Economic indicators are presented on a 100% ownership basis. The DCF and economic indicators are valid at the Effective Date of 1 July 2019.

The DCF is based on TEP provided by the Company and reviewed by SRK. SRK has incorporated adjustments where deemed appropriate, in discussion with the Company. Working capital movements have been modelled. VAT movements have not been deemed material.

SRK has compared forecast unit costs to historical costs achieved during the last five years.

2.11.2 Key Assumptions

The DCF reflects production, capital and operating expenditures and revenues from 1 July 2019 till the end of the life of mine on an annual basis.

The DCF applies:

- mine production forecasts generated by SRK's mine plan;
- commodity prices derived and adjusted from average prices received at auctions to date as provided by Gemfields (see Section 2.10.7);
- unit operating cost, administration, management overheads and auction fees, capital costs based on historical costs reviewed by SRK;

- a Base Case discount rate of 10%, which SRK considers this to be appropriate for this type of mine within the jurisdiction it is operating; this discount rate also aligns with the Mine's WACC of 9.9%, and the guideline stipulated in the AIM Note for Mining, Oil and Gas Companies, 2009. NPV values are also presented at 8% and 12% discount rates;
- a corporate tax rate of 30%, prior to deduction of royalties from the taxable profit for the determination of tax payable;
- royalties at a rate of 6% of revenue at the point of sale;
- an export duty of 15% on sales revenue that came into force between 1 January and 31 December 2019;
- no historical assessed tax losses carried forward; and
- capital investment is depreciated on an annual fixed percentage basis. It has been assumed that all capital items have been fully depreciated and at the end of the mine life there is no terminal value to consider.

A provision of USD 8 million has been included for mine closure. This is to cover the cost of removal of all equipment from the site, rehabilitation of all the remaining disturbed areas on site and pay staff retrenchment costs.

2.11.3 Commodity Prices

Commodity pricing is discussed in Section 2.10.9. Projected prices for the various products are presented in Table 2-46 .

Premium Emerald and Emeralds account for 99% of revenue; where High Quality Auctions account for 83% and the Low Quality Auctions for 16%. This leaves Beryl accounting for 1% of revenue only.

Table 2-46: Kagem: Commodity Prices

Commodity Prices (USD/ct)	2019	2020	2021	2022	2023	2024	2025	2026
Average	4.96	5.10	5.26	5.22	5.64	5.62	6.24	6.33
High Quality Auctions	72	74	77	80	83	86	89	89
Low Quality Auctions	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
Other	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075

2.11.4 Production and Revenue

The LoMp assumes that overall ore production from all sources will be 3,621 kt with an average grade of 209 ct/t. Over the life of mine based on the current Measured and Indicated Resource, it is planned to produce 0.755 Mct, and will generate USD 4,241 M in gross revenue.

The production sources include the pit areas and the ore stockpiles.

Revenue is attributed in the year of production. No delay in sales or revenue is modelled, and no account of existing stone inventory is taken.

Historical production and revenue statistics are presented in Table 2-47, and forecasts in Table 2-48 and Table 2-49.

Table 2-47: Kagem: Historical Production and Revenue

Year		Actual 2016	Actual 2017	Actual 2018	Actual 2019	Y1 2019	Y2 2020	Y3 2021	Y4 2022
Months in Period		12	12	12	6	6	12	12	12
Production									
Total Waste									
Chama	(kt)	9,385	9,666	11,217	5,918	5,169	12,043	12,023	11,995
Fibolele	(kt)	1,091	815	425	186	337	673	671	668
Total	(kt)	10,476	10,481	11,642	6,105	5,506	12,716	12,694	12,663
Total Ore									
Chama	(kt)	95	120	162	67	74	110	97	125
Fibolele	(kt)	21	23	12	6	2	1	1	4
Total	(kt)	116	143	174	73	75	111	98	128
Total Grade									
Chama	(ct/t)	247	158	194	205	226	163	213	191
Fibolele	(ct/t)	58	87	346	307	139	139	139	139
Total	(ct/t)	-	-	-	-	224	163	212	190
Total Content									
Chama	(ct 000's)	23,490	19,016	31,514	13,603	16,630	17,973	20,629	23,804
Fibolele	(ct 000's)	1,218	2,051	4,062	1,967	236	84	126	534
Total	(ct 000's)	24,708	21,067	35,576	15,570	16,866	18,057	20,755	24,338
Total Material Moved									
Chama	(kt)	9,480	9,786	11,379	5,985	5,243	12,153	12,120	12,120
Fibolele	(kt)	1,112	838	437	193	339	674	672	672
Total	(kt)	10,592	10,625	11,816	6,178	5,581	12,827	12,792	12,792
Stripping Ratio									
Chama	(t:t)	98.6	80.6	69.2	89.0	70.2	109.4	124.0	96.3
Fibolele	(t:t)	51.5	34.7	36.2	29.1	198.9	1,119.3	743.3	174.2
Total	(t:t)	90.0	73.1	66.9	83.7	73.1	114.9	129.8	98.6
Commodity Prices									
HQA	(USD/ct)	69.3	60.9	69.6	71.8	71.8	74.5	77.2	80.0
LQA	(USD/ct)	3.5	4.9	3.1	4.3	4.3	4.3	4.3	4.3
Revenue									
HQA	(USDM)	33.1	43.8	38.7	22.4	65.2	94.9	115.9	112.8
LQA	(USDM)	25.1	14.5	21.7	10.8	16.1	22.7	26.7	25.4
						0.9	1.3	1.5	1.5
Total Sales	**(USDM)**	**58.2**	**58.3**	**60.4**	**33.2**	**82.3**	**118.9**	**144.2**	**139.6**

Table 2-48: Kagem: Life of Mine Production

Year		Total	Y1 2019	Y2 2020	Y3 2021	Y4 2022	Y5 2023	Y6 2024	Y7 2025	Y8 2026	Y9 2027	Y10 2028	Y11 2029	Y12 2030	Y13 2031	Y14 2032	Y15 2033
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Production Mining																	
Total Waste																	
Chama	(Mt)	247	5.2	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	11.9	12.0	12.0	12.0	11.9
Fibolele	(Mt)	5	0.3	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.0	-	-	-	-	-	-
Total	(Mt)	252	5.5	12.7	12.7	12.7	12.7	12.7	12.6	12.7	12.1	12.0	11.9	12.0	12.0	12.0	11.9
Total Ore																	
Chama	(kt)	3,226	74	110	97	125	107	129	168	88	84	104	218	125	165	196	257
Fibolele	(kt)	100	2	1	1	4	9	15	31	34	4	-	-	-	-	-	-
Total	(kt)	3,326	75	111	98	128	115	144	199	122	89	104	218	125	165	196	257
Total Grade																	
Chama	(kt)	217	226	163	213	191	217	199	177	263	167	156	131	183	257	254	282
Fibolele	(kt)	139	139	139	139	139	139	139	139	139	139	-	-	-	-	-	-
Total	(kt)	227	224	163	212	190	211	193	171	229	165	156	131	183	257	254	282
Total Content																	
Chama	(Mct)	700	16.6	18.0	20.6	23.8	23.1	25.6	29.8	23.3	14.1	16.2	28.5	22.9	42.4	49.9	72.5
Fibolele	(Mct)	14	0.2	0.1	0.1	0.5	1.2	2.1	4.3	4.7	0.6	-	-	-	-	-	-
Total	(Mct)	714	16.9	18.1	20.8	24.3	24.3	27.7	34.0	28.0	14.7	16.2	28.5	22.9	42.4	49.9	72.5
Total Material Moved																	
Chama	(Mt)	250	5.2	12.2	12.1	12.1	12.1	12.2	12.1	12.1	12.1	12.2	12.1	12.1	12.1	12.2	12.1
Fibolele	(Mt)	5	0.3	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.1	-	-	-	-	-	-
Total	(Mt)	256	5.6	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.2	12.2	12.1	12.1	12.1	12.2	12.1
Stripping Ratio																	
Chama	(t:t)	77	70	109	124	96	113	94	71	136	142	116	54	96	72	61	46
Fibolele	(t:t)	50	199	1,119	743	174	76	44	21	19	10	-	-	-	-	-	-
Total	(t:t)	76	73	115	130	99	110	88	63	104	136	116	54	96	72	61	46
Stockpile Balance																	
Tonnage	(kt)	295															
Grade	(ct/t)	138															
Content	(Mct)	40,867															
Processing (including from stockpile)																	
Total Ore Treated	(kt)	3,621	74	146	146	146	146	145	146	142	146	146	146	146	146	146	146
Total Grade	(ct/t)	209	226	159	188	183	196	193	179	219	161	153	135	184	257	261	279
Total Content	(Mct)	755	16.6	23.3	27.4	26.8	28.6	27.9	26.1	31.1	23.5	22.4	19.7	26.8	37.5	38.2	40.7

Table 2-48 (Continued): Kagem: Life of Mine Production

Year		Total	Y16 2034	Y17 2035	Y18 2036	Y19 2037	Y20 2038	Y21 2039	Y22 2040	Y23 2041	Y24 2042	Y25 2043	Y26 2044
Months			12	12	12	12	12	12	12	12	12	12	12
Production Mining													
Total Waste													
Chama	(Mt)	247	12.0	11.9	11.9	9.0	9.1	9.2	5.5	5.2	0.2	-	-
Fibolele	(Mt)	5	-	-	-	-	-	-	-	-	-	-	-
Total	(Mt)	252	12.0	11.9	11.9	9.0	9.1	9.2	5.5	5.2	0.2	-	-
Total Ore													
Chama	(kt)	3,226	89	187	219	156	90	38	55	311	34	-	-
Fibolele	(kt)	100	-	-	-	-	-	-	-	-	-	-	-
Total	(kt)	3,326	89	187	219	156	90	38	55	311	34	-	-
Total Grade													
Chama	(kt)	217	161	174	234	166	270	278	278	286	289	-	-
Fibolele	(kt)	139	-	-	-	-	-	-	-	-	-	-	-
Total	(kt)	227	161	174	234	166	270	278	278	286	289	-	-
Total Content													
Chama	(Mct)	700	14.2	32.6	51.2	25.9	24.4	10.7	15.3	89.0	9.8	-	-
Fibolele	(Mct)	14	-	-	-	-	-	-	-	-	-	-	-
Total	(Mct)	714	14.2	32.6	51.2	25.9	24.4	10.7	15.3	89.0	9.8	-	-
Total Material Moved													
Chama	(Mt)	250	12.1	12.1	12.2	9.2	9.2	9.2	5.6	5.5	0.3	-	-
Fibolele	(Mt)	5	-	-	-	-	-	-	-	-	-	-	-
Total	(Mt)	256	12.1	12.1	12.2	9.2	9.2	9.2	5.6	5.5	0.3	-	-
Stripping Ratio													
Chama	(t:t)	77	136	64	54	58	101	239	100	17	7	-	-
Fibolele	(t:t)	50	-	-	-	-	-	-	-	-	-	-	-
Total	(t:t)	76	136	64	54	58	101	239	100	17	7	-	-
Stockpile Balance													
Tonnage	(kt)	295											
Grade	(ct/t)	138											
Content	(Mct)	40,867											
Processing (including from stockpile)													
Total Ore Treated	(kt)	3,621	146	146	146	146	146	146	146	146	146	146	47
Total Grade	(ct/t)	209	180	165	247	160	246	227	235	287	227	255	278
Total Content	(Mct)	755	26.2	24.1	36.2	23.4	36.0	33.1	34.3	41.9	33.1	37.3	13.2

Table 2-49: Kagem: Life of Mine Sales and Revenue

Year		Total	Y1 2019	Y2 2020	Y3 2021	Y4 2022	Y5 2023	Y6 2024	Y7 2025	Y8 2026	Y9 2027	Y10 2028	Y11 2029	Y12 2030	Y13 2031	Y14 2032	Y15 2033
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Carats Sales																	
HQA	(Mct)	42	0.9	1.3	1.5	1.4	1.6	1.5	1.5	1.8	1.3	1.2	1.0	1.4	2.1	2.3	2.7
LQA	(Mct)	170	3.7	5.2	6.1	5.8	6.4	6.1	6.0	7.3	5.2	5.0	4.2	5.8	8.6	9.2	10.5
Beryl	(Mct)	543	12.0	16.9	19.8	19.6	20.6	20.3	18.5	22.0	17.0	16.1	14.5	19.5	26.7	26.7	27.5
Total	(Mct)	755	16.6	23.3	27.4	26.8	28.6	27.9	26.1	31.1	23.5	22.4	19.7	26.8	37.5	38.2	40.7
Commodity Prices																	
HQA	(USD/ct)	87	72	74	77	80	83	86	89	89	89	89	89	89	89	89	89
LQA	(USD/ct)	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Beryl	(USD/ct)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Average Price	(USD/ct)	-	4.9	5.1	5.2	5.2	5.6	5.6	6.2	6.3	5.9	6.0	5.6	5.8	6.2	6.6	7.2
Revenue																	
HQA	(USDM)	3,680	65	95	116	113	132	128	135	163	115	111	92	128	192	209	245
LQA	(USDM)	747	16	23	27	25	28	27	27	32	23	22	19	26	38	40	46
Beryl	(USDM)	41	1	1	1	1	2	2	1	2	1	1	1	1	2	2	2
Total Revenue	(USDM)	4,468	82	119	144	140	161	157	163	197	139	134	111	155	231	252	293

Table 2-49 (Continued): Kagem: Life of Mine Sales and Revenue

Year		Total	Y16 2034	Y17 2035	Y18 2036	Y19 2037	Y20 2038	Y21 2039	Y22 2040	Y23 2041	Y24 2042	Y25 2043	Y26 2044
Months			12	12	12	12	12	12	12	12	12	12	12
Carats Sales													
HQA	(Mct)	42	1.5	1.2	1.8	1.2	2.0	1.9	1.9	2.3	2.0	1.9	0.7
LQA	(Mct)	170	6.0	5.1	7.6	4.9	8.2	7.6	7.8	9.3	7.8	7.9	2.8
Beryl	(Mct)	543	18.7	17.8	26.7	17.3	25.8	23.6	24.6	30.3	23.4	27.4	9.7
Total	(Mct)	755	26.2	24.1	36.2	23.4	36.0	33.1	34.3	41.9	33.1	37.3	13.2
Commodity Prices													
HQA	(USD/ct)	87	89	89	89	89	89	89	89	89	89	89	89
LQA	(USD/ct)	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Beryl	(USD/ct)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Average Price	(USD/ct)	-	6.2	5.4	5.4	5.4	6.1	6.2	6.0	5.9	6.4	5.6	5.4
Revenue													
HQA	(USDM)	3,680	135	108	162	105	181	170	172	204	175	171	59
LQA	(USDM)	747	27	22	33	22	36	33	34	41	34	35	12
Beryl	(USDM)	41	1	1	2	1	2	2	2	2	2	2	1
Total Revenue	(USDM)	4,468	163	132	198	128	219	205	208	247	211	208	72

2.11.5 Operating and Capital Costs

The forecast unit operating costs have been based on the last 18 months straight average and are shown in Table 2-50, alongside three years of historical costs and three years of forecast costs.

The forecast operating and capital costs are presented in Table 2-51.

Total capital expenditure is estimated to be USD 212 million over the LoM. This includes replacement capital for the mining fleet (USD 116 million), sustaining capital for the wash plant (USD 69 million), general sustaining capital for the overall mine and service, and a closure cost of USD 8 million.

Table 2-50: Kagem: Historical Operating Costs

Year		Actual 2017	Actual 2018	Actual 2019	Y1 2019	Y2 2020	Y3 2021
Months in Period		12	12	6	6	12	12
Unit Operating Costs							
Mining and production costs	(USD/t moved)	2.81	2.71	2.73	2.71	2.71	2.71
Mining and production costs	(USD/t treated)	206	181	228	206	238	238
Administrative costs	(USD/t treated)	27	23	32	26	26	26
Operating Costs							
Mining and production costs	**(USDM)**	**29.5**	**31.5**	**16.6**	**15.1**	**34.8**	**34.7**
Labour costs	(USDM)	12.3	12.7	6.5	6.0	13.9	13.9
Fuel costs	(USDM)	7.6	8.0	3.8	3.7	8.5	8.5
Repairs and maintenance	(USDM)	5.5	5.8	3.4	2.9	6.6	6.6
Camp costs	(USDM)	1.1	1.2	0.7	0.6	1.4	1.4
Blasting costs	(USDM)	1.6	1.9	1.0	0.9	2.1	2.1
Security costs	(USDM)	1.1	1.2	0.9	0.6	1.5	1.5
Other	(USDM)	0.2	0.7	0.3	0.3	0.8	0.8
Administrative expenses	**(USDM)**	**3.9**	**4.0**	**2.4**	**1.9**	**3.8**	**3.8**
Labour - G&A	(USDM)	1.0	0.9	0.6	0.5	0.9	0.9
Selling, marketing, advertising	(USDM)	0.2	0.3	-0.0	0.1	0.2	0.2
Rent and rates	(USDM)	0.1	0.0	0.0	0.0	0.0	0.0
Travel and accommodation	(USDM)	0.5	0.6	0.2	0.2	0.5	0.5
Professional and consultancy	(USDM)	0.7	0.4	0.2	0.2	0.4	0.4
Office expenses	(USDM)	0.2	0.3	0.1	0.1	0.2	0.2
Other	(USDM)	1.3	1.5	1.2	0.8	1.6	1.6

Table 2-51: Kagem: Life of Mine Operating and Capital Costs

Year		Total	Y1 2019	Y2 2020	Y3 2021	Y4 2022	Y5 2023	Y6 2024	Y7 2025	Y8 2026	Y9 2027	Y10 2028	Y11 2029	Y12 2030	Y13 2031	Y14 2032	Y15 2033
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12
UNIT OPERATING COSTS																	
Mining and production costs	(USD/t treated)	191	206	238	238	238	238	241	238	245	226	225	225	225	225	225	225
Admin and management costs	(USD/t treated)	181	165	127	149	145	164	161	165	200	145	140	121	158	224	241	277
Royalties and production taxes	(USD/t treated)	74	67	49	59	57	66	65	67	83	57	55	46	64	95	103	120
Export Duty	(USD/t treated)		168														
Total Operating Costs	(USD/t treated)	**631**	**606**	**536**	**594**	**584**	**634**	**629**	**637**	**736**	**572**	**558**	**506**	**606**	**782**	**827**	**924**
OPERATING COSTS	(USD/t treated)																
Mining and production costs	(USDM)	693	15.1	34.8	34.7	34.7	34.7	34.8	34.7	34.7	33.0	33.0	32.9	32.9	32.9	33.0	32.9
Admin and management costs	(USDM)	96	12.2	18.6	21.8	21.2	23.9	23.4	24.1	28.4	21.2	20.5	17.7	23.1	32.7	35.2	40.4
Royalties and production taxes	(USDM)	268	4.9	7.1	8.6	8.4	9.7	9.4	9.8	11.8	8.4	8.0	6.7	9.3	13.9	15.1	17.6
Export Duty	(USDM)	12	12.3														
Total Operating Costs	**(USDM)**	**1,629**	**44.6**	**60.6**	**65.2**	**64.3**	**68.3**	**67.6**	**68.6**	**74.9**	**62.6**	**61.6**	**57.2**	**65.3**	**79.4**	**83.3**	**90.9**
CAPITAL COSTS																	
Expansion	(USDM)	16.6	2.9	1.7	2.7	4.5	4.9	-	-	-	-	-	-	-	-	-	-
Sustaining Capital	(USDM)	175.7	3.4	3.7	2.1	4.3	4.7	7.6	10.0	5.9	9.2	10.9	8.8	10.8	6.8	6.5	7.8
Closure	(USDM)	**8.0**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Capital	**(USDM)**	**200.3**	**6.2**	**5.3**	**4.8**	**8.8**	**9.6**	**7.6**	**10.0**	**5.9**	**9.2**	**10.9**	**8.8**	**10.8**	**6.8**	**6.5**	**7.8**

Table 2-51 (Continued): Kagem: Life of Mine Operating and Capital Costs

Year		Total	Y16 2034	Y17 2035	Y18 2036	Y19 2037	Y20 2038	Y21 2039	Y22 2040	Y23 2041	Y24 2042	Y25 2043	Y26 2044
Months			12	12	12	12	12	12	12	12	12	12	12
UNIT OPERATING COSTS													
Mining and production costs	(USD/t treated)	191	225	225	225	171	171	171	103	103	5	-	-
Admin and management costs	(USD/t treated)	181	165	139	194	135	214	201	203	237	207	204	270
Royalties and production taxes	(USD/t treated)	74	67	54	81	53	90	84	85	102	87	85	91
Export Duty	(USD/t treated)												
Total Operating Costs	(USD/t treated)	**631**	**625**	**553**	**703**	**490**	**700**	**667**	**605**	**696**	**516**	**503**	**589**
OPERATING COSTS													
Mining and production costs	(USDM)	693	32.9	32.9	33.0	25.0	25.0	25.0	15.1	15.1	0.7	-	-
Admin and management costs	(USDM)	96	24.1	20.2	28.5	19.8	31.2	29.4	29.8	34.7	30.2	29.8	12.8
Royalties and production taxes	(USDM)	268	9.8	7.9	11.9	7.7	13.2	12.3	12.5	14.8	12.7	12.5	4.3
Export Duty	(USDM)	12											
Total Operating Costs	**(USDM)**	**1,629**	**66.8**	**61.0**	**73.3**	**52.4**	**69.3**	**66.6**	**57.3**	**64.6**	**43.6**	**42.3**	**17.1**
CAPITAL COSTS													
Expansion	**(USDM)**	**16.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Sustaining Capital	**(USDM)**	**175.7**	**7.2**	**10.5**	**13.9**	**4.0**	**11.0**	**4.0**	**6.7**	**7.9**	**8.0**	**-**	**-**
Closure	**(USDM)**	**8.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**8.0**
Total Capital	**(USDM)**	**200.3**	**7.2**	**10.5**	**13.9**	**4.0**	**11.0**	**4.0**	**6.7**	**7.9**	**8.0**	**-**	**8.0**

2.11.6 Kagem Economic Analysis Results

Kagem Cash Flow

Figure 2-63 provides an analysis of cashflow over the LoM and Table 2-52 presents a summary of the results of the financial modelling.

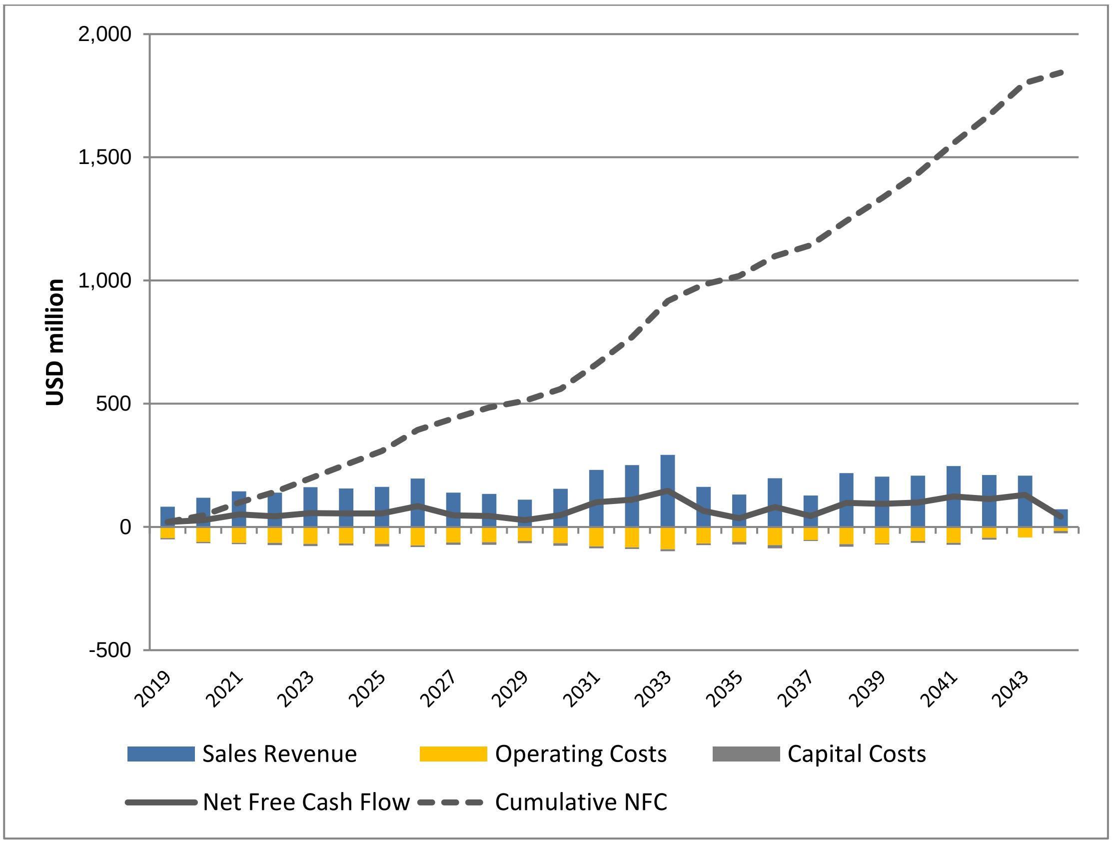


Figure 2-63: Kagem: Net Cash Flow

Table 2-52: Kagem: Cash Flow Summary Years 1 to 15

Year		Total	Y1 2019	Y2 2020	Y3 2021	Y4 2022	Y5 2023	Y6 2024	Y7 2025	Y8 2026	Y9 2027	Y10 2028	Y11 2029	Y12 2030	Y13 2031	Y14 2032	Y15 2033
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Economics																	
Sales Revenue	(USDM)	4,468	82	119	144	140	161	157	163	197	139	134	111	155	231	252	293
Operating Costs	(USDM)	1,629	45	61	65	64	68	68	69	75	63	62	57	65	79	83	91
Operating Profit - EBITDA	(USDM)	2,839	38	58	79	75	93	89	94	122	77	73	54	90	152	168	202
Tax Liability	(USDM)	793	11.3	17.3	23.4	22.0	27.1	25.6	26.8	35.0	21.2	19.6	13.8	24.3	42.9	47.9	58.1
Capital Expenditure	(USDM)	200	6.2	5.3	4.8	8.8	9.6	7.6	10.0	5.9	9.2	10.9	8.8	10.8	6.8	6.5	7.8
Working Capital	(USDM)	1.3	-	8.1	-0.4	1.8	-0.4	0.5	2.8	-4.4	-0.5	-1.9	3.6	6.3	1.7	3.4	-10.6
Net Free Cash Flow	**(USDM)**	**1,844**	**20**	**28**	**51**	**43**	**57**	**55**	**54**	**85**	**47**	**44**	**28**	**48**	**100**	**110**	**147**

Table 2-52 (Continued): Kagem: Cash Flow Summary Years 16 to 26

Year		Total	Y16 2034	Y17 2035	Y18 2036	Y19 2037	Y20 2038	Y21 2039	Y22 2040	Y23 2041	Y24 2042	Y25 2043	Y26 2044
Months			12	12	12	12	12	12	12	12	12	12	12
Economics													
Sales Revenue	(USDM)	4,468	163	132	198	128	219	205	208	247	211	208	72
Operating Costs	(USDM)	1,629	67	61	73	52	69	67	57	65	44	42	17
Operating Profit - EBITDA	(USDM)	2,839	96	71	124	76	150	138	151	183	168	166	55
Tax Liability	(USDM)	793	26.3	18.6	34.4	20.0	42.1	38.6	42.3	51.5	46.5	46.1	10.7
Capital Expenditure	(USDM)	200	7.2	10.5	13.9	4.0	11.0	4.0	6.7	7.9	8.0	-	8.0
Working Capital	(USDM)	1.3	-2.6	5.4	-4.4	7.3	-1.2	1.9	2.9	-0.5	-0.6	-11.2	-5.3
Net Free Cash Flow	**(USDM)**	**1,844**	**65**	**36**	**80**	**44**	**98**	**94**	**99**	**124**	**114**	**131**	**41**

Net Present Value

Net present values (NPV) of the cash flows are shown in Table 2-53 using discount rates from 8% to 12% in a post-tax context. At a 10% discount rate, the post-tax NPV is USD 600 million.

Table 2-53: Kagem: NPV Profiles at Various Discount Rates

	Discount Rate	NPV USD million
Net Present Value	8.0%	**719**
	10.0%	**600**
	12.0%	**510**

General Sensitivity

Figure 2-64 shows an NPV sensitivity chart for mine operating costs; capital expenditure and revenue. The NPV is most sensitive to revenue (product split, grade, or commodity price), as illustrated by the blue line in Figure 2-64. The Mine has lower sensitivity to operating costs and least sensitivity to capital as indicated by the flatter red and green lines in Figure 2-64. The revenue, operating and capital cost sensitivity of NPV is further illustrated in Table 2-54.

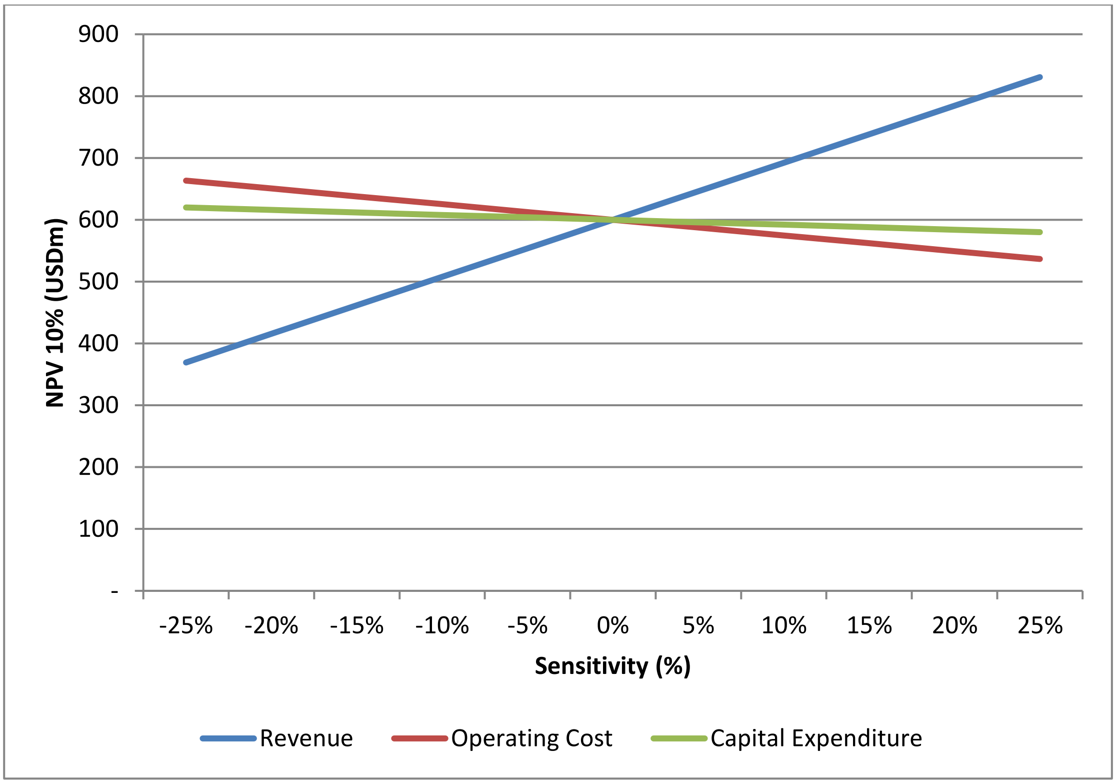


Figure 2-64: Kagem: Sensitivity Analysis

Table 2-54: Kagem: Dual Sensitivity Analysis for NPV at 10%

	REVENUE SENSITIVITY				
OPEX SENSITIVITY	-20%	-10%	0%	10%	20%
-20%	466	558	651	743	835
-10%	441	533	625	718	810
0%	415	508	600	692	785
10%	390	482	575	667	759
20%	365	457	549	642	734

	REVENUE SENSITIVITY				
CAPEX SENSITIVITY	-20%	-10%	0%	10%	20%
-20%	431	524	616	708	800
-10%	423	516	608	700	793
0%	415	508	600	692	785
10%	407	500	592	684	777
20%	399	492	584	676	769

	OPEX SENSITIVITY				
CAPEX SENSITIVITY	-20%	-10%	0%	10%	20%
-20%	667	641	616	591	565
-10%	659	633	608	583	557
0%	651	625	600	575	549
10%	643	617	592	567	541
20%	635	609	584	559	533

Sensitivity to Reserve Grade

The sensitivity to the overall Ore Reserve grade is illustrated in Table 2-55.

Table 2-55: Kagem: Sensitivity to Reserve Grade

Grade Sensitivity	NPV@10% (USDM)
20%	785
10%	692
0%	600
-10%	508
-20%	415

2.11.7 Closing Comments

Based on the work carried out for this CPR, SRK concludes the mine has favourable economics and based on the assumed commodity prices is considered robust in terms of the estimated operating margins and return on investment. The NPV at a discount rate of 10% is USD 600 million and annual cash flows are positive for the duration for the life of mine. On this basis SRK confirms the economic viability of the Ore Reserve.

SRK recommends further refinement of capital cost estimates is undertaken to optimise mine profitability; and that the financial model is updated regularly to reflect new production data relating to revised mine plans, resource grade estimates and prices realised at auctions.

2.12 Conclusions

2.12.1 Introduction

The following section includes a summary of the conclusions, recommendations, and principal risks and opportunities as they relate to Kagem. In all likelihood, many of the identified risks and/or opportunities will have an impact on the cash flow. SRK has provided sensitivity tables for simultaneous (twin) parameters, which cover the anticipated range of accuracy in respect of commodity prices, operating expenditures and capital expenditures. Specifically, these largely address fluctuations in operating expenditure and commodity prices.

In addition to those identified above, the Mine is subject to specific risks and opportunities, which independently may not be classified to have a material impact (that is likely to affect more than 10% of Kagem's annual post-tax pre-finance annual operating cash flow), but in combination may do so.

2.12.2 Conclusions

Geology / Mineral Resources

SRK has generated a Mineral Resource estimate for the Chama, Libwente, and Fibolele deposits of the Kagem Mine, using all available and valid data as at 1July 2019. SRK considers that adequate work has been undertaken at the Project to report Measured, Indicated and Inferred Mineral Resources in accordance with the JORC Code. The open pit mining, trial mining, drilling, sampling, logging, and other data gathering methods used by Gemfields are appropriate and have yielded suitable data for use in the subsequent geological and grade modelling.

As at 1July 2019, SRK notes that the Chama beryl and emerald deposit has Measured Mineral Resources, of 480 kt of RZ material, grading at 250 ct/t B&E, and an Indicated Mineral Resource of 3,710 kt of RZ material, grading at 270 ct/t B&E. There are no Inferred Mineral Resources reported at Chama, as mineralisation with lower confidence occurs below the reporting shell used to define the Mineral Resources. At Fibolele, the declared Mineral Resources comprise 130 kt of RZ material, grading at 160 ct/t B&E, classified as Indicated, and 1,200 kt of RZ material, grading at 160 ct/t B&E, classified as Inferred Mineral Resources. At Libwente, the Inferred Mineral Resources consist of 200 kt of RZ material, grading at 46 ct/t B&E. Furthermore, a Measured Mineral Resource, comprising stockpiles, of 295 kt of RZ material, grading at 138 ct/t B&E is reported.

The Mineral Resource Statement is reported within an optimised shell representing a price with a 30% mark up on the average price of USD5.92 /ct. The value of the different product splits, are as follows:

- Premium Emerald and Emerald: USD20.87 /ct; and
- Beryl (Beryl 1 and Beryl 2): USD0.075 /ct.

This represents the material within the block models which is considered to have reasonable prospects for eventual economic extraction, as required to report a Mineral Resource in accordance with the JORC Code.

Geotechnical Studies

SRK considers that the Chama pit slopes are stable, and the pit slopes are performing as designed. Kagem could work on improving berm definition to ensure that design berms are achieved. Whilst the geotechnical design criteria developed in 2015 for the current mining areas are appropriate, if further pushbacks are planned, a geotechnical review is recommended prior to the design being finalised.

Open Pit Mining

SRK has undertaken an open pit optimisation exercise for the Chama and Fibolele depsoits, using ore classified as Measured and Indicated, using the relative mining models. Based on the optimisation results and strategic objectives, SRK has selected optimum pit shells for Chama and Fibolele. Pushbacks has been selected to optimise stripping and provide optimal discounted cashflow and NPV whilst, providing the flexibility of multiple simultaneous cutbacks providing a balance between stripping ratio and quality of emeralds mined. The pushbacks also provide mining practicality incorporating a minimum mining width of 100 m from the current operating pushback.

The production scheduling of the Chama and Fibolele pits and pushbacks achieved a LoMp of 23 years. The waste dump design provides for sufficient capacity for the material within the pit after a swelling factor of 20% is applied. The variable occurrence of reaction zone in the production schedule will require sufficient stockpiling of ore to take place. Stockpiling capacity of 400kt is required next to the wash plant. The current equipment totals are sufficient for the next four years in the LoMp. SRK notes that the LoMp is achievable and that no major risks are foreseen for mining production.

Ore Reserves

As at 1 July 2019, SRK notes that the Kagem beryl and emerald deposit, has Ore Reserves, of 3,621 kt of grading at 209 ct/t beryl and emerald, including the stockpiles. Premium Emerald and Emeralds account for 99% of revenue; where High Quality Auctions account for 83% and the Low Quality Auctions for 16%. This leaves Beryl accounting for 1% of revenue only.

The current Mineral Resource model assumes a ratio of 11-12% (RZ/TMS) with a 15% dilution is applied as a global estimate. It is expected that the future RZ/TMS ratio might increase, but this would need to be confirmed by an update to the resource model. Mining of the reaction zone and all areas surrounding is highly selective. Due to the relatively large amount of dilution applied, backed by meticulous production geology practices as was witnessed during the site visit, it is assumed that all of the reaction zone is removed and therefore a 0% mining loss has been applied.

Processing and Washing

Based upon the work undertaken to date, SRK notes the following:

- the Kagem washing plant is relatively simple in its configuration, and appears to work effectively;
- current security measures appear to be adequate;
- the emerald recovery process is entirely dependent on hand picking of gemstones, and given the lack of clear distinction between the emeralds and the host rock, particularly with regard to density, there is little potential for automation other than the possibility of optical sorting which is currently under review; and
- the plant is capable of handling the current feed rate, and the on-going plant expansion will provide sufficient capacity for potential additional increase in production volumes. It also seems likely that the plant will be able to handle any increase that will arise from the re-processing of current and stockpiled oversize material.

Infrastructure

SRK notes the following:

- the Mine is well served with infrastructure and the site is accessed by good quality gravel roads which connect to the main highway;
- power is sourced from the national transmission grid to transformers at the camp and wash plant; backup diesel generators are used when the fixed connection is interrupted to ensure operations remain unaffected;
- process and non-potable water at the Mine is sourced from river water, and potable water is provided by treated ground water; and
- the site has appropriate communication systems in place.

Economic analysis

- the analysis to assess the economic viability of the Ore Reserve presents positive annual cashflows for the life of the mine, with an NPV of USD 600 million at a discount rate of 10%;
- the sensitivity analysis does not highlight any key areas of risk; and
- the mine economics remain the most sensitive to grade and price.

2.12.3 Recommendations

Geology / Mineral Resources

SRK recommends the following to provide data that will assist in improving the geological understanding and confidence in any future MRE updates:

- Complete a programme of drilling at both Libwente and Fibolele perpendicular to the main PEG / quartz-tourmaline vein trend to target the felsic intrusives. Targeted PEG / QT vein drilling is of equal importance to drilling focussed on the TMS unit, as the felsic intrusives are known to be a key control on the discordant RZ geometries.

- Complete additional drilling at Fibolele to test the down-dip extent of the TMS unit in the central and northern areas of the currently defined TMS model, where little drillhole data is available at depth.
- Routinely complete downhole surveying on all future diamond drillholes.
- Structurally orientate any future diamond drillholes to allow for the capture of key downhole structural data to provide a more robust basis for the interpretation of the TMS unit, and particularly the PEG and quartz-tourmaline veins, which are of variable orientation.
- Once sufficient oriented diamond drilling has been completed, commission a structural geology review, with particular emphasis on the Libwente deposit, which at present is the least well understood and potentially most structurally complex of the three main Kagem deposits.
- Routinely take thickness measurements and structural readings from all PEG dykes and quartz-tourmaline veins as part of the existing open pit mapping procedure.
- Where possible, de-water and conduct geological mapping of historic pits.
- Complete Niton XRF analysis on the entire length of drillholes, rather than just the TMS unit and 3 m into the hangingwall and footwall waste. This is essentially “free” data which, when coupled with sound geological logging and understanding, can help to provide a highly roust basis for geological interpretations.
- Where and when possible, complete handheld Niton XRF analysis along the entire length of historic holes to add to the Niton database.
- Routinely complete core photography on all new drillholes. Photographs should be taken as soon as the drill core arrives at the core facility, with depth markers clearly displayed. The core should be photographed wet and dry, ideally using a purpose built frame that allows a constant angle and distance from the camera.
- Lithological logging data should be input into a fixed data input system that only allows the input of the agreed upon codes into the logging database. This should avoid the input of erroneous codes into the drillhole database and negate the need for time consuming database clean-up prior to use for modelling or analysis purposes.
- There is currently a degree of discrepancy between the geo-location of the open pit survey wireframes and the geo-referenced satellite imagery. This should be checked and rectified as soon as possible to ensure the spatial consistency and accuracy of all data sources.

Geotechnical Studies

SRK has no specific recommendations regarding the geotechnical aspects of the operation.

Open Pit Mining

Based upon the work undertaken to date, SRK recommends the following:

- periodic (annual) review of the selected ultimate pit shell to ensure it is suitable given the market conditions;
- undertake further pit optimisations when additional geological information is gathered;
- detailed dump design for Fibolele; and
- the periodical update of the haulage analysis to ensure that equipment utilisation is optimal at Kagem.

Processing and Washing

Based upon the work undertaken to date, SRK recommends the following:

- While the storage areas identified for both washed fines and sorting rejects adjacent to the plant area appears adequate for the medium term, and will save on rehandle costs, it is uncertain whether the areas identified will have sufficient capacity for the expanded production rate for the expected life of the operation. It may be necessary at some point in the future to move some of this material to the waste rock dumps.
- A more comprehensive assessment is made of the available area for tailings disposal such that an estimate of the need to eventually rehandle tailings can be made.

Infrastructure

SRK has no specific recommendations regarding the infrastructure aspects of the operation

Social, Environment, and Health and Safety

Gemfields: Governance

The public and progressive commitments to sustainability, ethical and responsible mining should be visible across corporate and operational activities. These commitments made by Gemfields will require visible leadership from the corporate offices being formally managed and actively pursued at the operation level.

At the operating sites, sustainability will require the development of effective systems for the operationalisation of the corporate commitments. This would typically involve the development of ESHS management systems for the site that draw on the corporate commitment and policies. SRK understand this is the core task of the Continuous Improvement Manager.

Gemfields has an opportunity to deliver on its commitment to go "*over and above*" and set "*new benchmarks around sustainability"* for the sector. Both operations already have a considerable security programme that looks to restrict access to the mine licence areas. This coupled with a comprehensive biodiversity programme that brings in ecosystem services and social provisioning and involves local communities could set Gemfields apart from the sector.

Kagem: Environmental

The scope of the planned biodiversity study should be assessed against GIIP for biodiversity management. The study should build on the existing data and include a comprehensive assessment of species cumulation curves, seasonal data collection, habitat distribution across the site and assessment of land and ecological resource use. There are a number of biodiversity guidance documents that can be used to check the comprehensiveness of the current scope. The appointed consultant should be made aware of Gemfields' commitments to biodiversity and sustainability in order to assist the Company to develop a series of concrete actions to proactively manage biodiversity aspects of the mine licence area.

With respect to the implementation of ESHS management systems, Kagem needs to set a realistic timetable for the implementation of an integrated management system. The initiative needs to be driven by Gemfields and the senior site management team. If the process is left solely to the SHE team on site, the system will not add value and will not be maintained.

If implemented effectively, the management system will identify where Kagem should focus the most resources based on a structured approach to risk.

The operation should carry out a review of its closure liabilities based on a full life of mine plan and incorporating agreed post-closure land use objectives.

Kagem: Social

SRK recommends that an updated socioeconomic baseline is carried out prior to developing the new community development strategy. This can provide a baseline to measure the effectiveness and impact of community interventions against and improve transparency in reporting against international standards (for example, the SDG) at a corporate level.

Develop the CSR team's capacity and capability by supporting their involvement in the preparation of the social management system. Expand the role of the CSR team to play a larger role in social issues beyond the implementation of CSR activities. This can include a larger focus on public engagement and consultation, information sharing from local leaders to the wider communities, and a more proactive role in dealing with community complaints and community health and safety incidents and issues.

Ensure that social risks, including community health and safety and grievances are recorded on the ESHS risk and incidents' register to avoid social risks being dealt with on a reactive basis. SRK recommends a consolidated community/social risk register is prepared that clearly identifies mitigation actions and how they will be monitored and evaluated.

The grievance mechanism should be managed centrally so that external grievances addressed by any of the departments are documented and manged. All grievances received should be recorded by a designated person and shared with all departments at weekly meetings. The process should be recorded and the resolution process tracked by a designated person with input from the various departments as and when required.

Social Governance

SRK understands that the CIM is working towards operationalising Group level policies and procedures at Kagem, SRK recommends that Kagem prioritises the development of a social management system that comprises of policies and plans that reflect the global sustainability and corporate responsibility polices, with a social team that has the capacity and capability to implement this management system with the aim of continuous improvement.

The social management policies recommended for Kagem include:

- A community engagement and livelihoods policy.
- A community health and safety policy (unless incorporated into a SHEQ policy).

The social management plans recommended include:

- A Stakeholder Engagement Plan and Grievance Mechanism that identifies and classifies all potential stakeholders, that is, individuals and entities that have an interest in the mine, may be affected by or influence the mine operation, and how they will be engaged with. Transparency in the SEP and GM to allow accessibility for all stakeholders, including illegal miners.

- An updated sustainability and corporate responsibility (community development) strategy that addresses the social impacts identified in the EIS, is aligned with regional development strategies and looks beyond the life of the mine in order to offer long-term livelihood opportunities to communities and minimise dependency.
- A community health and safety plan.
- A socioeconomic monitoring and reporting plan to monitor, review and report on progress against the social risks and impacts identified in the EIS through improved data collection. This can also improve stakeholder communication regarding implemented and planned community interventions, improved transparency regarding project activities and manage community expectations.

Economic Analysis

SRK has no specific recommendations regarding the economic analysis completed regarding the operation

2.12.4 Risks

The Mine is subject to certain inherent risks and opportunities, which apply to some degree to all participants of the international mining industry. These include:

- **Commodity Price Fluctuations:** These many be influenced, inter alia, by commodity demand-supply balances for gemstones, specifically rough and cut emeralds. In all cases, these are critically dependent on the demand in the primary sales markets in which cut gemstones are consumed, an indication of which is the disposable income as generally reflected by the projected growth in GDP. Furthermore, the sales price varies significantly between both rough and cut gemstones and within the specific quality categories. Historical prices as recorded for the Mine production are largely based on a weighted average price received from auctions. Increased production of emeralds has the potential to adversely impact the market price for rough and/or cut emeralds. Increased production could come from the Kagem Mine or other parts of the world where gemstones could be mined;
- **Foreign Exchange and CPI Risk:** CPI for each specific country/currency is impacted by the assumed relationship between exchange rates and the differential in inflation between the respective currencies, that is, purchase price parity or non-purchase price parity. Given the low exposure to non-USD related expenditures as noted by Kagem, the overall foreign exchange risk is however considered immaterial;
- **Country Risk:** Specifically country risk including: political, economic, legal, tax, operational and security risks;
- **Legislative Risk:** Specifically changes to future legislation (tenure, mining activity, labour, occupational health, safety and environmental) within Zambia;
- **Mineral Resource and Ore Reserve estimation risk:** The presence and proportion of premium or higher quality gemstones may be more erratic than indicated from the bulk sampling (mining) undertaken to date. The total B&E ct/t grade may also be more variable than indicated to date. It is possible that certain parts of the deposits are richer than others and this has not yet been fully appreciated at this stage of the mine life;

- **Water Management Risk:** This risk relates to managing the impact of dewatering and discharge on water resources used by the local community;
- **Reputational risk: Management systems**: There is a potential reputation risk (also addressed at the Gemfields Group level) associated with the, as yet, poorly developed management systems on site. Given the mine has been in operation for a number of years and given the high-profile marketing campaign, the relatively informal approach to some elements of the environmental programme could attract criticism. SRK has noted the new initiatives to address this issue.
- **Reputational risk: Biodiversity management:** Gemfields has made some very strong statements about being an industry leader in the areas of sustainability. A number of commitments have been made to implement a more formal approach to biodiversity management. This is yet to be actioned.
- **Habitat modification** and tree clearance as a result of uncontrolled in migration by job seekers and artisanal and illegal miners. This is linked to the biodiversity risk in that the lack of a comprehensive biodiversity assessment means the significance of the impact is difficult to measure. Readily available satellite imagery spanning decades means the impacts of mines on the surrounding landscape can be tracked by any third parties or regulatory bodies who may want to criticise the mine's environmental record.
- **Lack of a social management system**: the work of the CSR team is directed by the existing community development (sustainability) strategy for Kagem which is heavily focused on delivery of outputs through CSR activities. The socioeconomic and cultural impacts identified in the EIS are not being fully addressed through the mitigation measures identified.
- **No stakeholder engagement process, plan or grievance mechanism**: Stakeholders have not been mapped and there is no formal system for stakeholder engagement, consultation and participation, and recording of stakeholder meetings. Although it is noted that incidents are logged with the SHEQ department and that respective departments deal with community complaints, there is no centralised system to log community grievances which details how the grievance was raised, the date, the department/person responsible and how it was resolved. This does not reflect the global policy commitments on community engagement and livelihoods which include development of an engagement strategy and grievance mechanism.
- **Limited primary socioeconomic data for the targeted communities:** Currently, other than the visual process used, there is no clear baseline against which to measure how standards of living are improving in the communities.
- **Lack of proactive engagement with illegal/artisanal miners:** There does not appear to be an assessment or study carried out to fully understand the dynamics of the illegal/artisanal mining presence in the area. This, together with the apparent lack of proactive engagement and dialogue with this group leaves the operation open to the potential risks posed by the illegal miners. In-migration linked to the influx of illegal/artisanal miners and the associated socioeconomic impacts is also a risk.
- **Limited social monitoring plans:** Gemfields' overall approach is aligned with the broader strategic aims of the Sustainable Development Goal (SDG). Without effective social monitoring plans and systems in place there is little evidence of the effectiveness and impact of community interventions to be able to report on the contributions made towards the SDG.

- **Injury to artisanal miners:** The Kagem security team is very aware of the challenges associated with the task of managing illegal incursions onto the property. They have identified that a key risk is the potential for an intruder to be injured as a result of falling or dislodging large rocks on the waste rock dump.
- **Historical challenges:** Historically, the security team did allow guard dogs to be released from their leads and to chase illegal miners. This has resulted in complaints in the past. In the same way historical behaviours has been used against the company at MRM, old practices could pose a risk if this issue is exploited by compensation seekers.
- **Economic Performance Risk:** The risk that the mine operations become uneconomic is considered relatively low, as demonstrated by the economic and sensitivity analyses.

2.12.5 Opportunities

The principal opportunities with respect to the Kagem Mine are largely constrained to:

- **Mineral Resource:** Potential increases through completion of successful exploration drilling at the Mine and the broader area within the licence. Additional drilling and bulk sampling may also supply additional information regarding the grade trends noted at the mine to date, and potentially help to define the underlying causes.
- **Ore Reserve:** Potential increase through:
  - refining current estimates with further exploration drilling and bulk mining to help to calibrate the estimation process and better define the presence of high value gemstones; and
  - upgrading of the Inferred Mineral Resources and unclassified material to Indicated and Measured through additional drilling.
- **Plant Throughput:** Improvement through implementation of an expansion beyond that planned in this LoMp; however, further production rate increases are likely to be contingent upon the capacity of the world market for emeralds.

3 MONTEPUEZ RUBY AND CORUNDUM MINE, MOZAMBIQUE

3.1 Geology

3.1.1 Regional Geology

The Montepuez deposit is located in northeast Mozambique (Figure 3-1), in the Numano block, which comprises accretionary, west-thrust faulted and highly metamorphosed Mesoproterozoic and Neoproterozoic rocks. This area forms part of the southernmost extent of the Mozambique Craton and is bound to the south by the Nampula block. The crystalline basement is overlain by Permo-Jurassic Karoo sedimentary rocks in the northwest and by Jurassic-Neogene sediments of the Rovuma Basin to the east, adjacent to the coastline. Where exposed, the basement is composed of allochthonous intrusive ortho-gneissic and para-gneissic complexes, juxtaposed along thrust-fault contacts to form separate metamorphic terranes. These terranes are separated from those to the south by the northeast-southwest trending Lurio Belt.

Metamorphism occurred during two distinct tectonic events; namely the Mozambican Orogeny (between 1100 and 850 Ma) and East African Orogeny (between 800 and 650 Ma). The basement rocks were re-tectonised and emplaced at ~538 Ma by thrusts, transcurrent shear zones and folds as part of Pan-African intracontinental orogenic processes.

The Montepuez ruby deposit is hosted by the Montepuez Complex (Figure 3-2), a strongly ductile-deformed, wedge-shaped, metamorphic terrane. The Montepuez Complex is composed of orthogneisses ranging from granitic to amphibolitic in composition, and paragneisses comprising quartzite, meta-arkose, marble lenses, quartz-feldspar gneiss and biotite gneiss. These metamorphosed sedimentary rocks have been intruded by granite, granodiorite, and tonalite.

Intense deformation has resulted in a highly complex structural framework, the local units folded into tight and isoclinal folds dissected by a suite of mainly northeast to southwest trending shear zones. The current interpretation suggests that the Montepuez Complex is structurally controlled by a complex, double plunging, re-folded fold.

The Montepuez Complex is bounded by thrust faults to the north by the Nairoto Complex, the oldest rocks in the region composed of ductile-deformed metamorphosed intrusives, and to the west by volcano-sedimentary meta-suites of the Xixano Complex.

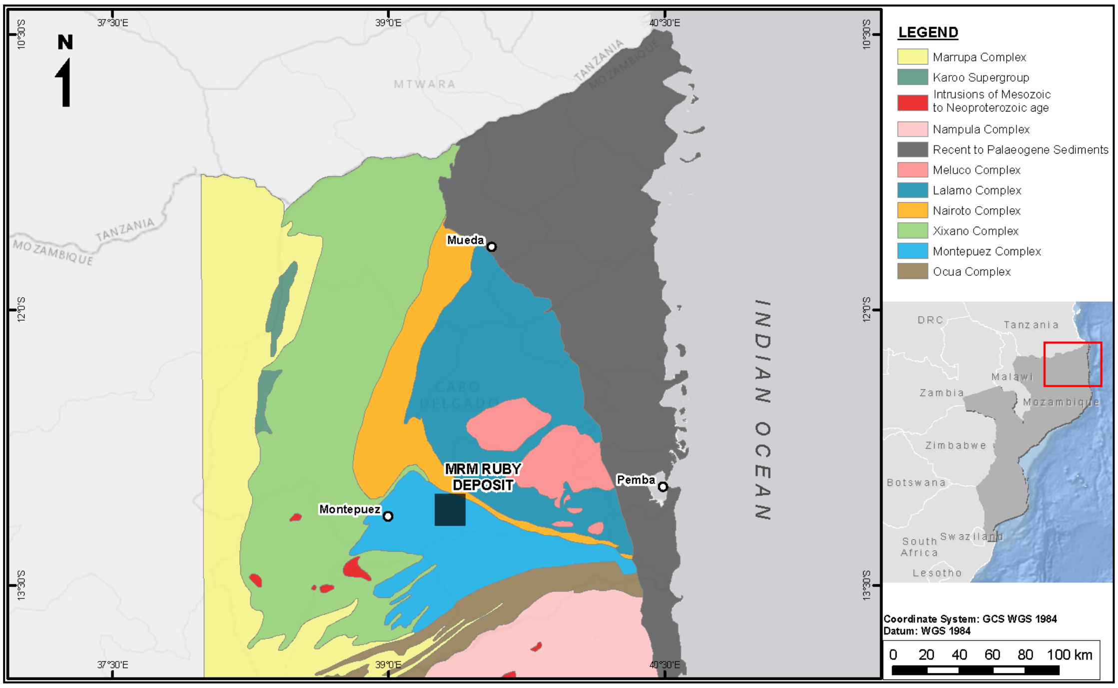


Figure 3-1: MRM: Regional geological map of Northern Mozambique

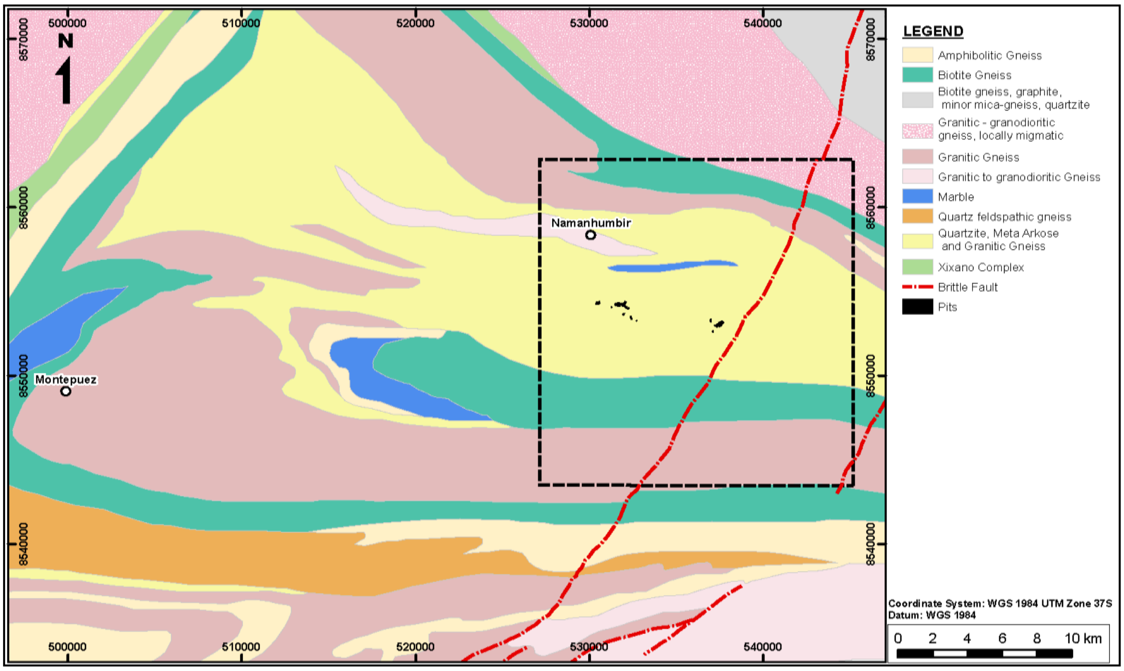


Figure 3-2: MRM: Semi-regional map of the Montepuez complex, overlain by the MRM Licence perimeter (black dashed line).

3.1.2 Deposit Geology

An overview of the geology and mineralisation of the Montepuez deposit is provided below. Note that, to date, mining of the ruby mineralisation by Gemfields has been primarily focussed on three main clusters of production pits in separate areas, termed by Gemfields as Mugloto (the western portion of the deposit), Maninge Nice (the north-eastern portion of the deposit) and Glass (the south-eastern portion of the deposit). These areas are referred to in describing the Montepuez geology and mineralisation presented in this section. Figure 3-11 in Section 3.1.6 shows the location and labels the bulk sampling pits and mining areas.

Lithologies

The local bedrock geology of the Montepuez deposit is characterised by a complexly deformed sequence of granitic to amphibolitic orthogneisses and carbonate, quartzite, biotite and hornblende paragneisses. This gneissic sequence may be broadly divided into four main lithological groups, namely amphibolite (Figure 3-3a), mafic gneisses, granitic gneiss and carbonate units, as described below.

Amphibolite: A melanocratic, often gneissic unit dominated by amphibole, with lesser feldspar and mica and common garnet and/or corundum porphyroblasts. Distinct carbonate alteration of the amphibolite unit is common, manifest in intense carbonate veining, typically as mm-cm scale sub-planar veins parallel to the host rock foliation (Figure 3-3b), or less commonly as an anastomosing vein stockwork (Figure 3-3c). The carbonate altered amphibolite typically exhibits a pale colour and fine grain size relative to the unaltered equivalent. The amphibolite unit is weakly to moderately foliated and is generally characterised by a lesser degree of strain than the adjacent gneissic units.

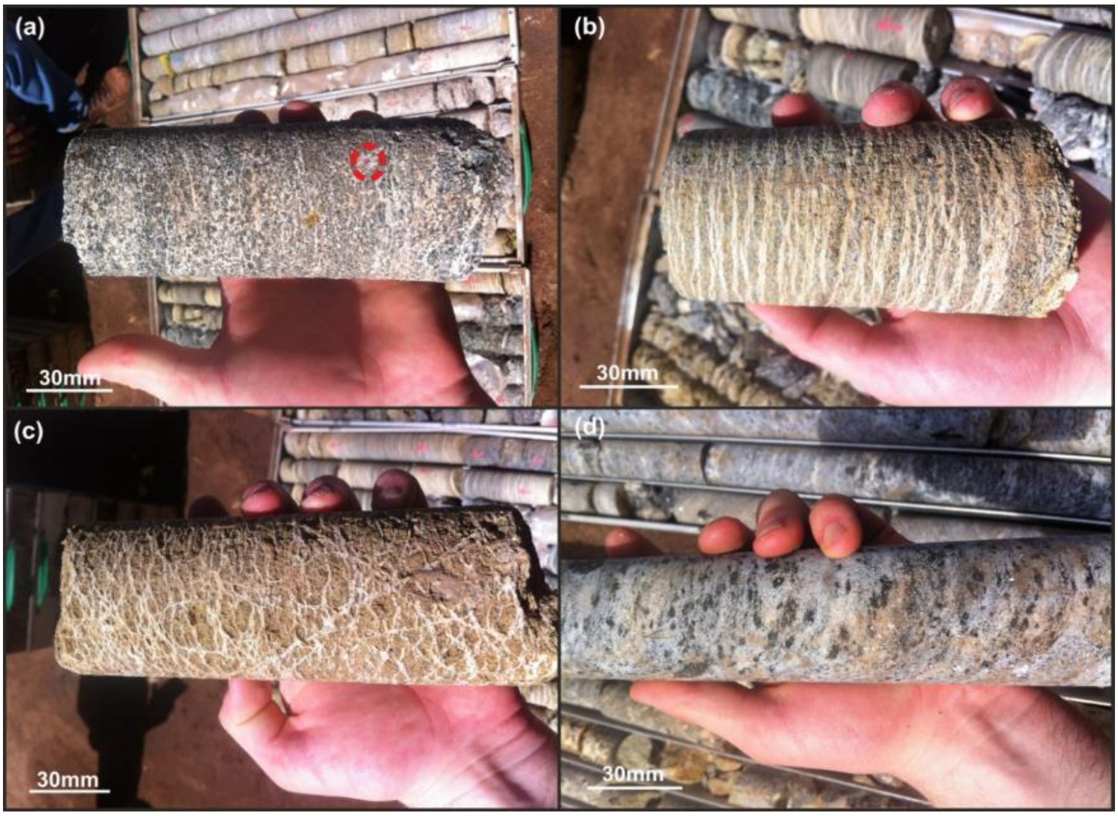


Figure 3-3: MRM: Montepuez bedrock lithologies

Notes to Figure 2-3
(from top left): a) Maninge Nice amphibolite, with visible ruby mineralisation (~2-3 mm gem circled in red), b) Moderately weathered amphibolite with carbonate veining parallel to the dominant foliation, c) Highly weathered amphibolite with stockwork-style carbonate veining, d) Hornblende-biotite gneiss

Mafic Gneiss: The bulk of the rock mass within the area of the Montepuez deposit comprises of a suite of mafic gneisses dominated by hornblende-biotite gneiss (Figure 3-3d) and biotite gneiss (Figure 3-4a). Both the biotite gneiss and hornblende biotite gneiss are composed of feldspar and quartz with an abundant mafic input dominated by hornblende and biotite, with lesser garnet and corundum. The key diagnostic differentiator between the biotite gneiss and hornblende biotite gneiss units is hornblende content, with hornblende-biotite gneiss comprising >30% of the amphibole species. Although both units are of variable grain size, the biotite gneiss is typically finer than the hornblende biotite gneiss, which is often defined by a more distinct compositional gneissic banding and characteristic clusters of hornblende porphyroblasts elongated parallel to the dominant foliation fabric. Much of the mafic gneiss suite is composed of a texturally distinct garnetiferous gneiss (Figure 3-4b) defined by abundant garnet and corundum porphyroblasts in a coarse biotite or hornblende-biotite gneiss, with pronounced gneissic banding, generally at a 5 to10 mm scale.

Granitic Gneiss: The bulk of granitic gneiss material intersected at the Maninge Nice and Mugloto areas is a massive to very weakly foliated, relatively coarse-grained unit dominated by quartz and feldspar (Figure 3-4c). Less commonly, at Mugloto, the granitic gneiss is characterised by a gneissic banding of alternating amphibole-rich and felsic bands with quartz and feldspar porphyroblasts.

Carbonate: The carbonate material (Figure 3-4d) within the gneissic package is typically coarse grained and is often found thinly interbedded with the mafic gneiss, granitic gneiss and amphibolite units. Much of the carbonate rock commonly shares diffuse contacts with the adjacent units, and variations in colour, considered a result of minor amphibole content, or Fe alteration related to contacting amphibolite units is not uncommon.

Other Units*:* Other minor lithologies observed locally in outcrop and, rarely, in drill core include quartzite, pegmatite and vein quartz. Due to their limited outcrop and drill core exposure, at present the relationship between these lithologies and the main gneissic package is unclear. For this reason, these units have not been modelled.

Figure 3-4: MRM: Montepuez bedrock lithologies

Notes to Figure 2-4
(from top left): a) Biotite gneiss, b) Garnetiferous gneiss, c) granitic gneiss, d) Carbonate

Overburden Sequence

The fresh bedrock units described above are overlain by up to 16 m of overburden material with an average thickness of approximately 5 m. This overburden package broadly comprises (from top to bottom) soil / lateritic material transitioning to clay rich material with increasing clastic content at depth. The contact between the clay and overlying soil is transitional and defined by increasing phyllosilicates and quartz / rock nodules. A gravel bed horizon, which comprises variably rounded quartz gravel and clastic material (up to approximately 15 cm in diameter) in a clay-rich matrix, occurs as lenses that form a semi-continuous horizon, at or near the basement contact. The gravel bed, which is the host of the secondary ruby mineralisation, is generally less than 2 m thick, with an average thickness of 0.45 m.

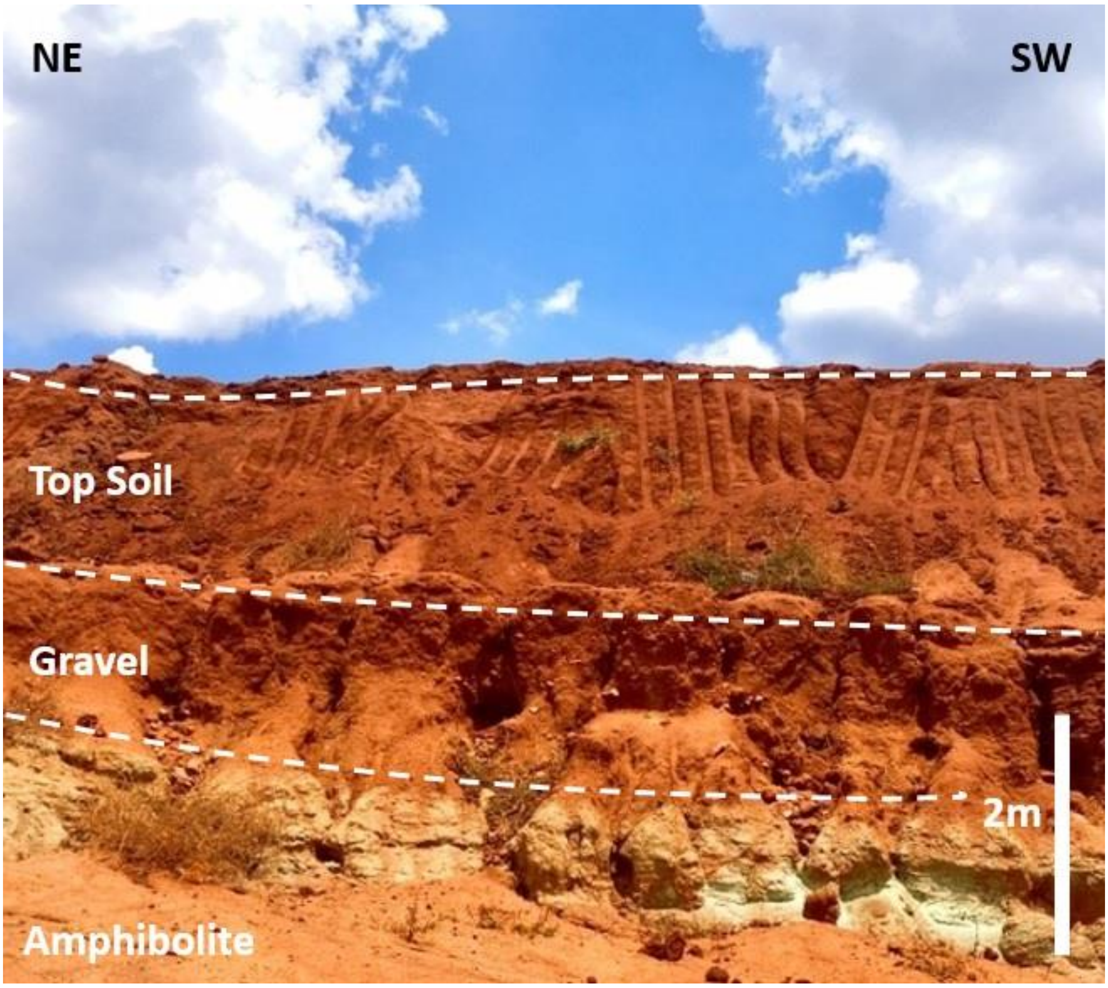


Figure 3-5: MRM: Overburden stratigraphy at the east face of Maninge Nice Pit

Structure and Stratigraphy

The Montepuez deposit has been subject to a complex deformation history, which is reflected in the structural complexity of the geometry of the sub-surface geological units. The gneissic sequence is variably foliated with variations in intensity from weakly to strongly foliated over distances of metres to tens of metres.

At the deposit-scale, the Montepuez deposit is interpreted to form a broadly east-west trending gentle-open fold system (Figure 2-6) with significant small-scale parasitic folding. The open folds are interpreted to form part of the northern limb of the complex, double-plunging, broadly east-west trending re-folded fold structure, as shown in Figure 2-2.

Interpretation of the available airborne geophysical survey data (magnetic and radiometric), topography and satellite data suggests that the deposit is intersected by a number of minor, discontinuous dominantly north-northwest to south-southeast trending shear zones, bounded to the south and east by larger scale east-west and north-northeast to south-southwest trending shear zones, respectively.

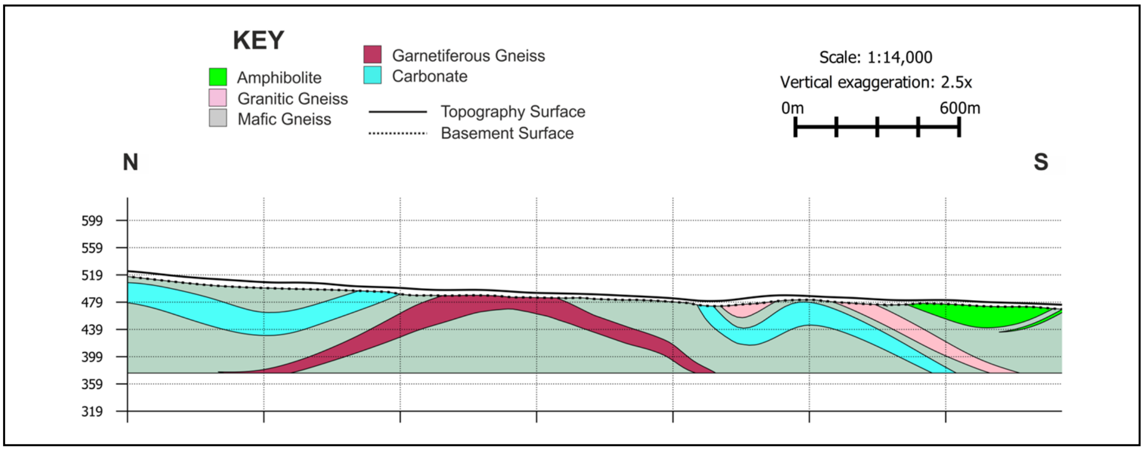


Figure 3-6: MRM: North-south section (vertical exaggeration = 2.5x) through the central Mugloto area displaying the interpreted gentle-open fold system

A broad stratigraphic sequence has been derived from the available data. In the area of the mains Maninge Nice pit, the mineralised amphibolite is underlain by approximately <10 m of folded granitic gneiss. This overlies a sequence of variably foliated mafic gneisses (biotite gneiss and hornblende-biotite gneiss) inter-layered with minor granitic gneiss intersections. A second major granitic gneiss layer, which is approximately 10 m thick, exists near the base of this sequence. To the north, coarse grained carbonate horizon outcrops in a broadly east-west orientation. This is bordered to the north by a number of discontinuous lenses of garnetiferous gneiss separated from the carbonate unit by approximately 50 to 100 m of mafic gneiss. The stratigraphic and geometrical relationship between this northern area and the gneissic sequence surrounding the Maninge Nice amphibolite is unclear. The carbonate horizon and underlying material are considered to form the northern limb of an east-west trending, downwards closing fold, with an axial plane running through the centre of the Maninge Nice amphibolite.

The stratigraphy of the Mugloto and Glass areas is not as well understood, due to a lack of diamond drilling in these areas; however, a broad sequence similar to that observed in the Maninge Nice area is apparent at Mugloto, primarily interpreted from auger drill hole logs (Figure 2-6). This is loosely defined by an amphibolite horizon, underlain by approximately 25 to 100 m of mafic gneiss, including numerous discontinuous lenses of garnetiferous material. Similar to Maninge Nice, a 10 to 50 m thick granitic gneiss horizon lies at the base of this mafic sequence. This is underlain by approximately 50 m of variably altered carbonate material, interlayered with mafic gneiss and some minor amphibolite lenses. At Glass, very broadly, the stratigraphic sequence appears to be characterised by central zone of E-W striking granitic gneiss, which occupies topographic highs, bordered by biotite gneiss, which outcrops to both the north and south of the E-W trending topographic highs, with hornblende biotite gneiss outcropping in the extreme south of the area delineated by drilling.

Mineralisation

Ruby mineralisation at Montepuez occurs in two settings, namely the underlying primary mineralisation, which is associated with amphibolites, and the overlying secondary mineralisation, hosted by the gravel bed. The current focus for exploration and production is the secondary mineralisation, which historically has been the source of higher quality gemstones; however, exploration and production has also targeted the primary mineralisation within the amphibolite.

Production of primary rubies has been restricted to the Maninge Nice area. Diamond drilling data suggests that primary ruby mineralisation is more abundant in this area. The primary rubies sourced from the Maninge Nice amphibolite form tabular hexagonal crystals, with a strong basal cleavage (Figure 2-7c). The recovered gemstones are typically highly fractured, and amphibole, mica and feldspar inclusions are common. Despite this, some of the primary crystals have internal clean and transparent regions that may be clipped to produce clean rough material. The primary rubies usually exhibit a lighter, pink colour, in comparison to the dark red secondary rubies, and thus most are typically classed as sapphire quality.

Where ruby mineralisation is intersected by diamond drilling, the ruby crystals are usually surrounded by a white feldspar rim (Figure 2-7a). Initial observations from the limited pit mapping suggest that the amphibolite-hosted ruby mineralisation is spatially associated with north-south trending feldspar and carbonate veins. These are considered to be related to dextral shear structures and also with stockwork-style pegmatite intrusives. Primary ruby mineralisation at Maninge Nice and Mugloto lies on the same structural trend as known ruby occurrences at Namahaca and Nacaca, which indicates the existence of a ruby rich mineralised trend. Primary amphibolite has not been identified in the Glass area by the shallow auger drilling completed in this area to date.

Secondary rubies, which are confined to the gravel bed horizon in the overburden, are typically more transparent, less included and often of a darker red colour than primary rubies in the in-situ amphibolite (Figure 2-7b and Figure 2-7d).

The current genetic model for the secondary ruby deposit proposes initial deposition within one or more major flooding events, followed by redistribution of the rubies by alluvial processes, such as those in a braided river system. Alluvial reworking resulted in the fragmentation of the more heavily included and fractured material into particle sized grains, concentrating the more durable clean material into the gravel bed deposits. As a result, the average gem quality of the secondary rubies is typically much higher than those contained within the primary amphibolite.

Figure 3-7: MRM: Montepuez primary and secondary ruby mineralisation

Notes to Figure 2-7

a) *Amphibolite ruby mineralisation with a feldspar rim, in diamond drill core, b) Ruby mineralisation in the secondary gravel bed, c) Primary amphibolite ruby mineralisation at Maninge Nice, d) A comparison of the Maninge Nice primary (right) and secondary (left) mineralisation styles*

Within the gravel bed unit, the quality and quantity of ruby gemstones varies significantly across the deposit. This may be a result of the variability of the primary host lithology, and will depend on the geomorphology of the area, as well as the nature of the physical and chemical weathering during the deposition of the secondary mineralisation.

MRM has put in place a classification system to record the quality of the rubies, in order to reflect this variation. This is described in detail in Section 3.8, but may be broadly categorised into Premium Ruby, Ruby, Low Ruby, Sapphire, Corundum and -4.6 mm qualities.

In the areas that have been the focus of production to date, generally, the grade (in terms of carats per tonne) is relatively similar between the Mugloto and Glass areas, although the proportion of the highest quality rubies recovered from Mugloto is greater than that at Glass. In both areas, local variation in the grade and quality of the ruby gemstones contained within the secondary gravel bed is attributed in part to varying degrees of remobilisation within the interpreted paleochannels. To date, production from the Maninge Nice area has been predominantly focussed on the gravel bed that directly overlies the primary mineralised amphibolite. Here, the total carats per tonne is an order of magnitude greater that the grades at Mugloto and Glass, but the quality of stone is typically less desirable. Production from a smaller pit at Maninge Nice, east of the main Maninge Nice pit (Pit 3) and not overlying primary mineralisation, suggests that, outside of the area directly underlain by the mineralised amphibolite, the grade and quality is more comparable to that at Mugloto and Glass.

Based on XRF studies completed by Gemfields, the primary source of the Mugloto area appears to be different from the source for Glass. Ruby / corundum stones recovered from Glass are typically higher in Cr and V, and lower in Fe than those stones in Mugloto. This difference in primary source is thought to be the main driver for the differences in quality of stones recovered.

At Maninge Nice, within the vicinity of the main pit (Pit 3), the secondary deposit can be genetically correlated with the underlying primary amphibolite deposits. Here, the gravel bed lies very close to the primary source, resulting in a higher number of carats per tonne being recovered. The distance of transport is indicated by the morphology of the stones, which, in the vicinity of Maninge Nice Pit 3, tend to be more platy in shape, indicating reduced transportation distances. The secondary stones at Maninge Nice are similar to those recovered from the primary sources, being typically tabular hexagonal crystals, with a strong basal cleavage. The stones are also highly fractured and included.

The stones recovered from Glass are similar to those at Maninge Nice Pit 3, except the secondary mineralisation does not overly the primary source. The stones indicate a higher transportation distance, meaning the number of stones recovered is reduced. The stones recovered from Glass area typically show a relatively high Cr content, a pink colour, higher V content and low Fe content than those in Mugloto and can also be correlated genetically with stones recovered from amphibolite sources.

Stones recovered from Mugloto are relatively high in Fe content. The primary source for these stones is yet to be identified. The primary source for these stones is thought to lie outside the area currently delineated by exploration drilling and pitting. The stones are typically dark red in colour, more transparent with fewer inclusions, and often rounded or tumbled in shape.

3.1.3 Data Quantity and Quality

Exploration

Gemfields exploration of the Montepuez deposit can be broadly defined in terms of two phases; namely Phase 1, completed prior to Q2 2015, and Phase 2, completed post Q2 2015. The main exploration methods being employed at the Montepuez deposit include auger and diamond drilling, small-scale exploration pits, and bulk sampling from a number of bulk sampling pits. This key data is supplemented by limited geological mapping and geophysical and soil geochemistry surveys.

Auger drilling and exploration pitting is primarily used to target the secondary mineralisation with the aim of determining the thickness and nature of the gravel bed and the overlying material. Diamond drilling is predominantly aimed at determining the nature of the basement geology with the aim of defining the primary mineralisation at Maninge Nice and understanding the bedrock geology in general. The main exploration tool used to determine ruby grade and quality is through bulk sampling. The grade and quality are determined for each mined area through recovered ruby quantity and quality data from the sorting house.

The approximate costing of exploration completed to date is given in Table 3-1.

SRK has not been supplied with any specific planned exploration programmes for MRM. Any further drilling is likely to be operational in nature and provided for in the capital provision of USD0.7 Mpa up to 2047. Furthermore, SRK understands that there are no planned greenfield exploration programmes which fall outside the confines of the MRM Mine.

Table 3-1: MRM: Approximate Exploration Expenditure to June 2019

Item	Cost (USD)
Satellite Images	25,000
Drilling Rig and Accessories (Rock Drill)	300,000
Exploration Pitting	170,000
Contractual Auger/Core drilling	1,900,000
Airborne Geophysical Survey	300,000
Drone Survey	10,000
Boseman's Jig	50,000
Geological & Survey Instruments (DGPS, Total Station, GPS, Laptops etc)	165,000
Leica Geosystems, Permanent Base Station	50,000
Geological Software (Leapfrog, Surpac, Target, etc)	125,000
Hydraulic Drilling Rig & Accessories (Sandvik DE 710)	800,000
Geology Site office & Core-Shed	250,000
Petrographic studies	25,000
Exploratory Processing Unit (10tph)	200,000
Light Motor Vehicles	350,000
Total	**4,720,000**

Topography

Previously, the highest resolution topographic data available for the Montepuez project area was the digital elevation model from the Shuttle Radar Topography Mission ("SRTM"), at a resolution of 90 mX by 90 mY, which has a fairly wide vertical accuracy range and a high-degree of smoothing.

In 2015, an airborne geophysical survey was completed by Thomson Aviation, which covered all of the licences. Currently, the highest resolution topographic data available is of airborne geophysical GeOZ-DAS Digital Data, at an accuracy of ±0.3 m. SRK notes that there are significant errors and inconsistencies between the topographic data supplied, the drillhole collars, and the ongoing operation pit surveying as completed by MRM. SRK strongly recommends that MRM addresses the surveying issues as a matter of priority.

Geological Mapping

Government Regional Geological Mapping: The first programme of systematic modern regional geological mapping within a GIS framework in the area surrounding the Montepuez project was conducted by a consortium of the British Geological Survey, Norges Geolgiske Undersakelse, and NorConsult AS an Eteng, between 2003 and 2005.

This included reconnaissance geological mapping of ten 1:250,000 scale map sheets in the provinces of Niassa and Cabo Delgado in the north of the country, bordering Tanzania. The work was part of a wider Mineral Resources Management Capacity Building Project commissioned by the government of Mozambique, with funding from the World Bank and Nordic Development Fund amongst others.

GaiaPix Photogeological Interpretation: During late 2012 to early 2013, MRM contracted GaiaPix to conduct photogeological mapping of the Montepuez area at both regional and local scales.

A regional photogeological interpretation of the area was constructed by applying pre-existing knowledge of the regional geology of the area to the interpretation of merged Landsat ETM and SRTM data. This resulted in a 1:150,000 scale geological map, covering an area of approximately 101 km by 63 km.

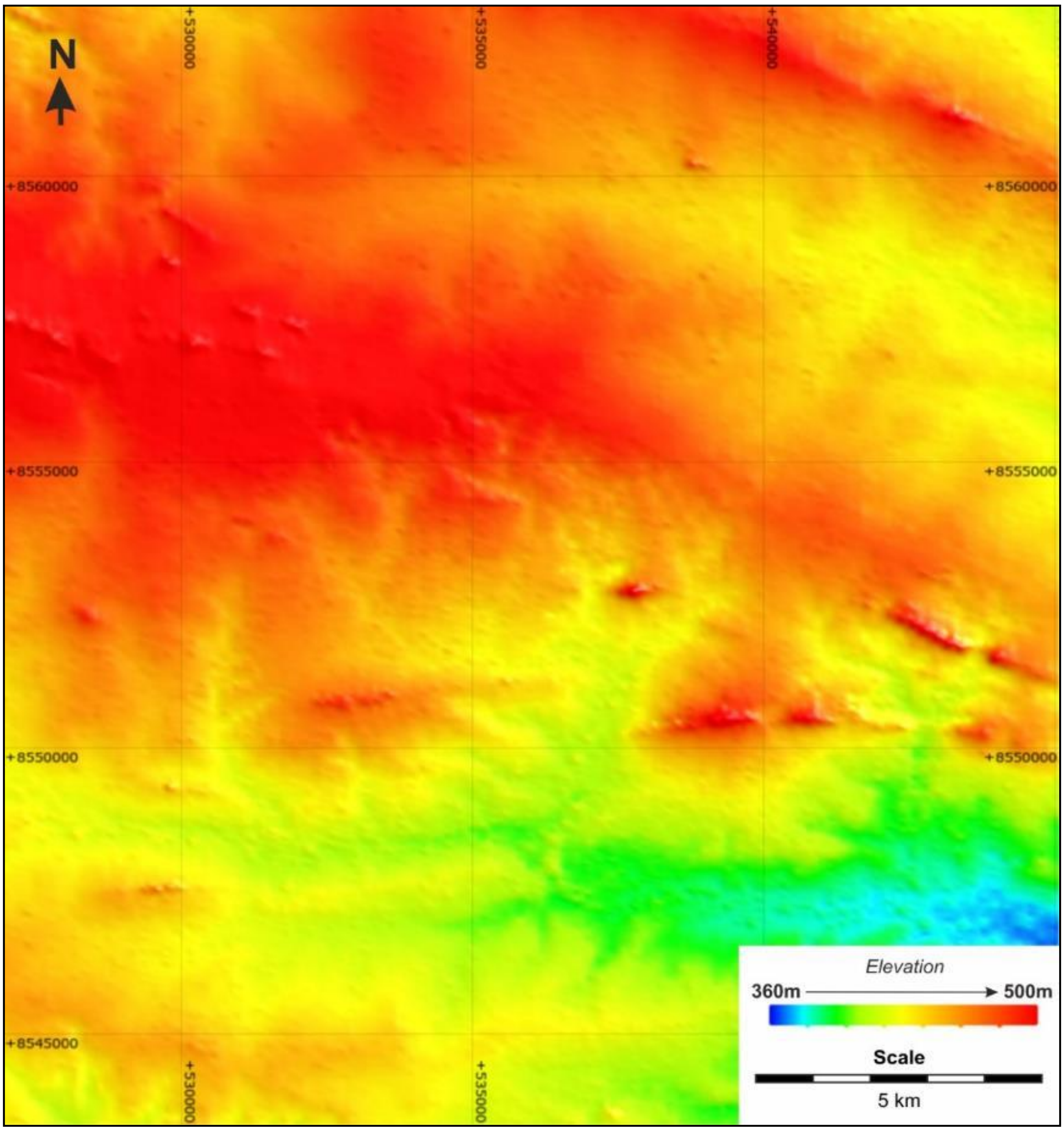


Figure 3-8: MRM: Topography surface generated from the GeOZ-DAS survey data, triangulated at a 40 m resolution.

The local photogeological map is interpreted at a scale of 1:25,000, covering an area of 19.4 km by 18 km, focussing on the Maninge Nice and Mugloto areas. The interpretation is based on SRTM data and GeoEye imagery. GaiaPix also conducted processing of regional ASTER data in order to produce regional mineral assemblage maps for illite, Mg OH carbonates, FeO, kaolin, pyrophyllite, alunite and silica. The interpretations were based on analysis of the following satellite data:

- GeoEye: high spatial resolution radiometric data at various bands within the visible and near infrared part of the electromagnetic spectrum, commissioned specifically for the Project in November 2012.

- Landsat ETM Data: multispectral radiometric data, incorporating one satellite scene with seven bands in the visible, near infrared, shortwave infrared and thermal part of the electromagnetic spectrum, and a panchromatic band of the visible spectrum.
- ASTER Data: high resolution images across 14 bands of the electromagnetic spectrum, including the visible and very near infrared, the short-wave infrared and the thermal infrared.
- SRTM Data: near-global digital elevation model data at a 90 m resolution.

In-house local mapping: MRM has completed a number of iterations of the local geological map for the area currently delineated by drilling and exploration pitting. The area is approximately 11 km by 4 km. The MRM map is based on downhole logging data, complimented by geological and structural mapping data from limited outcrops in the north of the Concession Area. The map, which represents the key lithologies identified in MRM's downhole lithological logging database, is regularly updated as new data becomes available.

Geophysical Surveys

Terravision: In April 2013, MRM contracted Terravision Radar (Terravision) to conduct a ground penetrating radar ("GPR") survey of the Montepuez Project area. The GPR survey was completed along a number of curvilinear profiles, predominantly focussed on the area around Maninge Nice and Novo Mina. The results of the Terravision survey helped to provide an early estimation of the thickness of the overburden cover and highlighted the variation in the morphology of the basement surface. The survey also identified a number of potential local paleochannel (gravel bed) deposits and gave an early indication as to the degree of artisanal workings (identified as voids in the GPR profiles) affecting the gravel bed deposit.

Magnetic Survey: -o supplement the Terravision GPR, an electromagnetic survey was completed in April 2013, MRM purchased regional TMI survey data from the Council for Geoscience in South Africa, who are re-sellers on behalf of the Mozambique government. The data, which is on a 75 m grid, was later manipulated to derive a TMI analytic signal map.

In addition to the Terravision and magnetic surveys documented above, MRM also commissioned GeoEye to conduct a high resolution radiometric survey in November 2012. The results of this study were used to inform a local photogeological interpretation, which is documented in Section 4.3.

Airborne Geophysical Survey: An airborne geophysical survey was completed between October and November 2015, which consisted of approximately 14,618 linear kilometres. The survey covered all of the licences currently held by Gemfields. The survey was flown at tree top level, to investigate the geophysical signatures, paleo-channels and structural features.

Geochemical Surveys

MRM has also completed geochemical sampling and analysis, predominantly in the area around Maninge Nice and Glass A, with a small number of additional samples taken from a small zone (600 mX by 700 mY) at Ntorro Blocks 1 and 2. In general, the sample locations follow a broad 100 mX by 100 mY grid. At each sample location, a soil sample was collected from an approximately 30 cm deep hole and stored in a zip-lock sample bag. A total of 270 samples were collected and analysed for a suite of 32 elements. Elemental analysis was conducted on site, using a handheld X-ray fluorescence analyser.

3.1.4 Drilling

Summary of Drill Programme

Drilling within the Montepuez Concession Area comprises a total of 3,385 drillholes for a total meterage of 42,377 m (Figure 3-9). This includes 2,972 auger holes for 21,232 m and 413 diamond holes for 21,145 m. The auger drilling is primarily on an approximate 140 m grid throughout most of the deposit, with areas of wider spaced drilling on a 200 m grid in the far west of the project and in an approximate 3 km wide area between Mugloto and Maninge Nice. A number of small pockets of close-spaced auger drilling on a 30-40 m grid have been completed in the Mugloto area. To date, no auger drilling has been completed in an approximate 750 m “buffer” west and south of Maninge Nice Pit 3; however, diamond drilling has been completed in this area.

The distribution of diamond drill holes is relatively sporadic and confined to the Maninge Nice area. The most dense areas of diamond drilling are centred around Maninge Nice Pit 3, and two other small (approximately 750 m x 250 m) pockets of dense diamond drilling in the east of Maninge Nice, where drill spacing ranges from 5 m to 75 m. North and west of Maninge Nice Pit 3, the diamond hole spacing is approximately 150 m, whilst in the east of Maninge Nice (outside of the pockets of close-spaced drilling described above), diamond holes are drilled on an approximate 200 m grid.

Across the entire deposit, the auger holes are drilled to an average depth of 7.1 m, whilst the diamond holes are drilled to an average depth of 51.2 m. All diamond and auger holes are drilled vertically and have not been surveyed.

To date, all of the auger drilling and 85 of the diamond holes were drilled by the South African external drilling contractor, Equator Drilling (Equator). The Equator holes were completed using a heavy duty Sandvik DE700 core drill, specially modified with an auger drill bit attachment for auger drilling. The in-house drilling was carried out using an RD30; a simple, trolley mounted wireline rig manufactured by Rock Drill India. The majority of diamond core is drilled at HQ diameter, with a small amount of NQ diameter core.

Exploration Pitting

In addition to auger and diamond drilling, MRM has also conducted close spaced exploration pitting in a number of key areas Figure 3-3. The exploration pits are shallow excavations with an average depth of 3.9 m and typical dimensions of 1 m^2 in cross section. The pits were excavated prior to auger and diamond drilling to provide an initial assessment of the depth and thickness of the secondary gravel bed mineralisation. The exploration pits were excavated by manual labour and have since been filled in to avoid exploitation by artisanal workers. A total of 823 exploration pits were completed between early 2012 and November 2013, for a total depth of 3,224 m. It should be noted that a total of 200 of the 823 exploration pits were terminated prior to reaching the planned depth, due to various technical difficulties, as documented in Table 3-3.

The exploration pit data is predominantly focussed on the central Mugloto and Maninge Nice areas (Figure 3-2 and Figure 3-3). At Maninge Nice, exploration pitting is concentrated in the area around the current Maninge Nice and Glass A pits and in a square grid (approximately 700 m by 900 m). In the central Mugloto, exploration pitting is concentrated in key areas, namely extending in a north-northwest to south-southeast direction in the area surrounding bulk sampling pits 1-6, and also in a smaller zone at Ntorro blocks 1, 2 and 3. The central Mugloto pits are arranged in grids at a spacing of 50 m by 50 m, 100 m by 50 m, or 200 m by 100 m.

All exploration pits were logged for geology, with "soil", "laterite", "clay" and "gravel bed" codes being recorded for the overburden (with corresponding interval "from" and "to" depths) and fresh rock being predominantly recorded as either "amphibolite" or "undifferentiated gneiss". In addition, for all exploration pits completed in the Mugloto area, the extracted gravel bed was weighed, before being placed through a small, portable jig, and the total weight of any recovered rubies and any recovered garnet recorded separately. No data for the weight of the extracted gravel bed and corresponding weight of recovered rubies and garnet is available for the exploration pits completed in the Maninge Nice or Glass areas.

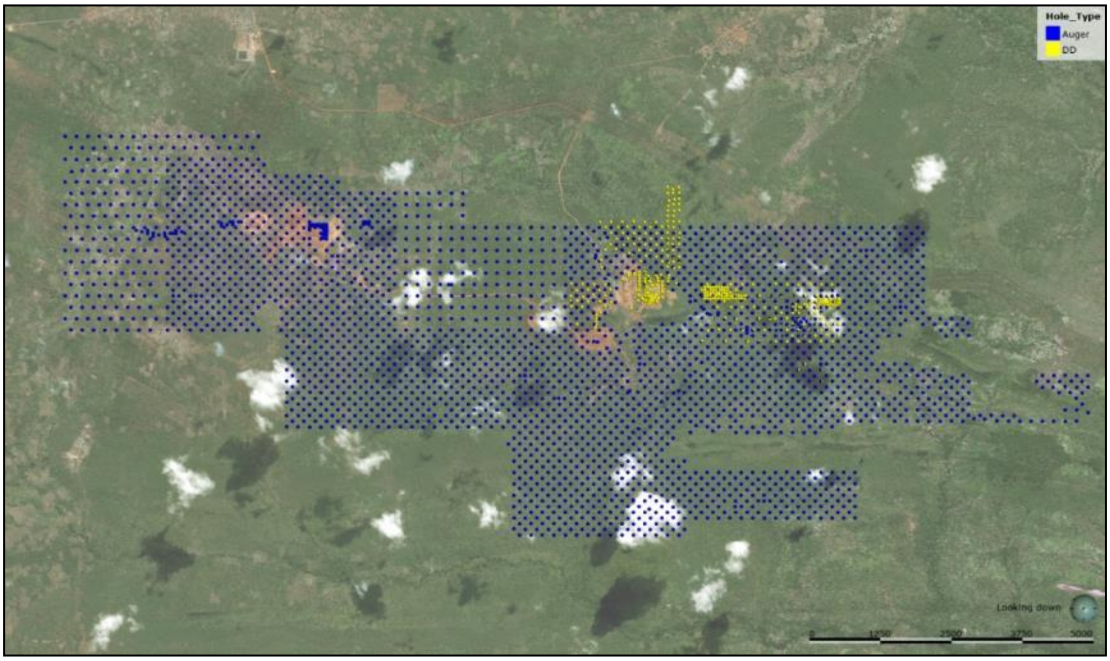


Figure 3-9: MRM: Diamond (yellow) and auger (blue) drill hole collar locations shown relative to Google Earth satellite imagery

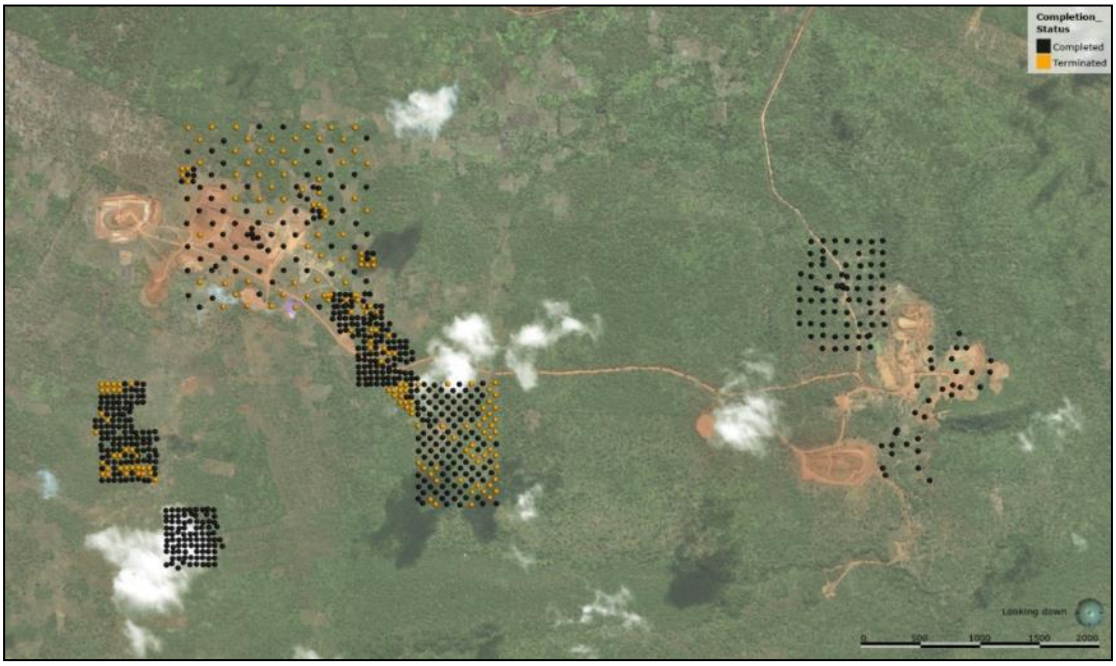


Figure 3-10: MRM: The completed (black) and terminated (orange) exploration pit collar locations shown relative to Google Earth satellite imagery

Table 3-2: MRM: Reason for exploration pit termination

Number of pits terminated	Reason for termination
175	*Encountered inordinately hard or consolidated overburden material, preventing further excavation by manual labour*
4	*Pit collapse*
19	*Water influx*
2	*Artisanal activity*

Collar Surveys

All drillhole and exploration pit collars were surveyed with standard hand-held GPS equipment. The collar X and Y values in the drill hole database relate to the hand-held GPS coordinates, whilst the elevation value is taken from the SRTM topography surface.

Downhole Surveys and Core Orientation

To date, all auger and diamond holes at MRM have been drilled vertically. No downhole surveying has been undertaken and none of the holes has been structurally oriented.

Logging, Data Capture, and Storage

MRM has put in place a logical logging and data capture procedure for diamond and auger drilling, to guide the on-site staff through the technical process. This aims to ensure a consistent methodology for the process of capturing data throughout the drilling campaign to allow for subsequent meaningful analysis. All logging is carried out by MRM geologists using methodologies which appear to be consistent with normal industry practice for this commodity type. SRK has made a number of recommendations to MRM to improve the logging process going forward to ensure that the most relevant data is captured in a consistent and user-friendly format.

Core and core blocks are placed in core boxes by the geo-assistant. Upon receipt at the core shed, the drill core is cleaned or washed, if required, and core blocks are checked by MRM staff. The core is then photographed both wet and dry. None of the Montepuez drill core is oriented and, as such, it is not possible to draw a core orientation line onto the core. Instead, a downwards arrow is marked on the core at 20-30 cm intervals, to denote the drilling direction. Metre marks are drawn on the core once the downwards arrow has been completed. The metre marks indicate the downhole depth, taking into account the position of any core loss.

Subsequent to core mark-up, geological logging is carried out by an MRM geologist. Geological data is recorded in a detailed log spread sheet designed to capture key geological information for each interval. This includes lithology, mineralogy, weathering, alteration, colour, grain size, structure/texture and intrusive features including veining or minor igneous bodies. A new interval is started at each lithological contact, with a minimum logging interval length of 1 m. These are detailed in Table 3-5 and described in detail in Section 2.2.1. No samples are taken from the core, but in addition to bulk mineralogy, the presence of any key minor or trace minerals of interest, including rubies, corundum, garnet and pyrite are recorded. Any ruby mineralisation is circled in red to highlight for future reference.

Table 3-3: MRM: Diamond drill hole database lithology information

Lithological Logging Code	Number of Records (DD database)	Total Meterage (m) DD database
Soil	1,757	5,403.94
Laterite	508	1,441.46
Clay	1,341	2,633.58
Sandy with Quartz	116	216.50
Quartz Pebble	7	5.10
Gravel Bed	797	333.15
Biotite Gneiss	907	3,542.60
Hornblende Biotite Gneiss	294	2,284.25
Granitic Gneiss	70	548.10
Undifferentiated Gneiss	299	234.65m
Amphibolite	223	790.04m
Quartzite	62	79.80m
Carbonate	46	395.10m
Impure Carbonate	49	230.90m
Quartz Vein	21	15.45m
Pegmatite	22	48.30m

Basic geotechnical data including recovery and rock quality designation (“RQD”) is also recorded by a geologist or geo-assistant, alongside the geology data in the geological logging sheet. Recovery is defined as the total length of core recovered as a percentage of the run length. RQD is defined as the core recovery percentage, only incorporating pieces of solid core greater than 10 cm in length measured along the centre line of the core.

Once the drill core has been geologically and geotechnically logged, it is placed in storage for future reference.

During Phase 2 of the drilling campaign, the core recovery in the overburden sequence was significantly improved. The Company considers that the sample representation issues encountered during the drilling of the gravel bed, during Phase 1, have been significantly improved upon and that the core samples recovered in this phase do not have the same degree of "washing out" type issues as encountered previously.

For auger drilling, geological logging of the overburden material and the top of the weathered basement is conducted by an MRM geologist at the rig. For each 0.5 to 1 m run, the geologist assesses the overburden material to measure the depth of any contacts, before it is removed from the drill bit and placed into a tray for logging of the lithology / overburden material type. Once logging is complete, a small representative sample (approximately 0.5 to 2 kg) is placed into a sample bag for each metre and the rest of the material is discarded. Within the gravel bed, a representative 2 kg sample is bagged for future reference, and the rest of the material is sent for washing. Drilling ceases when fresh, un-weathered rock is intersected and the drill can no longer penetrate.

At the wash plant, the gravel bed material recovered from the auger drilling is weighed, before being put through a small, portable jig. The washed material is then re-weighed and sent to the sort house to record any recovered rubies. The gravel bed sample weight, washed sample weight and recovered ruby weight is then recorded.

3.1.5 Density

Bulk and in situ density measurements of the top soil, clay, gravel bed and weathered basement are routinely recorded once a month in the bulk sampling pits, concurrently with the mining. For determining the bulk density of the top soil or gravel bed material, the geologist selects five locations along the length of the bench, and it is heaped by the excavator. Each heap is then manually sampled into a container of known volume. For each heap, the material is transferred from the container into a poly-weave sack and transported to the Project camp for weighing.

The density of each sample is calculated by dividing the sample weight by the volume of the container. The final density is then taken as an average of the five derived density values. The in situ density measurements are taken by hammering a metal cylinder of known volume into the desired material in the pit face. The cylinder is then rotated and removed from the face and emptied into a plastic sample bag. In the instance that the cylinder is not fully packed with material, the sample is re-taken. The sample bag is then transported to the Project camp for weighing and the density calculated by dividing the sample weight by the volume of the cylinder. This process is repeated five times, roughly equal distances apart within the selected sample area, and the final density is taken as an average of the five derived density values.

During Phase 2, density measurements were taken routinely from the diamond core. During Phase 1, the Company identified some concerns regarding the sample recovery, particularly in the gravel bed sequence. During Phase 2, changes were made to the sample collection methodology which resulted in significantly improved sample recovery. As such, the core data was considered to be a better representation of the in situ density.

Density data is gathered from core data by wrapping the gravel bed sample in thin polythene and allowing to dry naturally. From this, a dry weight is taken. The sample is subsequently wrapped securely, placed into a container of water and the volume of displaced water measured. The density is derived using the following equation:

In-situ Density (g/cm^3) = Dry weight of sample (g) / Displaced volume of water (ml)

For each density measurement taken, additional information such as the weathering state, and alteration are recorded. As more measurements are taken, variations due to the weathering / alteration state should also be reflected in the tonnage estimation, but at the current time, there is insufficient data to draw meaningful comparisons.

The core density measurements per rock type are illustrated in Table 3-4.

Table 3-4: MRM: Summary of density database

Lithology	Number of Measurements	Average Density Value (t/m^3)
Amphibolite	108	2.53
Amphibolite/Impure Carbonate	2	2.71
Biotite Gneiss	580	2.83
Carbonate	109	3.06
Feldspathic Intrusion	7	2.61
Phlogopite	1	2.13
Granitic Gneiss	176	2.93
Gravel bed	35	2.12
Hornblende Biotite Gneiss	205	2.92
Impure Carbonate	2	1.71
Laterite	273	1.92
Mineralized Amphibolite	19	2.44
Pegmatite (1)	2	2.94
Pegmatite (2)	1	1.91
Pegmatite Intrusion	3	2.74
Quartz Vein	6	2.81

The density measurements recovered from core samples cover the total project area, while the bulk density measurements are restricted to the mining areas only and were reportedly based on samples that were not thoroughly dried. The drill core density measurements were used to derive the tonnage estimates presented in Section 3.2.8, as the core data covers a wider geographical space. In addition, the changes made to the diamond drilling for Phase 2 mean that the samples recovered are now more representative of the gravel bed as a whole.

3.1.6 Bulk Sampling and Production

The main exploration tool used to determine ruby grade at the Project is through bulk sampling from a number of bulk sampling pits. This process was later expanded to full scale mining of the secondary mineralisation. Since mining operations began, MRM has mined both secondary and primary ruby-bearing mineralisation. Mining has occurred in three separate locations within the deposit, namely the Maninge Nice, Mugloto, and Glass areas (Figure 3-11). For the period of July 2012 to the end of June 2019, approximately 21.5 Mt of material has been removed from the pits, including approximately 3.8 Mt of mineralised material. The mineralised material extracted from the pits is passed through the wash plant (via a stockpiling system) and subsequently sorted by hand to provide ruby grade and quality values for each area. The minimum size of stone recovered ("bottom cut") is 1.6 mm.

At the sort house, the material recovered from the was plant is initially split by hand into three categories, namely waste, garnet and rubies / corundum. The waste is discarded, and garnets stockpiled for future use, whilst the rubies / corundum are further split into various quality and size categories. This initially involves sieving the material to remove any gemstones less than 2.8 mm (classified as fines) and subsequently re-sieving to remove any gemstones less than 4.6 mm (classified as <4.6 mm). The remaining gemstones are then subdivided into five broad quality categories:

- **Premium Ruby:** Any rough greater than 0.5 g in weight and of desirable shape, clarity and red colour, with no or very few inclusions.
- **Ruby:** Less than 0.5 g in weight, but of a desirable shape, clarity and red colour. Rough 0.5 g or more in weight where the rough is either included or pink in colour which affects either recovery or appearance of the finished gem.
- **Low Ruby:** Gemstones with the required pinkish red to red colour, but translucent clarity with significant inclusions.
- **Corundum:** Opaque non-gem quality rough.
- **Sapphire:** Generally, very light pink to pink gemstones of variable shape and clarity. May contain orange and off-colour gems.

Once split into these broad quality categories, the gemstones are further divided and subdivided into various groups based on clarity, colour, size, weight, and shape (see Table 3-5), resulting in several hundred final subdivisions. The number of stones recovered for each of the sub-divisions are recorded during production. As all mine planning is based on the first, broad subdivision of stones, this is how grades are presented throughout this report.

Table 3-5: MRM: Premium ruby, ruby, low ruby, sapphire, and corundum quality subdivisions

Ruby classification	Level 1 Subdivision	Level 2 Subdivision	Level 3 Subdivision
Premium ruby	10 grades based on clarity and colour	10 weight grades	/
Ruby (secondary material)	10 grades based on clarity and colour	10 weight grades	/
Ruby (primary material)	Three grades based on degree of inclusions	6 size grades (<5.8 mm, 5.8-8 mm, 8-11 mm, 11-16 mm, 16-22 mm, +22 mm)	Three grades based on shape (flat, normal and thick)
Low ruby	Three grades based on colour (red, red-pink, pink-red)	Three size grades (<8 mm, 8-16 mm, +16 mm)	/
Sapphire	Three grades based on clarity	Three size grades (<8 mm, 8-16 mm, +16 mm)	/
Corundum	Three grades based on colour (red, red-pink, pink-red)	Three size grades (<8 mm, 8-16 mm, +16 mm)	/

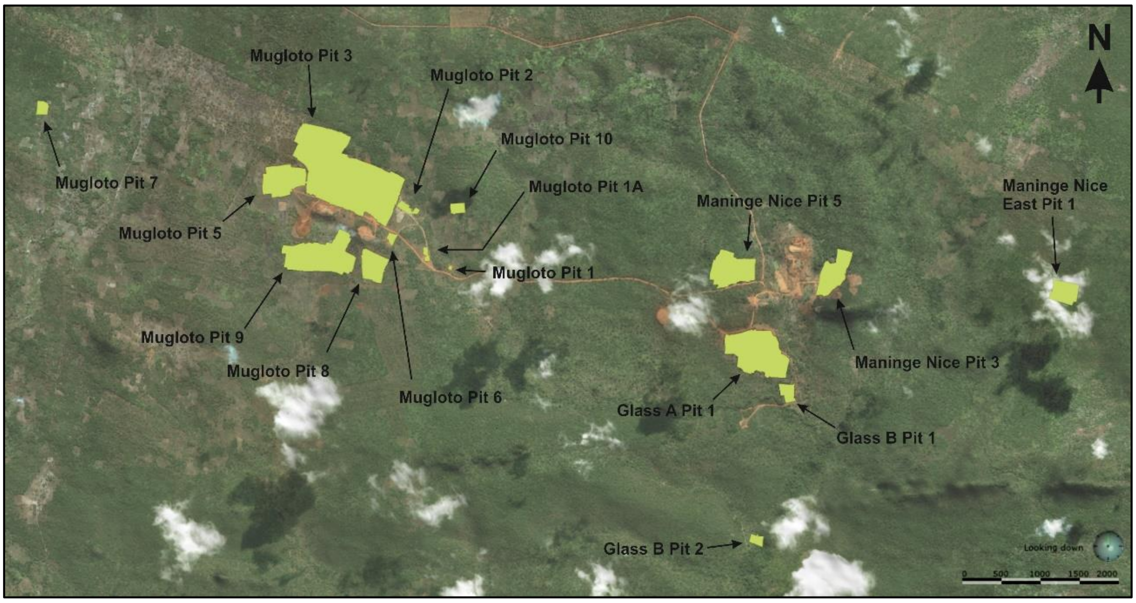


Figure 3-11: MRM: Current bulk sampling / production pit outlines in the Concession Area (excluding any historical pits since amalgamated into a single larger pit)

3.2 Mineral Resources

3.2.1 Deposit Modelling

The Montepuez geological model comprises two constituent parent domains relating to the differing styles of ruby mineralisation observed, namely the gravel bed host to the secondary mineralisation, and the amphibolite hosted primary mineralisation. The following section describes the modelling methodology applied to the two mineralisation styles.

Gravel Bed

Prior to constructing the gravel bed model, a basement surface wireframe, representing the base of the overburden material, was modelled. This was generated from the logged base of overburden in all auger holes and exploration pits. The basement surface, which is interpreted to represent the paleotopography at the time of the gravel bed deposition, forms the framework to guide the gravel bed model.

The gravel bed model was directly based upon logged gravel bed intersections in the auger holes and exploration pits. The terminated exploration pits were ignored (see Section 3.7.2) during this phase of modelling. During review of the exploration pit data, 200 exploration pits were identified as being marked as "terminated", of these, 17 include either logged gravel bed or logged fresh rock. These 17 pits were re-coded as "completed" and incorporated into the gravel bed model.

The diamond drilling was not used when generating the basement surface model, or in constructing the gravel bed volume. This is due to local inconsistencies in the logged depth of the basement when comparing diamond holes with proximal auger holes / exploration pits. On average, the logged gravel bed thickness in the diamond drill database (0.27 m) is significantly less than that in the auger drilling / exploration pit logging (0.45 m). It is considered that the differences in logging of the overburden and gravel bed in the diamond holes, relative to the auger holes and exploration pits, may be a result of "washing out" of the gravel bed during the wet diamond drilling process.

To construct the gravel bed model, hangingwall and footwall surfaces of the gravel bed horizon ("GB") were generated from the logged gravel bed intersections in the auger holes and exploration pits. Between drillholes, the trend of the footwall and hangingwall surfaces was guided by the geometry of the basement model. A 3D solid was then generated between the modelled hangingwall and footwall surfaces. In areas where no gravel bed was intersected, the model pinches out to a zero thickness mid-way between holes with and without logged gravel bed.

The gravel bed model is displayed in Figure 3-12 and Figure 3-13. The modelled thickness ranges between 0 to 3.5 m. Gravel bed thickness is variable throughout the deposit, although the gravel bed at Maninge Nice is typically thicker on average than elsewhere, whilst the area of gravel bed between Maninge Nice and Mugloto is generally the thinnest portion of the model.

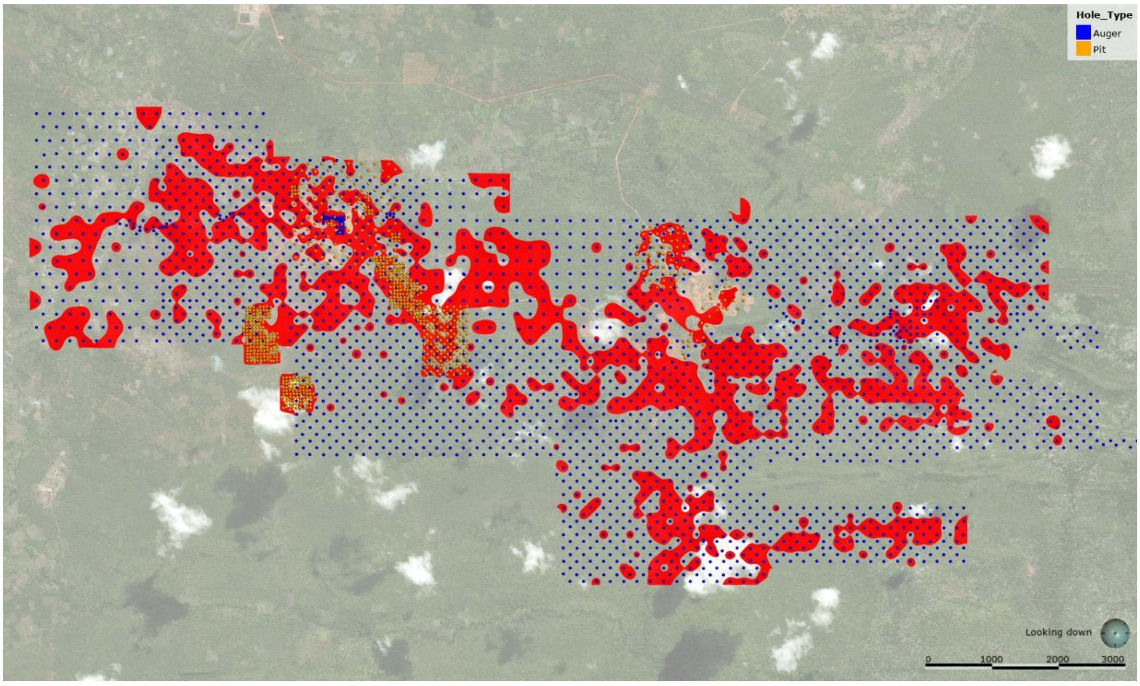


Figure 3-12: MRM: Plan view of the gravel bed model (in red), shown relative to the collar locations of auger drill holes (in blue) and exploration pits (in orange) and overlain on Google Earth satellite imagery

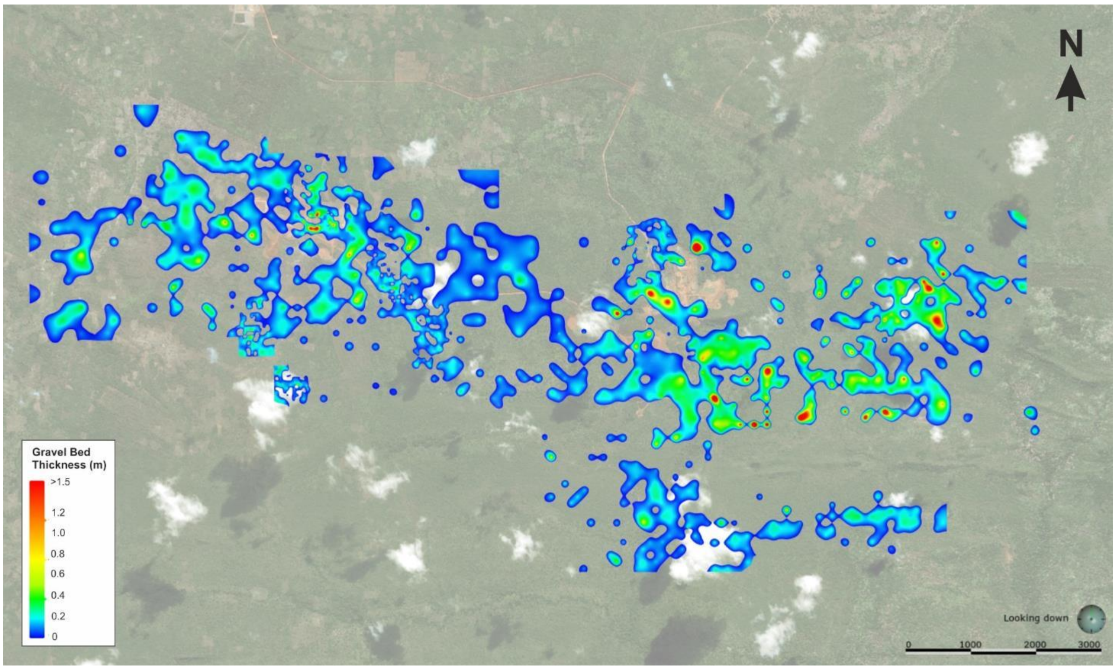


Figure 3-13: MRM: Plan view of the gravel bed model coloured by thickness

Gravel Bed “Skin”:

Due to the relatively thin average thickness of the gravel bed, and the inherent small-scale variability associated with the unit, it is not possible to mine the gravel bed in isolation. Furthermore, the gravel bed grade and tonnage statistics in the MRM production data relate to the gravel bed horizon, plus overburden waste, mined as part of the same face. MRM has indicated that the standard mining practice is to take an average 0.3 m of waste both above and below the gravel bed, with a standard minimum mining thickness of 1.5 m (that is, if the gravel bed is <0.9 m thick, then the face height reverts to 1.5 m). A gravel bed “skin” model was created to reflect this, based on the gravel bed model, expanded by 0.3 m on both the footwall and hangingwall sides, or set to a standard 1.5 m thickness where the gravel bed model is less than 0.9 m thick.

Maninge Nice Amphibolite

The Maninge Nice amphibolite body, host to the primary mineralisation, was modelled through sectional polyline interpretations, and cropped to terminate on the modelled basement surface (Figure 3-14 and Figure 3-15). The model incorporates logged amphibolite in a total of 11 Phase 1 diamond drillholes and four exploration pits that terminate in weathered amphibolite. The amphibolite unit is a near-flat lying, east-west trending lensoidal body, which is interpreted to lie in the hinge of a gentle, rounded synform with a broadly east-west trending axial plane, parallel to the regional structural trend.

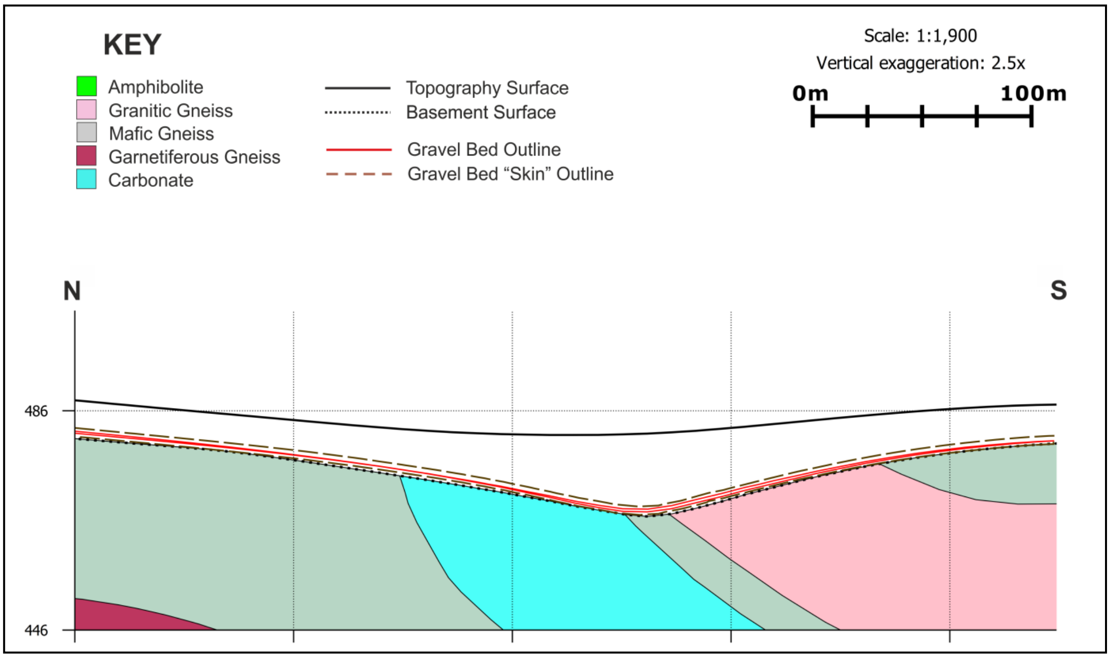


Figure 3-14: MRM: The modelled gravel bed (red) and gravel bed "skin" (dashed brown) shown relative to the basement geology model. Note that the gravel bed model broadly mirrors the trend of the basement surface

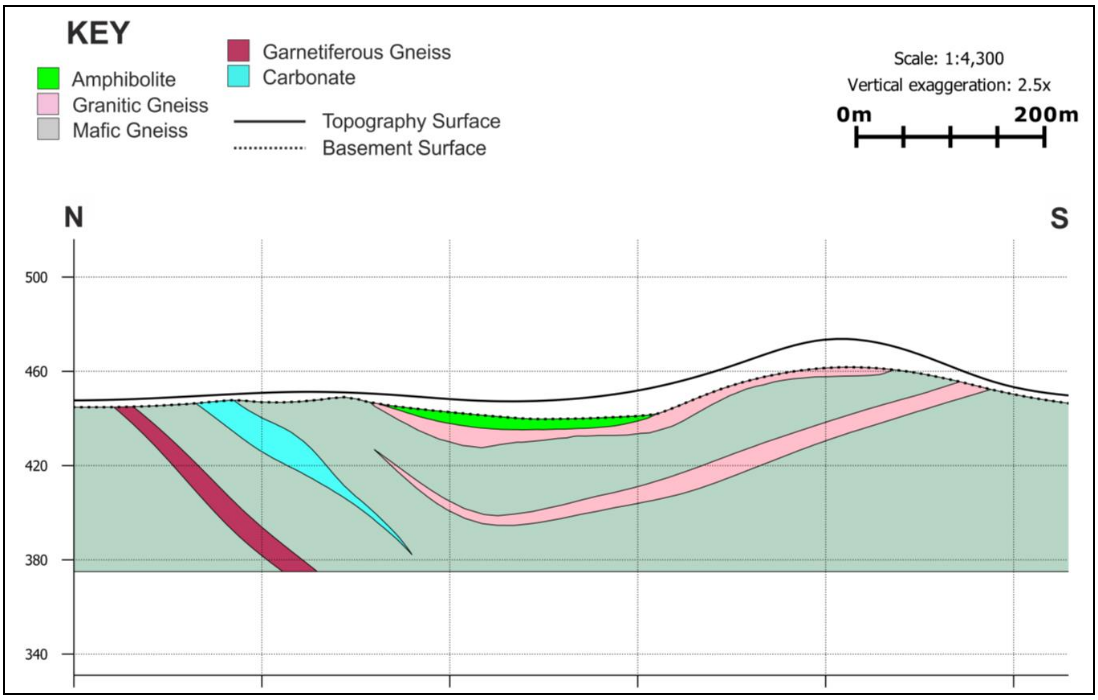


Figure 3-15: MRM: North-south cross section through the Maninge Nice area, displaying the amphibolite host to the primary mineralisation, in relation to the modelled granitic gneiss, mafic gneiss, carbonate and garnetiferous gneiss lithologies

The Maninge Nice amphibolite model was sub-domained into "Highly Weathered", "Moderately Weathered" and "Less Weathered" portions, based on the weathering codes in the MRM diamond drillhole geology log (Figure 3-16). The base of weathering extends beyond the deepest point of the principal amphibolite unit.

A minor (approximately 10-15 m true thickness) and discontinuous, south-dipping amphibolite lens is intersected by a total of four Phase 1 diamond drillholes, approximately 800 m east of the Maninge Nice pit. In addition, MRM completed two further models of amphibolite bodies based on the Phase 2 diamond drill data. As these areas have not been mined, or subjected to a bulk sampling programme, the modelled amphibolite bodies have not been used to support a declaration of Mineral Resources at this time.

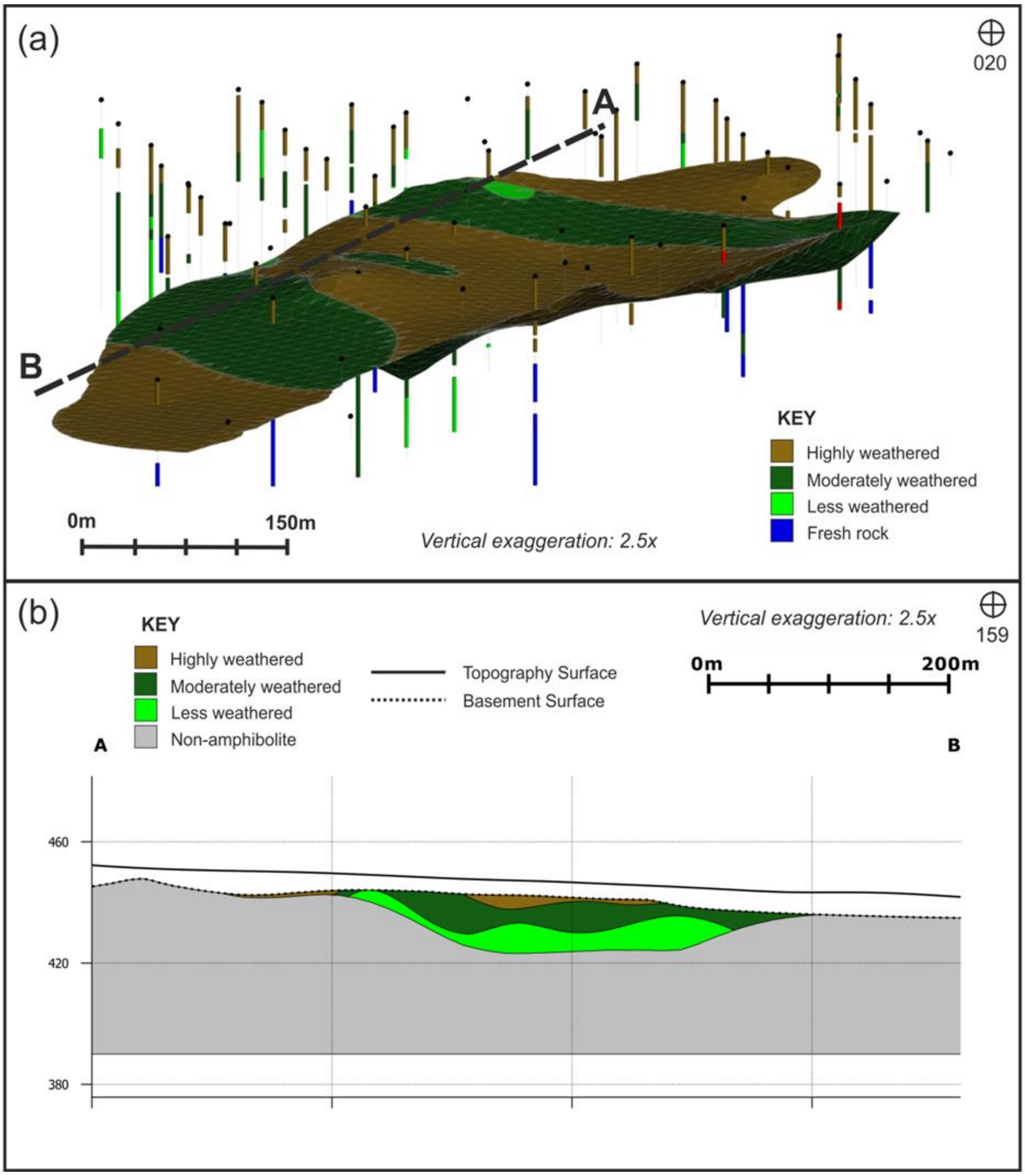


Figure 3-16: MRM: Oblique (a) and sectional (b) views of the Maninge Nice amphibolite model coloured by degree of weathering

3.2.2 Distribution of Ruby Grade within the Gravel Bed

Variation in Ruby Grade in the Auger Holes and Exploration Pits

In order to better understand the distribution of ruby grade within the gravel bed, analysis and modelling was based on the ruby stone recovery data from the exploration pits and auger drilling. The ruby recovery data from the auger drilling and exploration pitting represents the overall ruby grade, and does not provide any breakdown of stone quality, as is available from production. Nevertheless, given the large number of auger holes and exploration pits and their distribution throughout the gravel bed, it is considered that this data provides a useful insight into the variability of the overall ruby grade throughout the secondary deposit, particularly in areas a significant distance from the production pits.

Table 3-6 details the proportion of auger holes and exploration pits from which rubies have been recovered. The results indicate that, despite the larger volume of gravel bed recovered from the exploration pits relative to the auger holes, the incidence of rubies is similar in both.

Table 3-6: MRM: The proportion of auger holes and exploration pits with recovered rubies.

Data	*Number of holes / pits that intersect the gravel bed*	*Number of these holes / pits with recorded recovered rubies*	*Proportion of these holes / pits with recorded recovered rubies*
Auger Holes (all areas)	950	214	23%
Auger Holes in vicinity of Mugloto Exploration Pits	127	21	17%
Mugloto Exploration Pits	303	44	15%

To assess the variation in ruby grades from the auger drilling and exploration pitting, a block modelling exercise of grades within the modelled gravel bed was completed. For the auger holes completed in the Mugloto area, the ruby grade data typically relates to standard 1 m intervals, in which case the ruby recovery data grades were adjusted to remove dilution and the interval depths were changed to reflect that of the logged gravel bed.

In the small number of cases where the high-grade sample did not coincide with the logged gravel bed interval, this was assumed to be a logging error and the high grade was assigned to the logged gravel bed interval. All remaining logged gravel bed intervals, without any associated recovered rubies were assigned a background grade of 0 ct/t.

In all other auger holes and the Mugloto exploration pits, the ruby recovery intervals correspond to the logged gravel bed intervals, so no grade adjustments were necessary. No ruby recovery data is available for the exploration pits at Maninge Nice and Glass, and thus these pits were not used for the grade interpolation exercise.

After applying the adjustments described, the ruby grade data from the auger holes and exploration pits was interpolated into a block model, coded and sub-blocked against the gravel bed wireframe, based on the following criteria:

- in each auger hole and exploration pit, the ruby grade data was composited to a single sample over the gravel bed intersection;

- no production data was used for this exercise;
- composited ruby grades capped at 200 ct/t, to reduce the impact of anomalously high sample grades that are considered to be outside of the normal observed sample distribution;
- a parent block size of 400 m(x) x 400 m(y) x 100 m(z);
- a minimum sub-block size of 4 m(x) x 4 m(y) x 0.05 m(z);
- ruby ct/t grades were estimated into parent blocks, using the capped composite ruby recovery data inside the gravel bed wireframe, and sub-blocks assigned the grade of the corresponding parent block;
- ruby ct/t values were interpolated using Ordinary Kriging;
- isotropic variogram and search ellipsoid, with a range of 1,000 m and nugget of 90%; and
- a maximum of 10 samples were used to estimate into each block, in order to ensure a relatively local estimate and reduce the impact of distal high-grade intersections.

The gravel bed block model coloured by the interpolated auger drilling and exploration pit ruby grades is displayed in Figure 3-17. The model indicates a level of variation in total ruby grade across the gravel bed, with broad areas that are consistently low in grade and other broad areas that have variable, but demonstrably higher grade throughout.

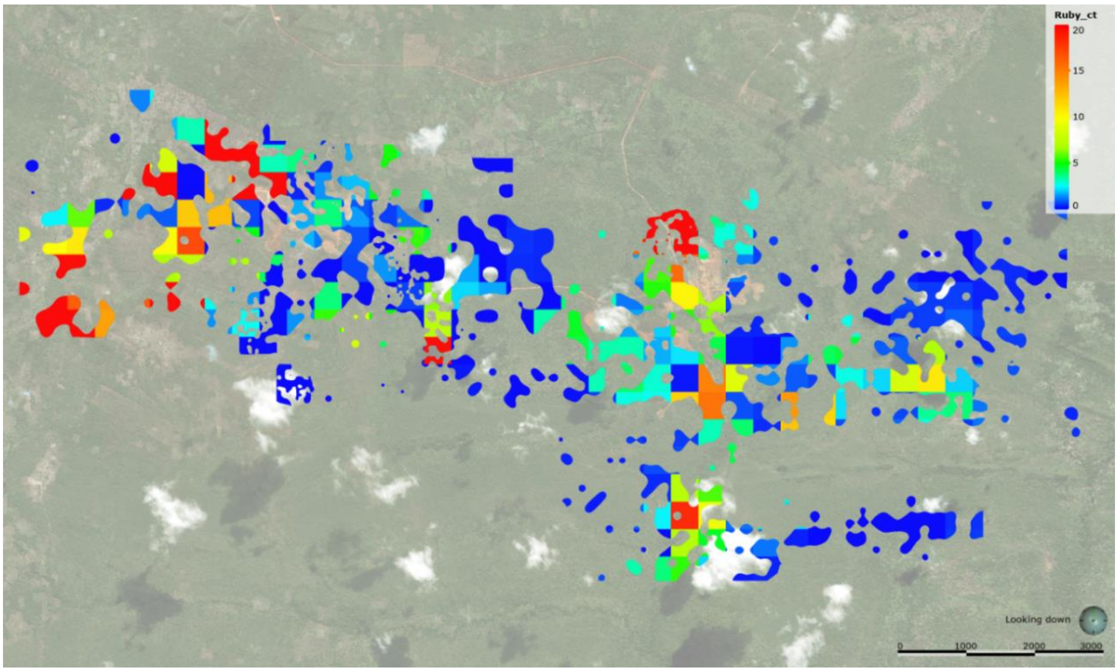


Figure 3-17: MRM: Gravel bed block model, coloured by interpolated auger drilling and exploration pit ruby grades

To assess the accuracy of the interpolated ruby grades, the block model grades were compared with the production pit records on a local basis, limited to the area of gravel bed extraction within each production pit. The production grades include mining dilution, whilst the modelled auger and exploration pit grades relate to the in situ gravel bed alone. In order to provide a like-for-like comparison of grade, a factor was applied to the production grades to remove the effect of dilution. The factor is based on the thickness ratio of gravel bed to gravel bed and skin, which was done separately for the Mugloto and combined Maninge Nice / Glass areas, resulting in the following factors, used to inflate the production grades to become in situ grades:

- Mugloto: 6.73;
- Maninge Nice / Glass: 4.36.

Figure 3-18 and Table 3-7 show the interpolated auger drilling and exploration pit grades and the factored production grades in the area of gravel bed extraction within each production pit. The production pits characterised by high total ruby grades correlate with increased interpolated ruby grades, and vice versa. Notable exceptions to this are Glass B Pit 1, Mugloto Pit 1, and Maninge Nice East Pit 1, all of which have only had minimal production to date, and Maninge Nice Pit 3, for which the high production grade is considered to be related to the presence of underlying primary mineralisation and for which there are very few auger holes in the vicinity.

Figure 3-18 and Table 3-7 also indicate that, despite the general correlation of relative grade in the two datasets, the block grades estimated from the auger drilling and exploration pits are generally significantly lower grade than the corresponding production pit grades. This is likely to be due to the very sporadic distribution of larger stones and presence of very small high-grade pockets which are encountered during production but only rarely, if ever, encountered in the relatively small volume of samples generated by exploration pitting and augering.

Given that the auger and exploration pit data do not match the grade values reported from production data and that auger-pitting data gives total ruby and corundum grade, rather than a breakdown of grade based on stone type, it is considered that this exploration data cannot be used directly to directly inform Mineral Resource grade estimate, but it does provide a useful tool for delineating broad areas of higher and lower grade, in areas where production data is not yet available.

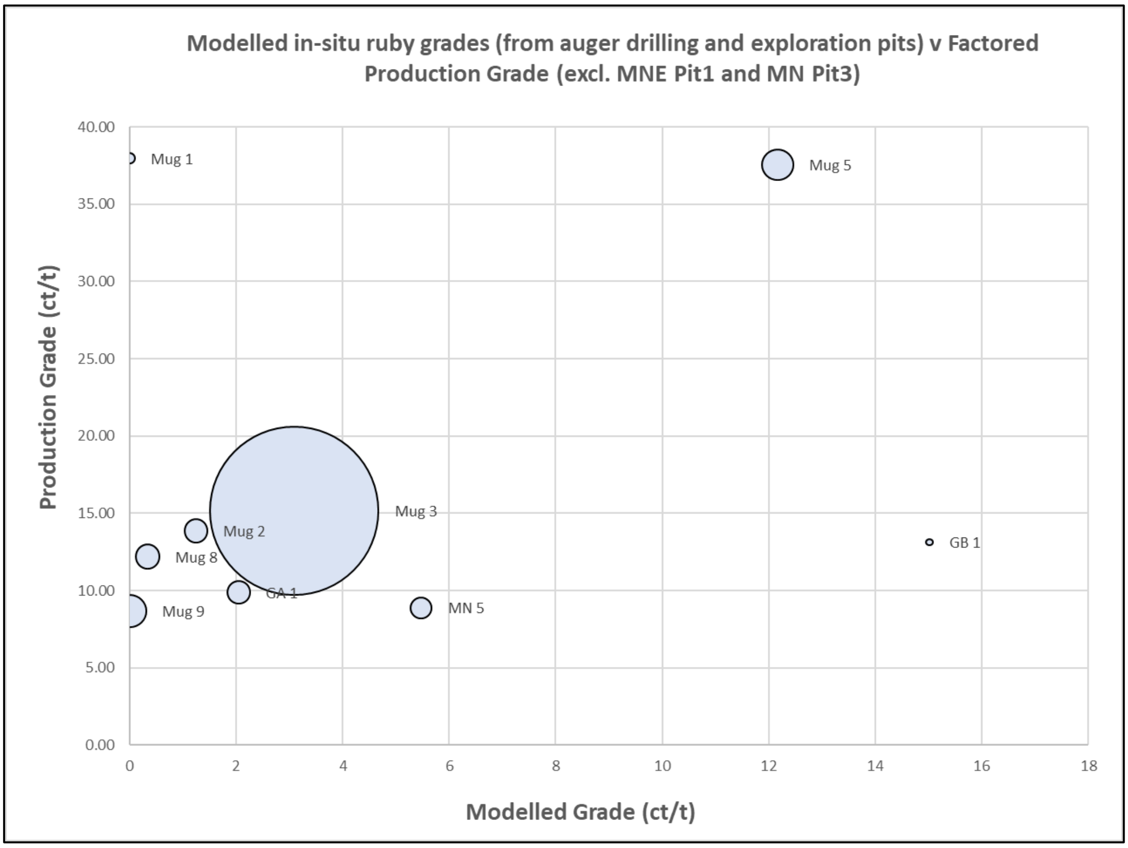


Figure 3-18: MRM: Scatterplot of interpolated auger drilling and exploration pit grades (x axis) against the factored in-situ production grades (y axis) in the area of gravel bed extraction within each production pit. Bubble size is relative to the tonnage of material processed from each pit

Table 3-7: MRM: Comparison of production grades and interpolated auger drilling and exploration pit grades, in the areas for which gravel bed has been extracted in each production pit*

Production Pit	Production Grades (total ruby ct/t) factored to remove dilution	Interpolated Block Grades from Auger Drilling and Exploration Pitting Data (total ruby ct/t)	Production Head Feed up to end of June 2019 (tonnes)
Glass A Pit 1	9.89	2.05	43,319
Glass B Pit 1	13.14	15.02	5,278
Maninge Nice Pit 3	265.07	0.83	403,668
Maninge Nice Pit 5	2.04	5.48	37,499
Mugloto Pit 1	37.97	0.00	11,189
Mugloto Pit 2	13.87	1.24	44,514
Mugloto Pit 3	15.18	3.09	2,101,475
Mugloto Pit 5	37.54	12.17	77,783
Mugloto Pit 8	12.21	0.33	48,170
Mugloto Pit 9	8.68	0.00	84,751

*Note that any production pits that do not over*lap with modelled gravel bed are not included in this table. Likewise, production pits from which gravel bed has been extracted, but not yet processed are not included.*

Variation in Production Grades

Consistent with the variability indicated by the auger hole and exploration pit ruby grade modelling, the historical production data also suggests a level of variation in grade across the modelled gravel bed. MRM notes that there is a degree of variability recorded between pits, which is a result of occasional erratic distribution of stones in the pockets and traps within the gravel bed.

The grade of the gravel bed is recorded on a weekly, monthly, and annual basis, with the production history being kept since the start of production in 2014. The production history demonstrates that there is a high degree of variability in the recorded grade, however in the larger pits the grade is similar on a year to year basis. The average grade across groups of exploration pits is considered appropriate for use in any mine planning exercises.

For reference, a mine-to-date summary of production grades from each pit is given in Table 3-8. The locations of these pits are given in Figure 3-4. Production grades are inclusive of mining dilution which is a significant factor in the gravel beds but only a negligible factor in the primary mineralisation. The percentage of each ruby quality class for each pit is shown in Table 3-9 and Table 3-10.

Table 3-8: MRM: Mined-to-date production data as of end of June 2019

Pit Name	Material Type	To plant (t)	Total Carats Recovered (ct)	Premium and Ruby Carats Recovered (ct)	Total Grade (ct/t)	Premium and Ruby Grade (ct/t)
Pit 1	Gravel Bed	11,189	63,134	3,662	5.64	0.33
Pit 2	Gravel Bed	44,514	91,758	8,593	2.06	0.19
Pit 3	Gravel Bed	2,101,475	4,739,332	1,803,712	2.26	0.86
Pit 5	Gravel Bed	77,783	433,929	11,815	5.58	0.15
Pit 7	Gravel Bed	2,901	117,823	271	40.61	0.09
Pit 8	Gravel Bed	48,170	87,389	29,822	1.81	0.62
Pit 9	Gravel Bed	84,751	109,312	29,309	1.29	0.35
Mugloto Total	**Gravel Bed**	**2,370,784**	**5,642,676**	**1,887,184**	**2.38**	**0.80**
Glass A Pit 1	Gravel Bed	43,319	66,056	14,531	1.52	0.34
Glass B Pit 1	Gravel Bed	5,278	15,904	173	3.01	0.03
Glass Total	**Gravel Bed**	**48,597**	**81,960**	**14,704**	**1.69**	**0.30**
Maninge Nice Pit 3	Gravel Bed	403,668	24,541,632	1,236,826	60.80	3.06
Maninge Nice Pit 5	Gravel Bed	37,499	76,596	11,491	2.04	0.31
Maninge Nice East Pit 1	Gravel Bed	2,829	123,392	193	43.62	0.07
Maninge Nice Secondary Total	**Gravel Bed**	**443,996**	**24,741,620**	**1,248,510**	**55.72**	**2.81**
Maninge Nice Pit3	Amphibolite	109,447	10,712,884	348,830	97.88	3.19
Maninge Nice Primary Total	**Amphibolite**	**109,447**	**10,712,884**	**348,830**	**97.88**	**3.19**

** Note that any production pits from which gravel bed has been extracted, but not yet processed, are not included.*

Table 3-9: MRM: Mined-to-date production split by pit and ruby quality classes (ct/t)

Pit	Material Type	Recovered Grade (ct/t)	Premium Ruby (ct/t)	Ruby (ct/t)	Low Ruby (ct/t)	Corundum (ct/t)	Sapphire (ct/t)	Low Sapphire (ct/t)	sub 4.6mm (ct/t)
Pit 1	Gravel Bed	5.64	0.00	0.32	0.48	0.56	3.21	0.00	1.06
Pit 2	Gravel Bed	2.06	0.03	0.16	0.17	0.11	1.13	0.00	0.46
Pit 3	Gravel Bed	2.26	0.20	0.66	0.08	0.09	0.22	0.40	0.60
5.580.030.1 20.080.120. 643.850.74 Pit 5	Gravel Bed	40.61	0.03	0.06	0.53	1.87	1.93	34.98	1.21
Pit 7	Gravel Bed	1.81	0.03	0.59	0.05	0.24	0.06	0.29	0.56
Pit 8	Gravel Bed	1.29	0.08	0.27	0.01	0.01	0.01	0.05	0.86
Pit 9	Gravel Bed	2.38	0.18	0.62	0.08	0.10	0.26	0.53	0.62
Mugloto Total	**Gravel Bed**	**1.52**	**0.06**	**0.28**	**0.07**	**0.08**	**0.63**	**0.26**	**0.16**
Glass A Pit 1	Gravel Bed	3.01	0.01	0.02	0.13	0.44	0.17	2.03	0.21
Glass B Pit 1	Gravel Bed	1.69	0.06	0.25	0.07	0.12	0.58	0.45	0.16
Glass Total	**Gravel Bed**	**60.80**	**0.02**	**3.05**	**5.97**	**8.41**	**22.42**	**8.46**	**12.47**
Maninge Nice Pit 3	Gravel Bed	2.04	0.06	0.25	0.02	0.10	0.01	0.09	1.51
Maninge Nice Pit 5	Gravel Bed	43.62	0.02	0.05	0.15	3.70	1.36	38.34	0.00
Maninge Nice East Pit 1	Gravel Bed	55.72	0.02	2.79	5.43	7.68	20.39	7.95	11.46
Maninge Nice Secondary Total	**Gravel Bed**	**97.88**	**0.01**	**3.18**	**9.17**	**13.43**	**48.05**	**4.47**	**19.56**
Maninge Nice Pit3	Amphibolite	97.88	0.01	3.18	9.17	13.43	48.05	4.47	19.56
Maninge Nice Primary Total	Amphibolite	**5.64**	**0.00**	**0.32**	**0.48**	**0.56**	**3.21**	**0.00**	**1.06**

** Note that any production pits from which gravel bed has been extracted, but not yet processed are not included.*

Table 3-10: MRM: Mined-to-date production split by pit and ruby quality classes (%)

Pit	Material Type	Recovered Grade (ct/t)	Premium Ruby (%)	Ruby (%)	Low Ruby (%)	Corundum (%)	Sapphire (%)	Low Sapphire (%)	sub 4.6mm (%)
Pit 1	Gravel Bed	5.64	0.1	5.7	8.4	10.0	56.9	0.0	18.8
Pit 2	Gravel Bed	2.06	1.5	7.9	8.1	5.4	54.8	0.0	22.4
Pit 3	Gravel Bed	2.26	8.8	29.3	3.6	4.1	9.7	17.8	26.7
Pit 5	Gravel Bed	5.58	0.6	2.1	1.4	2.2	11.4	69.1	13.2
Pit 7	Gravel Bed	40.61	0.1	0.2	1.3	4.6	4.7	86.1	3.0
Pit 8	Gravel Bed	1.81	1.4	32.7	2.6	13.3	3.5	15.8	30.6
Pit 9	Gravel Bed	1.29	6.2	20.6	0.9	1.0	0.9	3.9	66.5
Mugloto Total	**Gravel Bed**	**2.38**	**7.6**	**25.9**	**3.4**	**4.2**	**10.7**	**22.4**	**25.9**
Glass A Pit 1	Gravel Bed	1.52	4.0	18.0	4.4	5.3	41.2	16.9	10.2
Glass B Pit 1	Gravel Bed	3.01	0.4	0.7	4.3	14.6	5.7	67.2	7.1
Glass Total	**Gravel Bed**	**1.69**	**3.3**	**14.7**	**4.3**	**7.1**	**34.3**	**26.7**	**9.6**
Maninge Nice Pit 3	Gravel Bed	60.80	0.0	5.0	9.8	13.8	36.9	13.9	20.5
Maninge Nice Pit 5	Gravel Bed	2.04	2.8	12.2	0.8	5.1	0.7	4.5	74.0
Maninge Nice East Pit 1	Gravel Bed	43.62	0.0	0.1	0.3	8.5	3.1	87.9	0.0
Maninge Nice Secondary Total	**Gravel Bed**	**55.72**	**0.0**	**5.0**	**9.7**	**13.8**	**36.6**	**14.3**	**20.6**
Maninge Nice Pit3	Amphibolite	97.88	0.0	3.3	9.4	13.7	49.1	4.6	20.0
Maninge Nice Primary Total	Amphibolite	**97.88**	**0.0**	**3.3**	**9.4**	**13.7**	**49.1**	**4.6**	**20.0**

** Note that any production pits from which gravel bed has been extracted, but not yet processed are not included.*

The production data detailed in Table 3-8, Table 3-9, and Table 3-10 illustrate the variation between the different areas within the deposit. Production to date indicates that, overall (and excluding Mugloto Pit 7, which is spatially distinct from the remainder of the Mugloto pits), the amount of ruby and corundum recovered in the Mugloto and Glass areas is similar, but that the proportion of premium stones recovered from Mugloto is significantly in excess of the proportion of premium stones at Glass. Specifically, based on production to date, approximately 32.5% of stones from the Mugloto gravel bed are of premium ruby and ruby quality, whilst approximately 17.5% of the stones from the gravel bed at Glass are of premium ruby and ruby quality.

The overall grade at Maninge Nice Pit 3, which directly overlies the primary amphibolite-hosted mineralisation, is significantly in excess of the grades at Mugloto and Glass, but the proportion of premium and ruby stones is much lower (approximately 5%). Similarly, Maninge Nice East Pit 1, which also overlies amphibolite, is characterised by a high total grade, but very low proportion of premium and ruby stones (approximately 0.1%). Maninge Nice Pit 5, which does not overly primary mineralisation, has a similar grade and quality profile to Mugloto and Glass. This suggests that both Maninge Nice Pit 3 and Maninge Nice East Pit 1 are potentially not representative of the rest of the Maninge Nice area, owing to an abundance stones from the underlying amphibolite that have only been transported a short distance.

The other pit characterised by a comparably high grade and low proportion of high quality stones is Mugloto Pit 7, which is has a total grade of approximately 40 ct/t, of which <0.5% are of premium or ruby quality. This small pit is approximately 3km east of the other Mugloto Pits and represents the only production to date from the eastern portion of Mugloto. The results of the production from this pit, albeit based on a relatively small volume of mined gravel bed in relation to most other production pits, indicate potential differing grade profiles in the east and west of Mugloto.

3.2.3 Paleo Drainage Modelling

The current genetic model for the gravel bed hosted mineralisation involves initial deposition as a result of one or more major flooding events, followed by redistribution / remobilisation of the rubies by alluvial processes. In order to better understand the likely distribution of major drainage channels at the time that the gravel bed was deposited, a watershed analysis was completed, based on the modelled basement surface.

Catchments and drainage lines were delineated using Global Mapper software, which provides an analysis tool to generate watersheds (an area or ridge of land that separates water flowing to different rivers, basins or seas). The watershed calculation uses an eight-direction pour point algorithm to calculate the flow direction at each location, along with a bottom-up approach for determining flow direction through flat areas and a custom algorithm for automatically filling depressions in the terrain data.

Several delineation scenarios have been generated based on the adjustment of the stream cell count (“SCC”). This controls how much water must flow to a particular cell before it is considered part of a "stream". Larger values will result in only more water flow areas being delineated, while smaller values will cause more minor water flows to be marked as streams.

Figure 3-19 displays the major paleo drainage channels derived from watershed analysis of the modelled basement surface, at a stream cell count of 30,000. The drainage channels are also displayed relative to the gravel bed wireframe in Figure 3-20 and the interpolated gravel bed ruby grades from the auger drilling and exploration pitting data in Figure 3-21. Comparison of the drainage channels with the gravel bed and grade modelling suggests that the paleo drainage channels do somewhat influence the distribution and grade of the gravel bed. Most notably, the gravel bed appears to be more common in the vicinity of the drainage channels than away from the drainage channels. Similarly, the modelled ruby grade from the auger drilling and exploration pitting is typically higher in the vicinity of the paleo drainage channels than away from the channels, with the main areas of consistent lower grade being distal to any major channels.

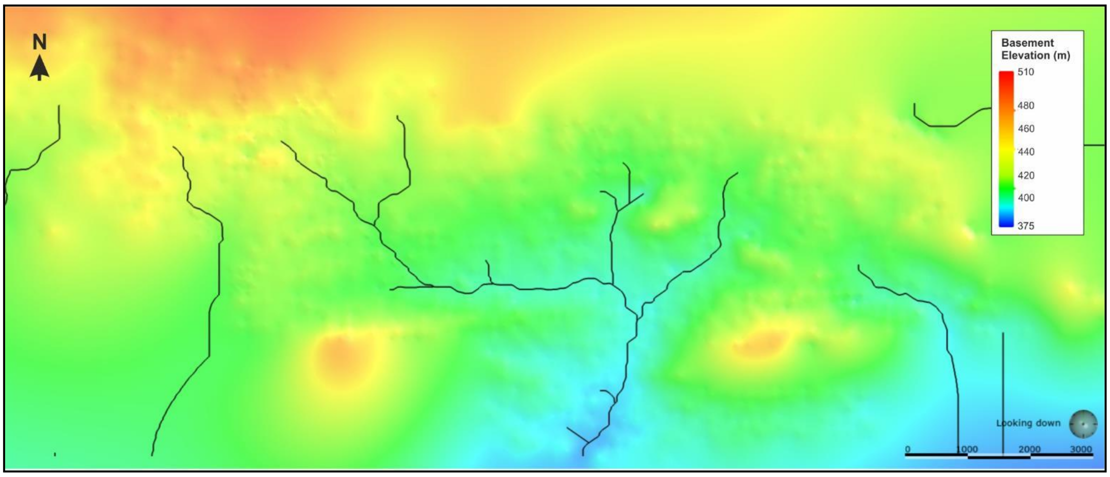


Figure 3-19: MRM: Major paleo drainage channels derived from watershed analysis of the modelled basement surface, shown relative to the modelled basement surface, coloured by elevation

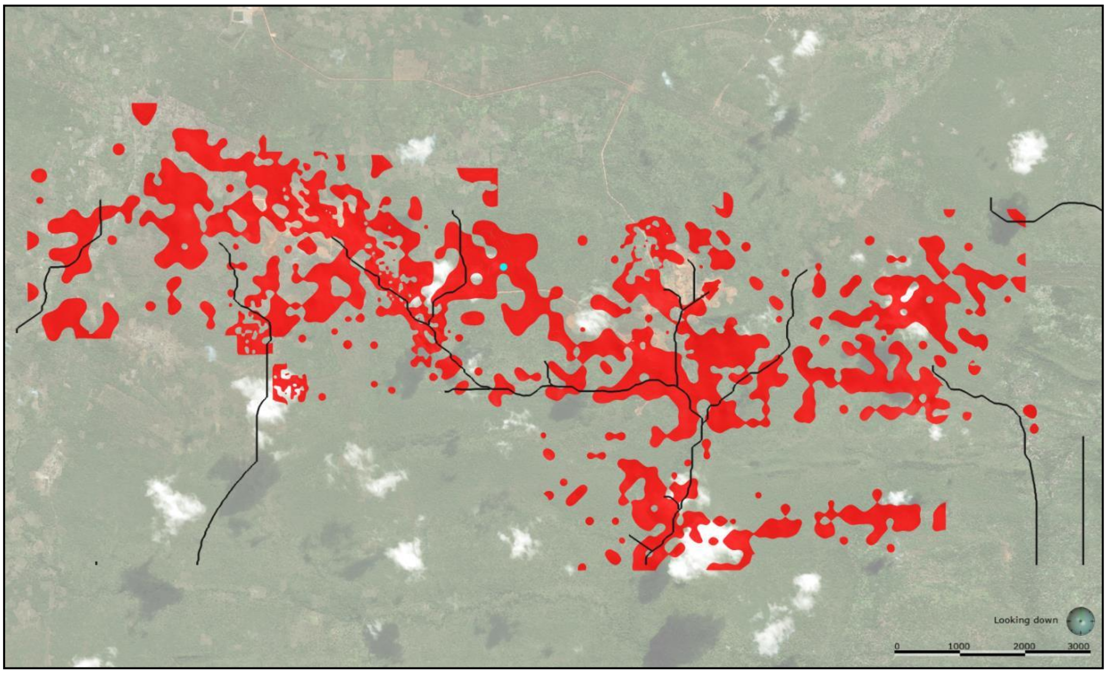


Figure 3-20: MRM: Major paleo drainage channels derived from watershed analysis of the modelled basement surface, shown relative to the modelled gravel bed and overlain on Google Earth satellite imagery

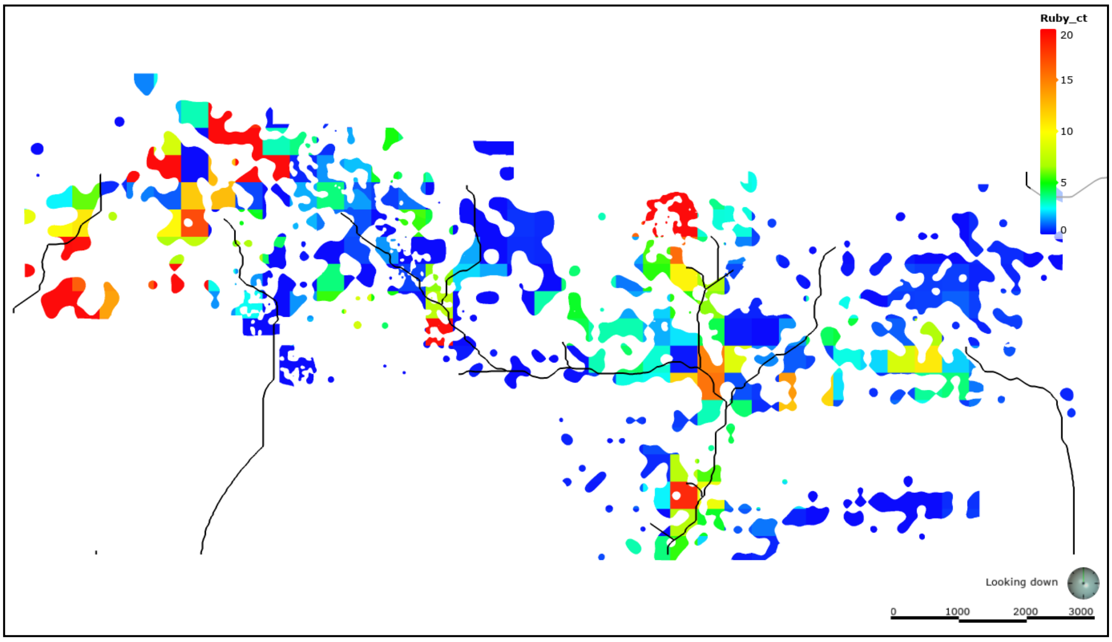


Figure 3-21: MRM: Major paleo drainage channels derived from watershed analysis of the modelled basement surface, shown relative to the gravel bed block model, coloured by interpolated auger drilling and exploration pit ruby grades

3.2.4 Gravel Bed Grade Domain Definition

In order to appropriately reflect the variation in ruby grade and quality throughout the gravel bed (as described in Section 3.2.2) in the Mineral Resource Estimate, the gravel bed model has been divided into a total of 10 spatial domains based on auger/pit grade populations and geological / topographical control. The domain outlines are largely based on the following:

- areas of similar total ruby grade in the production pits;
- areas of similar premium stone grade in the production pits;
- areas of similar total ruby grade modelled on ruby recovery data from the auger holes and exploration pits;
- good correlation in the general quantum of grade between the production pit grades and the ruby grade modelled on ruby recovery data from the auger holes and exploration pits; and
- broad division of domains based on major paleo drainage channels.

The gravel bed domains are displayed in Figure 3-22, and summarised below:

Mugloto Domain

Description: Comprises a number of production pits focussed along a single, south-east flowing, major paleo drainage channel. Production pits are of variable grade and quality but are generally of moderate grade and with a high proportion of premium stones. All production pits in this domain have a significantly lower total grade and (other than Mugloto Pit 1) a significantly higher proportion of premium stones than Mugloto Pit 7. It is noted that the proportion of premium stones at Mugloto Pit 1 is very low (<0.1%) compared to the other Mugloto pits; however, the proportion of ruby quality stones in this pit (approximately 5%) is relatively well aligned with the other Mugloto Pits and, at this stage, the total head feed from this pit is still quite low.

Included Production Pits (for which gravel bed has been processed): Mugloto Pit 1, Mugloto Pit 2, Mugloto Pit 3, Mugloto Pit 5, Mugloto Pit 8, and Mugloto Pit 9.

Mugloto West Domain

Description: To the west of the main Mugloto domain and focussed along a single, south-west flowing, major paleo drainage channel. The interpolated block grades from the auger holes and exploration pit ruby recovery data in this domain are significantly higher than the modelled grades in the Mugloto domain, which is consistent with the only production pit in this domain, Mugloto Pit 7, which has a very high total grade, but low proportion of premium stones compared to the other production pits in the main Mugloto domain. Mugloto Pit 7 includes a relatively small volume of mined gravel bed in relation to most other production pits, however, the clear differences in ruby grade and quality in this pit compared to the Mugloto Domain production pits, coupled with the contrast in the interpolated block grades between Mugloto and Mugloto West, justify defining a separate domain for the west of Mugloto at this stage.

Included Production Pits (for which gravel bed has been processed): Mugloto Pit 7.

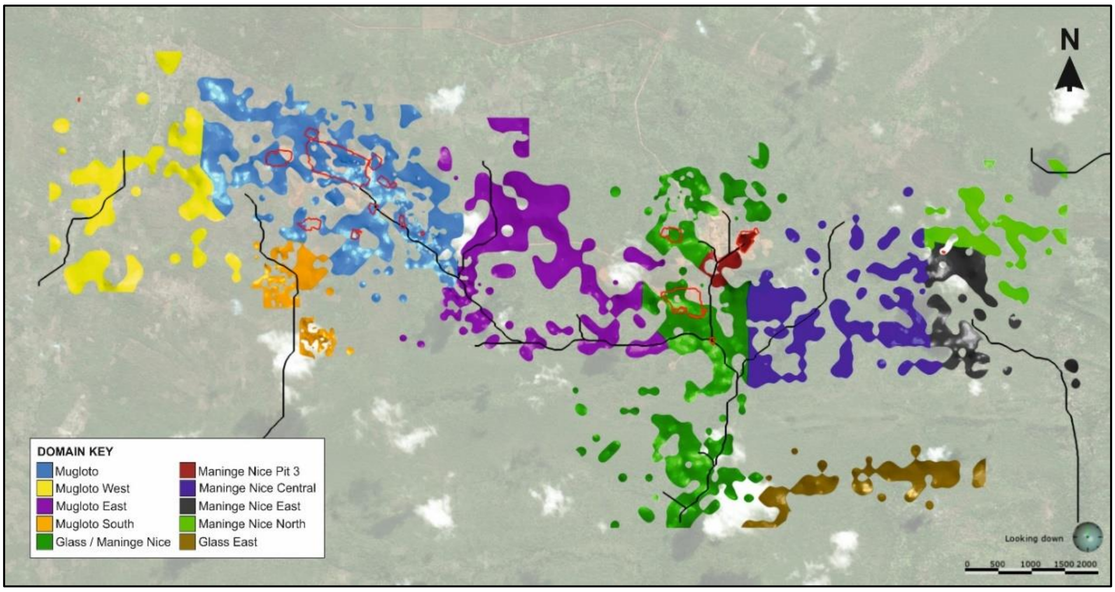


Figure 3-22: The gravel bed model, coloured by domain and shown relative to the paleo drainage channels (in black) derived from watershed analysis of the modelled basement surface. The extent of gravel bed extraction for all production pits with processed gravel bed are displayed as red outlines

Mugloto East Domain

Description: Based on the continuation of the main Mugloto paleo drainage channel and the confluence of this with another major (south flowing) paleo drainage channel. In this continuation of the Mugloto drainage, the gravel bed is not as continuous as up-stream and the interpolated ruby grade from the auger hole and exploration pit ruby recovery data is significantly lower than the Mugloto domain.

Included Production Pits (for which gravel bed has been processed): None.

Mugloto South Domain

Description: South of the main Mugloto Domain and focussed along a single, south flowing, major paleo drainage channel, separate to the paleo drainage channel that runs through the Mugloto and Mugloto East Domains. The domain is heavily sampled by exploration pits, almost none of which intersected any rubies, and as such the interpolated block grades from exploration pit and auger holes data are very low in this domain compared to the adjacent areas. This is distinctly different to the main Mugloto Domain.

Included Production Pits (for which gravel bed has been processed): None.

Glass / Maninge Nice Domain

Description: Comprises three production pits (Glass A Pit 1, Glass B Pit 1, and Maninge Nice Pit 5) focussed along a single, south flowing, major paleo drainage channel. The production pits are generally of moderate grade and with moderate proportion of premium stones. All production pits in this domain have a significantly lower total grade and significantly higher proportion of premium stones than Maninge Nice Pit 3.

Included Production Pits (for which gravel bed has been processed) – Maninge Nice Pit 5, Glass A Pit 1, Glass B Pit 1.

Maninge Nice Pit 3 Domain

Description: The very high total grade and low proportion of premium stones recovered from the gravel bed in Maninge Nice Pit 3 is likely to be attributable to the presence of the underlying mineralised amphibolite, which is also associated with a very high grade and low proportion of premium stones. This is considered to be potentially related to an abundance stones from the underlying amphibolite that have not been transported any significant distance, sitting within the gravel bed extracted from this pit. This interpretation is supported by the significantly lower grade and higher premium stone proportion attributed to the surrounding production pits (including Maninge Nice Pit 5). The extent of the Maninge Nice Pit 3 Domain is limited to downstream of the Maninge Nice amphibolite south to mid-way between Maninge Nice Pit 3 and Glass A Pit 1 (which is the production pit immediately downstream of Maninge Nice Pit 3).

Included Production Pits (for which gravel bed has been processed): Maninge Nice Pit3

Maninge Nice Central Domain

Description: Domain to the east of the main Maninge Nice / Glass paleo drainage channel, characterised by a significantly lower ruby grade interpolated from the auger hole and exploration pit ruby recovery data, compared with the corresponding interpolated ruby grade in the Glass / Maninge Nice Domain.

Included Production Pits (for which gravel bed has been processed): None.

Glass East Domain

Description: Domain to the southeast of the main Maninge Nice / Glass paleo drainage channel, characterised by a significantly lower ruby grade interpolated from the auger hole and exploration pit ruby recovery data, compared with the corresponding interpolated ruby grade in both the Glass / Maninge Nice Domain and the Maninge Nice Central Domain. The Glass East Domain is geographically disconnected from the Maninge Nice Central domain by an E-W oriented ridge. No major paleo drainage channels have been identified in this domain.

Included Production Pits (for which gravel bed has been processed): None.

Maninge Nice East Domain

Description: Domain to the east of the Maninge Nice Central Domain, centred around a separate major paleo drainage channel. The domain is tested by a single pit, Maninge Nice East Pit 1, which is associated with a very high total grade, but low proportion of premium stones. The pit directly overlies an amphibolite body, intersected by multiple diamond drillholes, which is directly along-strike from the mineralised primary amphibolite in Maninge Nice Pit 3. At this stage, no primary amphibolite has been excavated from Maninge Nice East Pit 1, and as such, the presence or otherwise (and the potential grade profile) of ruby mineralisation in this amphibolite body is unconfirmed. The similarity in grade profile (tha tis, very high total grade, with a very low proportion of premium stones) between the gravel bed mineralisation at Maninge Nice East Pit 1 and Maninge Nice Pit 3 suggests that the predominant source of stones in the gravel bed at Maninge Nice East Pit 1 may be the underlying amphibolite unit. For this reason, the extent of the Maninge Nice East Domain is restricted to catchments that feed into the major paleo drainage channel downstream of the in situ amphibolite that underlies Maninge Nice East Pit 1. It is noted that Maninge Nice East Pit 1 includes a relatively small volume of mined gravel bed in relation to most other production pits. The clear differences in ruby grade and quality in this pit compared to the production pits in the Glass / Maninge Nice Domain, justifies allocating this pit to a separate domain at this stage.

Included Production Pits (for which gravel bed has been processed): Maninge Nice East Pit 1.

Maninge Nice North Domain

Description: Domain directly north of Maninge Nice East Pit 1, characterised by a very low ruby grade interpolated from the auger hole and exploration pit ruby recovery data. This domain is situated upstream of the in situ amphibolite that directly underlies Maninge Nice East Pit 1 and is considered to possibly be the primary source of ruby mineralisation extracted from the gravel bed in this pit. This domain is separated from the Maninge Nice East Domain, since it is considered less likely that any stones from the in situ amphibolite beneath Maninge Nice East Pit 1 would be transported to the gravel bed upstream of this pit.

Included Production Pits (for which gravel bed has been processed): None.

3.2.5 Grade and Tonnage Estimation Approach

In order to produce a Mineral Resource model for input into the subsequent mining studies, SRK has generated a block model, coded and sub-blocked by the geological model volumes (namely the gravel bed, the gravel bed dilution skin and the primary Maninge Nice amphibolite), with all other blocks being coded as “waste”. The blocks were further coded by the gravel bed domains described in Section 3.2.4.

The approach taken to populate the empty block model with grade and density values for the derivation of the Mineral Resource is described in the following sections.

Production data and derivation of dilution factors

Where available, grades in the Mineral Resource are derived directly from the results achieved from the actual production results described in Section 3.1.6. This is the only data source which breaks down grade into each of the stone quality subdivisions and is considered to be the most robust and reliable representation of grade, given the large sample sizes upon which the average grades for each production pit are based. Gravel bed tonnage and grade production records, however, include mining dilution which is significant given the relatively thin gravel beds and the desire to achieve total recovery during mining. All production and stockpile tonnages, are reported as dry tonnages.

The in situ gravel bed model is based on logging and measurements taken directly from auger holes and exploration pitting. In order to use production tonnage and grade to derive equivalent in situ gravel bed tonnage and grade, factors for each need to be applied to the production records to remove the effect of dilution.

The amount of dilution planned to be incurred by mining was calculated by comparing the volume of gravel bed to the volume of gravel bed and planned dilution skin (Table 3-11). The mine plans to ensure complete recovery of the gravels by mining a minimum thickness of 1.5 m. Where the gravel is thicker than 0.9 m, then a skin of 0.3 m of over-dig is planned on both the footwall and the hangingwall. The planned mining dilution from the application of minimum thickness and skin is a function of gravel bed thickness; for example, a thickness of 0.2 m results in a factor of 7.5, and a thickness of 0.4 m results in a planned dilution factor of 3.75.

A dilution factor has been calculated for each domain. The final factors applied to the production grades were based on the total ratio of all Mugloto Domains, applied to all Mugloto production pit grades, and the total ratio of all Glass / Maninge Nice Domains, which was applied to all Glass and Maninge Nice pit grades.

In order to determine how the planned mining dilution compares with actual mining dilution, the production data from all of the bulk sampling pits from which in excess of 20,000 t of gravel bed has been extracted, was compared to the planned amount of gravel bed and skin dilution in each area, as based on the model. The volumes converted to tonnages are shown in Table 3-12.

Table 3-11: MRM: Determination of skin / gravel bed factor from modelled block volumes

Domain	Modelled Gravel Bed (m^3)	Modelled Gravel Bed + skin (m^3)	Factor: Gravel Bed / Skin	Production Pits Factor Applied to
Mugloto	1,178,330	6,746,079	5.73	-
Mugloto West	481,328	3,137,394	6.52	-
Mugloto East	542,641	4,912,703	9.05	-
Mugloto South	159,691	1,105,230	6.92	-
Total Mugloto	**2,361,990**	**15,901,407**	**6.73**	**All Mugloto Production Pits**
Glass / Maninge Nice	1,137,336	5,876,528	5.17	-
Maninge Nice Pit 3	70,892	319,430	4.51	-
Maninge Nice Central	1,093,573	3,566,405	3.36	-
Glass East	244,749	1,599,472	6.54	-
Maninge Nice East	421,688	1,667,995	3.96	-
Maninge Nice North	345,103	1,403,074	4.07	-
Total Maninge Nice / Glass	**3,313,341**	**14,432,905**	**4.36**	**All Glass and Maninge Nice Production Pits**

Table 3-12: MRM: Tonnages of gravel bed per bulk sampling pit, compared to production data

Pit Name	Material Type	Gravel Bed Material Mined (including dilution) (dry t)	Gravel Bed Modelled (t)	Gravel Bed + skin Modelled (t)
Mugloto Pit 1A	Gravel Bed	32,345	9,046	33,826
Mugloto Pit 3	Gravel Bed	1,914,618	253,796	1,091,992
Mugloto Pit 5	Gravel Bed	274,573	27,879	159,809
Mugloto Pit 8	Gravel Bed	197,584	3,068	27,883
Mugloto Pit 9	Gravel Bed	382,777	43,823	152,873
Maninge Nice Pit 3 (Secondary)	Gravel Bed	142,484	29,300	107,167
Maninge Nice Pit 5	Gravel Bed	551,785	65,391	393,229
Glass A Pit 1	Gravel Bed	30,272	7,524	15,341
Glass B Pit 1	Gravel Bed	32,345	9,046	33,826

For all but Mugloto Pit 1A, the production tonnage is in excess of what is predicted by the model. This is considered to be a function of the drillhole spacing, which is often wider than the dimensions of the production pits. Although the gravel bed model is considered to be suitable for long term mine planning, it is evident that small scale variations to the gravel bed model are identified when mining, allowing some additional areas to be mined.

The planned dilution factor was used to derive undiluted grade in the gravel bed model based on the diluted grade in the production records. This is illustrated in Table 3-13 to Table 3-16. Table 3-13 displays the diluted total production grades and undiluted grade for each pit. Table 3-14 shows the resulting grades broken down by stone type.

Table 3-16 shows the resulting undiluted grades for each domain, broken down by stone type. No factor was used for the amphibolite grades as this is not a consideration for the mining of the primary material.

Table 3-13: MRM: Application of factor to production grades per pit, to estimate in situ grades

Pit Name	Material Type	Total Grade from Production (ct/t)	Factor GB / Skin	In situ Total Grade
Pit 1	Gravel Bed	5.64	6.73	37.97
Pit 2	Gravel Bed	2.06	6.73	13.87
Pit 3	Gravel Bed	2.26	6.73	15.18
Pit 5	Gravel Bed	5.58	6.73	37.54
Pit 7	Gravel Bed	40.61	6.73	273.30
Pit 8	Gravel Bed	1.81	6.73	12.21
Pit 9	Gravel Bed	1.29	6.73	8.68
Glass A Pit 1	Gravel Bed	1.52	4.36	6.65
Glass B Pit 1	Gravel Bed	3.01	4.36	13.14
Maninge Nice Pit 3	Gravel Bed	60.80	4.36	265.07
Maninge Nice Pit 5	Gravel Bed	2.04	4.36	8.91
Maninge Nice East Pit 1	Gravel Bed	43.62	4.36	190.17
Maninge Nice Pit3	Amphibolite	97.88	-	97.88

Table 3-14: MRM: Calculated In situ grades for each stone type per pit

Domain	Material Type	Recovered Grade (ct/t)	Premium Ruby (ct/t)	Ruby (ct/t)	Low Ruby (ct/t)	Corundum (ct/t)	Sapphire (ct/t)	Low Sapphire (ct/t)	<4.6 mm (ct/t)
Pit 1	Gravel Bed	37.97	0.03	2.18	3.21	3.80	21.61	-	7.16
Pit 2	Gravel Bed	13.87	0.20	1.10	1.12	0.75	7.60	-	3.10
Pit 3	Gravel Bed	15.18	1.33	4.44	0.54	0.63	1.47	2.70	4.06
Pit 5	Gravel Bed	37.54	0.23	0.79	0.54	0.81	4.29	25.94	4.95
Pit 7	Gravel Bed	273.3	0.21	0.42	3.54	12.59	12.97	235.4	8.14
Pit 8	Gravel Bed	12.21	0.18	3.99	0.32	1.62	0.43	1.93	3.74
Pit 9	Gravel Bed	8.68	0.54	1.79	0.08	0.08	0.07	0.34	5.77
Glass A Pit 1	Gravel Bed	6.65	0.26	1.20	0.29	0.35	2.74	1.13	0.68
Glass B Pit 1	Gravel Bed	13.14	0.06	0.09	0.57	1.92	0.75	8.83	0.93
MN Pit 3	Gravel Bed	265.1	0.08	13.28	26.02	36.68	97.76	36.91	54.36
MN Pit 5	Gravel Bed	8.91	0.25	1.09	0.07	0.46	0.06	0.40	6.59
MN East Pit 1	Gravel Bed	190.2	0.07	0.23	0.65	16.13	5.94	167.2	-
MN Pit3	Amp	97.9	0.003	3.7	6.5	4.8	50.7	-	32.2

Table 3-15: MRM: Application of factor to production grades per domain, to estimate in situ grades

Domain Name	Material Type	Total Grade from Production (ct/t)	Factor GB / Skin	In situ Total Grade
Mugloto	Gravel Bed	2.33	6.73	15.70
Mugloto West	Gravel Bed	40.61	6.73	273.3
Mugloto East	Gravel Bed	No Production Data Available	-	-
Mugloto South	Gravel Bed	No Production Data Available	-	-
Glass / Maninge Nice	Gravel Bed	2.22	4.36	9.67
Maninge Nice Pit 3	Gravel Bed	60.80	4.36	265.1
Maninge Nice Central	Gravel Bed	No Production Data Available	-	-
Glass East	Gravel Bed	No Production Data Available	-	-
Maninge Nice East	Gravel Bed	43.62	4.36	190.2
Maninge Nice North	Gravel Bed	No Production Data Available	-	-
Maninge Nice Amphibolite	Amphibolite	97.88	-	97.9

Table 3-16: MRM: Calculated In situ grades for each stone type per domain

Domain	Material Type	Recovered Grade (ct/t)	Premium Ruby (ct/t)	Ruby (ct/t)	Low Ruby (ct/t)	Corundum (ct/t)	Sapphire (ct/t)	Low Sapphire (ct/t)	<4.6 mm (ct/t)
Mugloto	Gravel Bed	15.70	1.22	4.15	0.55	0.65	1.71	3.30	4.14
Mugloto West	Gravel Bed	273.3	0.21	0.42	3.54	12.59	12.97	235.42	8.14
Mugloto East	Gravel Bed	-	-	-	-	-	-	-	-
Mugloto South	Gravel Bed	-	-	-	-	-	-	-	-
Glass / Maninge Nice	Gravel Bed	9.67	0.24	1.14	0.37	0.73	2.14	1.26	3.79
Maninge Nice Pit 3	Gravel Bed	265.1	0.079	13.28	26.02	36.68	97.76	36.91	54.36
Maninge Nice Central	Gravel Bed	-	-	-	-	-	-	-	-
Glass East	Gravel Bed	-	-	-	-	-	-	-	-
Maninge Nice East	Gravel Bed	190.2	0.069	0.23	0.65	16.13	5.94	167.16	0.00
Maninge Nice West	Gravel Bed	-	-	-	-	-	-	-	-

SRK notes that a number of bulk sampling pits have been excluded from

Table 3-15 and Table 3-16 and have not been used to inform the block model grade estimates, for various reasons as documented below:

- Ntorro: Small pit with only 59 t of gravel bed processed. Incomplete production records available.
- Mugloto Pit 1A: Incomplete production records available.
- Mugloto Pit 4: Only waste stripping completed. No gravel bed extracted.
- Mugoloto Pit 6: Gravel bed extracted but not processed.
- Mugloto Pit 10: Only waste stripping completed. No gravel bed extracted.
- Glass B Pit 2: Only waste stripping completed. No gravel bed extracted.

The total tonnage of gravel bed and associated dilution extracted from these pits is 38,280 t, which accounts for approximately 1% of the total gravel bed extraction from all pits to date. This is not considered to be material to the resulting Mineral Resource Estimate.

Grade Assignment

Overall, the grade produced from each production pit typically far exceeds the grade estimated from exploration data alone as described. This is considered to be a consequence of the small volume of exploration samples being insufficient to adequately fully represent the statistical distribution of grades. In reality, the distribution is skewed by small pockets of very high-grade material which are missed by exploration samples but which contribute to production statistics once large volumes have been mined.

The grades assigned to the Mineral Resource model are derived primarily from production grades. For those domains that have no production data, then production data from neighbouring domains has been used but factored pro rata with average exploration data grades in each domain.

Grades have been assigned to the gravel bed block model in each of the domains outlined in Section 3.2.4. For each domain the grade and stone quality breakdown from production records in that domain has been assigned to the gravel bed blocks based on the following criteria:

- Within 100 m of each production pit perimeter, the gravel bed blocks have been assigned the factored un-diluted grade of the corresponding pit, as detailed in Table 3-14.
- Where a gravel bed block is within 100 m of at least two production pits, the block has been assigned the factored un-diluted grade of the nearest production pit.
- For domains that include at least one production pit, blocks more than 100 m from a production pit have been assigned the average undiluted production grade of all pits inside the corresponding domain weighted by the head feed tonnage reported for each pit, as detailed in Table 3-16.
- For domains that do not include any production data, grade and stone quality breakdown has been assigned using the average grade and quality breakdown of the nearest domain with available production data. The production grade has been factored pro rata with the average modelled exploration grades in each domain. The factors applied and resulting grades are detailed in Table 3-17.

- For all domains, the waste blocks and gravel bed dilution skin blocks have been assigned a total grade of 0 ct/t.

Table 3-17: MRM: Total undiluted ruby grades by domain

Domain	Exploration Grade (a *)	Production Grade (b *)	Production Grade Source Domain (c *)	Exploration Grade Factor (d *)	Resultant MRE block grade (e *)
Mugloto	5.38	15.70	Mugloto	N/A	15.70
Mugloto West	14.08	273.3	Mugloto West	N/A	273.3
Mugloto East	2.03	-	Mugloto	0.4	6.28
Mugloto South	0.52	-	Mugloto	0.1	1.57
Glass / Maninge Nice	6.93	9.67	Glass / Maninge Nice	N/A	9.67
Maninge Nice Pit 3	4.68	265.1	Maninge Nice Pit 3	N/A	265.1
Maninge Nice Central	2.72	-	Glass / Maninge Nice	0.4	3.87
Glass East	0.21	-	Glass / Maninge Nice	0.05	0.48
Maninge Nice East	2.32	190.2	Maninge Nice East	N/A	190.2
Maninge Nice North	0.26	-	Glass / Maninge Nice	0.05	0.48

** Table 3-17 Column name descriptions:*

***a** - Mean modelled total grade from auger holes and exploration pits (ct/t).*

***b** - Average (head feed weighted) undiluted production grade of all production pits inside the domain (ct/t).*

***c** - Nearest domain with available production data.*

***d** - Ratio between the average ruby grades modelled from auger drilling and exploration pits (as described in Section 0) in this domain and the corresponding grade in the nearest domain with available production data (rounded to the nearest 0.05).*

***e** – Final total ruby grade (ct/t) applied to the gravel bed blocks (for blocks more than 100 m from a production pit).*

The grade assignment is detailed on a domain by domain basis below:

Mugloto Domain:

Within 100 m of each production pit, the gravel bed blocks have been assigned the factored un-diluted grade of the corresponding pit. Blocks more than 100 m from a production pit have been assigned the average (weighted by head feed tonnage) factored undiluted production grade of all pits inside the Mugloto domain.

Mugloto West Domain:

Grade and quality breakdown consistent throughout the domain and based on the factored un-diluted grade from production of Mugloto Pit 7.

Mugloto East Domain:

No production data available. Grade and stone quality breakdown assigned based on multiplying the average (weighted by head feed tonnage) undiluted production grade of all pits inside the Mugloto domain by a factor of 0.4. The factor is based on the average ruby grades modelled from auger drilling and exploration pits in the Mugloto East Domain (2.0 ct/t), divided by the corresponding grade in the Mugloto Domain (5.4 ct/t).

Mugloto South Domain:

No production data available. Grade and stone quality breakdown assigned based on multiplying the average (weighted by head feed tonnage) undiluted production grade of all pits inside the Mugloto domain by a factor of 0.1. The factor is based on the average ruby grades modelled from auger drilling and exploration pits in the Mugloto South Domain (0.5 ct/t), divided by the corresponding grade in the Mugloto Domain (5.4 ct/t).

Glass / Maninge Nice Domain:

Within 100 m of each production pit, the gravel bed blocks have been assigned the factored un-diluted grade of the corresponding pit. Blocks more than 100 m from a production pit have been assigned the average (weighted by head feed tonnage) factored undiluted production grade of all pits inside the Glass / Maninge Nice domain.

Maninge Nice Pit 3 Domain:

Grade and quality breakdown consistent throughout the domain and based on the factored un-diluted grade from production of the gravel bed in Maninge Nice Pit 3.

Maninge Nice Central Domain:

No production data available. Grade and stone quality breakdown assigned based on multiplying the average (weighted by head feed tonnage) undiluted production grade of all pits inside the Glass / Maninge Nice domain by a factor of 0.4. The factor is based on the average ruby grades modelled from auger drilling and exploration pits in the Maninge Nice East Domain (2.7 ct/t), divided by the corresponding grade in the Glass / Maninge Nice Domain (6.9 ct/t).

Glass East Domain:

No production data available. Grade and stone quality breakdown assigned based on multiplying the average (weighted by head feed tonnage) undiluted production grade of all pits inside the Glass / Maninge Nice domain by a factor of 0.05. The factor is based on the average ruby grades modelled from auger drilling and exploration pits in the Glass East Domain (0.2 ct/t), divided by the corresponding grade in the Glass / Maninge Nice Domain (6.9 ct/t).

Maninge Nice East Domain:

Grade and quality breakdown consistent throughout the domain and based on the factored un-diluted grade from production of the gravel bed in Maninge Nice East Pit 1.

Maninge Nice North Domain:

No production data available. Grade and stone quality breakdown assigned based on multiplying the average (weighted by head feed tonnage) undiluted production grade of all pits inside the Glass / Maninge Nice domain by a factor of 0.05. The factor is based on the average ruby grades modelled from auger drilling and exploration pits in the Maninge Nice North Domain (0.3 ct/t), divided by the corresponding grade in the Glass / Maninge Nice Domain (6.9 ct/t).

Maninge Nice Amphibolite Domain:

The grades and tonnages assigned to the Maninge Nice Pit 3 Amphibolite Domain relate to production completed to date. The grade and quality breakdown has been applied consistently throughout the domain, based on the average production grade from the amphibolite in Maninge Nice Pit 3.

The undiluted grades for each gravel block are shown in Table 3-18. The gravel bed blocks, coloured by total ruby grade and premium ruby grade, are displayed in Figure 3-23 and Figure 3-24, respectively.

Table 3-18: MRM: Final undiluted grades assigned to the gravel bed blocks for all estimation domains

Domain	Material Type	Total Grade (ct/t)	Premium Ruby (ct/t)	Ruby (ct/t)	Low Ruby (ct/t)	Corundum (ct/t)	Sapphire (ct/t)	Low Sapphire (ct/t)	<4.6mm (ct/t)
Mugloto	Gravel Bed	15.70	1.22	4.15	0.55	0.65	1.71	3.30	4.14
Mugloto West	Gravel Bed	273.3	0.21	0.42	3.54	12.59	12.97	235.4	8.14
Mugloto East	Gravel Bed	6.28	0.49	1.66	0.22	0.26	0.68	1.32	1.65
Mugloto South	Gravel Bed	1.57	0.12	0.41	0.05	0.07	0.17	0.33	0.41
Glass / Maninge Nice	Gravel Bed	9.67	0.24	1.14	0.37	0.73	2.14	1.26	3.79
Maninge Nice Pit 3	Gravel Bed	265.1	0.08	13.28	26.02	36.68	97.76	36.91	54.36
Maninge Nice Central	Gravel Bed	3.87	0.10	0.46	0.15	0.29	0.86	0.50	1.51
Glass East	Gravel Bed	0.48	0.01	0.06	0.02	0.04	0.11	0.06	0.19
Maninge Nice East	Gravel Bed	190.2	0.07	0.23	0.65	16.13	5.94	167.2	-
Maninge Nice North	Gravel Bed	0.48	0.01	0.06	0.02	0.04	0.11	0.06	0.19

Figure 3-23: MRM: Gravel Bed blocks coloured by assigned undiluted total ruby grades (ct/t). The extent of gravel bed extraction for all production pits with processed gravel bed are displayed as black outlines

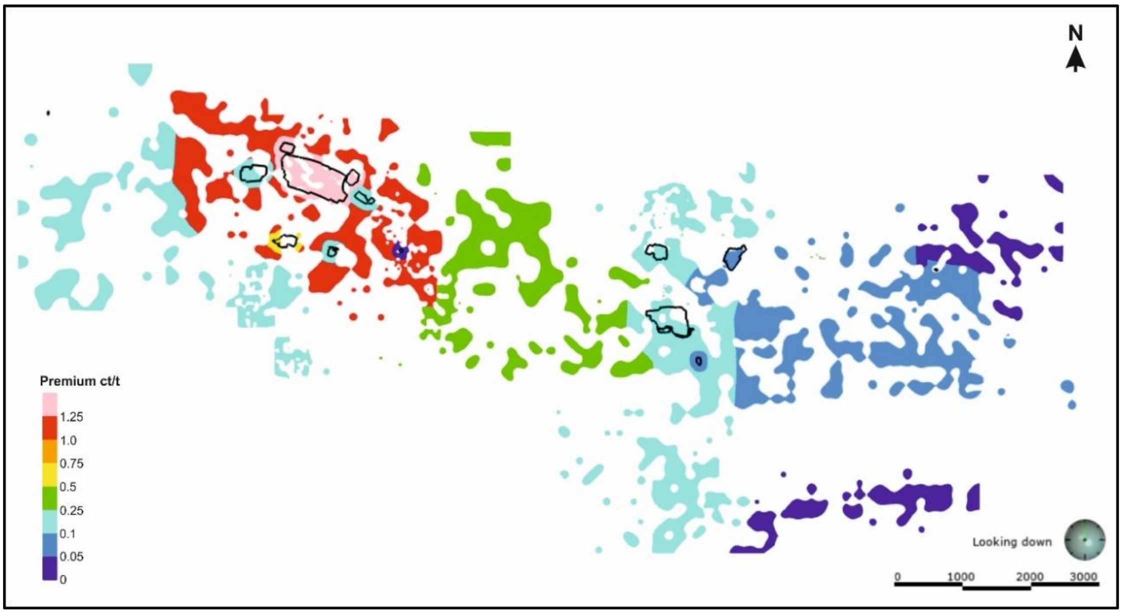


Figure 3-24: MRM: Gravel Bed blocks coloured by assigned undiluted premium ruby grades (ct/t). The extent of gravel bed extraction for all production pits with processed gravel bed are displayed as black outlines

Density and Tonnage Estimation

To generate a tonnage estimate, the average in situ density values, as derived from the core sampling, were applied. The density values applied by mineralisation type are shown in Table 3-19. Review of the available density data for the gravel bed material highlighted five samples which had abnormally high-density values reported and these were excluded from the dataset.

Table 3-19: MRM: In situ density data and modelled values

Material Type	Number Samples	Density Value (g/cm^3)
Gravel Bed	31	2.01
Amphibolite	108	2.53

Artisanal Mining Activities

The Concession Area has been subject to exploitation by artisanal miners in various areas, focussed on both the relatively easily accessible shallow secondary gravel bed mineralisation, as well as the underlying primary mineralisation. As MRM improved security at Maninge Nice in 2012, the focus of the artisanal activity shifted to the lower grade, higher quality secondary mineralisation in the central Mugloto area. MRM has since further increased security measures across the Concession Area to gain a degree of control over the artisanal mining activities and to prevent excessive additional removal of material from the deposit.

Through field mapping and interpretation of satellite imagery, MRM has mapped the broad areas affected by artisanal activity (Figure 4-8). These areas are typically sporadically dotted with small artisanal pits, on average approximately 1.3 m deep and 1.1 m wide. In order to ascertain the percentage of the total ruby / corundum mineralisation extracted by the artisanal workers within the broad outlines mapped by MRM, a detailed mapping programme of the artisanal excavations was completed by MRM staff in March 2015. This involved the selection of a number of representative areas within the artisanal outlines (Figure 3-25), across the Project area, and systematic tracing of these areas on foot in order to record the following information:

- Number of artisanal pits within the sample area.
- The average area (length*width) of each pit.
- The average depth of each pit.

This was completed over 7 sample areas, each covering an area of 10,000 m^2. The results, presented in Table 3-20, suggest that within the broad artisanal outlines mapped by MRM, approximately 2 to 6% ruby / corundum mineralisation has been removed by artisanal workers. In this region, artisanal mining is typically to the base of the gravel bed only, without lateral extensions under the surface. MRM monitors the artisanal mining activity in neighbouring areas, to ensure that the assumptions regarding depletion remain relevant. The average volume removed by artisanal mining activity was subtracted from the blocks within the areas mapped as being affected by mining.

Table 3-20: MRM: Artisanal pitting statistics within the artisanal outline sample areas

Area	Sample area (m^2)	Number of artisanal pits	Average pit area (m^2)	Average pit depth (m)	Total pitted area (m^2)	Pitted area (%)
A	10,000	279	1.43	6.5	399	4.0
B	10,000	308	1.56	4.0	480	4.8
C	10,000	373	1.56	3.5	582	5.8
D	10,000	341	1.56	3.5	532	5.3
E	10,000	271	0.90	6.0	244	2.4
F	10,000	278	1.54	3.0	428	4.3
G	10,000	312	1.54	3.0	480	4.8
Total / Average	70,000	2,162	1.44	4.2	3,146	4.5

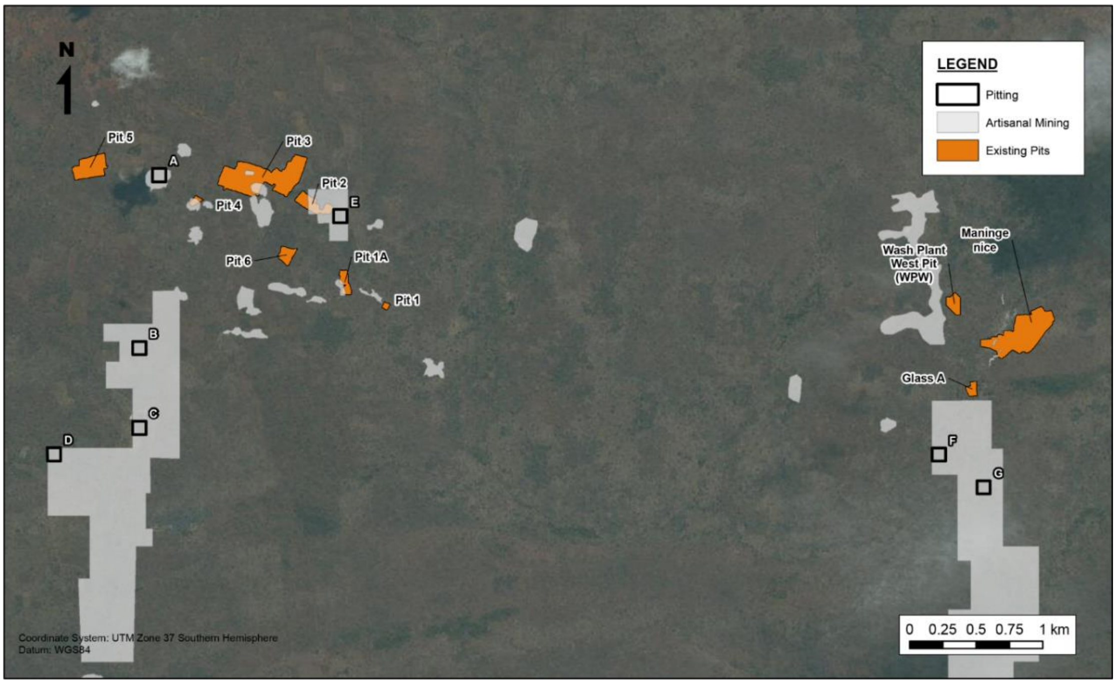


Figure 3-25: MRM: Plan view of the broad areas affected by artisanal excavation (in grey) in the area of the MRM bulk sampling operations (existing pits in orange): sample areas A-G are outlined in black

3.2.6 Mining Depletion

In order to reflect depletion of the mineralisation by production to date, the block model has been depleted for all gravel bed domains, based on pit surveys. The survey used reflects the effective date of the Mineral Resource of 1 July 2019. This was completed using the following approach:

- All gravel bed domains depleted based on the outline of extracted gravel bed in the pit surveys / maps, treated as a vertical wall to code the mining depletion into the gravel bed blocks (Figure 3-26.
- The Maninge Nice Pit 3 Amphibolite Domain was depleted to reflect mining up to 1 January 2018. As no mining has been completed in this area since then, the declared Mineral Resources for this domain have an effective date of 31 August 2018, consistent with the gravel bed domains.

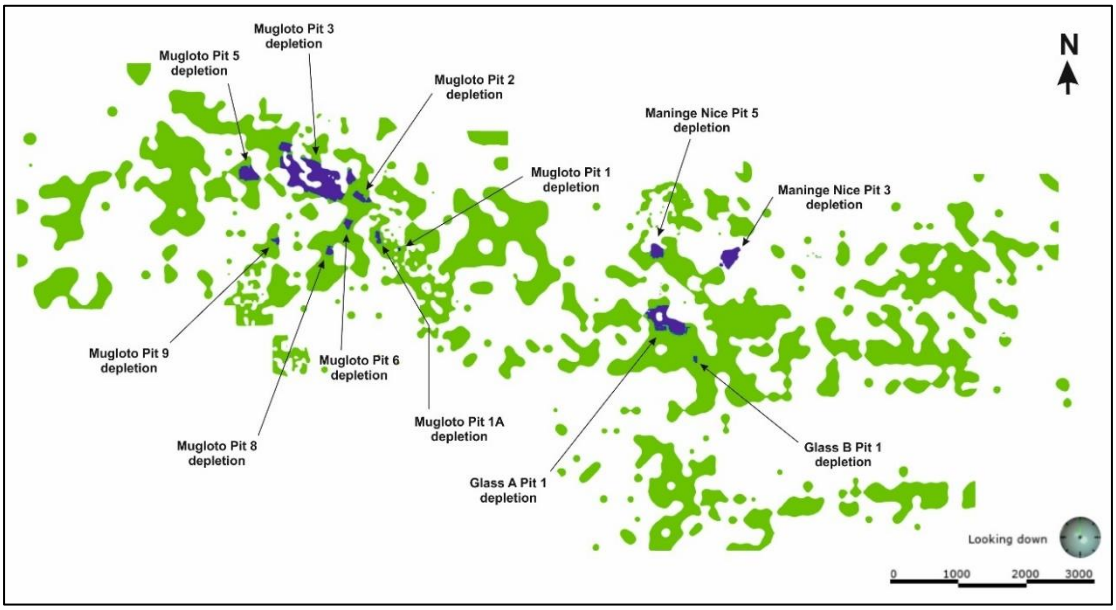


Figure 3-26: MRM: The gravel bed model coloured and labelled by mining depletion, with green areas being unmined, and blue, reflecting areas of depletion

3.2.7 Mineral Resource Classification

Introduction

SRK notes that the exploration and production activities completed by Gemfields since the commencement of the mine have improved the geological knowledge and understanding of the Montepuez deposit and the availability of historical production statistics supplemented with extensive exploration data has resulted in an improved understanding of overall grade distribution.

Evidence gathered from the detailed exploration, production, and geological modelling has provided a sufficient level of understanding and confidence in the geological and grade continuity to support the classification applied. This section describes the data analysis and considerations taken into account when deriving the classification of the Mineral Resources at MRM.

Classification strategy and assumptions

SRK has made a series of assumptions with the mineralising system at the Montepuez deposit. SRK has assumed that characteristics of the host lithology, whether primary amphibolite or secondary gravel bed remain constant to extents of the modelled unit with no changes in geology. Similarly, it is assumed that there is no changing in the mineralising system with depth. The host mineralisation was modelled using a combination of the regional scale interpretation, in-pit mapping, and available drill hole, auger, and exploration pit intersections.

Grade data is sourced from historical production data, either directly, or indirectly (where no production data is available in the vicinity) based on factoring production grades with data from auger drilling and exploration pitting. Grade estimates are therefore largely dependent on historical data for validation.

In order to develop a classification scheme for the Mineral Resources at Kagem, SRK has taken the following factors into account:

1. quantity and quality of the underlying data, the level of geological understanding for each type of mineralisation, and across the property as a whole;
2. confidence in the geological continuity of the host mineralisation;
3. confidence in the grades, as derived from the production and the understanding of the grade variation at a given production scale; and
4. the perceived level of risk associated with deviations from the assumptions made.

Classification guidelines

In order to classify the Mineral Resources at MRM, SRK has used the following approach:

Indicated Mineral Resources:

SRK has classified all gravel bed blocks inside of the Mugloto Domain, the Maninge Nice Pit 3 Domain and the Glass / Maninge Nice Domain (north of 8551200) as Indicated Mineral Resources.

All three domains are intersected by auger drilling and exploration pitting of a sufficient spacing to derive the outline of the gravel bed to an appropriate level of confidence for long term planning. Specifically:

- the Mugloto Domain is tested by auger drilling on a regular grid of 140 m, with small clusters of drilling at a tight spacing of approximately 35 m, whilst exploration pitting completed in the Mugloto Domain has been completed at a spacing of 50 m;
- in the Glass / Maninge Nice Domain, auger drilling is completed on a 140 m grid, with additional clusters of exploration pitting on an approximate 100 m grid; and
- the Maninge Nice Pit 3 Domain has not been subject to any auger drilling, however exploration pitting has been completed in this domain at a spacing of between 100 m and 200 m and addition domain has been subject to considerable production.

For all three domains, the drilling and exploration pitting to date has allowed for the construction of a gravel bed wireframe, which indicates reasonable consistency in the thickness and presence of gravel bed between holes / pits. The results of the close spaced auger drilling and exploration pitting completed in the Mugloto Domain indicate that gravel bed is continuous over sufficient distances for the wider spaced drilling completed across the domains to be appropriate to define the continuity of the gravel bed to a sufficient level of confidence for the classification of Indicated Mineral Resources.

By domaining the gravel bed model as described in Section 3.2.4, the modelled unit has been divided into zones each with relatively homogeneous grade and geological characteristics. This results in greater confidence in the grades assigned to the areas classified as Indicated Mineral Resources by avoiding extrapolation of grade across geologically distinct areas. Specifically, the Mugloto and Glass / Maninge Nice domains are defined by internally consistent modelled grade profiles and each border a single major paleo drainage channel. Although not used directly to inform the block model ruby grades, the modelled ruby grades from auger drilling and exploration pitting add weight to the definition of distinct domains.

All three domains, which have been classified as Indicated Mineral Resources, have been the focus of significant production. Complete grade recovery data is available for six production pits in the Mugloto Domain and three production pits in the Glass / Maninge Nice Domain. Grade recovery data is only available for one production pit in the Maninge Nice Pit 3 Domain; however, the production to date from this pit represent a relatively large proportion of the total domain. For these domains, the total tonnage of material extracted and processed is considered to be appropriate to derive a representative grade for the remainder of the domain. This supports an estimate of the overall domain grades to a sufficient level of confidence to support classification of Indicated Mineral Resources. The tonnage of mineralised material extracted and processed from each Indicated domain is compared to the model tonnage in Table 3-21.

Table 3-21: MRM: The proportion of mineralisation extracted and processed in the gravel bed domains, classified as Indicated Mineral Resources

Domain	Number of Pits (a *)	Mined Tonnage (b *)	Processed Tonnage (c *)	Remaining Resource (d *)	Proportion Extracted (e *)	Proportion Processed (f *)
Mugloto Domain	6	2,544,261 t	2,369,285 t	12,066,355 t	17%	16%
Glass / Maninge Nice Domain (north of 8551200)	3	724,541 t	87,855 t	6,314,435 t	10%	1%
Maninge Nice Pit 3 Secondary Domain	1	382,777 t	403,668 t	469,737 t	45%	47%

** Table 3-21 column name descriptions:*

***a** Number of Production Pits.*

***b** Mineralised material tonnage (including dilution) extracted from production pits.*

***c** Processed mineralised material tonnage including dilution.*

***d** Remaining Indicated mineralised material including dilution skin (according to the model presented herein).*

***e** Proportion of mineralised material extracted from the Indicated Domains.*

***f** Proportion of mineralised material processed from the Indicated Domains.*

For the primary amphibolite material, the classification of Indicated Mineral Resources is supported by relatively close spaced drilling, production data, and in-pit mapping. These aspects, in conjunction with the understanding and confidence in the geological and grade continuity, are sufficient to support the classification of Indicated Mineral Resources, as applied. Areas which are less well supported by drilling, are classified as Inferred Mineral Resources.

Inferred Mineral Resources:

SRK has classified all gravel bed blocks in the Mugloto West, Mugloto South, Mugloto East, Glass / Maninge Nice (south of 8551200), Maninge Nice Central, Glass East, Maninge Nice East, and Maninge Nice North domains as Inferred. These domains are characterised by a similar drillhole spacing to the Indicated domains, and confidence in the distribution of the modelled gravel bed is comparable. Specifically, the Maninge Nice Central, Maninge Nice East, Maninge Nice North, Glass East, and Glass / Maninge Nice (south of 8551200) domains and the southern portion of the Mugloto East Domain are tested by auger drilling on an approximate 140 m grid. The Mugloto West Domain and the northern portion of the Mugloto East Domain are drilled on approximate 200 m grids. The Mugloto South Domain is primarily modelled on the basis of exploration pitting completed on a close spaced grid of 50 m.

The primary basis for the Inferred classification of these domains is the presence of exploration data and lack of associated production data to derive the assigned grades. The grades of the Mugloto Pit 7 Domain and the Maninge Nice East Domain are based on a relatively small volume of production from a single pit in each domain, whilst the grade of southern portion of the Glass / Maninge Nice Domain is based on production data from the northern portion of this domain (no production data are available for the southern portion of the Glass / Maninge Nice Domain). The grade of all other Inferred gravel bed domains has been assigned based on factoring on the average grade and quality breakdown of the nearest domain with available production data, with the factor being based on the ratio between the average ruby grades modelled from auger drilling and exploration pits in the domain with production data and the domain without production data. Although the auger drilling and exploration pitting ruby grades are generally significantly lower than the corresponding production pit grades, in general, the production pits characterised by high total ruby grades correlate with increased interpolated ruby grades, and vice versa. It is therefore considered that this approach is suitable to assign grades to these domains at an Inferred confidence level.

3.2.8 Mineral Resource Statements

The Mineral Resource Statement for the Montepuez deposit is given Table 3-22 and Table 3-24. For reference, the Secondary Mineralisation Mineral Resources (excluding stockpiles), broken down by domain are provided in Table 3-23**.** The Competent Person with overall responsibility for reporting of the Mineral Resource is Dr Lucy Roberts, MAusIMM(CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. SRK considers that the Mineral Resource Statements are reported in accordance with the JORC Code.

The Mineral Resource classification applied to the deposit is illustrated in Figure 3-27, where the Indicated Mineral Resources are coloured red, and the Inferred Mineral Resources are coloured green.

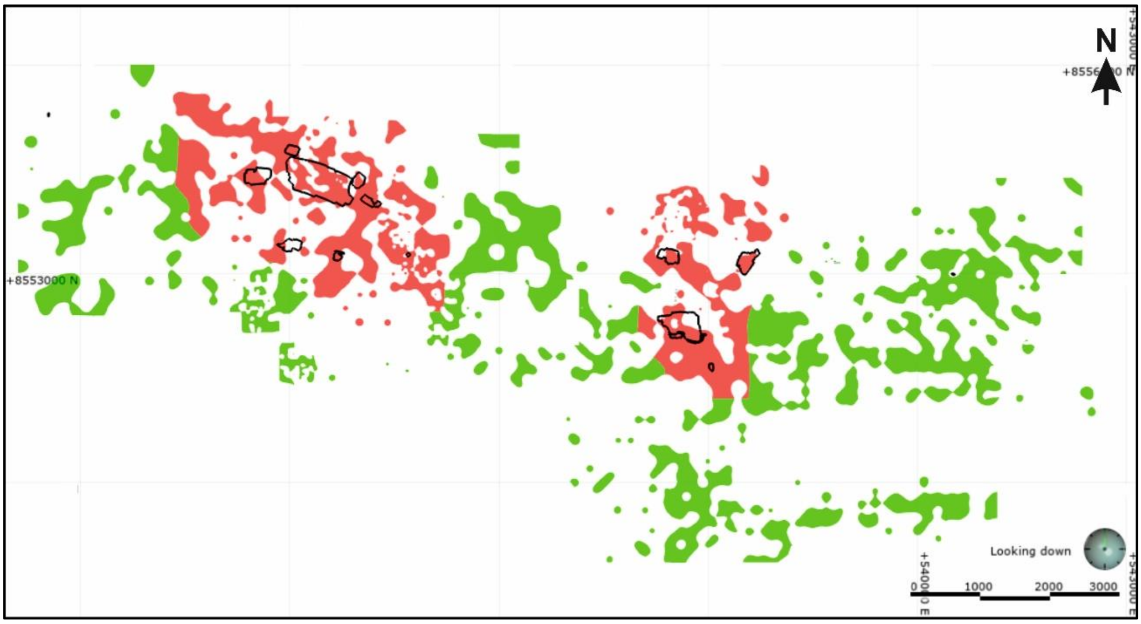


Figure 3-27: MRM: The block model coloured by classification with red = Indicated Mineral Resources and green = Inferred Mineral Resources. The extent of gravel bed extraction for all production pits with processed gravel bed are displayed as black outlines

Table 3-22: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Secondary Mineralisation

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Secondary	Indicated	2.01	18,900	0.14	0.6	3.1	3.8	72
	Inferred	2.01	39,800	0.03	0.1	11.1	11.3	449
Stockpiles - Secondary	Indicated	1.40	797	0.05	0.2	4.4	4.6	4
Total - Secondary	Indicated + Inferred	2.00	59,497	0.07	0.3	8.5	8.8	524

Table 3-23: MRM: Secondary Mineralisation Mineral Resources (excluding stockpiles) for the Montepuez ruby and corundum deposit, broken down by estimation domain

Mineralisation Domain	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Mugloto	Indicated	2.01	12,100	0.19	0.7	1.8	2.7	33
	Inferred	-	-	-	-	-	-	-
Mugloto West	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	6,300	0.03	0.1	41.8	41.9	264
Mugloto East	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	9,900	0.05	0.2	0.5	0.7	7
Mugloto South	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	2,200	0.02	0.1	0.1	0.2	0.5
Glass / Maninge Nice	Indicated	2.01	6,300	0.05	0.3	2.0	2.3	15
	Inferred	2.01	4,900	0.03	0.2	1.1	1.3	7
Maninge Nice Pit 3	Indicated	2.01	500	0.02	2.6	50.0	52.6	25
	Inferred	-	-	-	-	-	-	-
Maninge Nice Central	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	7,200	0.03	0.1	1.0	1.2	9
Glass East	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	3,200	0.002	0.01	0.1	0.1	0.25
Maninge Nice East	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	3,400	0.02	0.1	48.0	48.1	161
Maninge Nice North	Indicated	-	-	-	-	-	-	-
	Inferred	2.01	2,800	0.003	0.01	0.1	0.1	0.35

Table 3-24: MRM: Mineral Resource Statement, as at 01 July 2019, for the Montepuez ruby and corundum deposit – Primary Mineralisation

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (ct, 000)
Primary	Indicated	2.53	1,100	0.003	3.7	94.2	97.9	108
	Inferred	2.53	240	0.003	3.7	94.2	97.9	24
Stockpiles – Primary	Indicated	1.40	43	0.01	2.4	45.3	47.7	2
Total Primary	Indicated + Inferred	2.49	1,383	0.00	3.7	92.7	96.3	133

In presenting this Mineral Resource, the following apply:

- Mineral Resources for the gravel bed are reported inclusive of dilution to reflect the anticipated mining method, which has a minimum mining with of 1.5 m, or a total of 0.6 m of dilution where the gravel bed is greater than 0.9 m thick.
- Mineral Resources for Maninge Nice Pit 3 Primary amphibolite are reported as undiluted.
- The block model has been depleted to the relevant pit surveys, to match the effective date of the Mineral Resource of 1 July 2019.

- The average value of the ruby and corundum, as reported in the Mineral Resource Statement is USD17.68 /ct. SRK notes that the price assumptions used are conservative when compared to the prices received from the auction process to date. The assumed prices for the different products, as provided by Gemfields, are as follows:
  - Premium Ruby: USD975.56 /ct;
  - Ruby: USD37.93 /ct.
- Other (low ruby, -4.6 mm, corundum, sapphire): USD 0.75 /ct. Premium ruby and normal ruby are presented individually whilst other classes are combined; these comprise low ruby, corundum, sapphire, low sapphire, and -4.6 mm mixed ruby / corundum combined ("LR+CO+SP+LS+4.6"). A total grade for all classes is also presented for clarity.
- Mineral Resources are quoted with a bottom cut-off size of 1.6 mm, which is consistent with what can be recovered in the plant, and processed in the sort house.
- Mineral Resources are quoted on a 100% attributable basis (see Section 4).
- All figures are rounded to reflect the relative accuracy of the estimate. Where minor errors in summation occur, these are not considered to be material.
- Mineral Resources are reported inclusive of Ore Reserves.

For reference, the Secondary Mineralisation Mineral Resources (excluding stockpiles), broken down by domain are provided in Table 3-23**.** Note that all of the Primary Mineralisation is a single domain.

3.2.9 Comparison to Previous Estimates

The previous Mineral Resource estimate for the MRM Mine was declared as of 31 August 2018. At that time, no Exploration Targets were specifically declared. The Mineral Resource Statement, as of 31 August 2018 is given in Table 3-25 and Table 3-26.

Table 3-25: MRM: Mineral Resource Statement, as at 31 August 2018, for the Montepuez ruby and corundum deposit – Secondary Mineralisation

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Secondary	Indicated	2.01	19,500	0.2	0.7	3.1	4.0	79
	Inferred	2.01	39,800	0.03	0.1	7.1	7.3	290
Stockpiles - Secondary	Indicated	1.40	935	0.2	0.9	6.2	7.3	7
Total - Secondary	Indicated + Inferred	2.00	60,235	0.09	0.3	5.8	6.2	376

Table 3-26: MRM: Mineral Resource Statement, as at 31 August 2018, for the Montepuez ruby and corundum deposit – Primary Mineralisation

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Primary	Indicated	2.53	1,100	0.003	3.7	94.2	97.9	108
	Inferred	2.53	240	0.003	3.7	94.2	97.9	24
Stockpiles – Primary	Indicated	1.40	47	0.003	3.7	94.2	97.9	5
Total Primary	Indicated + Inferred	2.49	1,387	0.003	3.7	94.2	97.9	136

Compared to the August 2018 Mineral Resource Statement, the updated secondary Mineral

Resource, effective as of 01 July 2019, represents a change in tonnage and grade of the Indicated and Inferred Mineral Resources as outlined below:

- 600 kt reduction in material classified as Indicated, relating to mining depletion;
- 25% reduction in premium stone grade in material classified as Indicated;
  - 6% reduction in total grade in material classified as Indicated;
  - no change in tonnage for the material classified as Inferred;
  - no material change in premium stone grade in the material classified as Inferred; and
  - 55% increase in total grade in the material classified as Inferred.

The reduction in premium stone grade in the Indicated blocks is primarily a function of a reduction in the overall premium grade recovered from each of the pits in the Mugloto domain from which secondary mineralisation has been extracted / processed since the August 2018 Mineral Resource, namely Pit 3, Pit 5, Pit 8, and Pit 9.

Most notably, the premium grade of Mugloto Pit 3 in the production data up to June 2019 is 2.0 ct/t (corresponding to a total processing head feed of 2.1 Mt for this pit), down from a premium grade of 2.7 ct/t for the Mugloto Pit 3 production data used to inform the previous Resource (corresponding to a total processing head feed of 1.1 Mt for this pit). In assigning grade values to the block model, in the Mugloto domain, blocks more than 100 m from a production pit have been assigned the average production grade of all pits inside the Mugloto domain, weighted by head feed tonnage. Since Mugloto Pit 3 accounts for the majority of processed gravel bed in the Mugloto domain, this pit has a correspondingly large weighting in the derivation of grade values for the Mugloto domain, and thus the reduction in premium stone grade in the production from this pit is broadly reflected in the wider Indicated Mugloto block grades.

Aside from the Mugloto domain, other domains classified as Indicated are Maninge Nice Pit 3 Domain and the northern portion of Glass / Maninge Nice Domain. At Maninge Nice Pit 3, the overall premium grade of the processed secondary mineralisation has increased from 0.014 ct/t in the production data used to inform the previous Mineral Resource, to 0.018 ct/t in the production data up to June 2019. This is reflected in an increase in the premium grade of the Maninge Nice Pit 3 Domain block model; however, in comparison to the other Indicated domains, the premium grade of this domain is comparatively very low and the associated tonnage is also low, which means that the impact of this increase in premium grade in this domain on the total premium grade of all Indicated blocks is minimal.

In the Glass / Maninge Nice Domain, the only pit for which secondary mineralisation has been processed since the previous estimation is Maninge Nice Pit 5. In this pit, the overall premium grade has marginally increased from 0.055 ct/t to 0.057 ct/t since the previous MRE. This has resulted in a marginal increase in the premium stone grade for the Glass / Maninge Nice Domain; however, the impact on the total Indicated block premium grade is negligible, with the reduction in premium grade at Mugloto having the most significant impact.

The change in total grade across pits in Indicated domains from which secondary mineralisation has been extracted / processed since the August 2018 Mineral Resource is quite variable. For example, the total grade in the production data for Mugloto Pit 5 up to Jun 2019 is 5.6 ct/t, which is down almost 50% from a total grade of 10.3 ct/t for the Mugloto Pit 5 production data used to inform the previous Resource. Conversely, the total grade in the production data for Mugloto Pit 9 has increased by almost 80% between the June 2019 production data and the production data used to inform the previous Resource, from 0.7 ct/t to 1.3 ct/t. It should be noted that the total head feed associated with Mugloto Pit 5 and Mugloto Pit 9 is quite small, at 78,000 t and 85,000 t, respectively. Overall, the impact of the variable changes in total production grade from the pits inside of the Indicated domain, is a marginal decrease in the average total grade of the Indicated blocks. This is most heavily influenced by the production grades for Mugloto Pit 3 and Maninge Nice Secondary Pit 3, which are the two largest production pits by processed head feed tonnage, and both of which have marginally reduced total grades in the production data for all production up to June 2019, compared to the production data used to inform the previous estimate (namely, a 5% reduction in total grade at Mugloto Pit 3 and a 4% reduction in total grade at Maninge Nice Secondary Pit 3).

Other than the Mugloto West Domain and the Maninge Nice East Domain, the majority of Inferred domains to not include any production pits. The block grades assigned to these domains are based on a factor of the production grades from nearby Indicated domains, depending on the difference in the modelled ruby grades from exploration drilling in each domain. For these domains, the total grade has changed marginally, based on proportional to the change in total grade for the Indicated domains. The only production pit in the Mugloto West Domain is Mugloto Pit 7, which has not been the focus of any further mining or processing since the previous Resource Estimate, and thus the grade of this domain remains unchanged. Maninge Nice East Domain is a new estimation domain, centred around a new production pit Maninge Nice East Pit 1. At this stage, production from this pit has been minimal; however, the total grade recovered up to June 2019 is very high, at 43.6 ct/t. To constrain the impact of the high grade associated with this pit on the overall Inferred resource, the extent of this domain has been restricted to catchments that feed into the major paleo drainage channel downstream of the in situ amphibolite that underlies Maninge Nice East Pit 1. That said, the significant increase in total grade of the Inferred resource, relative to the previous estimate, can largely be attributed to the results of the Maninge Nice East Pit, used to inform the Maninge Nice East Pit Domain.

Since the completion of the 2018 Mineral Resource estimate, no production has been undertaken from primary sources, and there has been no change to the underlying geological model of the primary mineralisation. For this reason, the primary Mineral Resource remains unchanged.

3.2.10 Conclusions

SRK makes the following conclusions:

- The drilling, sampling, logging, bulk sampling and other data gathering methods used by MRM are appropriate and have yielded suitable data for use in the subsequent geological and grade modelling.
- Adequate work has been undertaken at the Project to report both an Indicated Mineral Resource and an Inferred Mineral Resource in accordance with the JORC Code.

- The variability of grade across the deposit needs further investigation and analysis as mining progresses to improve confidence in mine planning.
- Additional work is required to improve the understanding of both the bedrock and paleo-channel geology, these aspects have a direct control on the distribution if the ruby and corundum mineralisation, and so require a more detailed level of understanding.
- The data gathered during bulk sampling and production are considered adequate at present. Further information should, however, be collected to improve the understanding of the bed rock geology and ruby / corundum grades, to improve the confidence of future mining plans.

3.2.11 Recommendations

Based on the work carried out to date, SRK recommends the following to provide data that will assist in improving geological understanding and confidence in any future MRE updates:

- Fully reconcile the geological model against production data from the mining activities and gemstone sales to refine the modelling approach and optimise the sample spacing for defining the gravel bed. This should also include undertaking further analysis to characterise the size and quality of stones recovered in the different production areas. This would help to improve the understanding of the source of the secondary mineralisation in particular.
- Structurally orientate any future diamond drillholes, to allow for the capture of key down hole structural data to provide a more robust basis for the interpretation of the subsurface bedrock geometry.
- Once sufficient oriented diamond drilling has been completed, commission a regional and local structural geology review of the Montepuez deposit, with particular focus on determining the structural controls on the amphibolite primary mineralisation domain.
- Use in-pit mapping, drilling, or sampling data, in conjunction with a thorough review of the regional and deposit scale geology of the deposit to derive an understanding of the paleochannel system. This will increase geological understanding and confidence in the secondary mineralisation, the gravel bed morphology, and the ruby grade/quality distribution.
- Complete downhole surveying of any new, inclined drillholes.
- Streamline the geological logging system for both diamond and auger drilling to ensure that the most relevant data is captured in a consistent and user-friendly format, including the recommendations given below:
  - Auger drilling: expand on the current logging sheet to include the capture of data relating to the gravel bed clast size, shape, sphericity, material type, etc. This may assist in determining any correlation between ruby grade/quality, gravel bed material characteristics and paleochannel location.
  - Diamond drilling: make some minor amendments to the logging system currently in place, including the capture of weathering and alteration data in two separate columns, recording of contact type information, introduction of a “lith 2” column, etc.
  - Record more detailed geotechnical information, preferably in a separate spreadsheet to the geological log.

- Develop standardised project-specific set of logging codes and a fixed data input system that only allows the input of the agreed upon codes into the logging database.
- Avoid systematic capture of data in the log sheet comments column.

- Ensure topographic and pit surveying is maintained in a consistent coordinate system, with errors identified being rectified as soon as possible.
- Continue to systematically record density from all new and pre-existing drill core. Ideally, a bulk density reading should be taken in every 4-5 m of competent core.
- Extend in situ and bulk density data gathering exercises to all lithologies encountered during mining and increase frequency of sample taking. This will improve confidence in the density values used for tonnage estimation, and also identify and variation in the density across the deposit.
- Complete detailed aerial photography of the prospect in order to improve on the accuracy of the artisanal working outlines.
- Systematically record information from the bulk sampling locations, including gravel bed thicknesses, morphology, basement morphology, sedimentary features or other geological information which would provide additional understanding of the depositional environment.
- Maintain auger spacing in any further areas to be delineated. The auger drilling is a quick and relatively inexpensive way of gathering data, and so should be used extensively throughout the licence area.
- MRM should have a sufficiently high level of understanding of the grade and quality distribution of the rubies in both the primary and secondary mineralisation to further characterise the variability across the deposit. This can be completed through additional bulk sampling activities in different parts of the deposit, through developing the understanding of the geology, and though the systematic recording of appropriate data. All of these aspects can be completed during the mining of the deposit, as part of the day to day production activities.

3.3 Open Pit Mining

3.3.1 Introduction

This section includes all mining engineering related aspects for MRM and describes the engineering methodology applied in determining a forward looking mine plan as a basis for determining the viability of the operation. The previous LoMp for MRM was completed in 2018. This has been updated in 2019 by SRK to reflect the depletion of material mined in the past year and updates to the block model. Forecast cost estimations made use of actual production and costing data received from MRM and is associated with typical accuracy levels for an operational mine.

3.3.2 Historical Mining Operating Statistics

Historical mine production statistics for the different operating areas is shown in Table 3-27. It can be seen that total tonnes mined increased from the 0.9 Mtpa “trial mining” in 2013 to a peak mine production of 4.8 Mt in 2017. An historical overall stripping ratio of 4.6 has been achieved (t:t) since inception. Table 3-27 includes the detail of each of the different pit areas ore and waste mined over time. A map with an overview of the different pit areas, Figure 3-28, is shown in section 3.3.

The historical wash grade statistics is shown in Table 3-28, summarising the overall historical carats achieved per annum. Despite an increase in ore mined from 2016 to 2017, a decrease in total carats is seen, which stems from a drive to focus efforts on areas delivering higher quality carats instead of quantity to improve early profitability of the operation.

Table 3-27: MRM: Historical Mining Statistics

Pit	Statistic	Metric	2012	2013	2014	2015	2016	2017	2018	H1 2019	Total
Mugloto Secondary GB	Waste	kt	-	26	1,305	2,364	1,754	2,806	2,502	1,652	12,410
	Ore	kt	-	21	295	361	353	569	581	367	2,547
	Total Excavation	kt	-	48	1,600	2,725	2,107	3,375	3,084	2,018	14,957
	Overall SR	:	-	1.2	4.4	6.6	5.0	4.9	4.3	4.5	4.9
	Head Feed	kt	-	18	99	175	258	707	744	371	2,372
	Recovery	kct	-	2	243	485	1,261	1,345	823	342	4,500
	Grade	ct/t	-	0.11	2.45	2.77	4.88	1.90	1.11	0.92	1.90
Maninge Nice Primary Amphibolite	Waste	kt	-	-	-	-	-	-	-	-	-
	Ore	kt	1	92	22	5	32	-	-	-	153
	Total Excavation	kt	1	92	22	5	32	-	-	-	153
	Overall SR	:	-	-	-	-	-	-	-	-	-
	Head Feed	kt	-	12	12	53	32	0	-	-	109
	Recovery	kct	0	1,983	517	2,118	6,092	3	-	-	10,713
	Grade	ct/t	-	158.78	43.96	39.79	193.32	5.93	-	-	97.88
Maninge Nice SecondaryGB	Waste	kt	19.21	274	729	382	130	500	748	590	3,372
	Ore	kt	10	119	99	36	14	66	146	38	528
	Total Excavation	kt	29	393	828	418	144	566	894	628	3,900
	Overall SR	:	1.9	2.3	7.4	10.5	9.2	7.6	5.1	15.5	6.4
	Head Feed	kt	0	41	144	38	38	88	56	37	441
	Recovery	kct	157	3,943	6,872	1,557	6,260	4,187	1,505	167	24,647
	Grade	ct/t	1,382.01	97.32	47.88	41.22	163.87	47.71	-	4.45	55.87
Glass Secondary GB	Waste	kt	-	17	-	395	892	490	23	46	1,862
	Ore	kt	-	15	-	67	215	234	21	30	582
	Total Excavation	kt	-	32	-	461	1,107	724	44	77	2,445
	Overall SR	:	-	1.1	-	5.9	4.2	2.1	1.1	1.5	3.2
	Head Feed	kt	-	2	-	30	14	5	-	-	50
	Recovery	kct	-	36	-	23	43	16	-	-	118
	Grade	ct/t	-	20.60	-	0.79	3.11	3.01	-	-	2.35
Other Material Handling, Roadworks, Slimes etc	Waste	kt	-	20	94	79	174	160	601	147	1,275
	Ore	kt	-	-	-	-	-	-	-	-	-
	Total Excavation	kt	-	20	94	79	174	160	601	147	1,275
Total (does not include roadworks and slimes handling)	Waste	kt	19.21	316	2,034	3,141	2,776	3,797	3,273	2,288	17,644
	Ore	kt	12	248	416	469	614	869	748	435	3,810
	Total Excavation	kt	31	564	2,450	3,610	3,390	4,665	4,021	2,723	21,454
	Overall SR	:	1.7	1.3	4.9	6.7	4.5	4.4	4.4	5.3	4.6
	Head Feed	kt	0	73	254	296	342	801	799	409	2,973
	Recovery	kct	157	5,964	7,632	4,183	13,656	5,550	2,328	508	39,978
	Grade	ct/t	1,385.38	82.18	30.01	14.15	39.93	6.93	2.91	1.24	13.45

1 – "Other" includes – Material Handled for Haul Road Maintenance.

Table 3-28: MRM: Historical Washed Grade and Quality Statistics for all pits

Quality	UOM	2012	2013	2014	2015	2016	2017	2018	H1 2019	Total
Head Feed	T	134	72,571	260,148	298,589	342,675	801,786	799,354	408,756	2,984,014
Premium	*ct*	43	547	46,980	62,432	83,065	122,351	92,178	34,467	442,063
Ruby	*ct*	88,371	567,216	533,256	415,645	654,539	500,301	408,542	248,330	3,416,198
Low Ruby	*ct*	69,849	984,784	799,077	340,422	1,112,113	405,026	399,617	236,897	4,347,784
Corundum	*ct*	101,434	1,250,723	966,464	569,760	1,611,409	720,058	316,162	134,795	5,670,802
Sapphire	*ct*		2,535,055	4,449,784	2,278,042	4,967,280	707,962	337,523	168,638	15,444,283
Low Sapphire	*ct*					1,484,541	2,508,128	1,318,186	314,926	5,625,781
-4.6mm	*ct*		1,271,677	856,217	534,571	3,815,684	1,097,909			7,576,057
Mixed Grades	*ct*	31,639	105,294	11,283	6,250					154,466
Fines & Dust	*ct*		2,948							2,948
Total Recovery	ct	291,334	6,718,244	7,663,059	4,207,121	13,728,631	6,061,733	2,872,208	1,138,053	42,680,382
Grade	ct/t	2,172.19	92.57	29.46	14.09	40.06	7.56	3.59	2.78	14.30

3.3.3 Mine Design and Method

The MRM mining operation broadly refers to three main operating mining areas, or blocks, namely:

1. Maninge Nice;
2. Mugloto; and
3. Glass.

The Maninge Nice blocks (Main and East) areas contain primary amphibolites and secondary gravel bed mineralisation, whereas the Mugloto and Glass areas only contains Secondary gravel bed mineralisation. The site layout of the main operating areas is shown in Figure 3-28.

The mining method comprises conventional open-pit operations: excavate, load and haul to in-pit backfill, waste rock stockpile locations, and stockpiles at the wash plant facility. Mining takes place in two 8 hour shifts and all equipment is owned and operated by the mine.

The operation is ‘free dig’ for the gravel bed ore and the weathered zone within the amphibolites. Based on the logging of the primary mineralisation, the weathered zones were found to extend to a depth of 40 m. This assumes that no drilling and blasting will be required for the primary mineralisation either.

The Maninge Nice and Mugloto mining areas are segregated into sub-areas based on the secondary mineralisation extents derived from the auger drilling and exploration trial pitting.

Mining in Mugloto and Maninge Nice varies in depth between 5 m and 8 m (overburden and ore). Waste mining is undertaken in 2.5 m flitches. The flitch heights are reduced as the excavation approaches the gravel bed horizon as directed by on-site geologists. Small equipment sizes allow for highly selective mining, as shown in Figure 3-29.

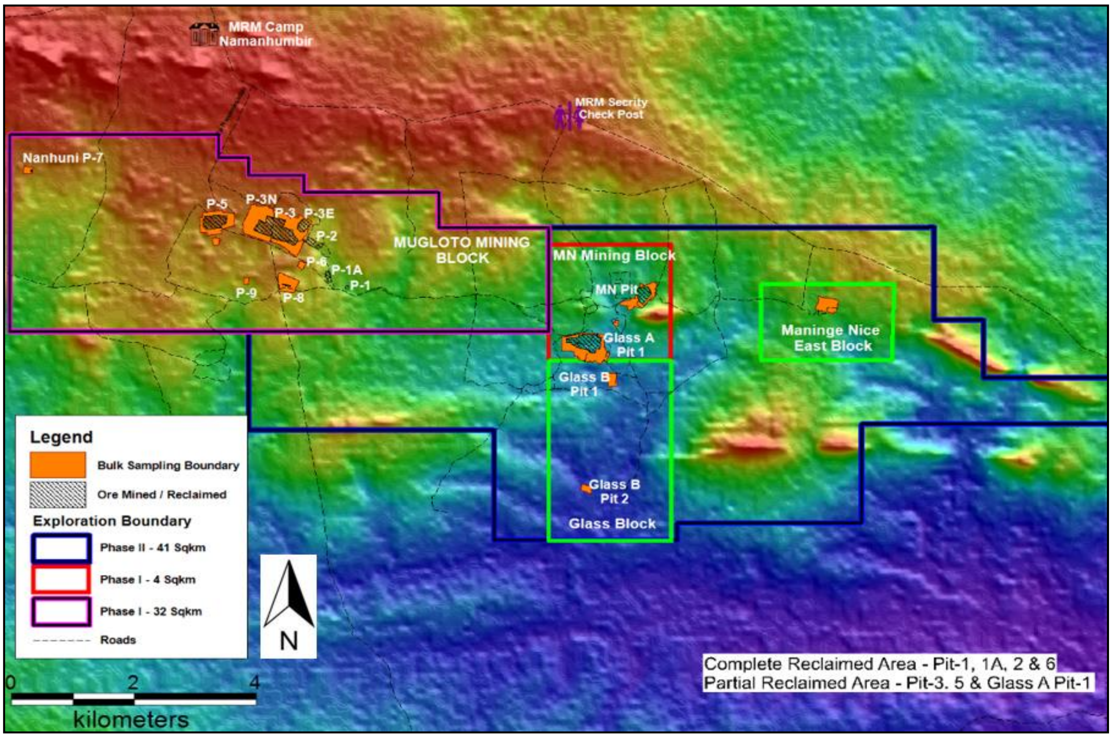


Figure 3-28: MRM: Mining Areas

Figure 3-29: MRM: Selective Mining at MRM under Geology supervision

Waste stripping volumes for the primary mineralisation at Maninge Nice are based on a preliminary pit shell; however, it is noted that the dip of the mineralisation is shallow enough to allow access into the pit along the footwall. The ultimate pit depth in relation to the primary ore in Maninge Nice Primary is approximately 40 m.

Dilution calculation

To calculate dilution, a three dimensional "dilution skin" has been modelled around the gravel bed or secondary mineralisation. The methodology assumes that due to equipment size and potential variation in the geology, additional waste material will be mined along with the gravel bed. The dilution skin was constructed according to the following rules.

For areas of gravel bed <0.9 m thick:

- the gravel bed skin was manipulated to ensure a 1.5 m thickness;
- to achieve this, the total thickness of the gravel bed at any point was subtracted from 1.5 and half of this value added to the elevation of the hangingwall and subtracted from the elevation of the footwall, respectively;

- if the gravel bed skin hangingwall extended above the topography, then the elevation at this point was re-set to the elevation of the topography and the difference subtracted from the foot wall level to maintain the 1.5 m thickness.

For areas of gravel bed >0.9 m thick:

- 0.3 m was added to the gravel bed hangingwall and subtracted from the gravel bed footwall to produce the gravel bed skin;
- if the gravel bed skin extended above the topography, then the elevation at this point was re-set to the elevation of the topography and the following rules applied to the footwall:
  - if the new total thickness (z of topography – z of gravel bed skin footwall) is >1.5 m, then no change was made to the elevation of the gravel bed skin footwall; or
  - if the new total thickness (z of topography – z of gravel bed skin footwall) is <1.5 m, then the elevation of the footwall was changed to the elevation of the topography minus 1.5 m, in order to maintain the 1.5 m thickness of the gravel bed skin.

Owing to the application of historical factors to derive RoM grades, no additional dilution or other grade adjustments factors are deemed necessary for the primary mineralisation.

Grade Control and Reconciliation

Grade control is practically constrained to visual inspection and mining of the mineralised zones is only undertaken during daylight hours. Geologists on site direct the mechanical loader from within the pit area to ensure that the gravel bed is mined correctly. Historical and current practice in respect of reconciliation is to record production mined, washed, and recovered on a pit by pit basis. All material mined from a pit area is also stockpiled according to the mineralisation and the area where it was mined. All ore material is re-handled when fed into the processing plant.

Waste Rock Dumps

In mining the gravel bed, waste is stockpiled on nearby clearings and then re-handled to be used as back fill in the mined out areas. Backfilling of the Maninge Nice pits is only possible in areas which do not overlie the primary mineralisation and, consequently, external waste rock dumps will be required for Maningie Nice primary mining. No formal waste dump strategy or design has been developed in this area as the mining was predominantly focussed on the gravel bed, which allows for in pit backfilling, as shown in the Mugloto Pit 3E in Figure 3-30. SRK notes that backfilling of mined out areas is an established practice on site and therefore achievable.

Figure 3-30: MRM: Backfilling of mined out area

Stockpiles

A stockpiling strategy has been included in MRM's plan to manage the expected variability in the gemstone grading distribution and the impacts of the wet season on productivity. The stockpiling strategy provides more than six months of production stockpiled near the wash plant. The total stocks on 30 June 2019 are shown in Table 3-29.

Table 3-29: MRM: Stockpile totals on end of June 2019

Area	Mineralisation Type	Density (g/cm³)	Tonnage (kt)	Grade Premium Ruby (ct/t)	Grade Ruby (ct/t)	Grade Other (ct/t)	Contained Carats (ct ,000)
Maninge Nice	Stockpiles - Primary	1.4	43	0.014	2.393	45.292	2,051,075
	Stockpile - Secondary	1.43	90	0.017	0.078	9.579	870,700
Mugloto	Stockpile - Secondary	1.4	175	0.089	0.298	9.853	1,792,091
Glass	Stockpile - Secondary	1.4	532	0.043	0.216	1.681	1,032,137
Total	Stockpiles	1.403	840	0.048	0.202	3.120	1,746,003

3.3.4 Economic Potential

The stripping ratio, thicknesses and mineralisation type were the main strategic drivers for the LoMp sequence to optimise economic potential. The approach to mine planning has been to balance practical mining considerations with prioritising gravelled areas with low stripping ratios. Gravelled areas with historically high premium rubies have been prioritised earlier in the schedule.

The economic potential was tested in the financial model by taking cognisance of the following economic factors:

- commodity prices;
- revenue based deductions which include royalties, production taxes and management and auction fees;
- operating expenditures; and
- modifying factors.

Commodity Prices: SRK notes that the Company's current reporting of sales revenue is derived from the auction results. The auction results are classified into MRM gemstone grading categories which comprise Premium Ruby, Ruby, and Other, in order of decreasing value.

Gemfields' analysis of commodity prices is based on historical price-demand-supply assessment to establish a price relationship which in conjunction with forecast demand-supply analysis is then used to generate a future price. Marketing and pricing are further discussed in Section 3.8.

Revenue Deductions: Determination of recoverable revenue typically would require a consideration for mineral processing recovery, royalties, and selling charges. In this respect, SRK notes that no deduction is made for typical "processing recovery" (grades estimates are based on historical production), royalties (according to the Mozambique regulations), and a direct selling charge for management and auction expenses are levied in relation to commodity price.

Operating Expenditures: SRK has reviewed 5 years of historical operating costs and derived unit operating costs based on the previous 18 month of production.

Modifying Factors: A dilution skin has been designed around the gravel bed mineralisation to determine the diluted modelled tonnage and grade from an in situ to a RoM basis.

3.3.5 Production Scheduling

The current LoMp as outlined by MRM requires a ramp up from the 2018 annualised total rock mining of 4.4 Mtpa total to 7.5 Mtpa by 2021, with ore mining from 800 ktpa to 1.5 Mtpa by 2021 (Figure 3-31). The production schedule commences on 1 July 2019 from the survey at the end of June 2019. The current LoMp production is projected to extend until 2030, resulting in a life of mine of 12 years. The LoMp has been optimised to mine material classified as Indicated only. The physicals for each of the mining areas are summarised in Table 3-30.

The mining sequence targets areas with lower stripping and high historical ruby recoveries at the start of the schedule in an effort to improve project net present value. The wash plant feed includes material that has been stockpiled since the start of the LoMp. The starting balance of the stockpile (840 kt) will be gradually reduced in the LoMp to 432 kt, which corresponds to three months of production, until the end of the LoM.

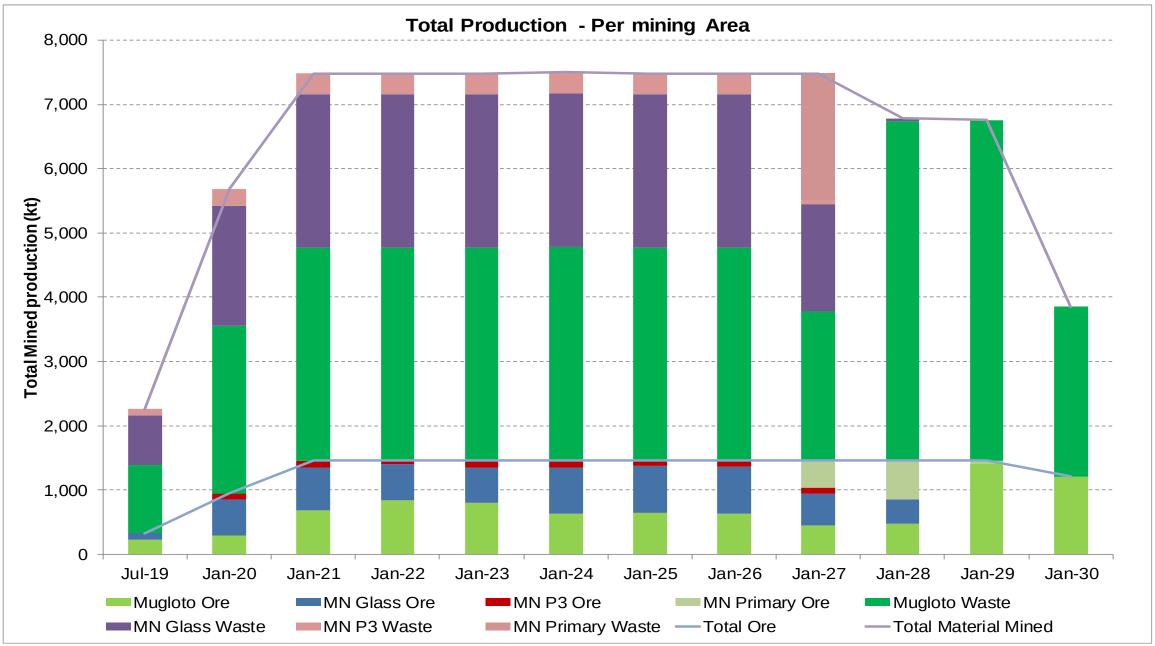


Figure 3-31: MRM: LoM Production profile

Table 3-30: MRM: Life of Mine Physicals by Mining Area

Material Mined		
Total Material Mined - Mugloto	(kt)	**47,373**
Mugloto Waste	(kt)	**39,076**
Mugloto Ore	(kt)	**8,297**
Mugloto Ore - Dilution	(kt)	**6,797**
Mugloto Ore - Gravelbed	(kt)	**1,501**
Mugloto Premium Ruby	(ct)	**1,725,614**
Mugloto Ruby	(ct)	**6,029,727**
Mugloto Other	(ct)	**11,031,522**
Stripping Ratio	(t:t)	**4.7**
Total Material Mined - MN Glass	(kt)	**24,143**
MN Glass Waste	(kt)	**18,640**
MN Glass Ore	(kt)	**5,503**
MN Glass Ore - Dilution	(kt)	**4,176**
MN Glass Gravelbed	(kt)	**1,327**
MN Glass Premium Ruby	(ct)	**289,398**
MN Glass Ruby	(ct)	**1,447,981**
MN Glass Other	(ct)	**11,488,277**
Stripping Ratio	(t:t)	**3.4**
Total Material Mined - MN P3	(kt)	**3,165**
MN P3 Waste	(kt)	**2,412**
MN P3 Ore	(kt)	**752**
MN P3 Ore - Dilution	(kt)	**617**
MN P3 Ore	(kt)	**135**
MN P3 Premium Ruby	(ct)	**10,684**
MN P3 Ruby	(ct)	**1,799,972**
MN P3 Other	(ct)	**34,062,874**
Stripping Ratio	(t:t)	**3.2**
Total Material Mined - MN Primary	(kt)	**3,056**
MN Primary Waste	(kt)	**1,972**
MN Primary Ore	(kt)	**1,084**
MN Primary Ore - Dilution	(kt)	**0**
MN Primary Ore	(kt)	**1,084**
MN Primary Premium Ruby	(ct)	**3,252**
MN Primary Ruby	(ct)	**3,968,677**
MN Primary Other	(ct)	**102,138,408**
Stripping Ratio	(t:t)	**1.8**
Total Material Mined	**(kt)**	**77,737**
Total Waste	(kt)	**62,101**
Total Ore	(kt)	**15,636**
Total Ore - Dilution	(kt)	**11,590**
Total Ore - Gravelbed	(kt)	**4,047**
Total Premium Ruby	(ct)	**2,028,948**
Total Ruby	(ct)	**13,246,357**
Total Other	(ct)	**158,721,081**
Stripping Ratio	(t:t)	**4.0**

3.3.6 Equipment Selection

MRM is an established operating mine with equipment selection suitable for the operating conditions. The primary equipment fleet is shown in Table 3-31.

The primary excavators selected are CAT 336D hydraulic excavators with CAT 730C ADT for waste mining and TATA 2523 Prima tipper trucks for ore mining. The smaller tipper trucks are more suitable for longer haulage distances (>5 km) to transport ore to the stockpiles and primary crusher.

The primary units are also supported by CAT 950H wheel loaders, CAT D7R and D9R track dozers, and CAT 140H graders. Equipment replacement cycles have been estimated at 18,000 engine hours for all the primary equipment excluding the TATA 2523 trucks which are estimated at 10,000 engine hours.

As part of the mine planning process, SRK has run a check on the total trucks required for ore hauling at MRM and is satisfied that the equipment fleet sizes and types are compatible with the estimated production schedule tonnage and haulage distances.

Table 3-31: MRM: Primary Equipment

Primary Equipment		2019	2020 Replacement	2021 Replacement
Description		**(number)**	**(number)**	**(number)**
Excavator	*CAT 330D*	2		
Excavator	*CAT 336D*	11	2	
ADT	*CAT 725*	7		
ADT	*CAT 730C*	20	5	3
ADT	*BELL B30E*	8		
Tipper	*TATA 2523*	16	11	
Tipper	*TATA Prima*	18		
Dozer	*CAT D7R*	1		
Dozer	*CAT D9R*	3		
Wheel loader	*CAT 950H*	5	2	
Wheel loader	*CAT 950L*	1		
Wheel loader	*BELL L2706*	2		
Drill Rig	*Sandvik*	1		1
Grader	*CAT 140H*	2		

3.3.7 Conclusions and Recommendations:

Open pit mining at MRM is well established and SRK does not foresee any major risks related to mining and believes that the forward looking LoMp is achievable.

Based upon the work undertaken to date, SRK recommends the following:

- More accurate operational mine scheduling and planning is recommended to optimise costs and equipment optimisation. The physical and lateral extents of the area of mineralisation will imply a variation in tipper trucks for the transported ore to the ROM stockpiles in the future.
- It is recommended that the mine schedule be updated on a quarterly basis, following a margin block ranking methodology that would seek to optimise revenue and cashflow.

- It is recommended that return journeys of tipper trucks are utilised to back-haul waste from the waste stockpiles to the pits.

3.4 Ore Reserves

3.4.1 Introduction

SRK has prepared the Ore Reserve Statement for the MRM operation in accordance with the JORC code. Details used in deriving the Ore Reserve Statements are included in this section.

3.4.2 Modifying Factors

The Modifying Factors applicable to the derivation of Ore Reserves comprise estimates for the selective mining unit. The Modifying Factors considered by the SRK to be appropriate for the secondary mineralisation is based on the greater of:

1. 0.3 m dilution skin to both the roof and floor contacts; or

2. a minimum total thickness of 1.5 m. The diluting grade density has been assumed at 2.01 t/m^3. Owing to the application of historical factors to derive RoM grades, no additional dilution or other grade adjustments factors are deemed necessary for the primary mineralisation.

Grade capping has been applied to the Mugloto secondary mineralisation to limit the grade of the higher value gemstones based on historically mined averages. Premium ruby production has historically accounted for approximately 8% of stones by weight. Since revenue is very sensitive to the premium ruby grades and quality split, SRK has verified that this percentage is not exceeded at any time, to ensure that revenue is not overstated.

Due to the nature in which dilution has been modelled, namely that a dilution skin has been applied around the modelled resource, no mining losses have been applied for the secondary material.

3.4.3 Ruby and Corundum Prices

Table 3-32 summarises the prices per carat applied in the economic evaluation of the Ore Reserves. These are further discussed in Section 3.8.

Table 3-32: MRM: Commodity Prices Applied

Total Sales	(USD/ct)	
Premium	(USD/ct)	975.56
Ruby	(USD/ct)	37.93
Other	(USD/ct)	0.75
Average	(USD/ct)	17.68

3.4.4 Ore Reserve Statement

The Ore Reserve statement presented in Table 3-33 has been derived from the Mineral Resource described in Section 3.2.

As at 1 July 2019, SRK notes that the MRM ruby deposit has Ore Reserves (including stockpiles), of 1,127 kt of primary material grading at 97.88 ct/t ruby and corundum and 19,641 kt of secondary material grading at 3.85 ct/t ruby and corundum.

Table 3-33: MRM: Ore Reserve Statement, as at 1 July 2019, for the Montepuez Ruby Deposit

Classification	Tonnage	Premium Ruby	Ruby	LR+CO +SP+4.6	Total Grade	Contained Carats
	(kt)	(ct/t)	(ct/t)	(ct/t)	(ct/t)	(Mct)
Probable Ore Reserves						
Primary						
Mineralisation	1,084	0.003	3.66	94.22	97.88	106.1
Stockpiles	43	0.003	3.66	94.22	97.88	4.2
Secondary						
Mineralisation	18,844	0.141	0.58	3.09	3.81	71.8
Stockpiles	797	0.046	0.36	4.27	4.67	3.7
Total						
Mineralisation	19,928	0.134	0.75	8.05	8.93	178.0
Stockpiles	840	0.044	0.52	8.88	9.45	7.9
Total Probable	**20,768**	**0.130**	**0.74**	**8.08**	**8.95**	**185.9**

SRK makes the following comments in relation to the Ore Reserve declaration:

- The Ore Reserve is presented on a 100% attributable basis. SRK notes that Gemfields shareholding in MRM is 75% (see Section 4).
- The Mineral Resource grades are quoted with a bottom cut-off stone size of 1.6 mm.
- The reported grades are recovered grades, as opposed to in-situ grades, due to the nature of the type of mineralisation and operation.
- A Probable Ore Reserve has been derived from the reported Indicated Mineral Resource; No Proved Ore Reserve has been reported, notably as no Measured Mineral Resource has been reported.
- No material classified as Inferred Mineral Resources has been converted to Ore Reserves.
- The mining production plan has been revised and updated by SRK and deemed achievable. The mining method and equipment is considered suitable for the style of mineralisation.
- The gravel mining operation at MRM is a shallow, efficient, low-cost free dig mining operation which is not expected to present any major technical or logistical challenges in the future.
- The mine will keep at least six months of ore on a RoM stockpile to mitigate the effect of the variability of the gravel beds in terms of gemstone distribution, and interruptions due to weather conditions.
- The Ore Reserve is based on an increase in process plant capacity, from 800 ktpa to 1,500 kpta. The flowsheet is to remain unchanged and the plant is to be constructed in 2020 for commissioning in 2021. Whereas delays in construction may occur, SRK find the projected production to be reasonable.
- A discounted cashflow model has been prepared to evaluate and demonstrate MRM's economic viability.
- The relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties and capital costs have also been included.

- The stones prices applied in the discounted cashflow model are USD 976/ct for Premium, USD 38/ct for Ruby and USD 0.75/ct for the Other category of low-quality stone.
- SRK notes that Premium stones account for 79% of revenue, and Ruby stones for 17% of revenue.
- 100% of sales revenue from MRM stones is attributed to the mine.
- The economic evaluation has resulted in an NPV of USD 567 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM.
- SRK has relied upon the Company to confirm that the required permits and licences are in good standing and expected to remain so for the duration of the LoMp.
- SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve.
- SRK highlights that the key risk to the forecast production and revenue presented in the LoMp, is the nature of the mineralisation leading to difficulty in estimating grades; and the split between stone quality, as prices per category vary more than 1000 fold.

It is recommended that Ore Reserve estimates are calibrated on an ongoing basis by comparing the results of mined pits against the estimates of in situ tonnage from the auger drilling and pitting.

The projected prices and volumes for the sale of ruby products from the Mine should be verified on an ongoing basis to update the financial projections in the LoMp.

The CP responsible for reporting Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the IOM3, a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code. Mrs Anderson has review and relied on:

- the mining technical evaluation and mine plan authored by Mr. Hanno Buys Pr.Eng MEng MSAIMM, a Senior Consultant (Mining Engineering) with SRK;
- the review of the mineral processing undertaken by Dr David Pattinson CEng, MIMMM, BSc, a Corporate Consultant (Minerals Processing and Metallurgy) with SRK; and
- the review of the environmental and social aspects by Mr John Merry, a Principal Consultant (Environmental and Social Management) and Dr Cathryn MacCallum FIMMM CEnv CSci, a Principal Consultant (Social Development and Management), both with SRK.

3.5 Mineral Processing and Tailings Management

3.5.1 Summary

The processing of ores from the MRM deposits is relatively straight forward and involves standard industry proven mineral processing methods and equipment to recover rubies and the associated semi-precious gemstones.

Initially, a small, temporary, 83 tph, process plant was set up at the site for large scale sample treatment to assess the precious gemstone content and quality. This plant was also used to assess the processing characteristics of the ore in terms of clay and moisture content, the amount and size of contained gravel and gemstone and the performance of different items of equipment. The preliminary flow sheet was based on the test work performed at Mintek, South Africa.

Following initial operation of the 83 tph plant, MRM contracted ADP in South Africa to design and construct a new, permanent process plant including a wash plant rated for 200 tph fresh feed and a Dense Media Separation (“DMS”) plant, rated for 83 tph. The plant design was based on test work and the operating experience from the smaller temporary plant. The new plant includes some of the larger equipment from the original plant and new equipment. The wash plant flowsheet incorporates wet scrubber screening to remove -1.6 mm solids followed by a log washer to breakdown clay balls followed by double deck, wet screening at 25 and 1.6 mm to remove further fines and a coarse +25 mm stone fraction. The drained -25 mm +1.6 mm fraction is further processed in the DMS plant. The lighter fraction from the DMS is rejects and the heavy fraction, containing the precious stones, is drained and collected in a secure vessel for daily transfer to the recovery house for further processing, with the rubies being recovered using UV sorting. The -1.6 mm fraction from the scrubber screen and the -1.6 mm fraction from the wet screen prior to the DMS are pumped to the tailings circuit where grit is removed using a hydrocyclone prior to thickening to produce a tailings slurry. Flocculant is used to aid thickening.

The tailings slurry is pumped to settling paddocks in worked out pits where it consolidates and dries prior to transfer to permanent storage in old workings. The coarse grit and the DMS rejects are removed to waste. The coarse (+25 mm) fraction is stockpiled.

3.5.2 Laboratory Test work

Laboratory test work has been performed by two laboratories: Mintek, Randburg, South Africa, and Council of Scientific and Industrial Research - Institute of Minerals and Materials Technology (“IMMT”), Odisha, India. Mintek performed some settling tests on fine material and limited sorting tests were performed on both ore and concentrates by TOMRA and the suppliers of the Minex sorters.

Mintek Test work

Mintek performed test work for a metallurgical scoping study. Four samples were received: a mineralized amphibolite, a coarse +1.6 mm gravel sample, together with a barren rock, and a soil sample.

The test work was conducted in two phases. Phase 1 involved sample characterisation tests, scrubbing tests to evaluate breaking up the clayey material and gravity concentration tests including Heavy Liquid Separation (“HLS”) and Mineral Density Separation or jigging test work on the coarser +1 mm fraction and Shaking Table test work on the finer -1 mm fraction. Mineralogical evaluation was performed using X-ray Diffraction analyses. In Phase 2, two samples, gravel and amphibolite, were used; 2 kg samples of ruby/corundum were added to the each of the two samples and HLS test work performed.

The test work showed that the amphibolite sample contained significant amounts of clay and the intense scrubbing was required to break-up the clay bound particles. The HLS results showed that it was possible to beneficiate the corundum minerals by gravity techniques. The bulk of the material was rejected as waste; at a low-cut density of 2.8, as there were visually no corundum pieces at this cut density. The majority of the corundum reported at high specific gravity ("SG") of 3.7 to 4.0 g/cm^3. Mineralogical test work also showed the ruby/corundum is liberated at high densities and the relatively small amount lost to the waste was found to be attributed to entrainment, where corundum is present as fine liberated particles in a much coarser low SG sample, as well as some particles finely inter-grown with gangue.

The metallurgical scoping study considered three options: jigging, DMS, and a combination of primary jigging followed by DMS. The DMS option could treat the de-slimed feed material whilst jigging could be used as a pre-concentration step on the de-slimed feed prior to DMS of the jig concentrate. Efficient jigging can only be performed on closely sized fractions, which means that the feed would have to be classified and treated in a number of parallel jig circuits. In addition, the efficiency of separation of a jig may result in some lost gemstones in the rejected material. Jigs were used in the temporary 83 tph plant and DMS was used in the new 200 tph plant.

IMMT Test work

The IMMT test work was performed in 2014 on a gravel sample designated MRM-010. The sample was nominally -25 mm. The d_{80} of the sample was 13.8 mm and d_{50} was 4.0 mm. It is noted that 85% was coarser than 1 mm and the balance contained material down to sub-micron sizes. HLS, performed on 12 size fractions between 20 mm and 45 µm, at an SG of 2.89, demonstrated that the heavier particles, including the gemstones, could be easily concentrated into the sinks fraction. The overall mass yield of the sinks fraction was 2.0%. The efficiency of gemstone recovery was not determined. Gravity test work using a number of different pieces of equipment indicated that the separation could be achieved on +1 mm material using jigging. The mass yield from the jig was around 4.0%.

SGS Settling Tests

SGS performed laboratory setting tests on three samples from the MRM. The samples were Maninge Nice Amphibolite, Maninge Nice Gravel Bed, and Mugloto Gravel Bed. The tests were performed on the -63 µm fraction. The results are presented in Table 3-34. The underflow solids were all less than 40% w/w solids and lime was required to achieve acceptable overflow clarity.

Table 3-34: MRM: Typical settling test results

	Feed solids	Flocculant dosage	Calculated underflow density	Lime addition for O/F clarity
	% w/w	g/tonne	%/w/w	
Maninge Nice Amphibolite	7.5	33	30.7	Y
Maninge Nice Gravel Bed	10	50	38.0	Y
Mugloto Gravel Bed	10	40	37.3	Y

Sorting Tests

Limited sorting tests have been performed for both ore and concentrates. Tests have been performed at the TOMRA test facility in Wedel, Germany and in Leuven, Belgium. In addition, optical sorting has been evaluated by Binder+Co AG suppliers of the Minexx sorters. In both cases, the testing indicated that automatic sorting of the gemstones from the ore or from pre-concentrated material was feasible and warranted further evaluation. Further testwork has been performed and has been used for the design of a new sort house.

3.5.3 Processing Facilities

Current 200 tph Wash Plant and DMS

The temporary plant has been dismantled. The log washer and the wash screen from the old plant has been installed as part of the circuit in the new wash plant. The flowsheet with design mass balance is shown schematically in Figure 3-32.

The new plant incorporates a scrubber and a DMS plant. The scrubber unit has been designed to process up to 200 tph of fresh feed. The mass balance varies significantly depending on the ore source and consequently equipment has been sized taking in to account relatively large variations. The DMS module has been designed to process 83 tph of -25 mm +1.6 mm sized feed from the wash plant.

Process Description

Large RoM stockpiles are maintained ahead of the plant. The stockpiles are segregated by pit designation and in-pit location. Ore can be fed to the plant either from these stockpiles or directly from the pits.

Plant feed is loaded in to the feed hopper by a Front End Loader (“FEL”). The amount of wet feed is measured by a calibrated sensor in the FEL bucket and is recorded automatically. A static grizzly removes any oversize stone or large pieces of clay and the feed is washed into the scrubber screen feed box by a manually controlled high pressure monitor spray. The oversize from the feed grizzly is collected and periodically broken up and re-fed in to the feed hopper.

The slurried feed gravitates in to the scrubber screen and further water sprays remove nominally -1.6 mm material. The scrubber screen discharges on to a double deck screen, the upper deck removes the coarse stones and the lower deck the -2 mm particles in a slurry.

The wet solids from both screen decks are conveyed to the log washer feed. The -2 mm material from both the scrubber screen and the discharge screen is pumped to the tailings circuit.

The log washer is required to breakup clay balls which bind finer particles together, potentially containing gemstones. Water is added and the resulting slurry discharges on to another double deck washing screen. This screen removes +25 mm stones to a stockpile and minus 1.6 mm solids as a slurry. The -25 mm +1.6 mm washed solids are collected and conveyed to the DMS plant feed hopper. The removal of clay is very important as it will impair the operation of the DMS plant and affect the separation efficiency. The coarse stone from the wash screen may contain some clay balls and consequently is stockpiled for further treatment at a later date. A small amount of coarse stone is added to the feed to assist in breaking up clay balls in the scrubber screen.

The drained -25 mm +1.6 mm fraction is further processed in the DMS plant. This plant utilises ferro-silicon (FeSi) for the dense media. The plant incorporates feed screening, feed/media mixing, two dense media cyclones together with the cyclone feed pumps, a dense media handling circuit incorporating magnetic separator for recovery and densification of the FeSi and a split drain and rinse screen for removal of the FeSi media and washing of both the concentrate (heavy fraction) and the reject (lighter fraction). Washing of the both products is essential to minimise the loss of the FeSi from the circuit. The plant incorporates instrumentation to control the density set points to ensure efficient separation of the concentrate, including the gemstones, from the lighter rejects. The lighter fraction from the DMS is rejects and are discarded to dump and the heavy fraction, containing the precious stones, is drained and collected in a secure vessel for daily transfer to the recovery house for further processing by hand.

The -1.6 mm fraction from the scrubber screen and the -1.6 mm fraction from the wet screen prior to the DMS are pumped to the tailings circuit where grit is removed using a hydrocyclone prior to thickening to produce a tailings slurry. Flocculant is used to aid thickening.

The tailings slurry is pumped to settling paddocks in worked out pits where it consolidates and dries prior to transfer to permanent storage in old workings. The coarse grit and the DMS rejects are removed to waste.

The layout of the plant is shown in Figure 3-33. The scrubber screen, log washer and wash screen, DMS plant, and the tailings degrit and thickener are labelled for clarity. Pictures of the wash plant scrubber and the DMS plant are shown in Figure 3-34 to Figure 3-39.

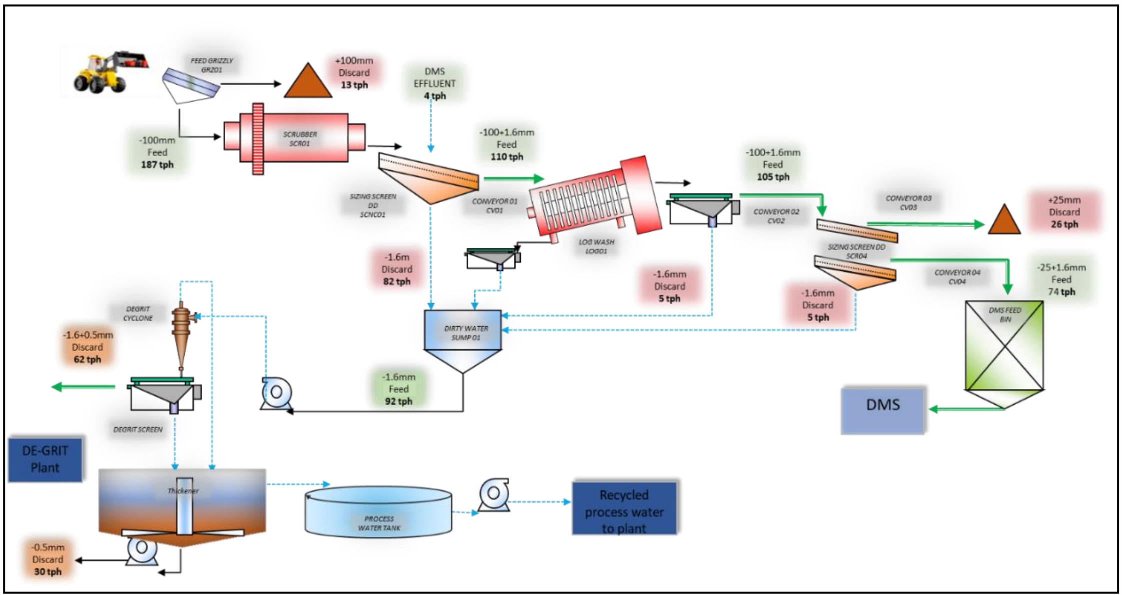


Figure 3-32: MRM: Plant flow sheet

Figure 3-33: MRM: Plant layout

Figure 3-34: MRM: Wet scrubber screen

Figure 3-35: MRM: DMS plant showing feed screen, media pumping circuits, dense media cyclones and drain and rinse screen

Figure 3-36: MRM: DMS plant and discard conveyor

Historical Processing Operating Statistics

The temporary wash plant started operations in November 2012. The current plant has been operating since December 2016. The current plant is used for both bulk sampling and production.

The installed capacity of the new wash plant is 200 tph, although nominal operating capacity is 150 tph. The clay content of the ore has a marked impact on the throughput that can be achieved. Operating staff reported that the maximum feed had been restricted to approximately 135 tph due to a capacity bottleneck in de-gritting and tailings thickening circuit and problems with the clay content of the ore. The DMS plant is designed for 83 tph but to date, due to the reduced feed rate, has been required to operate intermittently for around 46% of the available operating time to meet the production schedule.

The plant recovers gemstones using DMS technology and the mass yield of concentrate (heavies) containing the gemstones is less than 0.1%. Density tracer tests have been conducted on the DMS plant and have indicated satisfactory separation of the heavy fraction from the lighter discard.

Potential stone breakage has been noted in a few of the final gemstones and this has been investigated on the plant. Preliminary indications are that breakage is not occurring in the plant and that the “breakage” is probably due to clipping of stones in the recovery house to remove small defects.

The plant operation is targeted to meet the scheduled gem auctions and the ore fed to the plant is adjusted in terms of ore source, which affects gemstone content and quality, and ore tonnage processed. The plant operation is not continuous and, as noted above, the plant utilisation is relatively low due to plant bottlenecks and issues with clay content of the ore.

Further Wash Plant Expansions

MRM has advised that there is a plan to install a second wash plant, mirroring the existing plant, in 2021. This will likely increase capacity from that time. The present plant feed system impacts on the plant feed rate, which can result in surges in plant feed. To improve production feed, a constant feed system, including an apron feeder has been identified as being a potential solution. This project is anticipated to be completed by February 2020.

Recovery House

The existing recovery house is located in a high security compound. Access to the compound and the recovery house is highly restricted. All gemstone recovery is currently performed manually in the high security area under strict supervision. All operations are covered by cameras.

The existing recovery house has been modified to accept the new concentrate transfer vessel from the plant. The concentrate is pneumatically moved from the transfer vessel in to a holding tank inside the high security area.

Additional screening capacity was installed to allow the size classification of larger quantities of concentrate from ores that contain a higher mass of heavies. In addition, a small belt magnet was installed to remove any iron impurities in the recovery house feed.

MRM has sanctioned a new recovery house incorporating automatic recovery machines, using UV sorting. This plant is located adjacent to the wash plant to allow direct transfer of concentrate between the two operations.

Recovery House

Following the installation of the new wash plant in 2018, MRM has decided to construct a new recovery house and recovery installation incorporating state of the art hands-off UV sorting equipment. The recovery house was commissioned in February 2019 and is now fully operational.

Research completed by the Company has demonstrated that automatic sorters utilising UV light can be used successfully to recover rubies. ADP was used as the construction and installation contractor based on their proven track record on the wash and DMS plant and to provide seamless integration of the existing plant and the recovery house. The recovery house is located adjacent to the wash plant/DMS in the same secure area. The recovery house includes strict security measures including CCTV in all areas. The complex is designed to house three separate facilities:

- Personnel Control Centre;
- Recovery; and
- Recovery House.

Recovery

Concentrate from the DMS plant is transferred to the sizing area by pipeline, and the recovery area accommodates all mechanical recovery processes:

- de-watering;
- drying;
- cooling; and
- UV sorting.

The capacity to recirculate processed material has been built in to the design and material can be recirculated until recovery shows zero.

The sizing section is shown in Figure 3-37.

The sort house area houses manual sorting and classification, as well as physical material grading. This area also houses vaulting and export areas. The layout is shown in Figure 3-38.

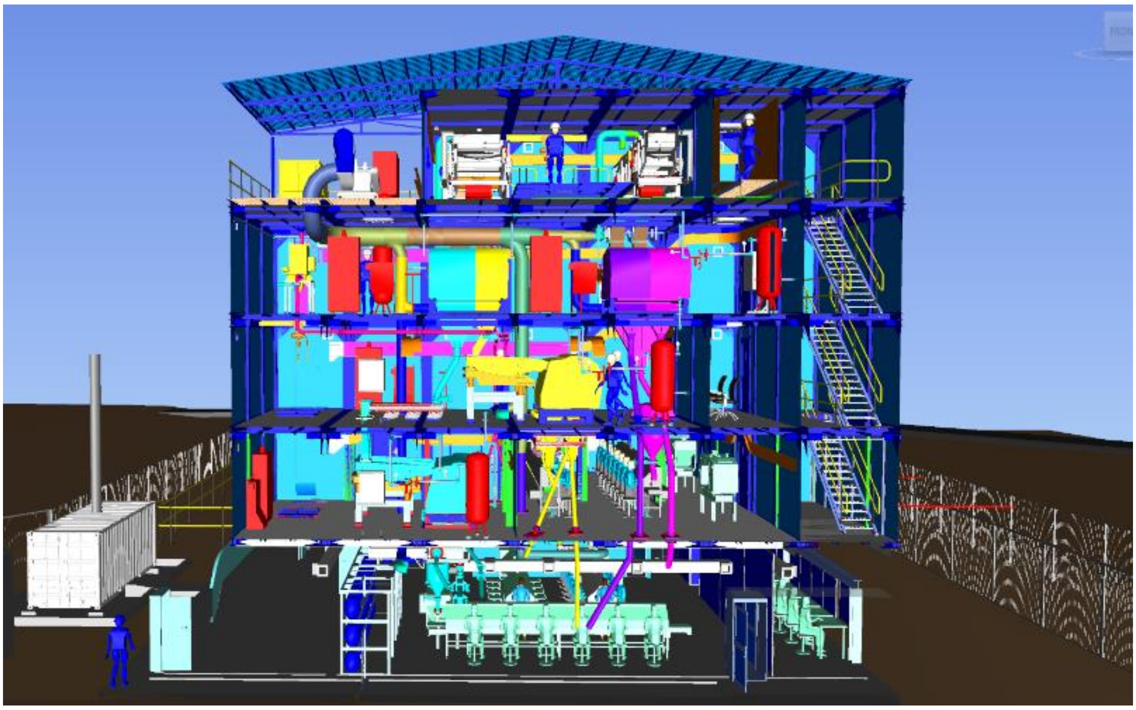


Figure 3-37: MRM: Sizing section

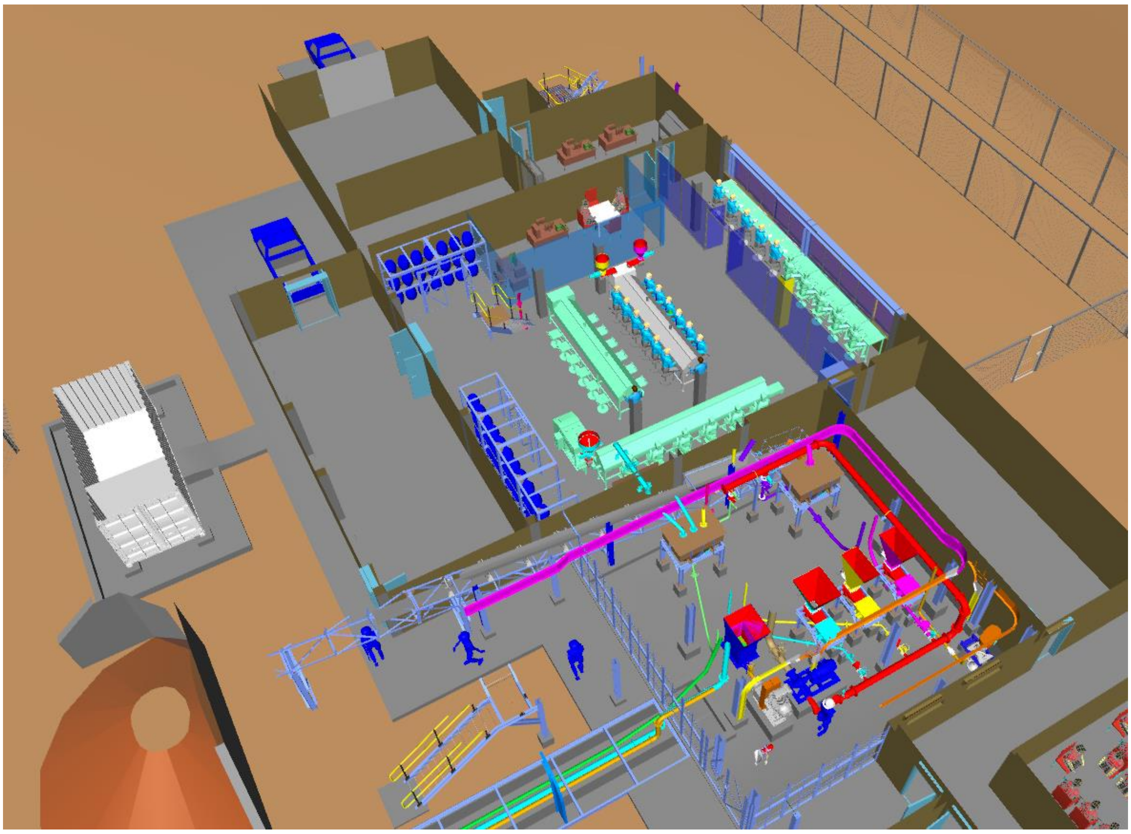


Figure 3-38: MRM: Recovery House layout

3.5.4 Waste and Tailings Management

Overview

At the operation, waste is considered to include both:

- overburden waste rock from mining; and
- coarse rejects and sludge, being the fine tailings from the wash plant.

The operation consists of conventional open pit mining (excavate, load and haul) focussed on three main operating areas: Mugloto, Maninge Nice, and Glass. Stripped material intended for plant feed is stored in a series of stockpiles located immediately adjacent to the wash plant. Feed stockpiles are surveyed on a monthly basis for inventory purposes.

A significant volume of waste material is currently generated from mining operations. This material is dumped in a series of designated waste stockpiles close to the respective open pit locations.

Sludge Management Guidelines

MRM implements a number of surface water management sediment control features such as perimeter interception ditches and silt traps installed around any of the haul feed or waste stockpile areas. This is to control the amount of silt entering local water courses. The sludge management strategy is as follows:

- ensure that sludge is stored in an environmentally safe manner;
- determine a designated area for storing sludge from the current wash plant;
- retain any information regarding the generation, storage and treatment of sludge;
- vehicles carrying sludge will be kept clean and maintained; and
- sludge storage areas will be secured to prevent over spilling.

Current Wash Plant Waste Streams

MRM currently operates a wash plant and DMS plant at a feed rate of up to 200 tph. Four waste streams are generated from the wash plant:

1) **Stream 1**: +25 mm coarse reject material: washed gravel/cobbles generated from the wet screening process; production rate for this stream is approximately 26 tph. The drained solids contain less than 5% moisture by weight. This material is currently stockpiled for future evaluation.
2) **Stream 2**: -25 mm +1.6 mm DMS rejects up to 83 tph. The drained solids contain less than 5% moisture by weight.
3) **Stream 3**: -1.6 mm +75 µm: gravel, sand and silt material generated from the de-grit screen at up to 62 tph. The drained solids contain less than 5% moisture by weight.
4) **Stream 4**: -75 µm (tailings): silt and clay fines, generated from the de-gritting and classification of the scrubber feed screen and the washing screen underflow streams in the wash plant. This material, silt and clay fines, is generated at a rate of up to 30 tph and is thickened using flocculant and pumped as a thick slurry to tailings paddocks where further dewatering and natural drying occurs.

The coarse DMS rejects and waste material generated from streams 2 and 3 are collected from the respective stockpiles and loaded onto haul trucks for transport back to the waste stockpiles adjacent to each pit, to be used as backfill material when mining operations permit.

The collected silt and sand tailings fractions (stream 4) is periodically cleaned from the ponds by excavator and trucked to open pit areas for disposal. Any tailings supernatant water is collected via channels and pumped back to the plant for reuse.

Tailings Circuit

Nominally -1.6 mm solids removed in the scrubber screen, scrubber discharge screen, and the wash screen are pumped as slurries to the tailings de-gritting section. The slurries from the different sources are combined and pumped to a hydrocyclone classifier. Coarse underflow discharges from the hydrocyclone on to a 0.5 mm screen and the +0.5 mm solids are dewatered and collected for transfer to dump via truck. The -0.5 mm screen undersize discharges as a slurry back in to the cyclone feed pump hopper. The hydrocyclone overflow slurry containing -0.5 mm solids gravitates to an 18 m diameter thickener. Flocculant solution is added to the thickener feed to aid solids settling and the thickener underflow is pumped to the tailings settling paddocks. Average flocculant consumption is approximately 40 g/t of wash plant feed. Overflow from the thickener discharges to the water tank for reuse in the wash plant.

The tailings settling paddocks are located in operational mining areas. Further settling of solids occurs and any excess water is collected via temporary channels and is pumped using a diesel powered mobile pump back to the thickener water tank for reuse. Once a paddock has been filled the tailings slurry is diverted to the next one. The solids in the full paddock are allowed to dry and are then excavated and trucked to a worked-out pit for final disposal. Tailings discharge, the typical paddock system and the water return trenching and pumping system are shown in Figure 3-39 to Figure 3-41, respectively.

MRM indicates that the amount of fine material separated from the DMS feed exceeds the capacity of the circuit, and that this represented a bottleneck to production. MRM notes that the samples of thickener underflow have been sent to Roytec in South Africa for filtration testing. MRM advised that once these results are available the feasibility of the filtration technology will be evaluated.

Figure 3-39: MRM: Thickener underflow discharge in to tailings paddock

Figure 3-40: MRM: Tailings paddocks

Figure 3-41: MRM: Tailings return water system

De-grit circuit and thickener

The de-gritting and thickener circuits are considered by MRM to be undersized and are currently a bottleneck to production. The amount of fine material from the scrubber, discharge screen, and the wash screen regularly exceed the capacity of the tailings circuit. The wash plant feed is managed to maintain acceptable operation of the de-grit/thickener circuit.

MRM notes that the de-grit circuit was enhanced by replacement of the single 760 mm diameter hydrocyclone with two 450 mm diameter units, installation of a second de-grit screen, and a new thickener. The thickener underflow (tailings) settling paddocks are located in operational mining areas. Further settling of solids occurs and any excess water is collected via temporary channels and is pumped, using a diesel powered mobile pump, back to the thickener water tank for reuse. Once a paddock has been filled, the tailings slurry is diverted to the next one. The solids in the full paddock are allowed to dry and are then excavated and trucked to a worked-out pit for final disposal.

The samples of thickener underflow have been sent to Roytec in South Africa for filtration testing. MRM advised that once these results are available the feasibility of the filtration technology will be evaluated. After commercial and technical evaluation of the test results, the project is expected to be completed in November 2019.

Tailings Filter System

In 2018, MRM investigated the feasibility of filtering the fine fraction of the tailings for disposal as a cake. The filter feed would be the underflow from the existing thickener and typically, based on industry practice, the moisture content of the cake would be 15 to 20% by weight. Samples of tailings were submitted to Roytech in South African for evaluation.

Currently, the thickener underflow is disposed in the mining areas, which is temporary inhouse arrangement, to enable the process plant to function. Gemfields is currently evaluating long-term sustainable solutions.

3.5.5 Conclusions

Based upon a review of the information for the current operations, SRK notes the following:

- The current facility is considered broadly fit for purpose, at least in the short-term, for both operational gemstone production and for any ongoing bulk sample preparation required; however, for optimisation and an effective forward strategy, upgrading of waste management practices are required.
- The de-gritting and thickening section of the wash plant is significantly undersized, is a bottleneck to production and should be changed or expanded as soon as possible.
- During the wet season, significant volumes of surface water run-off flow into the settling ponds, making regular clearance problematic. This may result in uncontrolled discharge of tailings slurry into the holding pond structure if not adequately managed (overtopping and associated erosion are considered the most credible potential failure mechanism).

- The current coarse grain size waste management strategy assumes that the majority of waste generated will be backfilled in redundant open pit areas. SRK notes that this is not likely to be feasible due to bulking of the coarse reject material post processing and trucking to the disposal zones. In addition, given the fine grain size of the slimes, it is anticipated that drying in the holding cells is not efficient and that compaction of the partly dried material following re-handling to backfill is not effective. Swell factors of between 30 to 40% for all waste should be considered during volumetric calculations going forward.
- Filtration and other testing to consider feasibility of additional dewatering of the fine tailings (slimes) has been undertaken, and a feasibility study prepared to evaluate and cost a revised fine tailings dewatering, handling and disposal system. SRK understands that the preferred solution includes centrifuge technologies and that it will be in place within the next 12 to 18 months. Once operational, this should make the current system of informal drying lagoons, periodic excavation, and slimes-waste backfilling to the mining void obsolete by the end of 2020.
- SRK was specifically requested to consider whether the provisions for tailings (slimes) management, and the associated documentation, comply with those detailed in the disclosure of information request made to mine operators by the Church of England Pensions Board in April 2019 in response to the recent Brazilian tailings dam failures. The Church of England Pensions Board request was made to allow them to consider investment decisions on the basis of whether tailings storage facility designs and operational practices are effective in managing risks. In this regard, SRK interprets that the disclosure request relates primarily to 'above ground' tailings storage facilities (that is, those which require retention structures or dams that retain waste at higher elevations than surrounding ground/topography; those with significant risk of run-out impacting on downstream receptors and communities). This being the case, SRK notes that no facilities of this type are present at the site where instead tailings are initially managed in shallow drying cells before they are re-handled in to the completed open pit voids as backfill. Nevertheless, there are potential risks with the current system including possible overtopping resulting in suspended solid contamination of downstream water courses. SRK notes that the current facilities are designed and are supported by both operational management documentation and emergency action plans. Regular visual inspections are undertaken and it is understood that water quality is monitored both on site and in the immediate downstream environment. In all cases, the documentation is quite limited, but not exceptionally so, given the simplicity of the current tailings scheme and the relatively low associated risks. SRK considers that 'tipping rules' should be prepared and recommend that the UK Quarry Regulations (1999) has appropriate guidance on their aims and content. SRK also notes that significant changes to the scheme are anticipated in 2020 where new technology will be commissioned to further dewater the tailings slimes which will then be stored as a dry 'cake'. The cake storage areas and management practices will require new designs, design justification calculations, and operational management documentation. This should all be prepared in line with best practice. SRK anticipates different provisions to be required for wet and dry seasons as management of dry cake can be a challenge in periods of high volume and / or intense rain storms.

3.5.6 Recommendations

SRK makes the following comments and recommendations:

- SRK recommends that a full review of the proposed revised tailings dewatering system feasibility be undertaken. This should include consideration of; sample representativity; technology proposal; costs; risks; and, benefits. SRK understand that this project is advanced but review and due diligence should be completed at all critical stages.
- Upgrade the de-gritting and thickener as soon as possible if filtering/centrifuge/dry-stacking is not feasible, or if significantly delayed for any reason.
- A stockpile, backfilling and waste deposition management plan is recommended to be put in place, so that deposition of coarse and fine reject material generated from the wash plant is appropriately scheduled and optimised. This type of documentation are often referred to as the ‘tipping rules’. This plan should be sufficient to cover both the short and long term project requirements which will change as the new slimes management process is commissioned. The ‘tipping rules’ essentially detail how the waste areas will be safely investigated, designed, operated and closed including the key performance constraints (integrity; safety; contamination, etc), monitoring requirements (including inspections) and emergency provisions. The document should be based upon relevant laws, legislation and guidance, and should be regularly updated. SRK anticipate significant changes to international guidance on tailings management practices will be made in the near future as the reports associated with recent significant failures in Brazil (and elsewhere) are released.
- A detailed, seasonal water balance should be prepared for the wash plant and site as a whole. This should allow the design of appropriate freeboard in waste storage areas (to prevent overtopping) and design of surface water management plus sediment control features such as base/internal/surface drains, perimeter ditches and silt traps will be installed in and around all waste storage areas, including those associated with future slimes ‘cake’ storage.
- Prepare more transparent operating cost details inclusive of all cost elements for the wash and DMS plants.
- Prepare a project schedule and cost control model for the new Recovery House project.
- A closure plan should be prepared covering all areas of historic and future mine waste and tailings storage.

3.6 Infrastructure

3.6.1 Mine Roads

The Mine offices and camp are currently accessed by a 1.2 km gravel road which passes through the village of Namanhumbir from regional Route 242. The regional Route 242 connects Pemba and Montepuez. A 4 km gravel road connects the Mine gate with the maintenance area, recovery house and wash plant.

Gravel haul roads 16 m wide connect the wash plant with the Mugloto and Maninge-Nice mining areas (Figure 3-42) which are shared by both light and heavy vehicles. For security reasons, haul trucks currently travel to the wash plant in convoys.

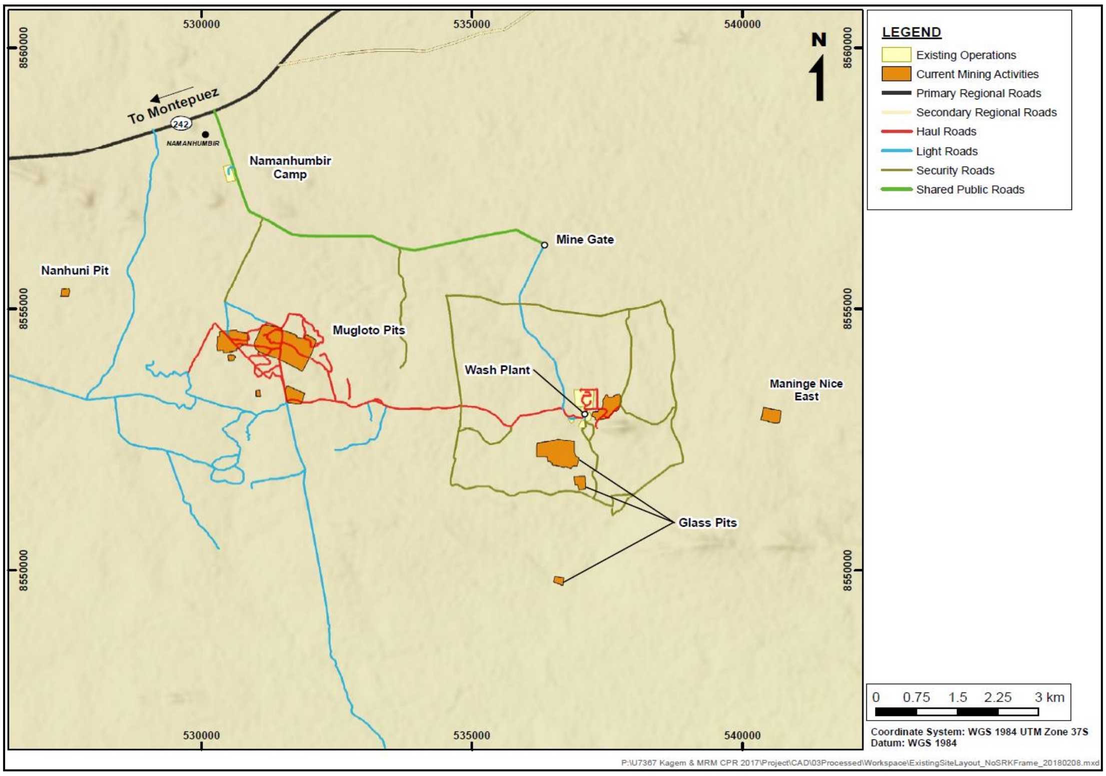


Figure 3-42: MRM: Existing Project Layout

3.6.2 Accommodation and Administration

The main offices, stores and accommodation are located at the Namanhumbir camp and comprises predominantly prefabricated and block work structures within a fenced compound. This facility will be expanded to support the proposed expansion project. SRK understands the existing workforce as at June 2019 totals 1,184 employees.

3.6.3 Mobile Equipment Maintenance

All light and heavy mobile equipment is currently maintained in a common maintenance area comprising a double bay workshop, wash pad and lay down area. The existing workshop is constructed from 40’ shipping containers which are also used for offices, stores, welfare, hose room and electrical workshops.

A 12.5 t capacity mobile crane is used to maintain the larger equipment. The maintenance area has a single access for entry and egress and the workshop orientation requires vehicles to drive in and reverse out. The storehouse within the maintenance area is replenished weekly from the MRM primary at the newly built warehouse located next to the exploration yard.

All non-hydrocarbon industrial waste from maintenance activities is currently stored at the rear of the maintenance area, some of which is located outside the perimeter fence-line adjacent to nearby water bodies. Waste hydrocarbons are currently stored in drums in an open area to the rear of the workshops. A contractor periodically collects and transports waste hydrocarbons to Pemba for treatment and safe disposal.

All light and heavy vehicles are washed prior to maintenance activities on a raised earth platform. A pollution control unit is located adjacent to the wash pad; however, this unit needs improvement and is being upgraded to reduce water ponding and the potential for hydrocarbon spillage.

MRM imports goods, spares and consumables from a variety of suppliers to support the current operation. The mobile equipment maintenance suppliers are based in Maputo, whilst the Original Equipment Manufacturers for the wash plant are based in South Africa. The imported goods are received at either Nacala or Maputo ports and transported to the Mine by road.

MRM has defined all goods/spares into critical, medium and low importance categories. The primary warehouse has a 6-month inventory of critical spares and a 1-month inventory of medium/low importance spares. All perishable and non-perishable food is sourced locally and a delivered to site every 15 days.

Fuel is delivered daily by Petromoc in 10,000 litre capacity road tankers and stored in a 46,000 litre capacity bunded facility which is owned, maintained and operated by Petromoc. Light vehicles refuel use the metered dispensing system adjacent to the fuel tanks whilst an MRM fuel bowser refuels heavy equipment within the mining and waste operating areas.

The fuel supply contract with Petromoc is based on a 5-year rolling contract (dated 2012) as long as neither party manifests intention to terminate the same 60 days before the renewal date.

3.6.4 Utilities

Power

The entire operation is running on power supplied by Electricidade de Moçambique with 3 phase 33 KV line voltage 12.6 km-long connection to the mine. Diesel generators are also installed at mine and camp to provide power when the fixed connection is interrupted to ensure operations remain unaffected.

A 1100 KVA and a 250 KVA diesel generator are installed at processing unit for backup for processing unit as well mine office. Two diesel generators comprising 250 and 200 KVA in line for equal distribution of electrical load have been installed for the increased power requirement at Namanhumbir camp.

Communications

The communication systems at the operation are closely linked to the security measures. The support infrastructure benefits from a WiFi connection and operatives utilise two-way radio communications. Security monitoring utilises CCTV and biometric identification for personnel daily attendance records.

Water

There are 7 boreholes on site, five of which have received potable water certification. A single borehole supports the Namanhumbir camp with water pumped to elevated tanks for domestic and sanitary consumption. Raw water is treated by a small reverse osmosis plant in the kitchen prior to use by kitchen staff for food preparation. Drinking water is imported in bottles. Foul and domestic waste water from the Namanhumbir camp is collected and reticulated to a septic tank and soak pit.

MRM maximises the recycling of water within the wash and DMS plants via the thickener overflow tank. Tailings decant water is pumped back to this tank. Detailed water usage figures are not available, but MRM reports that the plant recycles up to 93% of the water used. Make-up demand is drawn from a nearby reservoir. The make-up reservoir is formed form an earth dam constructed in the valley of a seasonal water course. During the dry season, the reservoir is replenished by six boreholes.

SRK recommends that a more detailed water balance is developed to optimise the reservoir capacity to accommodate demands from the increased production. This should include an assessment of downstream water users to understand potential limits on discharge flows and sediment control.

Waste Management

There is no domestic or industrial waste disposal site at the mine and as such when this type of waste is generated the following procedure applies:

- when waste is generated and requires disposal, the HSE Officer Environment shall be informed of the nature and quantity of waste;
- the HSE Officer will develop recommendations for each unique case of waste disposal; and
- these recommendations shall be followed by the departments responsible.

Every area that produces hazardous, medical, and or non-hazardous waste must have a satellite accumulation site indicated by sign boards.

- Hydrocarbon contaminated waste is disposed of at the industrial landfill by a contractor.
- Medical and domestic waste is incinerated on site, with the ash resulting from this being disposed of at the industrial landfill. Non-biodegradable waste is segregated and is disposed of by contractor.

3.6.5 Security

Due to the nature of the business, the security situation in the MRM concession, and the areas around the concession, can change quickly. In 2018, MRM approved a security plan, but continuously evaluates the situation and looks to amend and update the security plan as the project develops.

The main security challenges are:

- illegal mining activity, which is the biggest challenge for MRM Security; and
- theft of rubies at various stages through the process.

The current security plan involves 493 personnel from multiple sources. The security plan has the following key components:

- subdivision of the operational area into three security blocks / zones which are further subdivided into smaller zones for better control and coordination;
- each zone would have an operating base with a dedicated expatriate security officer in charge of each security zone;

- radio communications between zones and operating bases; and
- all necessary equipment to support the security operation including training, dedicate vehicles, communications and GPS devices, spotlights, torches and digital cameras / recorders.

3.6.6 Conclusions

SRK notes the following conclusions:

- The Project is well served in terms of infrastructure. No significant challenges with regards to the current or planned arrangements are anticipated.
- Water management is the most significant issue to address on an on-going basis. SRK notes that current and planned actions are designed to ensure that infrastructure requirements will not adversely impact on the operations performance.

3.6.7 Recommendations

SRK makes the following comments and recommendations:

- MRM must continue with the planned program of investment in infrastructure.
- Investments in water infrastructure, roads, and community support should be prioritised as these will have the most significant impact on the operation.

3.7 Social, Environment, and Health and Safety

3.7.1 Introduction

This chapter focuses on the compliance of MRM with:

- applicable Mozambique environmental legislation and environmental authorisations;
- performance relative to GIIP, including the requirements of the London Stock Exchange ESG reporting guidelines;
- appropriateness of the existing management systems and CSR activities;
- environmental and social issues of concern;
- risks and liabilities;
- the appropriateness of closure planning and cost estimates; and
- recommendations for improvement to existing management measures and reduce risk.

This section of the report builds on the original report produced following previous site visits. This update is based on a further site visit to MRM by Dr Cathryn McCallum in October 2019, and a desk top review by John Merry.

3.7.2 Environmental and Social Setting

General Background

The Montepuez operation is located in northern Mozambique approximately 170 km inland of Pemba. The northern boundary of the mining concessions is located 11 km south of the Quirimbas National Park.

The general operational setting is described in Section 1.2. Of significance is the intensity of the rainfall which falls predominantly during the months of December through to March. The Maninge Nice Pit areas have intact Miombo woodland forest and remnants of forest vegetation reaching a height of approximately 15 to 20 m. At the Mugloto pit areas, the vegetation comprises long grasses and the natural Miombo woodland has been disturbed by subsistence farming activities for maize and other subsistence crops.

Mozambique is rich in natural resources and has a number of mining projects across the country, mining coal, graphite, and mineral sands, as well as significant agricultural potential. Cabo Delgado Province, which hosts MRM, also has offshore gas deposits[1]. There is a relatively large potential pool of labour with about 70% of Mozambique's population of 28 million (2016) living and working in rural areas[2].

Almost 70% of the population live on less than USD 2.5 a day and 60% on less than USD 1 a day in 2018. Cuts in welfare expenditure, combined with large chunks of the public budget allocated to defence spending and debt servicing, have been widely criticised by civil society.

The number of people entering the labour market each year is higher than the number of job opportunities available, and the unemployment rate in 2018 was 24.91%. The rate of early pregnancy is amongst the highest in the world, half of children are malnourished and over half do not finish primary school. Conflict, weak government, high levels of corruption and a growing risk of radicalisation threaten Mozambique's stability[3].

According to an EU report[4] on conflict in Mozambique, the potential for civil unrest is exacerbated by the exploitation of natural resources in the north of the country. The population of Cabo Delgado Province in 2017 stood at 2.3 million. As with the rest of Mozambique, the province has a large youth population with just under half the population (44.6%) under the age of 15, and the highest illiteracy rate in the country. Montepuez District is the second largest district in the province and the most populous with just over 12% of the population. Around 70% of the population of the district is illiterate[5].

In the project area there are limited employment opportunities and agriculture is a key livelihood strategy for the majority contributing to subsistence, income generation and food security. Subsistence crops commonly grown include maize, rice, beans, cassava, pumpkins, sorghum, and fruit trees.

The province is subdivided into localities, with a Chefe De Posto as the senior administrator. Localities are split into "villages". There are five villages located within the mining concessions or on the periphery of the concession boundary. The MRM operation within the concession requires physical and economic displacement. A resettlement plan was prepared and approved in August 2018 by the government of Mozambique to resettle 105 families from Nthoro Village. A new resettlement village is currently being built by MRM outside the concession area boundary.

[1] https://www.worldbank.org/en/country/mozambique/overview#1
[2] https://www.worldbank.org/en/country/mozambique/overview
[3] https://www.gov.uk/world/organisations/dfid-mozambique
[4] *https://www.iss.europa.eu/sites/default/files/EUISSFiles/Brief%205%20Mozambique_0.pdf*
[5] BTI 2018 Country Report - Mozambique, *p. 20.*

Artisanal and Illegal mining

In the past five years, more than half the state revenue in Cabo Delgado came from taxes associated with exploitation of the ruby fields. Small producers and artisanal miners make up 90% of the industry and since the discovery of the ruby fields, nearly 10,000 people have come to northern Mozambique ‘digging and trading rubies or offering goods and services to those doing the mining’. Currently MRM is the only large-scale ruby mining operation; however, Fura Gems acquired licences between 2017 and 2018 and is planning to explore up to 1,100 km^2 in Montepuez and the Chiure District of Cabo Delgado.

The MRM operation is the first formal large-scale mining activity to take place in the Montepuez region. Approximately ten years ago, the area was dominated by artisanal mining activity in designated areas around Namahaca and Nacaca until these areas were incorporated into larger mining licences. The artisanal mining community around Montepuez has faced many challenges since the rubies were first discovered. Laws and regulations relating to artisanal mining and large-scale mining overlap and are considered to be contradictory. Mining without a licence was not considered a major criminal offence until February 2016 and the miners now face considerable jail time and fines if caught.

In 2015, it was estimated approximately 1500 artisanal (illegal) miners were active across the MRM concession. These numbers have been reduced through a concerted security effort. Concerns and a 2018 claim related to alleged human rights abuses have resulted in a series of rights-based approaches being adopted in the management of concession security and apprehension of illegal miners in the concession, in line with the Un Voluntary Principles of Security and Human Rights.

Illegal artisanal miners’ incursion into the concession continue, exacerbated by the established illicit gemstones supply chain in the province and the poverty profile of the area.

3.7.3 Mineral Rights and Environmental and Social Approvals

Mining Concessions

In February 2012, the Mozambican government granted MRM mining and exploration concessions for the two adjoining mining concessions 4702C and 4703C, which cover an area of approximately 33,600 ha. These were dated 11 November 2011 and valid for 25 years. Bulk sampling began in August 2012. In December 2015, MRM was granted a consolidated Mining Concession which combined the two concession areas under 4703C (ref 1588/CM/INAMI/2015) valid until 11 November 2036.

Article 44 of the Mining Law No 20/2014 states that prior to the beginning of any development and extraction operation in the area covered by the concession, the mining concession holder is required to obtain the following primary environmental approvals:

- an Environmental Licence;
- a Land Use Permit, termed a “DUAT”; and
- an approval for the compensation and resettlement plan (“RAP”).

The Mining Law includes specification on mine closure. The National Institute of Mines (“INAMI”) (Article 26) is responsible for reviewing and approving rehabilitation and closure.

Mining Contracts

Article 8 of the Mining Law states that the Government may enter into a mining contract with the holder of a mining concession. SRK understands that MRM has a mining licence but does not have a mining contract with the government.

Social Requirements Under Mining Legislation

Mozambique has been at the forefront of developing a legal and regulatory environment that is aligned with the African Mining Vision. The result is two basic laws for mining: the 2014 Mining Sector Law (20/2014), and the 2014 Mining Tax Regime and Fiscal Benefit Law (28/2014).

The main government policies and regulations dealing with the social aspects of mining seek to establish a clear rights-based approach to guaranteeing land for Mozambicans and supporting rural community land rights while encouraging private investment. These include:

The Corporate Social Responsibility Policy for Mineral Resources Extractive Industry (Resolution21/2014);33, which focuses on developing and maintaining constructive relations between government, communities and companies.

The Mining Law Regulations (Decree 31/2015 from 31 December 2015), governs artisanal and small-scale mining as two separate activities. These regulations define the legal characteristics of the mining title (artisanal) and/or mining pass (Small scale) and the procedures for attributions, renewal, upgrading and other situations of these mining certificates.

Environmental and Social Approvals

Mozambican environmental legislation is generally well developed. The Environmental Law No 20/97 and its Regulations establish the guidelines and rules applicable to all sectors of activity. In 2015, a new regulation on the process of environmental impact assessment was established (Decree 54/2015).

In addition to Decree 54/2015, sectoral specific regulations were also issued in 2015 in the form of Decree 31/2015 of 31 December: Regulations of the Mining Law.

The Decree on Environmental Impact Assessment (54/2015) stipulates that for the mining and oil sector specific environmental regulations apply. For mining projects, the environmental impact assessment process is supervised by the National Mining Institute and the relevant national or provincial department, depending on the size of the project. In addition, the Regulations of the Mining Law (31/2015) establish that social impacts of mining projects need to be identified and addressed.

The current environmental approval process, based on an EIA, is regulated by Decree no 54/2015 of 31 December 2015. The Ministério de terra, Ambiente e Desenvolvimento Rural ("MITADER") is the authority responsible for reviewing this report and issuing the environmental licence. The Decree of 2015 also introduced the categories of A+, A, B and C. Several pieces of mining and environmental legislation guide the process to be followed when undertaking the EIA. They also guide the review of the EIA reports by MITADER and subsequent issuing of Environmental Licences by MITADER.

In Mozambique, land is primarily held by the government, which also legally recognises the role of customary tenure systems. In the rural area studied, although land ultimately belongs to the state, the area is controlled by the chiefs and elders who regulate the land under the custodianship of their Traditional Authority.

In principle, the holder of a mining concession has the right to apply for land use title in accordance with Article 28 of the Land Law Regulations Decree 66/98 and Article 12 of the Mining Law. A land use permit issued in connection with a mining concession has the duration of that concession.

Article 15 of Decree 31/2012, the Regulation on the Resettlement Process Resulting from Economic Activities, indicates that if relocation of local communities is required, a memorandum of understanding between the mining licence holder, the state and the affected community must stipulate payment by the licence holder of fair and transparent compensation. Resettlement Action plans should be approved by District Governments and linked to District land use plans.

Current Status of MRM Environmental Approvals and Licences

MRM was originally granted Environmental Licences by the Ministry of Environment (by the Governor of the Province of Cabo Delgado), for Category B Projects, on 9 March 2012 for mining on the Mining Concessions 4703C and 4702C (Environmental Licenses 006/2012 and 007/2012, respectively). These licenses expired on 28 November 2016. A condition for the renewal of the licences was the completion of an EIA process as the mine was then considered a Category A facility. The EIA report was subsequently approved, and the company holds a valid environmental licence through to August 2024 for the mine site and a separate licence valid until April 2023 for the unit in the industrial park in Maputo.

MRM holds a valid approval for its RAP and was issued a Category "A" Environmental Licence that is valid until August 2024.

A separate 'Borrow Pit Licence' was obtained from the relevant authorities, permitting MRM to extract soil for internal roads maintenance.

MRM originally applied for two separate DUAT (two licenses; 4702 and 4703) prior to their amalgamation. These cover a total area of 256.66 km^2.

- The first DUAT for license no. 4703, covering 76.41 km^2 was approved in November 2016.
- The second DUAT for license no 4702 for an area of 180.25 km^2 was approved in April 2018.

The land use permits are valid until 2036.

3.7.4 Stakeholder Engagement and CSR

Stakeholder engagement

There is currently no formal stakeholder engagement plan at MRM and, as a result, there are no formal stakeholder records. MRM has engaged consultants and are in the process of establishing an operational stakeholder engagement plan and a grievance mechanism, referred to as the operational grievance mechanism ("OGM").

A stakeholder mapping process has been completed and a community engagement plan for seven communities prepared. These communities in an around the concession are visited once or twice a week. At formal meetings, minutes and notes of the meetings are recorded and kept as word files.

Grievances can be lodged in person, through community boxes, by email/ letter or by contacting a hotline called the Linhe Verde (green line). There are also a number of human rights boxes in the concession, but these do not currently feed into the OGM.

Grievances are received and monitored by the CSR team. Each department within MRM has a designated grievance officer and grievances received are passed on to them for initial resolution. All grievances received are to be resolved and or responded to within 30 days of receipt.

CSR

As with Kagem, MRM assigns 1% of ruby sales annually for CSR activities, managed by a CSR team. MRM's CSR team is headed up by an assistant CSR manager who is supported by a team of three community liaison officer, three community liaison assistants and a grievance management officer. Meetings are held with affected communities to determine what should be prioritised over the next 12 months and this is used to prepare an annual CSR budget and plan for MRM/ Gemfields Board approval.

Currently the planning process does not consider the regional fund, comprised of MRM royalty payments to the Government, administered by the District or the regional development plan.

To date the funds have been used to improve social infrastructure and access to education and health care. Access to water has also been improved with 12 boreholes with handpumps constructed.

The annual nature of the CSR plan and budget inhibits a strategic focus on community self-sufficiency and sustainable development.

3.7.5 Resettlement and Livelihood Restoration

MRM has completed a RAP (prepared by Genesis Consultants). In addition to the legal framework outlined above, the RAP document also referenced the following laws: Territory Planning Law (Law No. 17/2007 of 18 July); Regulation of the Law of the Ordinance of the Territory (Decree No. 23/2008 of 1 of June); and Regulation on the Exhumation of Bodies (Decree No. 42/90 of 29 December). The 2016 RAP was then updated in 2017 to minimise the need for resettlement, in line with IFC Performance Standard 5. This was approved by the Provincial Directorate of Land, Environment and Rural Development ("DIPTADER") in August 2017.

Just under 1000 households (984) have been economically displaced, of which 834 have received compensation payments for loss of crops and fruit trees. The remaining 105 households in Nthoro Village will be physically and economically displaced by the project. A new settlement is in the final stages of construction for the Nthoro community, in line with government regulations.

There will also be 150 residential units with water and electricity supply, a primary school, a market, a church, a mosque, a police station, a cemetery, a waste landfill and designated farmland. It is anticipated that everyone will be resettled by March 2020.

It is envisaged that livelihood restoration will focus on food security and enterprise. It is unclear how CSR activities will link with the LRP once the resettlement is completed.

3.7.6 Approach to Environment, Social, and Health and Safety Management

At MRM there are five people employed in the Health and Safety, Social, and Environment ("HSE") department. Assuming line management is held responsible for HSE performance of their respective areas of the operation this should provide an appropriate resource base to develop the management systems and perform the internal monitoring and audit functions. SRK understands that a number of the management team members were appointed recently. The key will be in the selection of the appropriate skill sets to meet the ESHS performance committed to by Gemfields.

MRM has a site HSE policy that aligns with the Gemfields corporate commitments to the implementation of a management system compliant to ISO 14001 and OSHAS 18001. In 2019, the implementation of a formal management system was at a very early stage. As noted elsewhere in this report, there is a renewed emphasis on this driven from the Gemfields corporate office. Documentation and discussions with SRK suggests there is still a significant amount of work to be done on the HSE management systems.

SRK has requested to see monthly or quarterly HSE management reports and any recent environmental monitoring data. It is understood these are not available at this stage.

Social and Community Management

All of the MRM management team are relatively new in post, with everyone having started their contracts within the last 18 months. Most of the manager and department heads interviewed during SRK's 2019 site visit were in the process of establishing a range of management processes and systems to improve the accountability of their respective departments. This was the case for Human Resources, Procurement, Security and the CSR team.

Other than consideration of individual human rights in the apprehension of artisanal miners, increasing security and policing the concession area, there is no ASM management strategy and recommendations from a 2015 study on ASM do not appear to have been implemented. This means there are no alternative livelihood options for the disadvantaged and increasingly marginalised youth that exist in and around the concession and who appear to make up the majority of illegal artisanal miners.

3.7.7 Closure Planning and Cost Estimate

As required under Mozambique law, a closure plan and closure cost estimate has been developed as part of the EIA. The costs of on-going rehabilitation for mined out areas are included in the financial model projections for MRM. Based on SRK's experience, the cost estimate included in the EIA is relatively low and does not cover all elements of a comprehensive closure programme such as redundancy payments and retraining costs. As a result, MRM has a more conservative closure provision in the model. This is to cover the cost of removal of all equipment from the site, rehabilitation of all the remaining disturbed areas on site and pay staff retrenchment costs.

SRK note that rehabilitation of the open pits concurrent to mining operations is a key closure objective. Improvements have been made in the stripping and storage of topsoil, but topsoil stores can still be improved (the material depth exceeds ideal topsoil storage guidelines and there is no attempt to revegetate the stored soil).

3.7.8 Social, Environmental and Governance Risks

This section outlines the primary social and environmental risks associated with the MRM operation.

Key Environmental Risks

- **Poor compliance with EMP:** Based on the recent audit reports provided, MRM are not complying with their obligations under the approved EIA report. This risks potential fines as well as reputational damage.
- **HSE Management Systems:** The status of the implementation of the management systems still appears to be at a very early stage. This situation has not changed since the last review in 2017. This is a reputation risk given the high-profile commitments made to accreditation to ISO standards.
- **Water resources and water management**: There appears to be a lack of understanding of water availability, water use, and potential vulnerability of the operation to climate change impacts. The risk is that the operation is not prepared for extreme drought or flood conditions leading to production loss or competition for scarce resources.
- **Biodiversity management**: The existence of only basic environmental baseline data and lack of a clear biodiversity management programme is a potential risk when compared to the high-profile Gemfields marketing programme.

Key Social Risks

- **No Sustainable development strategy:** The CSR budget for local development activity is significant and SRK was informed that there is a corporate strategy that stipulates funding should prioritise education, health and food production; however, none of the CSR activities is tied into the district or regional development plan or the SDG. Consequently, the current use of the CSR budget presents a risk of engendering community dependency rather than contributing to more sustainable communities.
- **Youth disengagement and conflict:** There are few alternatives to engaging in illegal artisanal mining activity. Reportedly, there are links between illegal mining and the Islamic insurgency in the north of the province, thus presenting a potential conflict risk.
- **Increase in ASM activity:** While there are a series of comprehensive security measures being put in place to reduce incursions onto the concession, unless there are viable livelihood alternatives and proactive engagement, it will remain an uphill battle. A number of similar risks were highlighted in the 2015 report, but SRK understands these are still to be addressed. This presents an ongoing risk associated with artisanal miners as well as the risk of population influx and associated social challenges.
- **Poor stakeholder engagement records:** The absence of a stakeholder engagement strategy, plan, and data management process, present a social risk to the operation and makes MRM vulnerable to misinformation, rumours and potentially false allegations.

- **Limited social monitoring plans:-** Gemfields' overall approach is aligned with the broader strategic aims of the SDG. MRM needs to develop social monitoring plans and systems to be able to evaluate effectiveness and impact of CSR activities and their contribution towards the SDG.

Key Governance Risks

Other than the absence of a comprehensive social and HSE management system and the potential for the different departments to work in silos, there are no significant governance risks at the MRM site.

3.7.9 Recommendations

Environmental

MRM needs a clear programme to transpose the comprehensive set of Gemfields policies and procedures into site specific policies and practical operating procedures. This should be done within the framework of an ESHS management system.

The risk registers developed as part of the management system should help prioritise the ESHS efforts of the operation and start to close the gaps in the EIA / EMP compliance commitments.

The recent biodiversity study should be further developed to meet international standards for biodiversity management. This should be linked to a practical action plan that can be implemented on site.

The project should develop a comprehensive understanding of its water balance and implement a water quality and quantity monitoring programme. SRK understands that flow meters have been installed on water supply boreholes and this information will feed into the future site water balance.

Social Recommendations

The CSR annual plan should be reviewed and aligned with regional priorities and the SDG to become a three to five-year strategic plan with a set of qualitative and quantitative key performance indicators., to reduce the risk of dependency.

The human terrain and the ASM value chain needs to be understood, so that the root causes/ drivers of ASM can be addressed rather than the symptoms currently focussed on through the security approach. The illegal trade in gemstones needs to be addressed at the same time as supporting viable alternative livelihood strategies for the youth of the district.

A holistic approach to stakeholder and community engagement is required, that strengthens the capacity of the various sectors of the communities in the project affected area to communicate and engage.

Records of all stakeholder engagements need to be regarded by MRM as an effective insurance policy against potential allegations of wrong doing. Engagement records should be kept and stored digitally in a fit for purpose data base, so that issues and grievances can be recorded and tracked accordingly.

Procurement processes should be adapted for local content benefit, both in terms of contracting providers as well as payment, so that local benefits can be realised.

3.8 Ruby and Corundum Marketing and Sales

3.8.1 Introduction

Rubies, along with sapphires, belong to the corundum mineral family. Corundum in its basic form is colourless, and various trace elements are responsible for the different colours that the mineral exhibits; the red variety is called ruby; the blue variety is called sapphire and all the other rainbow colours fall within the “fancy coloured sapphire” range. Corundum is the hardest of the coloured gemstones, second hardest among natural minerals after diamonds.

Rubies are extremely rare and are believed to be associated with the plate tectonic processes, subduction and collision, found in a range of hues in only a few localities in the world.

Ruby value is primarily dependent on the purity and brilliance of its colour, coupled with unusual size (carat weight) and fine clarity of the gem. The finest colour of rubies has been traditionally called “pigeon blood”, a trade term used in the market to describe rare and the most prized red rubies.

The trace element from which rubies get their colour is chromium. Additionally, if the iron content present in corundum is low, the ruby reacts positively to UV light and fluoresce. Iron rutile, often present in the gemstone, gives the stone a uniform silky colour, which is very common for Burmese marble-type gemstones. When the iron level is high, a more transparent less fluorescent crystalline structure is formed, common for the Thailand basalt-related rubies. The iron content of amphibole-type Mozambique rubies falls in between the iron-rich Thai rubies and the iron-deficient Burmese gems, producing gems distinguished by high transparency, vivid red colour and good fluorescence. Where the gemstone is not of ruby or sapphire grade, it is referred to “corundum”, having a much lower value.

3.8.2 Ruby Formation and Mining

Ruby deposits are formed under metamorphic growth conditions. Ruby deposits can be classified into two main categories: either metamorphic or magmatic-related. Metamorphic deposits, such as those in Myanmar, have specific metamorphic environments, such as marble in which the rubies are found. Magmatic-related deposits require eruptive events to transport the rubies to the surface such as those gemstones from Cambodia and Thailand and the rubies are found in basalt. There is, however, a third, newer group, the amphibolite-type which has properties outside of the first two groups, such as the rubies from Malawi, Tanzania, Madagascar and Mozambique. These rubies are found in amphibole-related deposits and fill the gap in terms of chemical composition and colour, between the highly fluorescent rubies found in marble rocks and the weakly-fluorescent basalt-type rubies.

Rubies can be recovered from primary or secondary sources: the primary being the rocks where they are formed, or a secondary location where they have been transported to. A large number of rubies which were originally embedded in rock were washed out due to erosion and can be found in former and recent rivers, known as ‘alluvial deposits’. Corundum is largely found in alluvial deposits. Rivers can transport gemstone bearing rock many hundreds of kilometres. These deposits are found below the surface of the riverbed and manual labour is required to extract the rock and soil in order to examine it for gemstones. In ruby deposits such as those found in Mozambique, the alluvial deposits may be between 1 to 10 m below the surface.

3.8.3 Global Ruby Occurrences

Historically, rubies have been mined in Southern Asia and more recently, Eastern Africa. New significant and commercially viable deposits were discovered in Mozambique in the beginning of the twenty first century. High quality rubies have traditionally been produced in Myanmar (previously Burma) and Kashmir. Later, rubies were mined in Thailand, Madagascar, and Tanzania.

Myanmar

Myanmar has always been regarded as the world's most important source for rubies as well as the largest producer by volume for a significant period of time; however, lack of investment in the industry and other factors resulted in exhaustion of the existing mines and decline in Myanmar's overall market share. Based on recent production and the work carried out at the Project, Mozambique is currently believed to be the most significant ruby find in the world since Myanmar.

Rubies were originally mined in the historic area of Mogok in the Mandlay region, reported by many as having some of the world's finest rubies as well as being the standard against which other ruby sources are compared. Since the mid-1990s, large deposits of lower quality rubies have also been found at Mong-HSu in the Shan state. These rubies tend to be a deeper or darker colour than the Mogok rubies; however, all of these resources have largely been exhausted. Furthermore, the mining of rubies and other gemstones in Myanmar has been the subject of international scrutiny and subsequent trade bans. In 2007, the EU imposed sanctions on precious gemstones and the USA imposed a ban on rubies and jade from Myanmar the following year. USA restrictions are still in place, while the EU lifted its measures in 2013 after government reforms. It must be noted that the Mogok mines, which have been closed for the past decade, have recently been reopened. It is noted that foreign miners and investors are not able to invest in the sector as mining is only permitted to be undertaken by Myanmar based individuals and companies.

Kashmir

The mining operation in Kashmir is situated in an extremely remote and mountainous terrain, consisting of two main workings, at 14,300 feet (4,360 m) and 12,500 feet (3,810 m), that are only accessible between the months of May and October, due to severe weather conditions during the rest of the year. These factors contribute to Kashmir rubies having limited commercial viability.

Thailand – Cutting and Polishing Hub

Significant ruby deposits were found in Thailand in the second half of the twentieth century. The Thai gemstone treatment industry grew as it was discovered that the darker red tone of rubies could be enhanced through the heating treatment. This, combined with new finds of rubies in Madagascar and Mong-HSu deposit in Myanmar, resulted in Thailand becoming one of the major manufacturing hubs (cutting, treatment, and trade centre) for coloured gemstones. The major corundum mining areas in Thailand are Chantabun and Battambang and the largest ruby cutting factories are in the Chanthaburi district as well as Bangkok. Thai rubies were important to the market because of the scarcity of Burmese rubies; however, Thailand has declined to be a corundum supplier, yet it has firmly maintained its position as the world's premier cutting and polishing hub for corundum. It has been reported that 90% of the world's rubies pass through Thailand and, together with India, is renowned for being the world's leading coloured gemstone manufacturing and trading centre.

Other Ruby Deposits

There are a number of ruby deposits situated in approximately 20 countries. Afghanistan and Cambodia have some of the oldest known ruby deposits, though production is sporadic and, like Kashmir, deposit locations are remote. Rubies were also found in Vietnamese district of Luc Yen in the 1980s and more recently in the Tanzanian provinces of Songea and Winza, however, the quantities were small, and the quality of the ruby was inferior. In 1966, ruby districts were reported in Greenland and a mining company, LNS Greenland, is currently exploring the Aappaluttoq area. Newer deposits have been discovered in Australia, Kenya (Mangari), Malawi (Chimwadzulu), Madagascar (Andilamena and Vatomandry), Colombia, Russia, and the USA (Montana). Sri Lanka is also a land rich in corundum, but mainly produces sapphires of very good quality.

Mozambique Discovery

Due to the remoteness of Kashmir deposits and the difficulties associated with Myanmar, the discovery of rubies in the Montepuez district in Mozambique in 2009 was an important development for the coloured gemstone industry. Gemfields acquired 75% of the Project as well as a 25-year mining licence. Gemfields is currently the world's single largest producer of coloured gemstones. Gemfields has estimated that the Montepuez mine should account for around 40% of the world's ruby supply. In 2016, Gemfields reported that up to 10.3 Mct of rubies and sapphires were recovered at Montepuez in a year. Gemfields plans to expand its mining activities in Mozambique by exploring new districts.

The highlands of Northern Mozambique are dominated by a Precambrian basement section of the famous Mozambique Belt that extends up north to the Mediterranean. In this basement, large regions were metamorphosed at high temperature and high pressure during the Pan-African tectonic event, 550 to 800 million years, creating suitable conditions for the formation of gemstones. Deposits of the Pan-African Orogeny are much older than the Himalayan range gem deposits that are only 40 million years old. The ruby deposit of Montepuez is located in the eponymous tectonic unity. This unit is mainly composed by strongly deformed gneiss and quartzite, with few marble lenses.

The production mostly consists of tabular hexagonal crystals, with some fine euhedral crystals from primary deposits, although such material is usually highly fractured and included. Rough gemstones showing abraded aspect due to weathering come from secondary deposits located over the primary deposit or along streams that passed over it. The material is composed of slightly tumbled crystals that are more transparent and less included than the rubies from primary deposits. This is due to the fact that rubies from secondary deposits are trapped during millions of years with other heavy minerals. Those heavily included and fractured are broken and turned into sand through weathering processes. In contrast, clean rubies are tumbled and concentrated in gem rich gravels. Therefore, the proportion of clean high quality gemstones is much higher in secondary / alluvial deposits.

The Montepuez rubies are invaluable to the ruby industry because of the range of sizes, quality and especially the wide range of colour and florescence of the gemstones, alongside providing a controlled and regular supply. This potentially enables the rubies produced to suit a large range of different markets and personal preferences. According to Vincent Pardieu, a renowned gemmologist, the main characteristics of Montepuez rubies are the following:

1. Purplish-red to red colorations with a slight milky haze.
2. Some exceptionally clean and clear crystals observed. The exceptional quality gemstones which represent about 1% of current yield.
3. The most common internal feature of Montepuez gems is the presence of rounded transparent crystals, which under analysis by the Gemmological Institute of America (GIA) proves to be amphibole (any class of rock-forming silicate typically occurring as fibrous or columnar crystals).

This new and consistent source of rubies has had a considerable impact on the international market.

Gemfields reported that total auction revenues at MRM since 2014 have surpassed USD 500 million

3.8.4 Treatment of Rubies

A variety of treatments are applied to rubies to improve their quality to expand the market to a broader base, providing alternative options for commercial jewellery at competitive prices. This has had the effect of expanding demand and making rubies more available and affordable in the market. More material available for sale has dramatically increased the demand for corundum in general (rubies and sapphires), as supplies were limited to those gemstones that displayed desirable characteristics. In general, treated rubies are far more available than untreated gemstones and sell into the market at affordable prices. Effective disclosure and consumer education on various gemstone treatments and the relative value of each type of gemstone continues to add value to the downstream market. The largest companies like Gemfields promote transparency and responsibility and are actively educating the downstream market and consumers alike.

There are three common ruby treatments. Firstly, the technique of heat with high temperature, common in the 1970s, sees the rubies being heated in an oven in a controlled environment to improve the colour and/or clarity of the gemstone. This heat treatment drastically improves the colour and clarity of the gemstones especially for the mid to lower priced, commercial jewellery. Darker shades, as well as blue and/or purplish colour centres are removed leaving a purer, red colour. Natural inclusions, crystals with a melting point lower than corundum, are burned out leaving the gemstone practically eye clean.

Glass fill treatment is the second most common process. This treatment is aimed at improving the appearance of low-quality ruby by infusing the stone with a high refractive index lead glass and smooth out the appearance of heavily fractured gemstones by filling surface reaching fracture with melted glass. When the amount of glass filling is equal or greater than the natural host material, the ruby is called in the trade by the name of "composite Ruby" as per nomenclature issued by the American Gemmological Lab to describe the same.

The third is deep colour diffusion heat treatment that consists of diffusing elements such as chromium (for rubies) and titanium (for sapphires) into the structure of the colourless corundum from outside to change the gemstone colour.

Transparency and adequate disclosure of any kind of treatment applied to gemstones in fundamental in the trade, also because most of time, only a gemmological Laboratory would have the tools and the knowledge to detect and identify them. Gemfields understands that the mine production is very vast and includes all grades of rubies, therefor treatments are needed, thus demand all their auction clients to appropriately disclose and value the goods accordingly.

3.8.5 Ruby Market Mechanisms

The wholesale market of rough rubies, just like that of all coloured gemstones, though unlike diamonds, has always operated following century old practices, which often appear unregulated and artisanal in their method of conduct. Traditionally, the major trading centres for coloured gemstones are India and Thailand, as well as mine sites, when dealers are able to travel to the fields to procure directly from the source.

Cut and polished gemstones, manufactured in the main trading hubs (as above, Thailand and India), have been sold to the wholesale market globally during international trade shows, or by appointment at the factories. Procurement and sourcing have always been dependant on the connections and the ability to travel for most of clients, coupled by the uncertainty of production coming from artisanal scale mines. This has meant that jewellery houses could not plan a production around rubies (or sapphires alike), as no stable or consistent supply have ever been possible.

Gemfields aims to develop and lead a sector that has historically remained unregulated and largely illicit, by showcasing the benefits of a more systematic, modern and transparent approach to coloured gemstone mining so that the industry becomes more responsible and legitimate, providing sustainable long-term social, economic and environmental benefits to both the country and local communities.

Gemfields has developed and implemented an innovative grading and auction system for selling its rough gemstones. The auctions are held in secure locations with the material separated into homogenous lots and certified as having been produced by Gemfields The world's leading rough gemstone buyers submit sealed bids for individual lots. A sale occurs if the highest bid received exceeds a pre-determined, but undisclosed, reserve price. The auctions have brought a level of professionalism and transparency previously not seen in the industry.

In the absence of an industry standard for evaluating rough coloured gemstones, Gemfields established its own grading system to assess each gem according to its individual characteristics (size, colour, shape and clarity). This approach has been instrumental in providing buyers with confidence in the consistent quality of the material on offer.

Gemfields twelve auctions held since June 2014 have generated USD 513 million in total revenue, setting a new benchmark for the quality of African mines. It has also demonstrated the quality of supply the Montepuez Project can provide. An exceptional 40.23 ct rough ruby (dubbed the "Rhino Ruby" given its size and characteristics) from Montepuez formed part of the December 2014 auction, and a 45 ct pair of vivid red rubies dubbed as 'Eyes of the Dragon' was part of June 2015 auction.

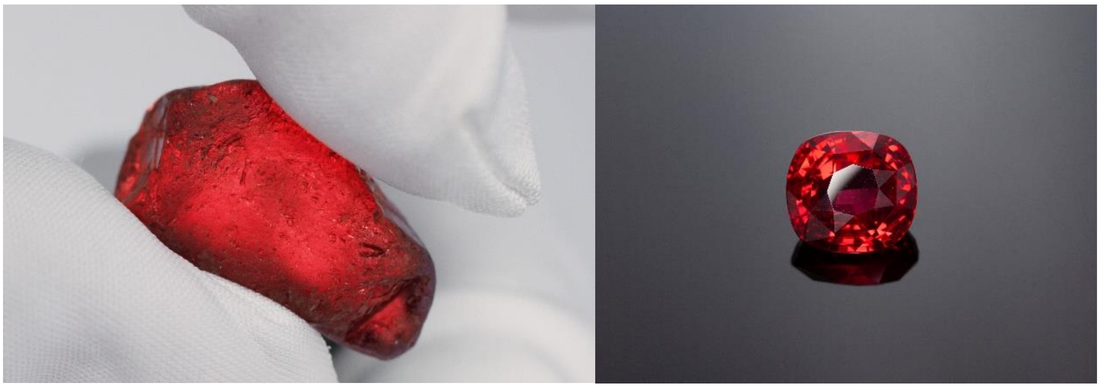


Figure 3-43: MRM: The 40.23 ct rough Rhino Ruby and the 7.68 ct cut Rose of Mozambique ruby

Gemstone Market Size

Coloured gemstones continue to outperform the wider jewellery market (Knight Frank report, Q1 2019) primarily due to the major economies' recovery and growth, combined with a fashion trend which has shifted towards responsibly sourced coloured gemstones. Gemfields ability to transparently supply a consistent production of quality gemstones to the downstream markets and its intensive global marketing and communications efforts, are being relied upon by the International clientele looking to adhere to best standards in the industry. According to the United Nations Commodity Trade Statistics Database, the international coloured gemstone industry has been growing at a CAGR of 19% for the last five years (2012 to 2016) and currently stands at USD 8.6 billion. The emerald, ruby, and sapphire market make up 87% of the coloured gemstone market and currently stands at USD 7.5 billion, with 22% CAGR over the period, 2012 to 2016. The information is still largely lacking but it is estimated that rubies and sapphires make up for 50% of the world's coloured gemstone market with the largest demand for rubies originating from Asia.

The gemstone industry is highly fragmented. Small to medium scale miners produce a large amount of the gemstones and do not declare their data. The world's top gemstone manufacturing hubs, India and Thailand, experienced steady growth in their exports of emeralds, rubies and sapphires in 2016 of 9% and 8%, respectively. Meanwhile, exports from Hong Kong, the main trading hub, more than doubled reaching USD 2 billion (2015: USD 1.3 billion). Asian markets and the USA regained momentum and showed extremely encouraging results with China, Japan and India growing by 92% (USD 2.3 billion), 11% (USD 1.4 billion) and 19% (USD 0.08 billion) respectively, and the USA imports increasing by 8% (USD 1.3 billion).

Quantity of Ruby per Country

Mozambique has replaced Myanmar as the world's largest producer of rubies and according to the Gemfields 2016 update, approximately 10.3 Mct of ruby and corundum was extracted from the Montepuez Project in Mozambique in FY 2015-2016. It was reported by the 2015 United Nations Commodity Survey that the export value of gemstones from Mozambique totalled USD 99.3 million. This is a significant increase from 2013, where it was reported that the Mozambique gemstone export totalled USD 1.1 million. This significant increase is due to the discovery and production of rubies at the Montepuez mine and subsequent Gemfields auctions in Singapore. The international interest in rubies was also confirmed by the results of Gemfields' initial auctions. The first auction in Singapore generated USD 33.5 million and the second, USD 43.3 million. Gemfields also hosted a lower quality ruby auction in Jaipur, India, in April 2015, raising USD 16.1 million and a higher quality auction in Singapore in June 2015 raised USD 29.3 million.

Madagascar became a major producer of ruby with the discovery of the Andilamena and Vatomandry deposits in 2000 and other more recent discoveries. It was reported in 2018 by the United Nations Commodity Trade report that around USD 25 million worth of precious and semi-precious stone were exported from Madagascar.

Ruby Value

Due to its hardness, transparency, rarity and colour, ruby is considered one of the most valuable and expensive of all gemstones. It is accepted that large rubies are considerably rarer than diamonds of comparable quality and size. Rubies have been attracting high prices at recent auctions. Rubies from Myanmar command the highest prices, this is probably due to historical values. The 'Burma brand' is heavily entrenched in the ruby market and still fetches the highest prices, even though the Mozambican ruby is comparable in colour quality. For instance, in 2014, the 'Graff ruby', a 8.62 ct Burmese ruby, from the collection of Greek financier, Dimitri Mavromatis, was bought by Laurence Graff for the record breaking price of USD 8.6 million, valuing it at just under USD 1 million per carat. The 'Sunrise Ruby', a Cartier ring exhibiting a 25.59 ct pigeon's blood Burmese ruby, surrounded by diamonds, has sold at the 2015 Sotheby's Magnificent jewellery auction in Geneva for a record breaking value of USD 30.4 million. The same year, Christie's realised another world record breaking sale, with the 'Crimson Flame' ruby, an unheated Burmese ruby of 15.04 ct which went under the hammer for USD 18 million (or USD 1.1 million per carat).No other remarkable rubies have appear at auction recently, not due to a reduced interest, rather as a matter of the rarity of gems of this kind.

For a non-heated Burmese ruby, a 2 ct ruby can fetch prices of 200% to 300% more than a treated gemstone; however, in the enhanced category of rubies, country of origin no longer plays a definitive role. *The Gem Guide* reports that heated Mozambique rubies under 3 ct are averaging prices approximately 75% of a heated Burmese ruby

The price ratio between 1 ct extra fine upper quality brilliant cut diamonds and unheated Burmese rubies at the present time somewhere around USD 20,500 to USD 20,700 per carat. Mozambican rubies with the same characteristics would fetch around half of the Burmese gem at around USD 12,000 per carat. The particular shade of colour shown by a ruby has a considerable influence on its value.

The market recognition of Mozambique rubies has steadily risen in recent years with the equivalent per-carat values of these gemstones having tripled. Mozambique gemstones are, however, still selling for about half the price of comparable Myanmar rubies. The consensus is that although Mozambican rubies will continue to be available well into the future, high auction price results for Myanmar rubies will ultimately continue to drive up ruby prices for all origins.

Table 3-35 to Table 3-37 present the prices for 1.00 to 1.99 ct, corundum ruby (USD/ct.) from 2008 to 2016, respectively for treated rubies, untreated Burmese rubies and untreated Mozambique rubies. Figures for untreated Mozambique rubies are only available from 2014.

The following generic terminologies have been used: ‘Commercial’, ‘Good’, ‘Fine’ and ‘Extra Fine’. Figures represent averages of the ranges given by The Gem Guide for respective categories. It is important to note the steady rise of prices from 2012 to 2013, this is largely due to the discovery of ruby deposits in Mozambique. There was a slight drop in some heated goods between 2013 and 2014. This is can be largely attributed to the increased supply of heated polished rubies as the Chinese market focused on non-heated (unenhanced) gemstones; however, the price for heated and unheated rubies alike started growing again in 2016.

Table 3-35: MRM: Corundum Ruby (Heated) Prices USD/ct (1.00 to 1.99 ct)

Period	Commercial	Good	Fine	Extra Fine
2019	340	1,620	3,600	8,100
2018				
2017				
2016	294	1,330	3348	7,020
2015	245	1,108	2,790	5,850
2014	185	923	2,325	4,875
2013	185	923	2,175	5,525
2012	185	820	1,950	5,175
2011	185	820	1,950	5,225
2010	185	820	1,750	4,600
2009	185	820	1,750	4,600
2008	185	820	1,750	4,600

Source: ‘The Gem Guide’

Table 3-36: MRM: Corundum Ruby (Unheated Burmese) Prices USD/ct (1.00 to 1.99 ct)

Period	Commercial	Good	Fine	Extra Fine
2019	1000	5,000	12,200	22,700
2018				
2017				
2016	874	2,990	7,993	20,700
2015	475	2,600	6,950	18,000
2014	475	2,600	6,950	18,000
2013	465	2,063	6,200	22,313
2012	465	1,950	5,450	19,950
2011	465	1,950	5,450	19,950
2010	415	1,550	3,900	14,700
2009	-	1,550	3,900	14,700
2008	-	1,550	3,900	14,700

Source: 'The Gem Guide'

Table 3-37: MRM: Corundum Ruby (Unheated Mozambique) Prices USD/ct (1.00 to 1.99 ct)

Period (July/August)	Commercial	Good	Fine	Extra Fine
2019	840	3,000	7,000	13,000
2018				
2017				
2016	630	2,220	5,700	12,000
2015	525	1,850	4,750	10,000
2014	525	1,850	4,750	10,000

**Source: 'The Gem Guide'*

Note: Significant difference in prices for untreated rubies in the Commercial category of Mozambique and Burma origin is due to the fact that lower end commercial rubies from Mozambique are rarely available and The Gem Guide does not track these prices categories for Mozambique rubies.

3.8.6 Ruby Grading

MRM sources two distinct types of rubies at the Project, these are from primary and secondary deposits. The characteristics of these products are different, therefore, different grading processes are used. It is noted that there is a grading system developed and adopted by the Company for its auctions. There are 530 grades between primary and secondary ruby and the grading system is still evolving with each auction as more knowledge and experience is gained with various characteristics of Mozambican rubies.

Rubies from Primary Deposits

Primary deposits tend to deliver higher grade production but of an overall lower value per carat. Most of these rubies are included with fractures meaning some of this material needs to be treated to make it more durable and hence saleable. After cleaning, the rubies are graded and sorted twice; by colour (very light pink to red) and clarity of the crystal (translucent to opaque) before and after treatment. After treatment, the fractures appear less visible and colour becomes more homogeneous resulting in fewer colour categories.

Rubies from Secondary Deposits

Secondary deposits tend to deliver lower grade production but the gemstones generally have a much higher per carat value. The majority of the rubies are very clean with good to exceptional colour. This is as a result of their alluvial origin. Only the most durable, highest quality rubies survive the weathering, erosion, transport, and deposition processes over millions of years.

Ruby Heat Treatment

Gemfields pilot tested the sale of a heated parcel of commercial quality rubies from primary deposit during the LQ auction in April 2015. This parcel was clearly marked, and the type of treatment transparently disclosed as per ethical practices that Gemfields champions. The parcel was well received by the market and the parcel sale was successful.

Gemfields has subsequently decided to sell rubies in their natural form only and allow its clients to carry out treatments. This is to allow clients to make their own best judgement, to fulfil the needs of their individual markets, and test treatments they deem necessary. The client then also takes responsibility for full disclosure and transparency when valuing and selling their product.

3.8.7 Historical Prices Achieved

The first Montepuez ruby auction, held in June 2014, comprised of a mixture of both higher and lower quality material, while the second and fourth auctions held in December 2014 and June 2015 respectively were composed of predominantly higher quality material. The April 2015 Jaipur auction was composed of predominantly lower quality material. Auctions comprise a mix of higher to lower quality material and the mix varies from auction to auction. The differences in auction mixes are a direct result of the Company's desire to build its understanding of the downstream market in order to optimise its long-term ruby auction format. Auction attendees were drawn from Austria, China, India, Israel, Sri Lanka, Thailand, the United Kingdom, and the USA. The auction results of the Montepuez auctions held to date are summarised in Table 3-38, Table 3-39, and Table 3-40.

At the April 2015 auction, it is noted that of the 66 lots offered at the auction, 51 lots were offered on an untreated basis while 15 lots were offered as having been heat-treated (as was the case in the June 2014 auction where Gemfields offered both untreated and treated material). All of the treated lots offered used industry-accepted treatment techniques and were offered and sold on a fully disclosed basis.

In 2018, MRM held mixed-quality auctions in Singapore, in June and December, with revenues of USD 71.8 million and USD 55.3 million, resulting in a record annual revenue of USD 127.1 million. The auctions realised average prices of USD 122.0/ct and USD 84.3/ct respectively. A total of 2.9 Mct of ruby and corundum were produced during the year, with a focus on high-quality, low-occurrence deposits which provide premium rubies.

Of the 2.9 million carats of production for the year, 1.5 million carats were recovered from Maninge Nice secondary ore, 0.8 Mct from Mugloto secondary ore, and 0.6 Mct from the fines (−4.6 mm material).

Proceeds are repatriated to Montepuez Ruby Mining Limitada in Mozambique, in which Gemfields owns 75%, and with royalties due to the Government of Mozambique being paid on the full sales price achieved at the auction.

The market intel and experience gained during the first four years of ruby auctions, lead Gemfields to the strategic decision to organise mixed auctions of high and low quality grades during the same week, as opposed to splitting them in separate events. The new format, which is proving to be successful for Gemfields as well as for the clients attending, foresee a weeklong auction: the clients must submit their bids for the high grade parcels by the end of the 3rd day, and results are announced then. The commercial grade material generally consists in “kilos” of smaller and lesser quality rubies. The clients can continue inspect these for two extra days, at the end of which they need to place their bids, and results are announced straight after.

The reason behind this strategic decision is that each gemstones market is unique in itself and what worked with emeralds, does not work with rubies. Often, the same client who buys high grade rough rubies, is also interested in the lesser quality suitable for treatment, or in small sizes suitable for calibrated production. By offering all grades at the same time, clients can plan their future production with greater precision, better responding to the market needs and allowing a more solid return for Gemfields.

The historical prices achieved by product for all auctions including direct sales of lower quality products are summarised in Table 3-38 to Table 3-41.

Table 3-38: MRM: Summary of Auction Results 2014 to 2015

Auction Results (Ruby & Corundum)	June 2014	December 2014	April 2015	June 2015	December 2015
Location	Singapore	Singapore	Jaipur, India	Singapore	Singapore
Type	Rough Ruby & Corundum (Higher and Lower Quality)	Rough Ruby (Higher Quality)	Rough Ruby & Corundum (Lower Quality)	Rough Ruby (Higher Quality)	Rough Ruby (Higher and Medium Quality)
Carats offered	2.03 Mct	85,491 ct	4.03 Mct	72,208 ct	92,136 ct
Carats Sold	1.82 Mct	62,936 ct	3.99 Mct	47,451 ct	90,642 ct
No. of lots offered	62	41	66	46	49
No. of lots sold	57	35	58	28	45
% of lots sold	92%	85%	88%	61%	92%
% of lots sold by weight	90%	74%	99%	66%	98%
% of lots sold by value	91%	97%	93%	87%	95%
Total auction sales	USD 33.5 M	USD 43.3 M	USD 16.1 M	USD 29.3 M	USD 28.8 M
Average per ct sales	USD 18.4/ct	USD 688.6/ct	USD 4.0/ct	USD6 17.4/ct	USD 317.9/ct

Table 3-39: MRM: Summary of Auction Results 2016 to 2017

Auction Results (Ruby & Corundum)	June 2016	December 2016	June 2017	November 2017
Location	Singapore	Singapore	Singapore	Singapore
Type	Rough Ruby & Corundum (Higher, medium and Commercial Quality)	Rough Ruby & Corundum (Higher, medium and Commercial Quality)	Rough Ruby (Higher, medium and Commercial Qualities), no corundum	Rough Ruby (Higher, medium and Commercial Qualities), no corundum
Carats offered	1,60 Mct	1,37 Mct	1,05 Mct	0.68 Mct
Carats Sold	1,52 Mct	1,09 Mct	0.90 Mct	0.60 Mct
No. of lots offered	75	76	83	76
No. of lots sold	71	58	78	71
% of lots sold	95%	76%	94%	93%
% of lots sold by weight	95%	80%	85%	89%
% of lots sold by value	98%	85%	98%	N/A
Total auction sales	USD 44.3 M	USD 30.4 M	USD 54.8 M	USD 55.0 M
Average per ct sales	USD 29.2/ct	USD 27.8/ct	USD 61.1/ct	USD90.8/ct

Table 3-40: MRM: Summary of Auction Results 2018 to 2019

Auction Results (Ruby & Corundum)	June 2018	December 2018	Jun 2019
Location	Singapore	Singapore	Singapore
Type	Rough Ruby (Higher, medium and Commercial Qualities), no corundum	Rough Ruby (Higher, medium and Commercial Qualities), no corundum	Rough Ruby (Higher, medium and Commercial Qualities), no corundum
Carats offered	0.63 Mct	0.69 Mct	0.98 Mct
Carats Sold	0.59 Mct	0.66 Mct	0.96 Mct
No. of lots offered	86	90	90
No. of lots sold	82	88	84
% of lots sold	95%	98%	93%
% of lots sold by weight	93%	96%	98%
% of lots sold by value	N/A		
Total auction sales	USD 71.8 M	USD 55.3 M	USD 50 M
Average per ct sales	USD 122/ct	USD 84.3/ct	USD 52.0/ct

Table 3-41: MRM: Historical Sales by Product 2014 to 2019

All Auctions & Direct Sales	2014		2015		2016		2017		2018		2019		Total	
Product	(ct 000's)	(USD/ ct)	(ct 000's)	(USD /ct)	(ct 000's)	(USD /ct)	(ct 000's)	(USD /ct)	(ct 000's)	(USD /ct)	(ct 000's)	(USD /ct)	(ct 000's)	(USD /ct)
Premium	46	1,462	49	984	58	803	57	1,048	59	1,366	21	1,383	290	1,144
LP + Ruby	42	154.2	627	30.8	1,620	16.1	590	75.6	544	82.0	251	74.1	3,674	43.4
Low Ruby	328	5.64	1,293	3.16	933	2.76	855	6.92	641	2.44	398	2.78	4,448	3.84
Corundum	1,460	0.65	1,147	1.60	0	0.00	220	2.08	0	0.00	291	2.53	3,118	1.28
Sapphire	0	0.00	970	0.10	0	0.00	240	0.67	0	0.00	0	0.00	1,210	0.21
Low Sapphire	0	0.00	0	0.00	0	0.00	7,050	0.15	0	0.00	0	0.00	7,050	0.15
-4.6	7	36.19	11	1.08	0	0.00	45	9.06	0	0.00	0	0.00	62	10.55
Reject with some Low Sapphire	0	0.00	0	0.00	0	0.00	2,710	0.05	0	0.00	0	0.00	2,710	0.05
Total	**1,882**	**40.85**	**4,097**	**18.07**	**2,611**	**28.65**	**11,766**	**9.51**	**1,244**	**102.16**	**962**	**51.99**	**21,600**	**21.52**

3.8.8 Future Prices

In respect of the commodity price, SRK has not undertaken a detailed price analysis, but has reviewed the average prices received from all auctions to date in six different product categories and with guidance from Gemfields has forecast prices based on actual prices received in auctions to date in each of the categories (Table 3-42). The two main products making up 95% of revenue are the premium ruby and ruby. The average actual price achieved for premium emeralds from all auctions to date is USD 1144/ct and the lowest annual average price was in 2016 at USD 803/ct. Gemfields has advised using a price forecast of USD 976/ct at the lower range of prices received to offset any potential risks regarding market volatility. With respect to the ruby product the price forecast is USD 37.9/ct biasing towards the lower price achieved in 2016.

Table 3-42: MRM: Forecast Commodity Prices

Commodity Prices (USD/ct)	July 2019+
Average	17.68
Premium	975.6
Ruby	37.9
Other	0.75

3.8.9 SRK Comments

SRK considers the commodity prices used to be reasonable. The use of actual prices achieved at auctions to date to guide the forecast is also considered reasonable. Figure 3-44 to Figure 3-46 show the 5 year actual prices achieved, from 12 auctions, and the forecast prices used for premium, ruby and the average for the other products. The forecast prices are reasonable relative to historical prices, if not conservative.

- The forecast prices for Premium product aligns with the historical prices since 2015 with the added proviso that Gemfields felt it prudent to cap prices at this level for this product to remain conservative on projections.
- With respect to the Ruby price forecast with significant sales since 2015 and low price realised again the forecast price has been biased towards the 2016 price.
- With respect to the Other products, these contribute less than 5% of revenue. Gemfields again considered it appropriate to adopt conservative prices. SRK concurs with this approach as it is conservative.

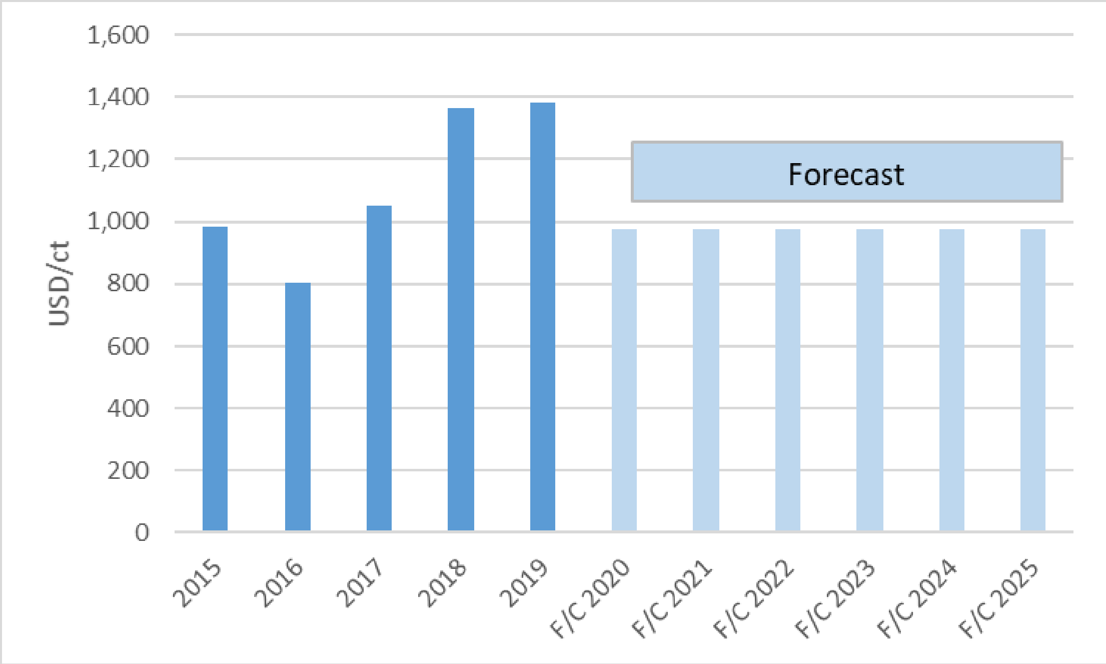


Figure 3-44: MRM: Historical and Forecast Premium Ruby Price

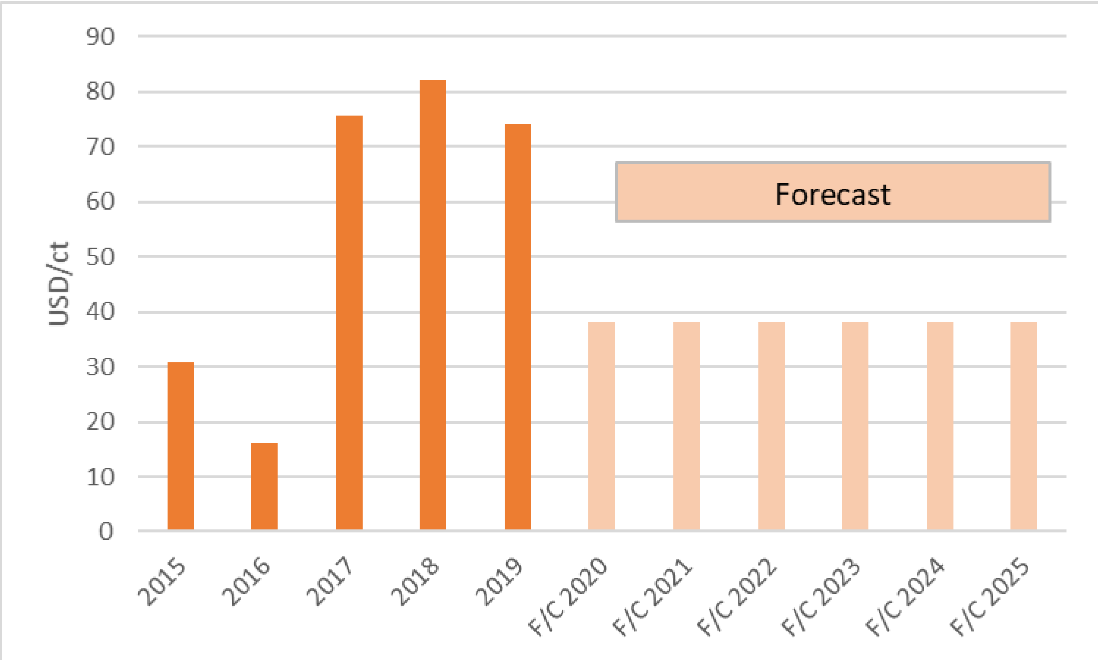


Figure 3-45: MRM: Historical and Forecast Ruby Price

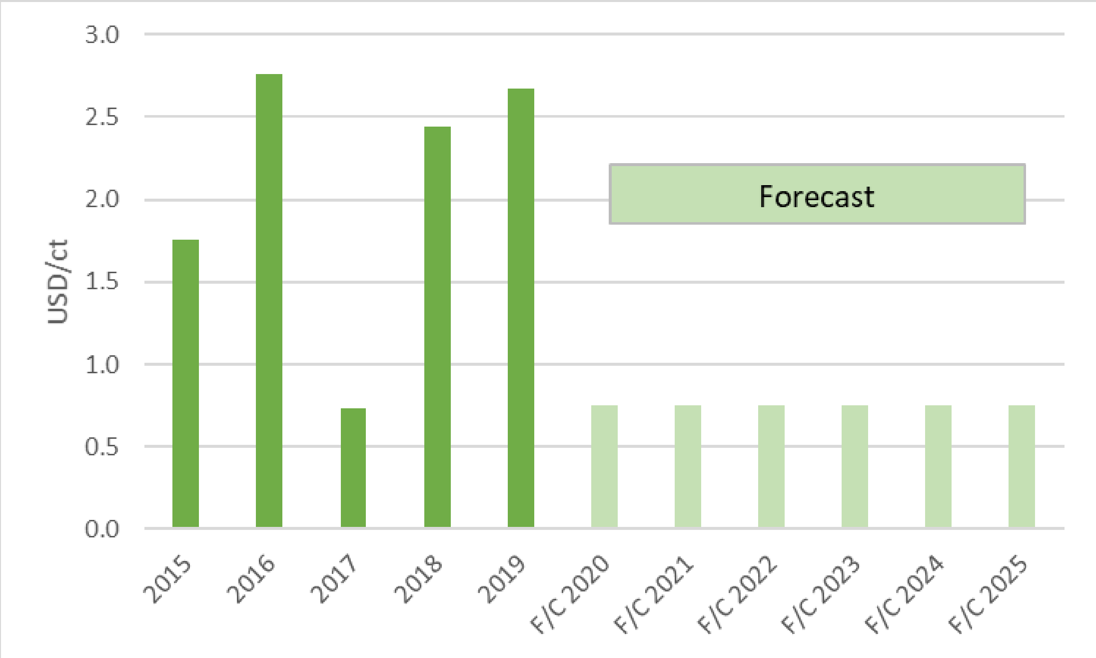


Figure 3-46: MRM: Average Historical and Forecast Price for Other Products

3.8.10 Future Sales

Ruby and emerald put together occupy a miniscule single digit market share in the total gemstone sphere, and therefore has a huge potential for growth. Awareness among consumers is constantly rising in terms responsibly sourced colour gemstones. The profit margin in colour gemstones are higher than that for diamonds. Historically, the colour gemstone sector has been severely constrained by supply both in quantity and reliability. With assurance of consistent supply in volumes, the market space for ruby has the potential for significant growth.

The demand and supply rule work well in an efficient and mature market space. For example, the first ten years of Kagem operation after acquisition has seen three-fold increase in emerald production and seven-fold increase in price. This was achievable by ensuring consistent and reliable supply supported by marketing efforts to build market confidence. The colour gemstone sector remains small and underdeveloped when compared with more established commodity sectors.

With planned augmentation of mining and washing capacity in place, the mine looks to build up stockpile of products. That will be of help in stabilising supply to the market, and effectively neutralising the impact of grade variability.

There is a strong demand for ruby which is expected to remain, with the potential to increase. The demand for low-end category stones is good, with demand even exceeding supply. The lower quality material sells best in larger volumes. These are being presently held back to build stock. Various parcels of the low-grade material, in the entire range of it, have been sold in the past, and Gemfields is confident that demand will remain strong, though with a limited impact on the revenue stream.

3.8.11 Challenges to the Ruby Market

There is great growing potential in the market for Mozambique rubies. Gemfields is in the process of implementing necessary strategies to raise awareness and international demand for rubies from Mozambique.

It is noted, however, that there are several challenges that Gemfields faces with the market for rubies:

- In the coloured gemstone industry, a significant part of mining continues to be artisanal with small, local mining operations using very primitive methods. These organizations do not declare the amount of corundum mined. Consequently, estimates of the world's production are largely unavailable.
- With regards to consistent ruby pricing, the issue of reconciling the price disparity which currently exists in the market between Burmese and non-Burmese rubies remains a challenge; however, seen the growing importance of Mozambican rubies in the trade, this disparity is expected to reduce in time.
- Newer mining companies have acquired licences in Mozambique, adjacent to Gemfields' Montepuez Ruby mine and their implementation might mean direct competition in a market that is dominated by a few major players for manufacturing and trading rubies.

3.8.12 Gemstone Marketing Strategy

This section has been provided by Gemfields to outline its approach to marketing coloured gemstones.

Gemfields' mission is to be the global leader in African emeralds, rubies and sapphires, promoting transparency, trust and responsible mining practices.

Gemfields operates in a global context, which is seeing a general trend of increased interest in sustainability, with consumers increasingly questioning where their product originates from and the impact their purchase has on both the environment and individuals along the supply chain. Gemfields' value of transparency and history establishing positive impact through community and conservation projects can be said to play well to this increased scrutiny, providing a promising leadership position. This can be observed particularly in the case of Mozambican rubies as bans restrict traditional market leader, Burma, from meeting demand. In addition, fashion tastes are increasingly favouring personalised and unique features, properties which can be said to apply to coloured gemstones, with their inimitable formation and characterful inclusions.

Gemfields has invested significant efforts and funds marketing an industry that has never seen such, if any, formal coordinated marketing efforts in the past and revealing the value of the Mozambican rubies both to the trade and consumer.

To be able to market effectively, Gemfields has to be able to guarantee constant supply of its gemstones to the global market and make sure Mozambican rubies are available in the key geographies. In order to achieve this, Gemfields keeps in the region of six to 12 month's stocked ore at the mine at any given time and manages its inventory carefully to meet the growing market demand. Through its auction platform and cut and polished sales department, Gemfields is able to directly reach its target customers. The MRM operation has some 15 years of life with the capacity to provide a sustainable ruby supply to the market throughout this period.

As well as supplying the majority of the world's rough rubies and emeralds, Gemfields initiates marketing activations to build desire for coloured gemstones. Gemfields creates collaborations with many partners and international jewellery brands, including Fabergé, an iconic name with an exceptional heritage and a member of the Gemfields Group. Often surprising, unexpected and unique, these collaborations are chosen to promote consumer awareness, appeal and education of coloured gemstones, raising their profile and, in turn, providing greater benefit to their place of origin in Africa.

Starting from 2013, Gemfields' ruby marketing efforts focussed on building support within the trade, building awareness through trade show advertising and ambassadorial promotion. Gemfields continues to market Mozambican rubies as a high-end gemstone, although since 2015, the focus has shifted towards the end consumer as firm foundations have been maintained within the trade community. Gemfields' efforts focus on generating consumer awareness and demand for responsibly sourced African coloured gemstones. This means leading the industry as an authority on coloured gemstones and building presence in the market to familiarise consumers with Mozambican rubies.

Gemfields' approach is modern, disruptive, surprising and cool, seeking alignment with fashion and arts worlds to amplify likeminded values and reach new audiences, and establishing itself as a needed cog in the industry machine. Markets receiving particular attention at this point in time are the growing economies in China and the USA, while the UK, India and Middle East follow closely behind. Gemfields operates communications agencies in each market, deepening engagement and reach at a local level.

2018 saw the launch of Gemfields' most recent advertising campaign, 'Every Piece Unique', a playful portrayal of the brand values, designed to put core aspects of the business front and centre in consumer's minds. The campaign video highlights Mozambican rubies and Zambian emeralds, alongside Gemfields' with vital conservation work, community projects and a sustainable ethos. The departure from traditional jewellery advertisement is both a reflection of an appetite for innovation and changing consumer demands. With many sources (*Forbes, CB Insights, Luxe Digital*) citing millennial's preference for, and the growing prominence of, sustainability and social conscious as a prerequisite to purchase, it's the right time to be telling Gemfields' story. Reaching 8.5 million YouTube views to date, the campaign film is set in an art gallery, closing for the night, when the sculptures come to life through movement and dance.

Pertinent activations in 2019 are detailed here.

Growing presence of Mozambican rubies in global markets.

- Partnerships with brands saw Gemfields' Mozambican rubies in Valani Atelier and Paul Morelli's pieces at Couture Las Vegas; across Gemfields' 'Suite of Gemstones' at Couture Paris in pieces by AYA, Bina Goenka, Fabergé, Francis de Lara, GFG Jewellery by Nilufer and Margery Hirschey; in Bibi van der Velden's Hermitage Amsterdam showstopper the Memento Mori ring; and in new collections sold on Farfetch by The Alkemistry and Zoe Chicco.
- In-market activations bringing the latest advertising campaign to life in prominent consumer hubs, including celebrating Chinese New Year with a Baobab tree flowering with Mozambican rubies and Zambian emeralds in Shanghai, which resulted in 25 million reach and 5 million views of activation content across Weibo and WeChat. Further localised activations were held in London, New York, Mumbai and Dubai.

- Gemfields maintains a presence for Mozambican rubies at international trade shows, establishing a branded information booth and advertising, hosting press dinners with key titles and providing marketing materials to auction partners, who display these alongside their Mozambican rubies. International shows attended in 2019 include Hong Kong International Jewellery Shows, IIJS in Mumbai, JAS and JJS in Jaipur. More locally in Mozambique, Gemfields' held a presence with MRM to share corporate values at FACIM, Mozambique Mining Energy Conference, the Economic Cabo Delgado Fair, Mineral Resources and Energy Fair in Metujo and Maputo Gem Fair.

Increasing education and understanding of Mozambican rubies:

- In order to educate consumers on how to purchase Mozambican rubies, Gemfields developed a series of point-of-sale booklets, including a Buyer's Guide and guide to Mozambican rubies. These tools are displayed by Gemfields' auction partners alongside their product, and at jewellery collaborations.
- Gemfields promotes education and training in Mozambican rubies, launching a series of masterclasses across China in partnership with Shenzhen's GUILD Gem Lab, and supporting IGT's trade-focussed rough ruby masterclasses.
- In addition, Gemfields hosts media-facing masterclasses, most recently in Beijing, Shanghai and London, in order to deepen understandings of African gemstones and better promote the use of Mozambican rubies in media titles. Most recently, Gemfields presented an introductory course to emeralds, rubies and sapphires for luxury jewellery sales teams, to better assist their sales endeavours.

Helping Mozambican rubies reach new audiences via arts world:

- Gemfields partnered with designer Dan Tobin Smith to present VOID, an immersive art installation allowing visitors to travel through a series of large-scale projections that showcased the mysterious beauty of the inclusions within gemstones, scored with harmonised layers of the human voice – by female electronic drone choir NYX. Large-scale projections of Mozambican rubies, alongside rubies themselves, were visited by more than 4,000 art enthusiasts.

Amplifying communications:

- National Geographic photographer and filmmaker Shannon Wild vividly captured the mobile health clinics and schools in the remote Montepuez region of Mozambique to demonstrate the positive impact Mozambican rubies bring to local communities. "The projects were a real eye opener for me," says Wild. "To see how Gemfields is giving back - it's making a world of difference."
- Building a case for the 'rise of the ruby', Gemfields promoted a new all-time price-per-carat record observed at Gemfields' ruby auction, achieving global coverage of the increasing appreciation of Mozambican rubies.
- In June, Gemfields contributed to Knight Frank's latest Luxury Investment Index, documenting the increasing value of coloured gemstones, which are outperforming the wider jewellery market, and, thus, becoming increasingly popular with investors and collectors worldwide. The report supports Gemfields' assertions of the growing appeal of Mozambican rubies – a powerful statement to have underpinned with a credible source. Gemfields plan to replicate this report but with a China focus in 2020 to boost localised appeal.

- Gemfields maintains a strong digital presence, regularly updating an informative website journal, posting Facebook and Instagram updates and sending monthly newsletters to a database of press, investors and industry contacts. MRM maintains regular communication updates via LinkedIn and a monthly newsletter shared with employees.

3.9 Economic Analysis

3.9.1 Introduction

SRK has prepared an independent discounted cash flow model ("DCF") for the mine to assess the economic viability of the LoMp and associated Ore Reserves. The LoMp and its constituents supporting the Ore Reserves is also referred to as the Base Case. The Ore Reserves are reported in Section 2.5 and amount to 20.8 Mt with an average recovered grade of 8.95 ct/t, resulting in a total contained carats of 185.9 Mct.

This section presents the DCF for the MRM asset on a post-tax pre-finance basis, in real, US Dollar money terms. Economic indicators are presented on a 100% ownership basis. The DCF and economic indicators are valid at the Effective Date of 1 July 2019.

The DCF is based on technical and economic inputs ("TEP") provided by the Company and reviewed by SRK. SRK has incorporated adjustments where deemed appropriate, in discussion with the Company. Working capital movements have been modelled. VAT movements have not been deemed material.

SRK has compared forecast unit costs to historical costs achieved during the last 3 years.

3.9.2 Key Assumptions

The DCF reflects production, capital and operating expenditures and revenues from 1 July 2019 till the end of the life of mine on an annual basis.

The DCF applies:

- Mine production forecasts generated by SRK's mine plan.
- Commodity prices derived and adjusted from average prices received at auctions to date as provided by Gemfields (see Section 3.8).
- Unit operating cost, administration, management overheads and auction fees, capital costs based on historical costs reviewed by SRK.
- A Base Case discount rate of 10%, which SRK considers this to be appropriate for this type of mine within the jurisdiction it is operating. This discount rate also aligns with the Mine's WACC of 9.9%, and the guideline stipulated in the AIM Note for Mining, Oil and Gas Companies, 2009. NPV values are also presented at 8% and 12% discount rates.
- A corporate tax rate of 32%, prior to deduction of royalties from the taxable profit for the determination of tax payable.
- Royalties at a rate of 10% of revenue at the point of saleland tax at USD1/ha per year on 33,600 ha.
- No historic assessed tax losses carried forward.

- Depreciation of capital investment on an annual fixed percentage basis as per the fiscal regime of Mozambique. It has been assumed that all capital items have been fully depreciated and at the end of the mine life there is no terminal value to consider.

As required under Mozambique law, a closure plan and closure cost estimate has been developed as part of the EIA. The costs of on-going rehabilitation for mined out areas are included in the financial model projections for MRM. In addition to this, MRM has allocated a provision of USD 8 million for closure. This is to cover the cost of removal of all equipment from the site, rehabilitation of all the remaining disturbed areas on site and pay staff retrenchment costs.

3.9.3 MRM Commodity Prices

Commodity pricing is discussed in Section 3.8. Projected prices for the various products are presented in Table 3-43. The two main products making up 95% of revenue are the premium ruby and ruby.

Table 3-43: MRM: Commodity Prices

Commodity Prices (USD/ct)	
Average	17.68
Premium	975.6
Ruby	37.9
Other	0.75

3.9.4 Production and Revenue

The LoMp assumes that run of mine (ore) production from all sources will increase from the current 800 ktpa to 1,500 ktpa from 2021 onwards. Over the LoM of 15 years, it is planned to sell 186 Mct, of which 2.76 Mct are Premium Ruby, and will generate USD 2,758 million in gross revenue (undiscounted). Of the 186 Mct produced, 7 Mct are from existing stockpiles.

The production sources include the pit areas, the ore stockpiles, and the stone inventory.

Revenue is attributed in the year of production after applying a 6-months delay, meaning that revenue for 50% of stone production in one year is deferred to the following year.

Historical and LoM production and revenue at MRM is shown in Table 3-44 and Table 3-45, respectively.

Table 3-44: MRM: Historical Production and Revenue

Year		Actual 2016	Actual 2017	Actual 2018	Actual 2019	Y1 2019	Y2 2020	Y3 2021	Y4 2022
Months in Period		12	12	12	6	6	12	12	12
Production Mining									
Total Waste	**(kt)**	**2,776**	**3,797**	**3,273**	**2,288**	**1,932**	**4,742**	**6,022**	**6,022**
Mugloto Secondary	(kt)	1,754	2,806	2,502	1,652	1,062	2,607	3,311	3,311
Maninge nice Secondary	(kt)	130	500	748	590	106	261	331	331
Maninge nice Primary	(kt)	-	-	-	-	-	-	-	-
Glass Secondary	(kt)	892	490	23	46	764	1,874	2,380	2,380
Total Ore	**(kt)**	**614**	**869**	**748**	**435**	**398**	**1,150**	**1,500**	**1,500**
Mugloto Secondary	(kt)	353	569	581	367	223	290	697	837
Maninge nice Secondary	(kt)	14	66	146	38	16	94	90	57
Maninge nice Primary	(kt)	32	-	-	-	-	-	-	-
Glass Secondary	(kt)	215	234	21	30	98	562	673	566
Stockpile	(kt)					60	204	40	40
Total Material Moved	**(kt)**	**3,390**	**4,665**	**4,021**	**2,723**	**2,330**	**5,892**	**7,522**	**7,522**
Stripping Ratio	**(t:t)**	**4.5**	**4.4**	**4.4**	**5.3**	**4.9**	**4.1**	**4.0**	**4.0**
Mugloto Secondary	(t:t)	5.0	4.9	4.3	4.5	4.8	9.0	4.7	4.0
Maninge nice Secondary	(t:t)	9.2	7.6	5.1	15.5	6.4	2.8	3.7	5.8
Maninge nice Primary	(t:t)	-	-	-	-	-	-	-	-
Glass Secondary	(t:t)	4.2	2.1	1.1	1.5	7.8	3.3	3.5	4.2
Production Processing									
Plant Capacity	**(kt)**						**1,150**	**1,500**	**1,500**
Total Ore Treated	**(kt)**	**343**	**802**	**811**	**409**	**398**	**1,150**	**1,500**	**1,500**
Mugloto Secondary	(kt)	258	707	744	371	223	290	697	837
Maninge nice Secondary	(kt)	38	88	56	37	16	94	90	57
Maninge nice Primary	(kt)	32	0	0	0	0	0	0	0
Glass Secondary	(kt)	14	5	0	0	98	562	673	566
Stockpile	(kt)					60	204	40	40
Other (mixed sources)	(kt)	1	1	12	0				
Total Grade	**(ct/t)**	**40.1**	**7.6**	**3.5**	**2.8**	**5.0**	**7.8**	**4.1**	**4.6**
Mugloto Secondary	(ct/t)	4.9	1.9	1.1	0.9	1.5	2.7	2.9	2.3
Maninge nice Secondary	(ct/t)	163.9	47.7	27.0	4.4	36.7	44.6	28.1	58.2
Maninge nice Primary	(ct/t)	193.3	5.9	0.0	0.0	0.0	0.0	0.0	0.0
Glass Secondary	(ct/t)	3.1	3.0	0.0	0.0	2.9	3.5	1.8	2.4
Stockpile	(ct/t)					12.7	10.1	8.6	5.6
Other (mixed sources)	(ct/t)	100.8	402.2	45.3					
Total Content	**(ct 000's)**	**13,729**	**6,062**	**2,872**	**1,138**	**1,987**	**8,999**	**6,121**	**6,836**
Mugloto Secondary	(ct 000's)	1,261	1,345	823	342	340	775	2,010	1,937
Maninge nice Secondary	(ct 000's)	6,260	4,187	1,505	167	606	4,175	2,524	3,343
Maninge nice Primary	(ct 000's)	6,092	3	0	0	0	0	0	0
Glass Secondary	(ct 000's)	43	16	0	0	280	1,993	1,242	1,333
Stockpile	(ct 000's)					761	2,056	345	223
Other (mixed sources)	(ct 000's)	73	512	544	630				
Carats Sales Calculated									
Premium	(ct 000's)	83	122	92	34	45	108	135	165
Ruby	(ct 000's)	654	446	348	155	107	498	725	754
Other	(ct 000's)	12,919	4,982	1,888	319	6,332	10,378	6,700	5,559
Total Sales	**(ct 000's)**	**13,656**	**5,550**	**2,328**	**508**	**6,484**	**10,984**	**7,560**	**6,479**
Commodity Prices									
Premium	(USD/ct)	803	1,048	1,366	1,383	975.6	975.6	975.6	975.6
Ruby	(USD/ct)	16	76	82	74	37.9	37.9	37.9	37.9
Other	(USD/ct)					0.75	0.75	0.75	0.75
Average Price	**(USD/ct)**	**5**	**20**	**55**	**98**	**8.2**	**12.1**	**21.8**	**29.9**
Revenue									
Premium	(USDM)					44	106	132	161
Ruby	(USDM)					4	19	27	29
Other	(USDM)					5	8	5	4
Total Revenue	**(USDM)**	**75**	**112**	**127**	**50**	**53**	**132**	**165**	**194**

Table 3-45: MRM: Life of Mine Production and Revenue

Year		Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Production Mining																	
Total Waste	**(kt)**	**76,611**	**1,932**	**4,742**	**6,022**	**6,022**	**6,022**	**6,039**	**6,022**	**6,022**	**6,022**	**5,684**	**5,292**	**5,292**	**5,292**	**5,307**	**895**
Mugloto Secondary	(kt)	52,880	1,062	2,607	3,311	3,311	3,311	2,302	3,504	3,504	3,504	4,383	5,292	5,292	5,292	5,307	895
Maninge nice Secondary	(kt)	1,470	106	261	331	331	331	110	-	-	-	-	-	-	-	-	-
Maninge nice Primary	(kt)	1,972	-	-	-	-	-	1,972	-	-	-	-	-	-	-	-	-
Glass Secondary	(kt)	20,289	764	1,874	2,380	2,380	2,380	1,655	2,518	2,518	2,518	1,301	-	-	-	-	-
Total Ore	**(kt)**	**20,768**	**398**	**1,150**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,684**	**1,460**	**1,464**	**1,112**
Mugloto Secondary	(kt)	12,061	223	290	697	837	808	481	405	604	681	683	854	1,460	1,460	1,464	1,112
Maninge nice Secondary	(kt)	470	16	94	90	57	105	94	13	-	-	-	-	-	-	-	-
Maninge nice Primary	(kt)	1,084	-	-	-	-	-	339	579	167	-	-	-	-	-	-	-
Glass Secondary	(kt)	6,314	98	562	673	566	547	550	463	690	779	781	606	-	-	-	-
Total Material Moved	**(kt)**	**97,379**	**2,330**	**5,892**	**7,522**	**7,522**	**7,522**	**7,539**	**7,522**	**7,522**	**7,522**	**7,184**	**6,792**	**6,976**	**6,752**	**6,771**	**2,007**
Stripping Ratio	**(t:t)**	**3.69**	**4.9**	**4.1**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**3.8**	**3.5**	**3.1**	**3.6**	**3.6**	**0.8**
Processing																	
Plant Capacity	**(kt)**	**56,650**	**-**	**1,150**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**
Total Ore Treated	**(kt)**	**20,768**	**398**	**1,150**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,684**	**1,460**	**1,464**	**1,112**
Mugloto Secondary	(kt)	12,061	223	290	697	837	808	481	405	604	681	683	854	1,460	1,460	1,464	1,112
Maninge nice Secondary	(kt)	470	16	94	90	57	105	94	13	-	-	-	-	-	-	-	-
Maninge nice Primary	(kt)	1,084	-	-	-	-	-	339	579	167	-	-	-	-	-	-	-
Glass Secondary	(kt)	6,314	98	562	673	566	547	550	463	690	779	781	606	-	-	-	-
Stockpile	(kt)	840	60	204	40	40	40	36	40	40	40	36	40	224	-	-	-
Total Grade	**(ct/t)**	**8.95**	**5.0**	**7.8**	**4.1**	**4.6**	**7.6**	**28.0**	**40.3**	**13.7**	**2.3**	**2.6**	**2.9**	**3.4**	**2.4**	**2.4**	**2.8**
Mugloto Secondary	(ct/t)	**2.70**	1.5	2.7	2.9	2.3	2.9	2.4	3.3	2.2	2.2	3.2	2.8	3.4	2.4	2.4	2.8
Maninge nice Secondary	(ct/t)	**52.63**	36.7	44.6	28.1	58.2	75.2	62.4	23.5	-	-	-	-	-	-	-	-
Maninge nice Primary	(ct/t)	**97.88**	-	-	-	-	-	97.9	97.9	97.9	-	-	-	-	-	-	-
Glass Secondary	(ct/t)	**2.31**	2.9	3.5	1.8	2.4	1.8	2.8	2.6	2.2	1.6	1.8	2.9	-	-	-	-
Stockpile	(ct/t)	**9.45**	12.7	10.1	8.6	5.6	4.9	6.8	21.8	35.1	19.4	6.7	3.6	3.0	-	-	-
Total Content	**(ct 000's)**	**185,894**	**1,987**	**8,999**	**6,121**	**6,836**	**11,409**	**41,993**	**60,392**	**20,585**	**3,523**	**3,886**	**4,290**	**5,662**	**3,536**	**3,547**	**3,129**
Mugloto Secondary	(ct 000's)	32,547	340	775	2,010	1,937	2,365	1,141	1,336	1,331	1,508	2,208	2,400	4,985	3,536	3,547	3,129
Maninge nice Secondary	(ct 000's)	24,723	606	4,175	2,524	3,343	7,869	5,900	307	-	-	-	-	-	-	-	-
Maninge nice Primary	(ct 000's)	106,110	-	-	-	-	-	33,155	56,653	16,302	-	-	-	-	-	-	-
Glass Secondary	(ct 000's)	14,579	280	1,993	1,242	1,333	980	1,554	1,225	1,548	1,239	1,437	1,747	-	-	-	-
Stockpile	(ct 000's)	7,935	761	2,056	345	223	195	244	871	1,404	777	240	143	677	-	-	-

Table 3-45 (continued): MRM: Life of Mine Production and Revenue

Year		Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Carats Sales Calculated																	
Total Sales	**(ct 000's)**	**196,875**	**6,484**	**10,984**	**7,560**	**6,479**	**9,122**	**26,701**	**51,192**	**40,489**	**12,054**	**3,705**	**4,088**	**4,976**	**4,599**	**3,541**	**3,338**
Premium	(ct 000's)	2,827	45	108	135	165	175	147	128	139	151	181	223	328	336	261	220
Ruby	(ct 000's)	15,528	107	498	725	754	926	1,507	2,310	1,918	901	678	816	1,151	1,198	945	781
Other	(ct 000's)	178,520	6,332	10,378	6,700	5,559	8,021	25,047	48,754	38,432	11,003	2,845	3,049	3,497	3,065	2,335	2,337
Commodity Prices																	
Average Price	**(USD/ct)**	**17.7**	**8.2**	**12.1**	**21.8**	**29.9**	**23.3**	**8.2**	**4.9**	**5.9**	**15.7**	**55.2**	**61.3**	**73.6**	**81.7**	**82.6**	**73.6**
Premium	(USD/ct)	975.6	976	976	976	976	976	976	976	976	976	976	976	976	976	976	976
Ruby	(USD/ct)	37.9	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
Other	(USD/ct)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Revenue																	
Total Revenue	**(USDM)**	**3,480.8**	**53**	**132**	**165**	**194**	**212**	**219**	**249**	**237**	**189**	**205**	**251**	**366**	**376**	**292**	**246**

3.9.5 Operating and Capital Costs

The forecast unit operating costs have been based on the last 18 months straight average. and are summarised in Table 3-46. The USD 7.5 million in legal costs incurred during this period and associated with the settlement agreement with Leigh Day have been excluded as these are not planned to reoccur in the future.

The forecast operating and capital costs are presented in Table 3-47. The total capital expenditure is estimated to be USD 208 million over the LoM. Capital for engineering and mining has been estimated at USD 90 million and the wash plant at USD 11 million. Ongoing exploration capital is estimated at USD 10 million. Sustaining capital for the on-going operations is estimated to be USD 72 million. Closure costs are estimated at USD 8 million.

Table 3-46: MRM: Historical Operating Costs

Year		Actual 2017	Actual 2018	Actual 2019	Y1 2019	Y2 2020	Y3 2021
Months in Period		12	12	6	6	12	12
Unit Operating Costs							
Mining and production costs	(USD/t moved)	4.13	5.17	4.35	4.76	4.76	4.76
Mining and production costs	(USD/t treated)	24.0	25.6	29.0	27.9	24.4	23.9
Administrative and management expenses	(USD/t treated)	24.27	25.60	23.39	23.92	19.41	17.55
Royalties and production taxes	(USD/t treated)	14.4	15.5	12.1	13.4	11.5	11.0
Total Operating Costs	(USD/t treated)	63	67	65	65	55	52
Operating Costs							
Mining and production costs	**(USDM)**	**19**	**21**	**12**	**11**	**28**	**36**
Labour costs	(USDM)	6.7	7.0	4.5	3.9	10.0	12.7
Fuel costs	(USDM)	2.2	3.1	2.0	1.8	4.4	5.7
Repairs and maintenance	(USDM)	2.1	2.4	1.3	1.3	3.2	4.1
Camp costs	(USDM)	1.8	2.1	1.0	1.0	2.6	3.3
Blasting costs	(USDM)	-	-	-	-	-	-
Security costs	(USDM)	4.4	4.3	1.9	2.0	5.2	6.6
Other	(USDM)	2.1	1.9	1.2	1.1	2.7	3.4
Administrative expenses	**(USDM)**	**4.9**	**5.0**	**3.4**	**2.9**	**5.8**	**5.8**
Labour - G&A	(USDM)	1.5	1.6	1.1	0.9	1.8	1.8
Selling, marketing and advertising	(USDM)	0.0	0.0	0.0	0.0	0.0	0.0
Rent and rates	(USDM)	0.2	0.2	0.1	0.1	0.2	0.2
Travel, accommodation	(USDM)	0.1	0.4	0.2	0.2	0.4	0.4
Professional and consultancy	(USDM)	0.4	0.5	0.4	0.3	0.6	0.6
Office expenses	(USDM)	0.1	0.2	0.2	0.1	0.3	0.3
Other	(USDM)	2.6	2.1	1.4	1.2	2.4	2.4

Table note: "t moved" is the combined tonnage of ore and waste mined/moved.

Table 3-47: MRM: Life of Mine Operating and Capital Costs

Year		Total	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10	Y11	Y12	Y13	Y14	Y15	Y16
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
UNIT OPERATING COSTS																		
Mining and production costs	(USD/t $_{treated}$)	22.3	27.9	24.4	23.9	23.9	23.9	23.9	23.9	23.9	23.9	22.8	21.6	19.7	22.0	22.0	8.6	-
Admin and management costs	(USD/t $_{treated}$)	25.3	23.9	19.4	17.6	20.0	21.5	22.1	24.6	23.6	19.6	20.9	24.7	30.6	36.1	28.9	32.8	-
Royalties and production taxes	(USD/t $_{treated}$)	16.8	13.4	11.5	11.0	12.9	14.2	14.6	16.6	15.8	12.6	13.7	16.7	21.8	25.7	20.0	22.1	-
Total Operating Costs	**(USD/t $_{treated}$)**	**64.4**	**65.2**	**55.3**	**52.4**	**56.8**	**59.6**	**60.7**	**65.1**	**63.3**	**56.1**	**57.4**	**63.0**	**72.1**	**83.9**	**70.9**	**63.5**	**-**
OPERATING COSTS																		
Mining and production costs	(USDM)	464	11.1	28.1	35.8	35.8	35.8	35.9	35.8	35.8	35.8	34.2	32.3	33.2	32.2	32.2	9.6	-
Admin and management costs	(USDM)	524	9.5	22.3	26.3	30.0	32.3	33.1	36.9	35.4	29.4	31.3	37.1	51.5	52.7	42.3	36.5	17.6
Royalties and production taxes	(USDM)	349	5.3	13.3	16.5	19.4	21.3	21.9	25.0	23.8	19.0	20.5	25.1	36.6	37.6	29.3	24.6	9.5
Total Operating Costs	**(USDM)**	**1,337**	**26.0**	**63.7**	**78.6**	**85.2**	**89.4**	**91.0**	**97.7**	**95.0**	**84.2**	**86.0**	**94.5**	**121.4**	**122.4**	**103.8**	**70.6**	**27.1**
CAPITAL COSTS																		
Engineering and Mining	(USDM)	90	2.2	12.6	2.7	6.0	8.3	13.8	2.0	6.2	6.4	10.8	2.2	5.6	5.6	5.6	-	-
Exploration	(USDM)	10	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	-	-
Wash Plant & Sort Plant	(USDM)	11	-	9.9	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-
Security	(USDM)	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	-
I.T.	(USDM)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other & Sustaining	(USDM)	72	7.2	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	-	-
Closure	(USDM)	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.0	-
Total Capital	**(USDM)**	**191**	**10.1**	**28.2**	**8.4**	**11.8**	**14.1**	**19.6**	**7.9**	**12.1**	**12.2**	**16.7**	**8.0**	**11.4**	**11.4**	**11.4**	**10.0**	**10.0**

3.9.6 MRM Economic Analysis Results

MRM Cash Flow

Figure 3-47 provides an analysis of cashflow over the LoM and Table 3-48 presents a summary of the results of the financial modelling.

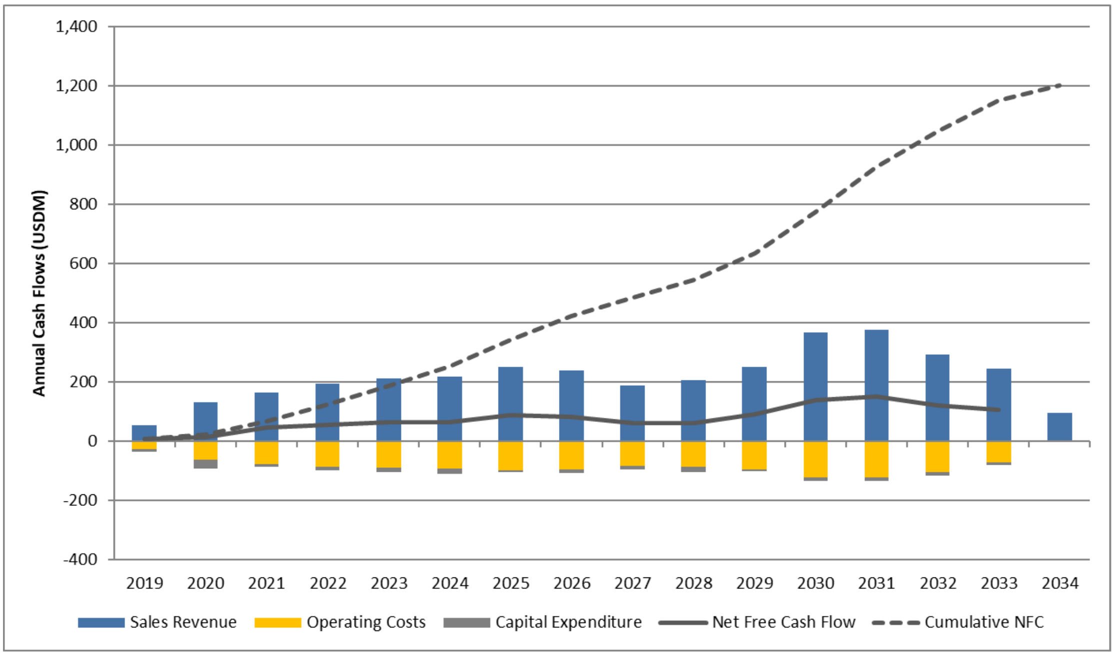


Figure 3-47: MRM: Net Cash Flow

Table 3-48: MRM: Cash Flow Summary Years 1 to 10

Year		Total	Y1 2019	Y2 2020	Y3 2021	Y4 2022	Y5 2023	Y6 2024	Y7 2025	Y8 2026	Y9 2027	Y10 2028	Y11 2029	Y12 2030	Y13 2031	Y14 2032	Y15 2033	Y16 2034
Months			6	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Economics																		
Sales Revenue	(USDM)	3,481	53	132	165	194	212	219	249	237	189	205	251	366	376	292	246	95
Operating Costs	(USDM)	1,337	26	64	79	85	89	91	98	95	84	86	95	121	122	104	71	27
Operating Profit - EBITDA	(USDM)	2,144	27	69	86	108	123	128	152	142	105	119	156	245	253	189	175	68
Tax Liability	(USDM)	739	9.8	24	31	38	43	44	53	49	35	40	54	86	88	65	60	21
Capital Expenditure	(USDM)	191	10.1	28	8	12	14	20	8	12	12	17	8	11	11	11	8	-
Working Capital	(USDM)	-5.5	-	1.5	1.8	2.6	1.6	0.6	2.7	-1.1	-4.2	1.5	4.3	10.1	1.0	-7.4	-1.0	-12.0
Net Free Cash Flow	(USDM)	1,219	7.3	15	45	56	64	64	88	82	62	61	90	137	152	120	108	59

Net Present Value

Net present values (NPV) of the cash flows are shown in Table 3-49 using discount rates from 8% to 12% in a post-tax context. At a 10% discount rate, the post-tax NPV is USD 567 million.

Table 3-49: MRM: NPV Profiles at Various Discount Rates

	Discount Rate	NPV USD million
Net Present Value	8.0%	**649**
	10.0%	**567**
	12.0%	**498**

Sensitivity Analysis - General

Figure 3-48 shows a sensitivity chart for operating costs; capital expenditure and revenue. The NPV is most sensitive to revenue (grade or commodity price) as illustrated by the blue line in Figure 3-48. The asset has lower sensitivity to operating costs and is least sensitive to capital as indicated by the red line and the much flatter green line in Figure 3-48. The operating and capital cost sensitivity is further illustrated in Table 3-50.

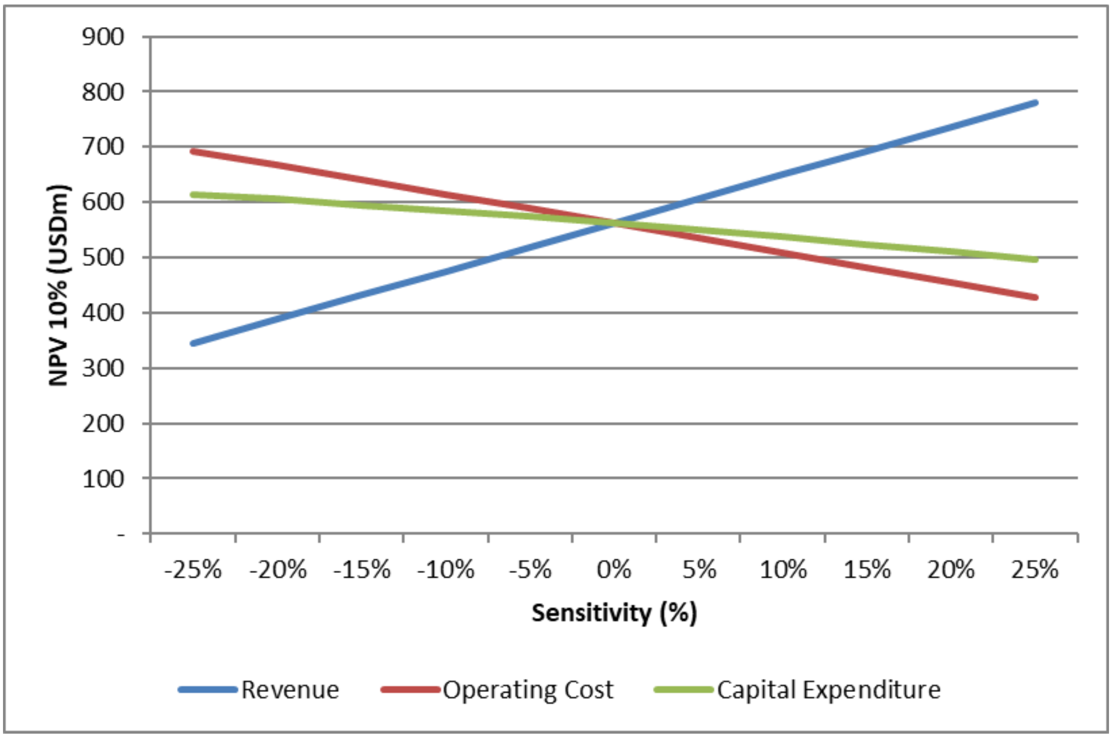


Figure 3-48: MRM: Sensitivity Analysis

Table 3-50: MRM: Sensitivity Analysis for NPV at 10%

NPV 10% (USDm)		REVENUE SENSITIVITY				
		-20%	**-10%**	**0%**	**10%**	**20%**
OPEX SENSITIVITY	-20%	482	574	667	759	852
	-10%	435	525	615	705	795
	0%	388	475	567	649	737
	10%	340	425	509	593	678
	20%	292	373	455	537	618

NPV 10% (USDm)		REVENUE SENSITIVITY				
		-20%	**-10%**	**0%**	**10%**	**20%**
CAPEX SENSITIVITY	-20%	431	518	605	692	779
	-10%	411	498	585	672	759
	0%	388	475	567	649	737
	10%	363	450	538	625	712
	20%	336	423	510	597	684

NPV 10% (USDm)		OPEX SENSITIVITY				
		-20%	**-10%**	**0%**	**10%**	**20%**
CAPEX SENSITIVITY	-20%	710	658	605	552	498
	-10%	689	638	585	532	477
	0%	667	615	567	509	455
	10%	642	590	538	484	430
	20%	615	563	510	457	403

Sensitivity to Resource/Reserve Grade

The NPV sensitivity to the overall Ore Reserve grade is illustrated in Table 3-51.

Table 3-51: MRM: Sensitivity to Reserve Grade on NPV

Grade Sensitivity	NPV@10% (USDM)
20%	728
10%	645
0%	**567**
-10%	480
-20%	397

Sensitivity to Reduced Sales

There is a significant increase in sales volumes in the LoMp, particularly regarding the lower quality products. Discussion on future sales increase and marketing strategy supporting this is contained in Sections 3.8.10 and 3.8.12 of this CPR. Further, it is noted that the distribution of revenue is heavily weighted to the two main products Premium and Ruby representing 79% and 17% of total revenue respectively over the LoM. The lower quality product's share of revenue is less than 4% as shown in Table 3-52. To demonstrate the sensitivity of NPV to reduced sales volumes of the lower quality products, however, a cap on annual sales of each of the lower quality products has been applied with impact on NPV shown in Table 3-53.

Table 3-52: MRM: LoM Revenue Split by Product

Product	(%)
Premium	79%
Ruby	17%
Other	4%

Table 3-53: MRM: Sensitivity to Sale Volumes on NPV

Sales Sensitivity	NPV@10% (USDM)
20%	737
10%	649
0%	**567**
-10%	475
-20%	388

3.9.7 SRK Comments

Based on the work carried out for this CPR, SRK concludes the mine has favourable economics and based on the assumed commodity prices is considered robust in terms of the estimated operating margins and return on investment. The NPV at a discount rate of 10% is USD 567 million and annual cash flows are positive for the duration for the life of mine. On this basis SRK confirms the economic viability of the Ore Reserve.

SRK recommends further refinement of capital cost estimates is undertaken in order to optimise profitability; and that the financial model is updated regularly to reflect new information relating to revised mine plans, resource estimates and prices realised at auctions.

3.10 Conclusions

3.10.1 Introduction

The following section includes a summary of the conclusions, recommendations, and principal risks and opportunities as they relate to MRM. In all likelihood, many of the identified risks and/or opportunities will have an impact on the cash flow. SRK has provided sensitivity tables for simultaneous (twin) parameters, which cover the anticipated range of accuracy in respect of commodity prices, operating expenditures and capital expenditures. Specifically, these largely address fluctuations in operating expenditure and commodity prices.

In addition to those identified above, MRM is subject to specific risks and opportunities, which independently may not be classified to have a material impact (that is likely to affect more than 10% of MRM's annual post-tax pre-finance annual operating cash flow), but in combination may do so.

3.10.2 Conclusions

Geology / Mineral Resources

SRK makes the following conclusions:

- The drilling, sampling, logging, bulk sampling and other data gathering methods used by MRM are appropriate and have yielded suitable data for use in the subsequent geological and grade modelling.
- Adequate work has been undertaken at the Project to report both an Indicated Mineral Resource and an Inferred Mineral Resource in accordance with the JORC Code.

- The variability of grade across the deposit needs further investigation and analysis as mining progresses to improve confidence in mine planning.
- Additional work is required to improve the understanding of both the bedrock and paleo-channel geology, these aspects have a direct control on the distribution if the ruby and corundum mineralisation, and so require a more detailed level of understanding.
- the data gathered during bulk sampling and production are considered adequate at present. Further information should, however, be collected to improve the understanding of the bed rock geology and ruby / corundum grades, to improve the confidence of future mining plans.

Open-pit mining

SRK makes the following conclusions:

- The mining method comprises conventional open-pit operations: excavate, load and haul to in-pit backfill, waste rock stockpile locations and stockpiles at the wash plant facility.
- The operation is ‘free dig’ for the gravel bed ore and the weathered zone within the amphibolites.
- Grade control is practically constrained to visual inspection and mining of the mineralised zones is only undertaken during daylight hours.
- A stockpiling strategy has been included in MRM’s plan to manage the expected variability in the gemstone grading distribution and the impacts of the wet season on productivity. The stockpiling strategy provides more than six months of production stockpiled near the wash plant.

Ore Reserves

As at 1 July 2019, SRK notes that the MRM ruby deposit has Ore Reserves (including stockpiles), of 1,127 kt of primary material grading at 97.88 ct/t ruby and corundum and 19,641 kt of secondary material grading at 3.85 ct/t ruby and corundum.

Dilution was modelled as a “skin” around the gravel bed unit, with the skin being based on the greater of a 0.3 m dilution skin to both the roof and floor contacts; or a minimum total thickness of 1.5 m. The diluting grade density has been assumed at 2.01 t/m^3. Owing to the application of historical factors to derive RoM grades, no additional dilution or other grade adjustments factors are deemed necessary for the primary mineralisation Due to the nature in which dilution has been modelled, namely that a dilution skin has been applied around the modelled resource, no mining losses have been applied for the secondary material

Processing and Tailings Management

Based upon a review of the information for the current operations, SRK notes the following:

The current facility is considered broadly fit for purpose, at least in the short-term, for both operational gemstone production and for any ongoing bulk sample preparation required. For optimisation and an effective forward strategy, however, upgrading of waste management practices are required for the reasons detailed in the following points.

- The de-gritting and thickening section of the wash plant is significantly undersized, is a bottleneck to production and should be changed or expanded as soon as possible.

- During the wet season, significant volumes of surface water run-off flow into the settling ponds, making regular clearance problematic. This may result in uncontrolled discharge of tailings slurry into the holding pond structure if not adequately managed (overtopping and associated erosion are considered the most credible potential failure mechanism).
- The current coarse grain size waste management strategy assumes that the majority of waste generated will be backfilled in redundant open pit areas. SRK notes that this is not likely to be feasible due to bulking of the coarse reject material post processing and trucking to the disposal zones. In addition, given the fine grain size of the slimes, it is anticipated that drying in the holding cells is not efficient and that compaction of the partly dried material following re-handling to backfill is not effective. Swell factors of between 30 to 40% for all waste should be considered during volumetric calculations going forward.
- Filtration and other testing to consider feasibility of additional dewatering of the fine tailings (slimes) has been undertaken, and a feasibility study prepared to evaluate and cost a revised fine tailings dewatering, handling and disposal system. SRK understands that the preferred solution includes centrifuge technologies and that it will be in-place within the next 12 to 18 months. Once operational, this should make the current system of informal drying lagoons, periodic excavation and slimes-waste backfilling to the mining void obsolete by the end of 2020.
- SRK was specifically requested to consider whether the provisions for tailings (slimes) management, and the associated documentation, comply with those detailed in the disclosure of information request made to mine operators by the Church of England Pensions Board in April 2019 in response to the recent Brazilian tailings dam failures. The Church of England Pensions Board request was made to allow them to consider investment decisions on the basis of whether tailings storage facility designs and operational practices are effective in managing risks. In this regard, SRK interprets that the disclosure request relates primarily to 'above ground' tailings storage facilities (that is, those which require retention structures or dams that retain waste at higher elevations than surrounding ground/topography; those with significant risk of run-out impacting on downstream receptors and communities). This being the case, SRK notes that no facilities of this type are present at the site where instead tailings are initially managed in shallow drying cells before they are re-handled in to the completed open pit voids as backfill. Nevertheless, there are potential risks with the current system including possible overtopping resulting in suspended solid contamination of downstream water courses. SRK notes that the current facilities are designed and are supported by both operational management documentation and emergency action plans. Regular visual inspections are undertaken and it is understood that water quality is monitored both on site and in the immediate downstream environment. In all cases the documentation is quite limited, but not exceptionally so given the simplicity of the current tailings scheme and the relatively low associated risks. SRK considers that 'tipping rules' should be prepared and recommend that the UK Quarry Regulations (1999) has appropriate guidance on their aims and content. SRK also notes that significant changes to the scheme are anticipated in 2020 where new technology will be commissioned to further dewater the tailings slimes which will then be stored as a dry 'cake'. The cake storage areas and management practices will require new designs, design justification calculations, and operational management documentation. This should all be prepared in line with best practice. SRK anticipates different provisions to be required for wet and dry seasons as management of dry cake can be a challenge in periods of high volume and / or intense rain storms.

Infrastructure

SRK notes the following conclusions:

- The Project is well served in terms of infrastructure. No significant challenges with regards to the current or planned arrangements are anticipated.
- Water management is the most significant issue to address on an on-going basis. SRK notes that current and planned actions are designed to ensure that infrastructure requirements will not adversely impact on the operations performance.

Economic Analysis

- The analysis to assess the economic viability of the Ore Reserve presents positive annual cashflows for the life of the mine, with an NPV of USD 567 million at a discount rate of 10%.
- The sensitivity analysis does not highlight any key areas of risk.
- The mine economics remain the most sensitive to grade, notably attributed to Premium and Ruby categories, and price.

3.10.3 Recommendations

Geology / Mineral Resources

Based on the work carried out to date, SRK recommends the following in order to provide data that will assist in improving geological understanding and confidence in any future MRE updates:

- Fully reconcile the geological model against production data from the mining activities and gemstone sales to refine the modelling approach and optimise the sample spacing for defining the gravel bed. This should also include undertaking further analysis to characterise the size and quality of stones recovered in the different production areas. This would help to improve the understanding of the source of the secondary mineralisation in particular.
- Structurally orientate any future diamond drillholes, to allow for the capture of key down hole structural data to provide a more robust basis for the interpretation of the subsurface bedrock geometry.
- Once sufficient oriented diamond drilling has been completed, commission a regional and local structural geology review of the Montepuez deposit, with particular focus on determining the structural controls on the amphibolite primary mineralisation domain.
- Use in-pit mapping, drilling, or sampling data, in conjunction with a though review of the regional and deposit scale geology of the deposit to derive an understanding of the paleochannel system. This will increase geological understanding and confidence in the secondary mineralisation, the gravel bed morphology, and the ruby grade/quality distribution.
- Complete downhole surveying of any new, inclined drillholes.
- Streamline the geological logging system for both diamond and auger drilling to ensure that the most relevant data is captured in a consistent and user-friendly format, including the recommendations given below:

  - Auger drilling: expand on the current logging sheet to include the capture of data relating to the gravel bed clast size, shape, sphericity, material type etc. This may assist in determining any correlation between ruby grade/quality, gravel bed material characteristics and paleochannel location.
  - Diamond drilling: make some minor amendments to the logging system currently in place, including the capture of weathering and alteration data in two separate columns, recording of contact type information, introduction of a “lith 2” column, etc.
  - Record more detailed geotechnical information, preferably in a separate spreadsheet to the geological log.
  - Develop standardised project-specific set of logging codes and a fixed data input system that only allows the input of the agreed upon codes into the logging database.
  - Avoid systematic capture of data in the log sheet comments column.
- Ensure topographic and pit surveying is maintained in a consistent coordinate system, with errors identified being rectified as soon as possible.
- Continue to systematically record density from all new and pre-existing drill core. Ideally, a bulk density reading should be taken in every 4-5 m of competent core.
- Extend in situ and bulk density data gathering exercises to all lithologies encountered during mining and increase frequency of sample taking. This will improve confidence in the density values used for tonnage estimation, and also identify and variation in the density across the deposit.
- Complete detailed aerial photography of the prospect in order to improve on the accuracy of the artisanal working outlines.
- Systematically record information from the bulk sampling locations, including gravel bed thicknesses, morphology, basement morphology, sedimentary features, or other geological information which would provide additional understanding of the depositional environment.
- Maintain auger spacing in any further areas to be delineated. The auger drilling is a quick and relatively inexpensive way of gathering data, and so should be used extensively throughout the licence area.
- MRM should have a sufficiently high level of understanding of the grade and quality distribution of the rubies in both the primary and secondary mineralisation to further characterise the variability across the deposit. This can be completed through additional bulk sampling activities in different parts of the deposit, through developing the understanding of the geology, and though the systematic recording of appropriate data. All of these aspects can be completed during the mining of the deposit, as part of the day to day production activities.

Open-pit mining

SRK makes the following comments and recommendations:

- More accurate mine scheduling and planning is recommended to optimise costs and equipment optimisation. The physical and lateral extents of the area of mineralisation will imply a variation in tipper trucks for the transported ore to the RoM stockpiles in the future.
- It is recommended that return journeys of tipper trucks are utilised to back-haul waste from the waste stockpiles to the pits.

Processing and Tailings Management

SRK makes the following comments and recommendations:

- SRK recommends that a full review of the proposed revised tailings dewatering system feasibility be undertaken. This should include consideration of sample representativity; technology proposal; costs; risks; and benefits. SRK understands that this project is advanced, but review and due diligence should be completed at all critical stages.
- Upgrade the de-gritting and thickener as soon as possible if filtering/centrifuge/dry-stacking is not feasible, or if significantly delayed for any reason.
- A stockpile, backfilling, and waste deposition management plan is recommended to be put in place so that deposition of coarse and fine reject material generated from the wash plant is appropriately scheduled and optimised. This type of documentation are often referred to as the ‘tipping rules’. This plan should be sufficient to cover both the short and long term project requirements which will change as the new slimes management process is commissioned. The ‘tipping rules’ essentially detail how the waste areas will be safely investigated, designed, operated and closed including the key performance constraints (integrity; safety; contamination etc), monitoring requirements (including inspections) and emergency provisions. The document should be based upon relevant laws, legislation and guidance, and should be regularly updated. SRK anticipates significant changes to international guidance on tailings management practices will be made in the near future as the reports associated with recent significant failures in Brazil (and elsewhere) are released.
- A detailed, seasonal water balance should be prepared for the wash plant and site as a whole. This should allow the design of appropriate freeboard in waste storage areas (to prevent overtopping) and design of surface water management plus sediment control features such as base/internal/surface drains, perimeter ditches, and silt traps will be installed in and around all waste storage areas, including those associated with future slimes ‘cake’ storage.
- Prepare more transparent operating cost details inclusive of all cost elements for the wash and DMS plants.
- Prepare a project schedule and cost control model for the new Recovery House project.
- A closure plan should be prepared covering all areas of historic and future mine waste and tailings storage.

Infrastructure

SRK makes the following comments and recommendations:

- MRM must continue with the planned program of investment in infrastructure.
- Investments in water infrastructure, roads and community support should be prioritised as these will have the most significant impact on the operation.

Social, Environmental, and Health and Safety

SRK makes the following comments and recommendations regarding the environmental aspects of the operation:

- MRM needs a clear programme to transpose the comprehensive set of Gemfields policies and procedures into site specific policies and practical operating procedures. This should be done within the framework of an ESHS management system.
- The risk registers developed as part of the management system should help prioritise the ESHS efforts of the operation and start to close the gaps in the EIA / EMP compliance commitments.
- The recent biodiversity study should be further developed to meet international standards for biodiversity management. This should be linked to a practical action plan that can be implemented on site.
- The project should develop a comprehensive understanding of its water balance and implement a water quality and quantity monitoring programme. SRK understands that flow meters have been installed on water supply boreholes and this information will feed into the future site water balance.

SRK makes the following comments and recommendations regarding the environmental aspects of the operation:

- The CSR annual plan should be reviewed and aligned with regional priorities and the SDGs to become a three to five-year strategic plan with a set of qualitative and quantitative key performance indicators., to reduce the risk of dependency.
- The human terrain and the ASM value chain needs to be understood, so that the root causes/ drivers of ASM can be addressed rather than the symptoms currently focussed on through the security approach. The illegal trade in gemstones needs to be addressed at the same time as supporting viable alternative livelihood strategies for the youth of the district.
- A holistic approach to stakeholder and community engagement is required, that strengthens the capacity of the various sectors of the communities in the project affected area to communicate and engage.
- Records of all stakeholder engagements need to be regarded by MRM as an effective insurance policy against potential allegations of wrong doing. Engagement records should be kept and stored digitally in a fit for purpose data base., so that issues and grievances can be recorded and tracked accordingly.
- Procurement processes should be adapted for local content benefit, both in terms of contracting providers as well as payment, so that local benefits can be realised.

Economic Analysis

SRK recommends further refinement of capital cost estimates is undertaken in order to optimise profitability; and that the financial model is updated regularly to reflect new information relating to revised mine plans, resource estimates and prices realised at auctions.

3.10.4 Risks

The MRM is subject to certain inherent risks and opportunities, which apply to some degree to all participants of the international mining industry. These include:

- **Commodity Price Fluctuations:** These many be influenced, inter alia, by commodity demand-supply balances for gemstones, specifically rough and cut rubies and sapphires. In all cases, these are critically dependent on the demand in the primary sales markets in which cut gemstones are consumed, an indication of which is the disposable income as generally reflected by the projected growth in GDP. Furthermore, the sales price varies significantly between both rough and cut gemstones and within the specific grade categories. Historical prices as recorded for the MRM production are largely based on a weighted average price received from auctions. Increased production of rubies and other coloured sapphires has the potential to adversely impact the market price for rough and/or cut rubies and sapphires. Increased production could come from MRM or other parts of the world where gemstones could be mined.
- **Foreign Exchange and CPI Risk:** CPI for each specific country/currency is impacted by the assumed relationship between exchange rates and the differential in inflation between the respective currencies, that is, purchase price parity or non-purchase price parity. Given the low exposure to non USD related expenditures as noted by MRM, the overall foreign exchange risk is however considered immaterial.
- **Country Risk:** Specifically country risk, including: political, economic, legal, tax, operational, and security risks.
- **Legislative Risk:** Specifically changes to future legislation (tenure, mining activity, labour, occupational health, safety, and environmental) within Mozambique.
- **Mineral Resource and Ore Reserve estimation risk:** The presence of premium quality gemstones may be more erratic than indicated from the bulk sampling and production undertaken to date. It is possible that certain parts of the deposits are richer than others and this has not yet been fully appreciated at this stage of the Project life. In addition, the market for some of the lower quality stones could be overestimated leaving some stones unsold at auction.
- **Water Management Risk:** The principal risk relates to having sufficient water during dry periods to sustain gravel washing operations. The related issue to this is managing the impact of dewatering and discharge on water resources used by the local community.
- **Poor compliance with EMP:** Based on the recent audit reports provided, MRM is not complying with its obligations under the approved EIA report. This risks potential fines as well as reputational damage.
- **HSE Management Systems:** The status of the implementation of the management systems still appears to be at a very early stage. This situation has not changed since the last review in 2017. This is a reputation risk given the high-profile commitments made to accreditation to ISO standards.

- **Water resources and water management:** There appears to be a lack of understanding of water availability, water use, and potential vulnerability of the operation to climate change impacts. The risk is that the operation is not prepared for extreme drought or flood conditions leading to production loss or competition for scarce resources.
- **Biodiversity management:** The existence of only basic environmental baseline data and lack of a clear biodiversity management programme is a potential risk when compared to the high-profile Gemfields marketing programme.
- **No Sustainable development strategy:** The CSR budget for local development activity is significant and SRK was informed that there is a corporate strategy that stipulates funding should prioritise education, health and food production; however, none of the CSR activities is tied into the district or regional development plan or the SDG. Consequently, the current use of the CSR budget presents a risk of engendering community dependency rather than contributing to more sustainable communities.
- **Youth disengagement and conflict:** There are few alternatives to engaging in illegal artisanal mining activity. Reportedly, there are links between illegal mining and the Islamic insurgency in the north of the province, thus presenting a potential conflict risk.
- **Increase in ASM activity:** While there are a series of comprehensive security measures being put in place to reduce incursions onto the concession, unless there are viable livelihood alternatives and proactive engagement, it will remain an uphill battle. A number of similar risks were highlighted in the 2015 report, but SRK understands these are still to be addressed. This presents an ongoing risk associated with artisanal miners as well as the risk of population influx and associated social challenges.
- **Poor stakeholder engagement records:** The absence of a stakeholder engagement strategy, plan, and data management process, present a social risk to the operation and makes MRM vulnerable to misinformation, rumours and potentially false allegations.
- **Limited social monitoring plans:** Gemfields' overall approach is aligned with the broader strategic aims of the SDG. MRM need to develop social monitoring plans and systems to be able to evaluate effectiveness and impact of CSR activities and their contribution towards the SDG.
- **Economic Performance Risk:** The risk that the mine operations become uneconomic is considered relatively low, as demonstrated by the economic and sensitivity analyses. The greatest asset specific risk relating to the NPV is perceived to be future grades being materially lower than estimated.

3.10.5 Opportunities

The principal opportunities with respect to MRM are largely constrained to:

- **Mineral Resource** potential increases through completion of successful exploration drilling at the MRM and the broader area within the licence.
  - upgrading of the Inferred Mineral Resources and the unclassified secondary material (approximately 40 Mt) to Indicated through additional exploration. Additional drilling and bulk sampling may also supply additional information regarding the grade trends noted at the mine to date, and potentially help to define the underlying causes.

- **Ore Reserve** potential increase through:
  - Refining current estimates with further exploration drilling and bulk mining to help to calibrate the estimation process and better define the presence of high value gemstones.
  - The market for some of the lower quality stones could be under estimated resulting in higher prices for these products than those presented.

4 CONSOLIDATED MINERAL RESOURCE AND ORE RESERVE STATEMENTS

4.1 Kagem

4.1.1 Mineral Resources

The Mineral Resource Statements for Kagem, on a 100% basis, are included in Table 4-1, and on a 75% basis in Table 4-2. The CP with overall responsibility for reporting of the Mineral Resource is Dr Lucy Roberts, MAusIMM (CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. SRK considers that the Mineral Resource Statements are reported in accordance with the JORC Code.

Table 4-1: Kagem: Mineral Resource Statement, as of 1 July 2019, for the Kagem Beryl and Emerald Deposit (100% basis)

Deposit	Classification	Tonnage (kt)	PE&E Grade (ct/t)	Beryl Grade (ct/t)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Measured	480	73	177	250	122
	Indicated	3,710	79	191	270	994
	Inferred					
	Measured + Indicated	**4,190**	**79**	**191**	**270**	**1,117**
Fibolele	Measured					
	Indicated	130	38	122	160	20
	Inferred	1,200			160	192
	Measured + Indicated	**130**	**38**	**122**	**160**	**20**
Libwente	Measured					
	Indicated					
	Inferred	200	-	-	46	9
	Measured + Indicated	**-**	**-**	**-**	**-**	**-**
Stockpiles	Measured	295	41	98	138	41
	Indicated					
	Inferred					
	Measured + Indicated	**295**	**41**	**98**	**138**	**41**
Total	Measured Mineral Resources	775	60	150	210	163
	Indicated Mineral Resources	3,840	75	190	265	1,015
	Inferred Mineral Resources	1,400			145	201
	Measured + Indicated	**4,615**	**75**	**180**	**260**	**1,178**

Table 4-2: Kagem: Mineral Resource Statement, as of 1 July 2019, for the Kagem Beryl and Emerald Deposit (75% basis)

Deposit	Classification	Tonnage (kt)	PE&E Grade (ct/t)	Beryl Grade (ct/t)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Measured	360	73	177	250	92
	Indicated	2,783	79	191	270	746
	Inferred					
	Measured + Indicated	**3,143**	**79**	**191**	**270**	**838**
Fibolele	Measured					
	Indicated	98	38	122	160	15
	Inferred	900	-	-	160	144
	Measured + Indicated	**98**	**38**	**122**	**160**	**15**
Libwente	Measured					
	Indicated					
	Inferred	150	-	-	46	7
	Measured + Indicated	**-**	**-**	**-**	**-**	**-**
Stockpiles	Measured	221	41	98	138	31
	Indicated					
	Inferred					
	Measured + Indicated	**221**	**41**	**98**	**138**	**31**
Total	Measured Mineral Resources	581	60	150	210	122
	Indicated Mineral Resources	2,880	75	190	265	761
	Inferred Mineral Resources	1,050	-	-	145	151
	Measured + Indicated	**3,461**	**75**	**180**	**260**	**883**

In reporting the Mineral Resources for the Kagem area, SRK notes the following:

- The average value of the beryl and emerald, as reported in the Mineral Resource Statement is USD5.92 /ct. The value of the different product splits, are as follows:
  - Premium Emerald and Emerald: USD20.87 /ct; and
  - Beryl (Beryl 1 and Beryl 2): USD0.075 /ct.
- Mineral Resources are quoted at appropriate economic cut-off grades which satisfy the requirement of 'potentially economically mineable' for open-pit mining; furthermore, the commodity prices incorporated into the cut-off grade calculations for derivation of optimised shells are those as stated previously, with a 30% mark up, to reflect an optimistic view.
- In addition, SRK has also completed a pit optimisation exercise which quantifies the amount of material which is likely to be mined using open pit methods. The optimised pits were derived using the same input parameters as those in the mining study (Section 2.4), but with a commodity price which reflects an optimistic view.
- Mineral Resources are quoted with a bottom cut-off size of 3 mm, which is consistent with what can be recovered in the plant and picked by hand from the belts.
- All Mineral Resources are quoted at 100%, and derivation of attributable Mineral Resources would necessitate application of the Company's 75% equity interest (see Section 4).
- All total grades quoted reflect beryl and emerald combined, expressed as carats per tonne. For the Measured and Indicated Mineral Resources, the product splits are consistent with those determined historically. "PE&E" is Premium Emerald and Emerald combined, and "Beryl" is Beryl-1 and Beryl-2 combined. One carat is defined as 0.2 g. Conversely, this equates to a conversion factor of 5 carats per gram.
- Mineral Resources are reported inclusive of Ore Reserves

4.1.2 Ore Reserves

The Ore Reserve statement for Kagem, on a 100% basis is presented in Table 4-3, and on a 75% basis in Table 4-4. The CP responsible for reporting Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the IOM3, a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code. Mrs Anderson has review and relied on:

- The mining technical evaluation and mine plan authored by Mr. Hanno Buys Pr.Eng MEng MSAIMM, a Senior Consultant (Mining Engineering) with SRK.
- The review of the mineral processing undertaken by Dr John Willis, MAusIMM(CP) MAIME PhD a Principal Consultant (Minerals Processing and Metallurgy) with SRK.
- The review of the environmental and social aspects by Mr John Merry, a Principal Consultant (Environmental and Social Management), Dr Cathryn MacCallum FIMMM CEnv CSci, a Principal Consultant (Social Development and Management), and Ms Insiya Salam, MSc, a Consultant (Social Development and Management), all with SRK.

Table 4-3: Kagem: Ore Reserve Statement, as at 1 July 2019, for the Kagem Beryl and Emerald Deposit (100% basis)

Deposit	Classification	Tonnage (kt)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Proved Ore Reserve	386	210	81
	Probable Ore Reserve	2,840	218	620
	Proved + Probable	**3,226**	**217**	**700**
Fibolele	Proved Ore Reserve	-	-	-
	Probable Ore Reserve	100	139	14
	Proved + Probable	**100**	**139**	**14**
Stockpiles	Proved Ore Reserve	295	139	41
	Probable Ore Reserve	-	-	-
	Proved + Probable	**295**	**139**	**41**
Total	Proved Ore Reserve	681	179	122
	Probable Ore Reserve	2,940	215	633
	Proven + Probable	**3,621**	**209**	**755**

Table 4-4: Kagem: Ore Reserve Statement, as at 1 July 2019, for the Kagem Beryl and Emerald Deposit (75% basis)

Deposit	Classification	Tonnage (kt)	B&E Grade (ct/t)	Contained Carats (Mct)
Chama	Proved Ore Reserve	290	210	61
	Probable Ore Reserve	2,130	218	465
	Proved + Probable	**2,420**	**217**	**525**
Fibolele	Proved Ore Reserve	-	-	-
	Probable Ore Reserve	75	139	10
	Proved + Probable	**75**	**139**	**10**
Stockpiles	Proved Ore Reserve	221	139	31
	Probable Ore Reserve	-	-	-
	Proved + Probable	**221**	**139**	**31**
Total	Proved Ore Reserve	511	179	91
	Probable Ore Reserve	2,205	215	475
	Proven + Probable	**2,716**	**209**	**566**

SRK makes the following comments in relation to the Ore Reserve declaration:

- The Ore Reserve is presented on a 100% attributable basis. SRK notes that Gemfields shareholding in Kagem is 75%.
- The Mineral Resource grades are quoted with a bottom cut-off stone size of 3 mm.
- The reported grades are recovered grades, as opposed to in-situ grades, due to the nature of the type of mineralisation and operation.
- A Probable Ore Reserve has been derived from the reported Indicated Mineral Resource, and a Proved Ore Reserve has been derived from the Measured Mineral Resource.
- No material classified as Inferred Mineral Resources has been converted to Ore Reserves.
- The mining production plan has been revised and updated by SRK and deemed achievable. The mining method and equipment remain unchanged. The Ore Reserves has been constrained and optimised applying relevant economic criteria.
- The mining operation at Kagem is an efficient, low-cost conventional mining operation which is not expected to present any major technical or logistical challenges in the future.
- A discounted cashflow model has been prepared to evaluate and demonstrated Kagem's economic viability.
- The relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties and capital costs have also been included.

- The average commodity prices applied in the discounted cashflow model vary between USD 4.96/ct in 2019 and USD 6.33/ct in 2026. This covers high quality auctions, low quality auctions, and other sales.
- Premium Emerald and Emeralds account for 99% of revenue; where High Quality Auctions account for 83% and the Low Quality Auctions for 16%. This leaves Beryl accounting for 1% of revenue only.
- 100% of sales revenue from Kagem stones is attributed to the mine.
- The economic evaluation has resulted in an NPV of USD 600 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM.
- SRK has relied upon the Company to confirm that the required permits and licences are in good standing and expected to remain so for the duration of the LoMp.
- SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve.
- SRK highlights that the key risk to the forecast production and revenue presented in the LoMp, is the nature of the mineralisation leading to difficulty in estimating grades; and the split between stone quality.

4.2 MRM

4.2.1 Mineral Resources

The Mineral Resource Statements for MRM, on a 100% basis is given in Table 4-5 and Table 4-6, and on a 75% basis in Table 4-7 and Table 4-8. The CP with overall responsibility for reporting of the Mineral Resource is Dr Lucy Roberts, MAusIMM (CP), a Principal Consultant (Resource Geology) with SRK. Dr Roberts has the relevant experience in reporting Mineral Resources on various coloured gemstone projects. SRK considers that the Mineral Resource Statements are reported in accordance with the JORC Code.

Table 4-5: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Secondary Mineralisation (100% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Secondary	Indicated	2.01	18,900	0.14	0.6	3.1	3.8	72
	Inferred	2.01	39,800	0.03	0.1	11.1	11.3	449
Stockpiles - Secondary	Indicated	1.40	797	0.05	0.2	4.4	4.6	4
Total - Secondary	Indicated + Inferred	2.00	59,497	0.07	0.3	8.5	8.8	524

Table 4-6: MRM: Mineral Resource Statement, as at 01 July 2019, for the Montepuez ruby and corundum deposit – Primary Mineralisation (100% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (ct, 000)
Primary	Indicated	2.53	1,100	0.003	3.7	94.2	97.9	108
	Inferred	2.53	240	0.003	3.7	94.2	97.9	24
Stockpiles – Primary	Indicated	1.40	43	0.01	2.4	45.3	47.7	2
Total Primary	Indicated + Inferred	2.49	1,383	0.00	3.7	92.7	96.3	133

Table 4-7: MRM: Mineral Resource Statement, as at 1 July 2019, for the Montepuez ruby and corundum deposit – Secondary Mineralisation (75% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Secondary	Indicated	2.01	14,175	0.14	0.6	3.1	3.8	54
	Inferred	2.01	29,850	0.03	0.1	11.1	11.3	336
Stockpiles - Secondary	Indicated	1.40	598	0.05	0.2	4.4	4.6	3
Total - Secondary	Indicated + Inferred	2.00	44,623	0.07	0.3	8.5	8.8	393

Table 4-8: MRM: Mineral Resource Statement, as at 01 July 2019, for the Montepuez ruby and corundum deposit – Primary Mineralisation (75% basis)

Mineralisation Type	Classification	Density (g/cm3)	Tonnage (kt)	Premium Ruby Grade (ct/t)	Ruby Grade (ct/t)	LR+CO+SP+LS+4.6 Grade (ct/t)	Total Grade (ct/t)	Contained Carats (ct, 000)
Primary	Indicated	2.53	825	0.003	3.7	94.2	97.9	81
	Inferred	2.53	180	0.003	3.7	94.2	97.9	18
Stockpiles – Primary	Indicated	1.40	32	0.01	2.4	45.3	47.7	2
Total Primary	Indicated + Inferred	2.49	1,037	0.00	3.7	92.7	96.3	100

In presenting this Mineral Resource, the following apply:

- Mineral Resources for the gravel bed are reported inclusive of dilution to reflect the anticipated mining method, which has a minimum mining with of 1.5 m, or a total of 0.6 m of dilution where the gravel bed is greater than 0.9 m thick.
- Mineral Resources for Maninge Nice Pit 3 Primary amphibolite are reported as undiluted.
- The block model has been depleted to the relevant pit surveys, to match the effective date of the Mineral Resource of 1 July 2019.
- The average value of the ruby and corundum, as reported in the Mineral Resource Statement is USD17.68 /ct. SRK notes that the price assumptions used are conservative when compared to the prices received from the auction process to date. The assumed prices for the different products, as provided by Gemfields, are as follows:
  - Premium Ruby: USD975.56 /ct;
  - Ruby: USD37.93 /ct.
- Other (low ruby, -4.6 mm, corundum, sapphire): USD 0.75 /ct Premium ruby and normal ruby are presented individually, whilst other classes are combined; these comprise low ruby, corundum, sapphire, low sapphire, and -4.6 mm mixed ruby / corundum combined (“LR+CO+SP+LS+4.6”). A total grade for all classes is also presented for clarity.
- Mineral Resources are quoted with a bottom cut-off size of 1.6 mm, which is consistent with what can be recovered in the plant and processed in the sort house.
- All figures are rounded to reflect the relative accuracy of the estimate. Where minor errors in summation occur, these are not considered to be material.
- Mineral Resources are reported inclusive of Ore Reserves.

4.2.2 Ore Reserves

The Ore Reserve statement for MRM, on a 100% basis is presented in Table 4-9 , and on a 75% basis in Table 4-10. The CP responsible for reporting Ore Reserves is Sabine Anderson, Principal Consultant (Due Diligence), who is a member in good standing of the IOM3, a recognised overseas professional organisation as included in a list available on the JORC website. She is a full-time employee of SRK and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the JORC Code. Mrs Anderson has review and relied on:

- The mining technical evaluation and mine plan authored by Mr. Hanno Buys Pr.Eng MEng MSAIMM, a Senior Consultant (Mining Engineering) with SRK.
- The review of the mineral processing undertaken by Dr David Pattinson CEng, MIMMM, BSc, a Corporate Consultant (Minerals Processing and Metallurgy) with SRK.
- The review of the environmental and social aspects by Mr John Merry, a Principal Consultant (Environmental and Social Management) and Dr Cathryn MacCallum FIMMM CEnv CSci, a Principal Consultant (Social Development and Management), both with SRK.

Table 4-9: MRM: Ore Reserve Statement, as at 1 July 2019, for the Montepuez Ruby Deposit (100% basis)

Classification	Tonnage (kt)	Premium Ruby (ct/t)	Ruby (ct/t)	LR+CO +SP+4.6 (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Probable Ore Reserves						
Primary						
Mineralisation	1,084	0.003	3.66	94.22	97.88	106.1
Stockpiles	43	0.003	3.66	94.22	97.88	4.2
Secondary						
Mineralisation	18,844	0.141	0.58	3.09	3.81	71.8
Stockpiles	797	0.046	0.36	4.27	4.67	3.7
Total						
Mineralisation	19,928	0.134	0.75	8.05	8.93	178.0
Stockpiles	840	0.044	0.52	8.88	9.45	7.9
Total Probable	**20,768**	**0.130**	**0.74**	**8.08**	**8.95**	**185.9**

Table 4-10: MRM: Ore Reserve Statement, as at 1 July 2019, for the Montepuez Ruby Deposit (75% basis)

Classification	Tonnage (kt)	Premium Ruby (ct/t)	Ruby (ct/t)	LR+CO +SP+4.6 (ct/t)	Total Grade (ct/t)	Contained Carats (Mct)
Probable Ore Reserves						
Primary						
Mineralisation	813	0.003	3.66	94.22	97.88	79.575
Stockpiles	32	0.003	3.66	94.22	97.88	3.15
Secondary						
Mineralisation	14,133	0.141	0.58	3.09	3.81	53.85
Stockpiles	598	0.046	0.36	4.27	4.67	2.775
Total						
Mineralisation	14,946	0.134	0.75	8.05	8.93	133.5
Stockpiles	630	0.044	0.52	8.88	9.45	5.925
Total Probable	**15,576**	**0.13**	**0.74**	**8.08**	**8.95**	**139.425**

SRK makes the following comments in relation to the Ore Reserve declaration:

- The Mineral Resource grades are quoted with a bottom cut-off stone size of 1.6 mm.
- The reported grades are recovered grades, as opposed to in-situ grades, due to the nature of the type of mineralisation and operation.
- A Probable Ore Reserve has been derived from the reported Indicated Mineral Resource; No Proved Ore Reserve has been reported, notably as no Measured Mineral Resource has been reported.
- No material classified as Inferred Mineral Resources has been converted to Ore Reserves. No Proved Reserves have been declared.
- The mining production plan has been revised and updated by SRK and deemed achievable. The mining method and equipment remain unchanged. The Ore Reserves has been constrained and optimised applying relevant economic criteria.
- The gravel mining operation at MRM is a shallow, efficient, low-cost free dig mining operation which is not expected to present any major technical or logistical challenges in the future.
- The mine will keep at least six months of ore on a RoM stockpile to mitigate the effect of the variability of the gravel beds in terms of gemstone distribution, and interruptions due to weather conditions.
- The Ore Reserve is based on an increase in process plant capacity, from 800 ktpa to 1,500 kpta. The flowsheet is to remain unchanged and the plant is to be constructed in 2020 for commissioning in 2021. Whereas delays in construction may occur, SRK find the projected production to be reasonable.
- A discounted cashflow model has been prepared to evaluate and demonstrated MRM's economic viability.
- The relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties and capital costs have also been included.
- The stones prices applied in the discounted cashflow model are USD 976/ct for Premium, USD 38/ct for Ruby, and USD 0.75/ct for the Other category of low-quality stone.
- SRK notes that Premium stones account for 79% of revenue, and Ruby stones for 17% of revenue.
- 100% of sales revenue from MRM stones is attributed to the mine.
- The economic evaluation has resulted in an NPV of USD 567 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM.
- SRK has relied upon the Company to confirm that the required permits and licences are in good standing, and expected to remain so for the duration of the LoMp.
- SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve.
- SRK highlights that the key risk to the forecast production and revenue presented in the LoMp, is the nature of the mineralisation leading to difficulty in estimating grades; and the split between stone quality, as prices per category vary more than 1000 fold.

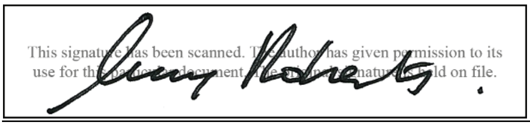
4.3 Summary of Mineral Resource and Ore Reserve Statements

The Mineral Resource and Ore Reserve Statements for the two assets, namely the Kagem emerald and beryl mine, and MRM ruby and corundum mine, are summarised in Table 4-11. The CPs for the Mineral Resources and Ore Reserves for the Kagem and MRM are stated in Sections 4.1and 4.2.

Table 4-11: Summary of Mineral Resources and Ore Reserves by Asset

	Gross			Net Attributable		
Category	Tonnes (kt)	Total Beryl and Emerald Grade (ct/t)	Contained Carats (Mct)	Tonnes (kt)	Total Beryl and Emerald Grade (ct/t)	Contained Carats (Mct)
Kagem						
Ore Reserves						
Proven	681	179	122	511	179	91
Probable	2,940	215	633	2,205	215	475
Total Ore Reserves	**3,621**	**209**	**755**	**2,716**	**209**	**566**
Mineral Resources						
Measured	775	210	163	581	210	122
Indicated	3,840	265	1,015	2,880	265	761
Inferred	1,400	145	201	1,050	145	151
Total Mineral Resources	**6,015**	**229**	**1,379**	**4,511**	**229**	**1,034**
Category	**Tonnes (kt)**	**Total Ruby and Corundum Grade (ct/t)**	**Contained Carats (Mct)**	**Tonnes (kt)**	**Total Ruby and Corundum Grade (ct/t)**	**Contained Carats (Mct)**
MRM – Primary Mineralisation						
Ore Reserves						
Proven	-	-	-	-	-	-
Probable	1,127	98	110	845	98	83
Total Ore Reserves	**1,127**	**98**	**110**	**845**	**98**	**83**
Mineral Resources						
Measured	-	-	-	-	-	-
Indicated	1,143	96	110	857	96	83
Inferred	240	98	24	180	98	18
Total Mineral Resources	**1,383**	**96**	**133**	**1,037**	**96**	**100**
MRM – Secondary Mineralisation						
Ore Reserves						
Proven	-	-	-	-	-	-
Probable	19,641	4	76	14,731	4	57
Total Ore Reserves	**19,641**	**4**	**76**	**14,731**	**4**	**57**
Mineral Resources						
Measured	-	-	-	-	-	-
Indicated	19,697	3.9	76	14,773	3.9	57
Inferred	39,800	11.3	449	29,850	11.3	336
Total Mineral Resources	**59,497**	**8.8**	**524**	**44,623**	**9**	**393**

For and on behalf of SRK Consulting (UK) Limited



Lucy Roberts
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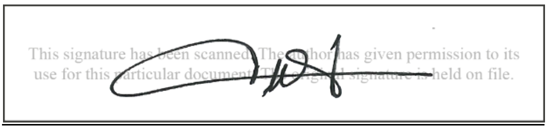

Sabine Anderson
Principal Consultant, Due Diligence
SRK Consulting (UK) Limited

GLOSSARY, ABBREVIATIONS, UNITS

Glossary

Albite	a plagioclase feldspar mineral, white or colourless, NaAlSi3O8. Its specific gravity is about 2.62 and it has a Mohs hardness of 6 - 6.5. It occurs commonly in metamorphic and igneous rocks.
Alteration	any change in the mineralogic composition of a rock brought about by physical or chemical means, esp. by the action of hydrothermal solutions.
Amphibolite	A metamorphic rock consisting mainly of amphibole and plagioclase, little or no quartz and having a crystalline texture.
Basalt	a dark coloured, fine grained volcanic rock, essentially composed of calcic plagioclase and pyroxene, with or without olivine. Magnetite is commonly an important accessory.
Basement	an underlying complex that behaves as a unit mass and does not deform by folding.
Beryl	a hexagonal mineral, Be3Al2Si6O18, from which beryllium is extracted; its principle occurrence is in granite pegmatites. Beryl is valued as a coloured gemstone.
Biotite	a common phyllosilicate mineral of the mica group, dark in colour, transparent and translucent silvery. It has a highly perfect basal cleavage and consists of flexible sheets, or lamellae, which easily flake off.
Blank (sample)	a prepared sample with a zero content of the target element which is being assayed/analysed for.
Bulk sampling	the taking of large samples, which may consist of large-diameter drill core, the contents of a trench or mine working, or a car or train load of ore material, for process testing in mine evaluation.
Capital Expenditure	expenditures incurred during the process of commencing, expanding or sustaining production.
Carat	a unit mass of gemstones, equal to 0.2 grams.
Carbonate	one of several minerals containing one central carbon atom with strong covalent bonds to three oxygen atoms and typically having ionic bonds to one or more positive ions.
Chiselling	Manual mining method, using picks and shovels.
Chlorite	a representative of a group of micaceous greenish minerals. Commonly in low grade schists, for example greenschists, or as alteration products of pyroxene, amphiboles or biotite.
Chromium	a chemical element which has the symbol Cr and atomic number 24. It is a steel grey, lustrous, hard metal that takes a high polish and has a high melting point.
Company	Gemfields Group Limited
Competent Person	A 'Competent Person' is a minerals industry professional who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a 'Recognised Professional Organisation' (RPO), as included in a list available on the JORC and ASX websites. These organisations have enforceable disciplinary processes including the powers to suspend or expel a member. A Competent Person must have a minimum of five years relevant experience in the style of mineralisation or type of deposit under consideration and in the activity which that person is undertaking. If the Competent Person is preparing documentation on Exploration Results, the relevant experience must be in exploration. If

	the Competent Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Competent Person is estimating, or supervising the estimation of Ore Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Ore Reserves.
Concordant	having boundaries parallel with bedding or foliation of the country rock. Said of intrusive igneous bodies.
Conformable	showing a continuous sequence of layers that were deposited without interruption in parallel order, one above the other.
Consensus market forecast	commodity prices determined by analysis of the average/range of forecasts by various financial institutions.
Core	a solid, cylindrical sample of rock typically produced by a rotating drill bit, but sometimes cut by percussive methods.
Corundum (Quality)	Opaque non-gem quality rough
Corundum	crystalline form of aluminium oxide, typically containing traces of iron, titanium, vanadium, and chromium
Dilution	the contamination of ore with barren or grade bearing wall rock during mining. The grade of the ore after mining is frequently lower than when sampled in place. Dilution also relates to the proportion of waste that is contained in the Run-of-Mine ore delivered to the metallurgical processing plant, and to the diluting tonnage expressed as a percentage of in-situ ore mined.
Dip	the angle at which a bed, stratum, or vein is inclined from the horizontal, measured perpendicular to the strike and in the vertical plane.
Discordant	of intrusive igneous bodies such as dykes, with margins that cut through the bedding or foliation of country rock.
Disseminated	finely spread throughout a rockmass.
Drillhole	technically, a circular hole drilled by forces applied percussively; loosely and commonly, the name applies to a circular hole drilled in any manner.
Drilling	the operation of making deep holes with a drill for prospecting, exploration, or valuation.
Dyke	tabular igneous intrusion that cuts across the bedding or foliation of the country rock.
Emerald	deep green variety of beryl, highly valued as a gemstone. It crystallises in hexagonal prismatic forms. Its colour is attributed to the presence of chromium.
Exploration	the search for coal, mineral, or ore by (1) geological surveys; (2) geophysical prospecting (may be ground, aerial, or both); (3) boreholes and trial pits; or (4) surface or underground headings, drifts, or tunnels. Exploration aims at locating the presence of economic deposits and establishing their nature, shape, and grade, and the investigation may be divided into (1) preliminary and (2) final.
Fault	a fracture or a fracture zone in crustal rocks along which there has been displacement of the two sides relative to one another parallel to the fracture. The displacement may be a few inches or many miles long.
Feldspar	the name of a group of rock-forming minerals which make up as much as 60% of the Earth's crust. Feldspars crystallize from magma in both intrusive and extrusive igneous rocks, and they can also occur as compact minerals, as veins, and are also present in many types of metamorphic rock. Feldspars are also found in many types of sedimentary rock
Felsic	derived from feldspar, or feldspathoid, and silica, and applied to light-coloured rocks containing an abundance of one or all of these

	constituents. Also applied to the minerals themselves, the chief felsic minerals being quartz, feldspar, feldspathoid, and muscovite.
Fines	a category of gemstone product, being of low grade and small size fraction.
Fold	a curve or bend of a planar structure such as rock strata, bedding planes, foliation, or cleavage. A fold is usually a product of deformation, although its definition is descriptive and not genetic and may include primary structures.
Foliation	a planar arrangement of dimensionally orientated minerals in metamorphic rocks formed by the recrystallisation and segregation of minerals growing under conditions of elevated pressure and shearing stress.
Free dig	waste stripping or ore mining without the requirement of drilling and blasting.
Garnet	a group of isometric nesosilicate minerals that have been used since the Bronze Age as gemstones and abrasives. Garnets are most often seen in red but are available in a wide variety of colours spanning the entire spectrum.
Gemfields	Gemfields Group Limited
Gemstones	any stone valued for its appearance, particularly after it has been cut and polished, often used in jewellery or adornments. Historically and sometimes still referred to as precious or semi-precious.
Gneiss / Gnessic	a metamorphic rock, having a coarse textural lineation or banding of the constituent minerals into alternating silicic and mafic layers.
Grade	the relative quantity or the percentage of ore-mineral or metal content in an orebody.
Granite	plutonic rock in which quartz constitutes 10% to 50% of the felsic components and in which the alkali feldspar/total feldspar ratio is generally restricted to the range of 65% to 90%.
Gravel Bed	variably rounded quartz gravel and clastic material (up to approximately 15 cm in diameter) in a clay-rich matrix
Hornblende	a monoclinic silicate mineral, the most common mineral of the amphibole group, dark green or black in colour, sometimes acicular or fibrous in fibrous or sheaf-like aggregates. Important constituent of metamorphic rocks.
Host rock	body of rock serving as a host for other rocks or for mineral deposits; e.g., a pluton containing xenoliths, or any rock in which ore deposits occur.
Hydrothermal	of or pertaining to hot water, to the action of hot water, or to the products of this action, such as a mineral deposit precipitated from a hot aqueous solution, with or without demonstrable association with igneous processes.
Igneous	rocks formed by the solidification of cooled magma (molten rock), with or without crystallisation.
Indicated Mineral Resource	that part of a Mineral Resource for which quantity, grade (or quality), densities, shape and physical characteristics are estimated with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes, and is sufficient to assume geological and grade (or quality) continuity between points of observation where data and samples are gathered. An Indicated Mineral Resource has a lower level of confidence than that applying to

	a Measured Mineral Resource and may only be converted to a Probable Ore Reserve.
Inferred Mineral Resource	that part of a Mineral Resource for which quantity and grade (or quality) are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and grade (or quality) continuity. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to an Ore Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.
Interpolation	estimation of a statistical value from its mathematical or graphical position intermediate in a series of determined points.
Intrusive	a mass of igneous rock that, while molten, was forced into or between other rocks.
Isoclinal fold	a fold whose limbs are parallel.
JORC Code	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2012 Edition, Prepared by the Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (“JORC”).
Kagem	the Kagem emerald and beryl mine
Laterite	a reddish clayey material, hard when dry, forming a topsoil in some tropical or subtropical regions
Log/logging	any various methods for obtaining a continuous record (a log) as a function of the depth of observations made on the rocks and fluids encountered in a bore hole.
Low Ruby (Quality)	Gemstones with the required pinkish red to red colour, but translucent clarity with significant inclusions
Mafic	pertaining to or composed dominantly of the ferromagnesian rock-forming silicates; said of some igneous rocks and their constituent minerals.
Magnetite	an isometric, strongly magnetic iron rich mineral, in which there can be some substitution of magnesium and manganese for iron, aluminium, chromium, manganese and titanium in various ionic states.
Mapping	recording geological information from an exposed rock surface.
Marble	a metamorphic rock composed essentially of calcite, dolomite, or a combination of the two, with a fine- to coarse-grained crystalline texture.
Measured Mineral Resource	that part of a Mineral Resource for which quantity, grade (or quality), densities, shape, and physical characteristics are estimated with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes, and is sufficient to confirm geological and grade (or quality) continuity between points of observation where data and samples are gathered. A Measured Mineral Resource has a higher level of confidence than that applying to either an Indicated Mineral Resource or an Inferred Mineral Resource. It may be converted to a Proved Ore Reserve or under certain circumstances to a Probable Ore Reserve.
Mesoproterozoic	a geologic era that occurred from 1,600 to 1,000 Ma.

Metasomatism	the chemical alteration of a rock by hydrothermal and other fluids. It is also known as "alteration". Metasomatism can occur via the action of hydrothermal fluids from an igneous or metamorphic source.
Mica	a group of phyllosilicate minerals.
Mineral Resource	a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality), and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade (or quality), continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling. Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories
Modifying Factors	considerations used to convert Mineral Resources to Ore Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors.
MRM	the Montepuez ruby and corundum mine
Muscovite	a mineral of the mica group, colourless or pale yellow, grown or green, transparent and translucent silvery. It has a highly perfect basal cleavage and consists of flexible sheets, or lamellae, which easily flake off.
Neoproterozoic	the unit of geologic time from 1,000 to 550Mya, before the first
Optical sorting	here, using a high resolution camera, specialised lighting and sensors to analyse the spectrum of transmitted light, gem crystals are sorted from other rocks by being knocked away using jets of compressed air.
Optimised shell	a shell, depicting an imaginary pit surface, prior to any engineering features such as benches or ramps.
Ore Reserves	is the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.
Ore	the naturally occurring material from which a mineral or minerals of economic value can be extracted profitably or to satisfy social or political objectives. The term is generally but not always used to refer to metalliferous material, and is often modified by the names of the valuable constituent.
Orebody	a geologically defined solid of ore. See ore.
Outcrop	to appear exposed and visible at the Earth's surface; to crop out.
Palaeoproterozoic	the earliest of three geologic eras of the Proterozoic era. The Palaeo-Proterozoic era spanned from roughly 2500Ma to roughly 1600Ma.
Paleo drainage	remnant of an inactive river or stream channel that has been filled or buried by younger sediment. The sediments that the ancient channel is cut into or buried by can be unconsolidated, semi-consolidated, consolidated or lithified
Pegmatite	a very coarse grained igneous rock typically found in veins, lenticular or podlike bodies. Often composed of quartz, feldspar and mica. Complex pegmatites are of greater mineralogical importance of economic interest than simple pegmatites.
Phlogopite	a yellow, greenish or reddish brown member of the mica family of phyllosilicates. It is also known as magnesium mica.
Plunge	the inclination of a fold axis measured in the vertical plane.

Premium Ruby (Quality)	Any rough greater than 0.5 g in weight and of desirable shape, clarity and red colour, with no or very few inclusions
Probable Ore Reserves	the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Ore Reserve is lower than that applying to a Proved Ore Reserve.
Proterozoic	an eon before the first abundant complex life on Earth. The Proterozoic Eon extended from 2,500Mya to 542Mya.
Proved Ore Reserves	the economically mineable part of a Measured Mineral Resource. A Proved Ore Reserve implies a high degree of confidence in the Modifying Factors.
Pseudomorph	a mineral compound resulting from a substitution process in which the appearance and dimensions remain constant, but the mineral which makes up the chief component of the compound is replaced by another. The name means False Form.
Quartz	a trigonal mineral, the most abundant mineral in the Earths' continental crust. It is made up of a lattice of silica, SiO2, tetrahedral. It has a hardness of 7 on the Mohs scale and a density of 2.65 t/m3.
Quartzite	a hard, metamorphic rock which was originally sandstone.
Reaction Zone	a contact zone between pegmatites and the TMS, where beryls and emeralds occur.
Ruby (Quality)	Less than 0.5 g in weight, but of a desirable shape, clarity and red colour. Rough 0.5 g or more in weight where the rough is either included or pink in colour which affects either recovery or appearance of the finished gem
Ruby	pink to blood red gemstone, a variety of crystalline corundum (Al2O3)
Run of mine	the ore which is mined and planned to be processed.
Sandstone	a medium-grained clastic sedimentary rock composed of fragments of sand size set in a fine-grained matrix (silt or clay) and more or less firmly united by a cementing material (commonly silica, iron oxide, or calcium carbonate).
Sapphire (Quality)	Generally, very light pink to pink gemstones of variable shape and clarity. May contain orange and off-colour gems.
Schist	a strongly foliated crystalline rock.
Sediment	solid material, organic or inorganic, that has settled out from a state of suspension in a fluid and has been transported and deposited by wind, water or ice. Such loose sediments may become consolidated and or cemented to form coherent sedimentary rock.
Sedimentary	formed by the deposition of sediment.
Sericite	fine grained mica, either muscovite, illite, or paragonite. A common alteration mineral of orthoclase or plagioclase feldspars in areas that have been subjected to hydrothermal alteration.
Shell	see "Optimised shell"
Sill	a concordant sheet of igneous rock lying nearly horizontal.
Specimen	a category of emerald and beryl product, consisting of large specimen stones.
SRK Group	SRK Global Limited.
SRK	SRK Consulting (UK) Limited
Stakeholders	in the context of social control, any party which may have an interest or be affected by a proposed or ongoing operation.
Strike	the course or bearing of the outcrop of an inclined bed, vein, or fault plane on a level surface; the direction of a horizontal line perpendicular to the direction of the dip.

Stripping ratio	the amount of soil, overburden or interburden that must be removed to gain access to a unit amount of ore or mineral material.
Stripping	Removal of waste material to expose ore.
Supergroup	a group of rocks formed during a single stratigraphic period.
Synformal structure/ Synform	a U-formed structure in strata of unknown stratigraphic sequence.
Talc	a very soft mineral, $Mg_3Si_4O_{10}(OH)_2$, with a hardness of 1 on the Mohs scale, that feels soapy when handled.
Thrust	a fault with a dip of 45 degrees or less over much of its extent, on which the hanging wall appears to have moved upward relative to the footwall.
Tourmaline	a crystal silicate mineral compounded with elements such as aluminium, iron, magnesium, sodium, lithium, or potassium. Tourmaline is a common accessory mineral in igneous and metamorphic rocks, and very common in pegmatites. Tourmaline gemstones come in a wide variety of colours.
Tremolite	member of the amphibole group of silicate minerals. Tremolite forms by metamorphism of sediments rich in dolomite and quartz.
Trenching	in geological exploration, a narrow, shallow ditch cut across a mineral deposit to obtain samples or to observe character.
Ultramafic	of igneous and meta-igneous rocks with very low silica content (less than 45%), generally >18% MgO, high FeO, low potassium, and are composed of usually greater than 90% mafic minerals (dark coloured, high magnesium and iron content.
Vein	an epigenetic mineral filling of a fault or other fracture in a host rock, in tabular or sheet-like form, often with associated replacement of the host rock; a mineral deposit of this form and origin.
Waste dumps	the area where mine waste or spoil materials are disposed of or piled.
Wireframe	three dimensional solids representing geological/mineralogical domains.

Abbreviations

ADT	Articulated dump trucks
AHK	Alfred H Knight laboratory in Kitwe, Zambia
AMP	Amphibolite
ASM	Artisanal and small scale mining
B&E	Beryl and Emerald
CAGR	Compound Annual Growth Rate
CIM	Continuous Improvement Manager
CP	Competent Person, as defined by the JORC Code
CSR	Corporate Social Responsibility
DCF	Discounted Cash Flow model
DMS	Dense Media Separation
DUAT	Land Use Permit (Mozambique)
EIA	Environmental Impact Assessment
EIS	Environmental impact statement
EMP	Environmental management plans
EPB	Environmental project briefs
EPF	Environmental Protection Fund
ESG	Environmental Social Governance

ESHS	Environment, social and health and safety
FEL	Front End Loader
G&A	General and administration
GB	Gravel bed
GGL	Gemfields Group Limited
GIIP	Good International Industry Practice
GoZ	Government of Republic of Zambia
GPR	Ground penetrating radar
HLS	Heavy Liquid Separation
HSE	Health and Safety, Social, and Environment
IMMT	Industrial Research - Institute of Minerals and Materials Technology
INAMI	National Institute of Mines (Mozambique)
IOM3	Institute of Material, Minerals and Mining
JORC	Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
LoMp	Life of Mine Plan
LSE	London Stock Exchange
MDS	Mineral Density Separation
MITADER	Ministério de terra, Ambiente e Desenvolvimento Rural
MRM	Montepuez ruby and corundum mine
MSD	Mine Safety Department
Mtpa	Million tonnes per year
NPV	Net Present Value
NRERA	Ndola Rural Emerald Restricted Area
NRG	New Resolution Geophysics
NTFP	Non-timber forest products
OGM	Operational Grievance Mechanism
PE&E	Premium emerald and emerald
PEG	Pegmatite
QAQC	Quality Assurance and Quality control
QMS	Quartz-mica schist
RAP	Resettlement plan
RoM	Run of mine
RQD	Rock quality designation
RZ	Reaction zone
SADCAS	South African Development Community Accreditation Service
SDGs	Sustainable Development Goals
SEP	Stakeholder Engagement Plan
SG	Specific Gravity
SGS	SGS laboratory in Kalalushi, Zambia
SHE	Safety, Health, and Environment
SHEQ	Safety, Health, Environment, and Quality
SR	Stripping ratio
SRK	SRK Consulting (UK) Ltd
SRTM	Shuttle Radar Topography Mission
TBS	Talc-biotite schist
TEP	Technical and economic inputs
TMI AS	Total magnetic intensity analytic signal

TMI	Total magnetic intensity
TMM	Total material movement
TMS	Talc-magnetite schist
UV	Ultra-violet light
XRD	X-ray Diffraction
XRF	X-ray Fluorescence
ZEMA	Zambian Environmental Management Agency

Units

cm	Centimetres
ct/t	Carats per tonne
g	Grams
g/cm^3	Grams per cubed centimetre
kg	Kilograms
kt	Thousand metric tonnes
m	Metres
Ma	Million years
Mct	Million carats
ml	Millilitres
mm	Millimetres
Mt	Million metric tonnes
ppm	Parts per million
t	Metric tonnes

APPENDIX

A JORC TABLE 1 - KAGEM

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• The main exploration methods being employed at the Kagem Mine include diamond drilling, and production from the ongoing mining operation. • Diamond drilling is primarily aimed at determining the nature and geometry of the talc-magnetite schist (TMS), pegmatites, and associated emerald-bearing reaction zones. • Grade data is derived from the current open-pit mining operations at Chama and Fibolele, and bulk sampling at Libwente. • Detailed geological logging is completed for all diamond drill holes. • The diamond holes are also periodically lab assayed and analysed with a handheld Niton XRF, as a validation of the lithological logging.
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• Drilling to date across the three deposit areas in question, (Chama, Fibolele and Libwente) comprises a total of 707 drillholes for a total meterage of 67,457.60 m. This includes 348 holes for 35,771 m at Chama, 117 holes for 9,875 m at Fibolele and 242 holes for 21,810 m at Libwente. • All drillholes are diamond core holes. • All diamond drilling has been competed in-house by two Gemfields owned Longyear LF 1000 D rigs. • Most holes start at HQ core diameter, switching to NQ diameter core once into competent rock. The majority of holes extend approximately 20 m beyond the TMS unit into footwall mica schist before being terminated. • The majority of diamond drillhole collars throughout the Kagem Mine licence were surveyed using total station theodolite. The remaining, most recent, collars have been surveyed using differential GPS. • Downhole survey data exists for a total of 246 holes throughout the Kagem Mine licence, which represents roughly 35% of the total number of holes drilled. The holes are surveyed using a REFLEX EZ-Com 2.0.0 tool, at average downhole intervals of approximately 25 m at Chama and Fibolele and 12 m at Libwente. • None of the holes have been structurally oriented.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Core recovery is recorded by a geologist upon the receipt of core at the drill core yard. The core boxes are laid out on logging tables, and all core carefully aligned, before measuring the recovered core for each run. • Core recoveries have been recorded for all post-2008 drill holes. Core recoveries in available drill hole data average 80.8%.

Criteria	JORC Code explanation	Commentary
		• Core recovery was not routinely recorded in the pre-2008 drilling campaigns. Where available, excepting expected low recoveries in the soil horizon, average values range from 57.6% to 98.5%. • It is not possible to obtain accurate emerald carat per tonne assay values from HQ or NQ size core samples. As such it is impractical to determine whether a relationship exists between core sample recovery and grade, and any bias would not be of great relevance to the MRE process. That being said, core recovery in the TMS unit, host to the emerald-bearing reaction zones, is reasonable, averaging at 91.1%.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• Geological data is recorded in a detailed log spreadhseet designed to capture key geological information for drill core each interval. • A 5cm minimum logging width applies. This is to ensure that the reaction zone material, which has an average downhole interval length of approximately 1 m, and is often at the <10 cm scale, is appropriately accounted for in the drillhole database. • The total drill core meterage across the Chama, Libwente and Fibolele deposits is 67,457.60 m. This includes 6,629.44 m of logged TMS, equal to ~9.8% of the total drill core length. • All diamond core has been geologically logged. • At present only basic geotechnical data, including recovery and rock quality designation ("RQD"), is routinely recorded.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	• Emerald and beryl grade data is derived from the current open-pit mining operations at Chama and Fibolele, and bulk sampling at Libwente. • Gemfields have conducted periodic geochemical assaying of the drillcore, for a suite of elements, which can be used to assist in interpreting the geometry of the TMS unit and emerald-bearing reaction zone. • The bulk of geochemical assay data for the Kagem Mine is supplied by handheld Niton XRF analysis, with laboratory assaying employed as a validation of the Niton data in selected drillholes. • Handheld Niton XRF analysis is completed from 3m above the hangingwall of the logged TMS unit to 3m below the footwall of the TMS. A Niton reading is typically taken every 0.33 m, or at 1 m intervals in places. • Half-core laboratory assay samples are taken within the TMS unit, in addition to the immediate hangingwall and footwall formations. The standard sample length is 1 m, although sample positions are adjusted at contact zones to conform with changes in lithology / alteration.

Criteria	JORC Code explanation	Commentary
		• SRK consider the handheld Niton and lab assay interval lengths to be appropriate for the geometry and thickness of the TMS unit and associated reaction zones. It is recommended that where handheld Niton or lab assaying is conducted in the future, Niton XRF analysis is conducted for the entire length of holes. • Gemfields have provided SRK with handheld Niton XRF data for a total of 7,088 samples from a 178 holes at Chama, Fibolele and Libwente. Laboratory assay data is available for a total of 715 samples from the selected sampled holes across the 3 deposits.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	• Half-core samples are sent for crushing, pulverisation and analysis to either the Alfred H Knight laboratory in Kitwe, Zambia, Shiva Analyticals in Bangalore, India, or the SGS laboratory in Kalalushi, Zambia. • Gemfields have provided SRK with a total of 39 QAQC samples, including internal blanks, internal duplicates, external blanks, external standards and external duplicates. • SRK is satisfied that the quality control procedures indicate no overall bias in the sample preparation and ICP-MS procedure. • Assays are not employed as a direct input to the resource model. Therefore, although the number of QAQC samples is limited, this is not considered a concern for the integrity of the resource estimate.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• Geological logging is recorded on printed detailed log spreadsheet templates and subsequently copied into a Microsoft Excel database. The original log hard copies are archived at the Kagem office on-site. • Handheld Niton and assay data is stored in separate Excel spreadsheets. • The resource model used to constrain the resource estimate is largely based on geological logging, with handheld Niton XRF data used to refine contact surfaces where appropriate. • A review of the drillhole database and summary logging of a series of drillholes conducted by SRK in June 2015, suggests that the geological information being recorded by Gemfields geologists is largely of a good quality. Lithological identifications are consistent and downhole contact depths have been captured to an appropriate level of accuracy. • It is noted that that there is a degree of inconsistency between the logging of the older, pre-2008 holes and more recent drilling, most notably relating to the thickness of the logged reaction zone intervals. For resource modeling purposes the footwall reaction zone interval selections in the pre-2008 drillholes were altered to reflect the average thickness (0.81m) of the footwall reaction zone material in the post-2008 drillholes.

Criteria	JORC Code explanation	Commentary
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• The majority of diamond drillhole collars throughout the Kagem Mine license were surveyed using total station theodolite. The remaining, most recent, collars have been surveyed using differential GPS. • The highest resolution pre-mining topographic data available for the Kagem Mine area is regional airborne barometric sensing data, at a resolution of 10mX by 10mY.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• Drilling at Chama is on a variably spaced grid broadly defined by close spaced drilling of approximately 25 m by 25 m, with drill spacing decreasing down-dip. Drill spacing down-dip is highly variable, but can be loosely described in terms of a 100 m by 200 m grid, decreasing to approximately 50 m by 50 m in places. • Fibolele is drilled on 50 m sections, with an on-section collar spacing of 50 m. Infill drilling has been completed in a small area in the south of the deposit on a 25 m by 25 m grid. • Drilling at Libwente has been completed on a variable grid of 100 m by 100 m, 100 m by 50 m or 50 m by 50 m, decreasing to 25 m by 25 m in places. Collar spacing decreases to roughly 200 m by 100 m in the north-western part of the deposit. • The given drill spacings are considered appropriate for the style of mineralization and resource classification applied. • No down-hole compositing has been applied.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• The majority of holes at the Chama deposit have been drilled perpendicular to the TMS unit. A small number of holes have been drilled on a 200 m by 200 m grid to assess the distribution and continuity of discordant pegmatite veining. • Only 3 holes at Libwente and 8 holes at Fibolele have been drilled to target the discordant pegmatite and QT veining, with the remaining holes drilled perpendicular to the TMS unit. • The current drill orientation, largely perpendicular to the TMS unit, results in an under-representation of discordant emerald-bearing reaction zones parallel to the pegmatite and QT veins, particularly at Libwente and Fibolele. • It is strongly recommended that a program of drilling perpendicular to the main pegmatite / QT vein trend is completed at both Fibolele and Libwente to target the discordant emerald-bearing reaction zones.
Sample security	• *The measures taken to ensure sample security.*	• Gemfields employ security staff to police the illegal removal of emerald stones from the open-pit mining and bulk sampling operations. • All members of staff and visitors are searched both when leaving any open pit, and when leaving the wider Project-site. This also applies to the wash plant and sort house.

Criteria	JORC Code explanation	Commentary
		• All material recovered from the open-pit operations is transported to the wash plant and sort house via a security escort. • After sorting of the emeralds into various classifications by the sorting staff, the emerald stones are stockpiled in a secure location, cordoned and permanently guarded by multiple security staff.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• SRK is unaware of any audits or reviews which have been completed at the Kagem mine

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• The Mine is operated by Kagem Mining Ltd, which is 75% owned by Gemfields, with the remainder owned by the Government of Zambia. • The Kagem Mine is situated in the Ndola Rural Emerald Restricted Area within the Kafubu area of the Copperbelt Province of Zambia. • The area is covered by the GL-713 license, which was originally granted to Kagem in March 2005.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• Exploration and mining were completed by third parties prior to 2008. Where necessary, the work completed by third parties has been adequately referenced in this report.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The currently defined emerald deposits of the Mine are hosted by talc-magnetite schists of the Mesoproterozoic Muva Supergroup, in the Kafubu area of the Zambian Copperbelt. • The broad deposit stratigraphy can be described in terms of footwall mica schist of the Lufubu basement complex, overlain by talc-magnetite schist, amphibolite and quartz-mica schist of the Muva Supergroup. The whole sequence is intruded by Lufilian (c. 550 Ma) pegmatite dykes and quartz-tourmaline veins • The Kagem deposits belong to a group referred to as "schist-hosted emeralds", relating to the interaction of Be-bearing fluids from pegmatoid dykes or granitic rocks, with Cr-rich mafic and ultramafic schists or un-metamorphosed ultramafic rocks. • Emerald mineralisation at the Chama, Libwente and Fibolele deposits is hosted by the ultramafic TMS unit, with three styles of mineralisation recognised, namely discordant reaction zone material adjacent to the pegmatite and quartz-tourmaline vein contacts, concordant reaction zone material concentrated along the footwall and occasionally the hangingwall contacts of the TMS unit; and discordant reaction zones hosted by brittle structures within the TMS unit, distal to the pegmatite and quartz-tourmaline veins..

Criteria	JORC Code explanation	Commentary

	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:*
	  ○ *easting and northing of the drill hole collar*
	  ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar*
	  ○ *dip and azimuth of the hole*
	  ○ *down hole length and interception depth*
	  ○ *hole length.*
	• *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*
		• Listing this material would not add any further material understanding of the deposits and Mineral Resource. Appropriately detailed plans and sections are detailed herein.

Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• Not applicable. No Exploration Results are specifically reported. • No metal equivalents have been used.
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Not applicable. The grade data applied to the Kagem resource estimation is derived from open pit mining and bulk sampling production, rather than drillhole intercepts. In any case, no Exploration Results, including mineralisation widths, are specifically reported. • The majority of drillholes at Chama, Libwente and Fibolele are oriented perpendicular to the TMS unit which hosts the emerald-bearing reaction zones.
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• Various maps, sections and technical figures are presented herein.
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• Average reaction zone thicknesses for both the pre- and post- 2008 drilling campaigns are presented herein.
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• Semi-regional airborne geophysical data was captured by New Resolution Geophysics in 2006. • Gemfields re-commissioned NRG to conduct more detailed geophysical data capture within the Kagem licence area in 2008. The license-scale data was interpreted by Vishnu Geophysics to produce a series of geophysical survey maps, including: total

Criteria	JORC Code explanation	Commentary
		magnetic intensity ("TMI"), TMI analytic signal ("TMI AS"), TMI first and second derivatives, apparent susceptibility, calculated digital terrain model, potassium, thorium and uranium amongst others. • Ground geophysical data was collected in-house by Gemfields geologists during the first two quarters of 2015, in targeted areas of the Kagem licence. Interpretation is on-going at the time of writing. • The on-site geologists complete detailed pit mapping of the operating open pits on a regular on-going basis. Updated digital geological maps of each pit are typically produced on a monthly basis.
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• No further exploration work is explicitly planned by Gemfields at this time

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.* • *Data validation procedures used.*	• SRK have validated the diamond drillhole data provided by Gemfields through standard validation checks in Microsoft Excel and subsequently through import via the ARANZ Leapfrog Geo drillhole data validation routine. • Any overlapping intervals, from depths > to depths, duplicate locations, out of place non-numeric values, missing collar and survey data, and any down hole intervals that exceeded the collar max depth were fixed prior to any resource modeling being undertaken.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Site visits by SRK personnel were completed at the following times: ○ 5 to 15 June 2015: ○ 22 to 26 June 2015: ○ 19 to 24 August 2019: ○ 7 and 11 October 2019.
Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* • *Nature of the data used and of any assumptions made.* • *The effect, if any, of alternative interpretations on Mineral Resource estimation.* • *The use of geology in guiding and controlling Mineral Resource estimation.* • *The factors affecting continuity both of grade and geology.*	• The wireframes used to constrain the Mineral Resource Estimate are predominantly based on geological logging, with handheld Niton XRF data used to refine contact surfaces where appropriate. • The geological interpretation used to guide the geological model is based on the "schist-hosted emerald" model whereby emeralds form as a result of the interaction of Be-rich fluids from pegmatite dykes with a Cr-rich ultramafic unit (in this case TMS). This interpretation is verified by production from the open pit operations where the emerald production comes from reaction zones confined to the TMS unit, typically either as concordant bodies along the TMS footwall, or discordant zones spatially associated with pegmatite veins. • SRK has assumed that the TMS unit remains constant to the extents of the modelled unit, with no changes in geology or mineralogy. • It is assumed that there is no change in the mineralising system with depth and no change due to weathering with depth.
Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• Numerous images and plots are included that adequately describe the dimensions and geometry of the deposit.
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.*	• Mineral Resource models were constructed, estimated and classified independently for the Chama, Fibolele and Libwente areas. • All geological modelling was undertaken in ARANZ Leapfrog Geo software, with grade and tonnage estimates being completed in either GEMS or Datamine.

Criteria	JORC Code explanation	Commentary
	• *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.* • *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the resource estimates.* • *Discussion of basis for using or not using grade cutting or capping.* • *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	• The TMS models were constructed through sectional polyline interpretations of the TMS footwall and hangingwall, based on Gemfields geological logging. Niton XRF chromium grades were used to refine the contact surfaces where appropriate. • The pegmatites were modelled using a combination of the regional scale interpretation, in-pit mapping, and available drillhole intersections. At Chama the discordant pegmatite model was generated using a Leapfrog indicator interpolation, applying a trend based on downhole pegmatite trends and geological mapping. The pegmatite dykes and QT veins at Fibolele and Libwente were modelled manually, using the Leapfrog vein modelling tool. • The reaction zones were modelled either directly (footwall / hangingwall) or from the intersection of the modelled pegamtites with the TMS unit. In the case of the discordant zones, the morphology of the reaction zones was derived from the modelled pegmatites, with the assumed thicknesses based on the percentage of reaction zone mined, in relation to the TMS. • SRK used a block model to quantify the volume, tonnage, and grade of the modelled reaction zones. The volume of the discordant and concordant reaction zones were defined from the geological model. • The anticipated grade of emerald and beryl and their relative importance is based on appropriate factoring of production data, to extrapolate of the recovery of these minerals from the tonnage of reaction zone processed during the period covered by the historical mining production statistics. • SRK has not attempted to model local variations in the reaction zone grade. However the reaction zone tonnage per block does vary locally according to SRK's wireframe models. • SRK has assumed that all emerald and beryl mineralisation is hosted by the modelled reaction zones, although SRK notes that the model has been adjusted to reflect the historical production. This results in a model of the volume of reaction zones which reflects the historical production, but may result in the spatial location of the reaction zones being less well defined.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• All densities are recorded as dry densities, and so all tonnages are reported on a dry basis.
Cut-off parameters	• *The basis of the adopted cut-off grade(s) or quality parameters applied.*	• The Mineral Resources are reported within an optimised pit shell. The parameters used to derive the shell were also used to calculate a cut-off grade, which was noted to

Criteria	JORC Code explanation	Commentary
		be significantly below the beryl and emerald grade recovered from the mine. Therefore applying a cut-off grade is largely irrelevant.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• The Modifying Factors considered by SRK to be appropriate for the Reaction Zone mineralisation is based on the historical reconciliation of the proportion of RoM Reaction Zone relative to the TMS volume. This mining dilution is estimated at 15%, and the diluting material is assumed to be TMS rock with a density of 2.85 t/m3 at zero grade. Owing to the application of historical factors to derive RoM grades, no mining recovery grade adjustment factors are deemed necessary for the reaction zone mineralisation.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.*	• Emerald and beryl are extracted at Kagem by combination of manual picking of stones within the pit, and processing of RoM ore which involves comminution, screening, washing and sorting facilities which are located close to the current mining activities.
Environmen-tal factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	• Kagem is progressively backfilling the mined out areas at the Chama Pit with waste rock from the mining operation. Fines within the tailings are being settled out and can be re-handled and placed in mined out areas or waste dumps when additional storage capacity is required. Topsoil is stockpiled and re-handled onto the waste dumps to facilitate re-vegetation. The waste products from the processing facilities are expected to be benign and do not contain any toxic substances. A key issue to manage at Kagem is the build-up of fines in the tailings area.
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	• An average density per rock type is used to estimate the tonnages. The densities applied are derived from extensive in-situ and core test work completed by Gemfields over the course of the mine life. The density values are further validated against production records.
Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.* • *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).* • *Whether the result appropriately reflects the Competent Person's view of the deposit.*	• In order to develop a classification scheme for the Mineral Resources at Kagem, SRK has taken the following factors into account: ○ Quantity and quality of the underlying data, the level of geological understanding for each deposit, and across the property as a whole. ○ Confidence in the geological continuity of the TMS, PEG, and RZ. ○ Confidence in the grades, as derived from the production/bulk sampling and the understanding of the grade variation at a given production scale.

Criteria	JORC Code explanation	Commentary
		○ The stage of development for each deposit (such as exploration, production, care and maintenance, etc). ○ The perceived level of risk associated with deviations from the assumptions made in defining and classifying the Mineral Resources. In particular, the definition of a Measured or Indicated Mineral Resource specifically requires there to be sufficient confidence for the subsequent application of modifying factors, and so the risk in classifying as such needs to be understood.
Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• SRK is unaware of any audits or reviews which have been completed at the Kagem mine
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• SRK have had to make a series of assumptions regarding the grade and quality distribution within the mineralisation. • No statistical or geostatistical analyses have been completed, and so cannot be used to quantify the relative accuracy or confidence of the grade estimates. • The confidence in the grade estimates is derived from bulk sampling or production records, as applicable. • SRK has supplied a series of recommendations for improving knowledge and confidence in the geological and grade estimates.

Section 4 Estimation and Reporting of Ore Reserves

(Criteria listed in section 1, and where relevant in sections 2 and 3, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	• *Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.* • *Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.*	• SRK developed a comprehensive estimate of the Mineral Resources that served as a starting point for Ore Reserve estimation • The Mineral Resources are reported inclusive of the Ore Reserves.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Site visits by SRK personnel were completed at the following times: ○ 5 to 15 June 2015: ○ 22 to 26 June 2015: ○ 19 to 24 August 2019: ○ 7 and 11 October 2019.
Study status	• *The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves.* • *The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.*	• •MRM is an operating mine, hence quality data from operations exists for operational and financial planning. SRK completed a thorough review of all aspects of the operation covering all relevant disciplines.
Cut-off parameters	• *The basis of the cut-off grade(s) or quality parameters applied.*	• The average value of the beryl and emerald, as reported in the Mineral Resource Statement is USD5.92 /ct. The value of the different product splits, are as follows: ○ Premium Emerald and Emerald: USD20.87 /ct; and ○ Beryl (Beryl 1 and Beryl 2): USD0.075 /ct. •
Mining factors or assumptions	• *The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).* • *The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.* • *The assumptions made regarding geotechnical parameters (eg pit slopes, stope sizes, etc), grade control and pre-production drilling.* • *The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate).* • *The mining dilution factors used.* • *The mining recovery factors used.* • *Any minimum mining widths used.* • *The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.* • *The infrastructure requirements of the selected mining methods.*	• A mining dilution of 15% was applied to the reaction zone mineralisation, and the diluting material is assumed to be TMS rock with a density of 2.85 t/m3 at zero grade. Owing to the application of historical factors to derive Run of Mine (RoM) grades, no mining recovery grade adjustment factors are deemed necessary for the reaction zone mineralisation. • Mining is via conventional open pit methods with free dig in the weathered zones and drill and blast required in fresh rock. • Geotechnical analysis was undertaken by SRK and estimated safe overall slope angle for closure of 50˚ based on 10 m bench heights and 5.5 m berm configurations. • Engineered ultimate pit design was developed for Chama Pit and used for the basis of the life of mine plan. • Inferred Mineral Resources are not included in the life of mine plan. • No mining recovery factors are deemed applicable as reported bulk sampling and production is inclusive of losses.

Criteria	JORC Code explanation	Commentary
		• No major additional infrastructure is required for the continuing of open pit operations at Kagem.
Metallurgical factors or assumptions	• *The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.* • *Whether the metallurgical process is well-tested technology or novel in nature.* • *The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.* • *Any assumptions or allowances made for deleterious elements.* • *The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.* • *For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?*	• SRK considers the current wash plant on site is entirely fit for purpose • The technology is well tested.
Environmen-tal	• *The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.*	• Appropriate environmental and social studies have been undertaken in accordance with Zambian law. The mine is considered to be fully permitted and has no outstanding licence issues. • The waste products from reaction zone washing are sand, clay and gravel. These are expected to be benign. No special measures or regulatory approvals are likely to be required for this material which can be placed into mined out areas or waste dumps where required as part of the mining process. • Waste rock dumps have been designed with closure in mind; on-going dump rehabilitation is currently underway and planned to continue for the life of mine plan; top-soil is being stockpiled for re-vegetation purposes.
Infrastructure	• *The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.*	• All the necessary infrastructure is in place or planned to be constructed at the Kagem Mine.
Costs	• *The derivation of, or assumptions made, regarding projected capital costs in the study.* • *The methodology used to estimate operating costs.* • *Allowances made for the content of deleterious elements.* • *The source of exchange rates used in the study.* • *Derivation of transportation charges.* • *The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.* • *The allowances made for royalties payable, both Government and private.*	• Relevant and appropriate operating costs have been incorporated into the discounted cashflow model, to the point of sale, including head office management and auction fees; mineral royalties. Capital costs have also been provided by Gemfields and reviewed by SRK. • No deleterious elements have been found to be present • Transport charges off site are covered in the sales costs that have been applied.
Revenue factors	• *The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.* • *The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.*	• The long term prices have been provided by Gemfields based on auction results and Gemfields price forecasts. • The average commodity prices applied in the discounted cashflow model vary between USD 4.96/ct and USD 7.19/ct during the life of mine, depending on the varying

Criteria	JORC Code explanation	Commentary
		production of Premium Emerald, Emerald and Other. This covers High Quality Auctions, Low Quality Auctions, and other sales.
Market assessment	• *The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.* • *A customer and competitor analysis along with the identification of likely market windows for the product.* • *Price and volume forecasts and the basis for these forecasts.* • *For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.*	• The Company has provided a detailed market study. • SRK notes that the Company has had significant success with the public auctions of emerald products since commencing operations in 2008 and has in place a very experienced management team.
Economic	• *The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.* • *NPV ranges and sensitivity to variations in the significant assumptions and inputs.*	• •The economic analysis is based upon: a Mineral Resource estimate by SRK; a mining plan produced by SRK, and commodity prices derived and adjusted from average prices received at auctions to date as provided by Gemfields. • SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve. • The economic evaluation has resulted in an NPV of USD 600 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM. • More detail regarding the economic inputs are reported herein.
Social	• *The status of agreements with key stakeholders and matters leading to social licence to operate.*	• Kagem has made substantial efforts to establish a so called 'social licence to operate' by establishing themselves in the community with a range of initiatives.
Other	• *To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves:* • *Any identified material naturally occurring risks.* • *The status of material legal agreements and marketing arrangements.* • *The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.*	• Key project risks are included herein and comprise environmental and social risks, reserve risk and permitting risk. SRK considers these to be manageable. • All key permits are in place or are under application for the Mine. • SRK considers the risk of the Mine not receiving the required permits is low. • Regarding marketing arrangements, the Company has in place a system of auction sales that have raised considerable funds for the Kagem operation.
Classification	• *The basis for the classification of the Ore Reserves into varying confidence categories.* • *Whether the result appropriately reflects the Competent Person's view of the deposit.* • *The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).*	• Measured, Indicated and Inferred Mineral Resources have been declared for the Kagem mine.
Audits or reviews	• *The results of any audits or reviews of Ore Reserve estimates.*	• •To SRK's knowledge, no external audits or reviews have been completed.
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the*	• In order to develop a classification scheme for the Mineral Resources at Kagem, SRK has taken the following factors into account: ○ Quantity and quality of the underlying data, the level of geological understanding for each deposit, and across the property as a whole.

Criteria	JORC Code explanation	Commentary
	factors which could affect the relative accuracy and confidence of the estimate. • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.* • *It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	○ Confidence in the geological continuity of the TMS, PEG, and RZ. ○ Confidence in the grades, as derived from the production/bulk sampling and the understanding of the grade variation at a given production scale. ○ The stage of development for each deposit (such as exploration, production, care and maintenance, etc). • The perceived level of risk associated with deviations from the assumptions made in defining and classifying the Mineral Resources. In particular, the definition of a Measured or Indicated Mineral Resource specifically requires there to be sufficient confidence for the subsequent application of modifying factors, and so the risk in classifying as such needs to be understood. • •SRK considers the level of exploration and production to be sufficient for Proved and Probable Ore Reserves in accordance with the JORC Code. • SRK expects that on-going mining operations will allow the accuracy of resource and reserve estimates to be refined by additional reconciliation work on a monthly basis.

Section 5 Estimation and Reporting of Diamonds and Other Gemstones

(Criteria listed in other relevant sections also apply to this section. Additional guidelines are available in the 'Guidelines for the Reporting of Diamond Exploration Results' issued by the Diamond Exploration Best Practices Committee established by the Canadian Institute of Mining, Metallurgy and Petroleum.)

3	JORC Code explanation	Commentary
Indicator minerals	• *Reports of indicator minerals, such as chemically/physically distinctive garnet, ilmenite, chrome spinel and chrome diopside, should be prepared by a suitably qualified laboratory.*	• At this stage, this is not considered necessary, as the beryl and emerald grade data used to estimate the Mineral Resources is taken from production or bulk sampling data • High level analysis of the handheld Niton XRF data against the lithological logging indicates a marked increase in both rubidium and potassium content within the reaction zone unit, thought to be related to the transformation of metabasic rock to phlogopite. It should be noted however, that this increase in Rb and K, may only tentatively be used to indicate the potential presence of phlogopite-rich reaction zone material, and not necessarily emerald mineralization itself.
Source of diamonds	• *Details of the form, shape, size and colour of the diamonds and the nature of the source of diamonds (primary or secondary) including the rock type and geological environment.*	• Mineralisation is confined to an ultramafic talc-magnetite schist unit, with emeralds typically contained within reaction zones relating to the interaction of Be-rich fluid from pegmatite dykes and quartz-tourmaline veins, with the Cr-rich talc-magnetite schist. • The reaction zones are composed of phlogopite-biotite-tourmaline aggregates, which are highly soft and friable, providing a protective buffer ideal for the preservation of beryl and emerald crystals. • The beryls are typically white to yellowish to bluish white, while the emeralds have a moderate to strong green colouration. • The beryl and emerald stones typically form subhedral to euhedral hexagonal crystals that often grow in aggregates of multiple stones. • Individual crystals can vary in size from <1mm to >10cm in diameter.
Sample collection	• *Type of sample, whether outcrop, boulders, drill core, reverse circulation drill cuttings, gravel, stream sediment or soil, and purpose (eg large diameter drilling to establish stones per unit of volume or bulk samples to establish stone size distribution).* • *Sample size, distribution and representivity.*	• Grade and quality data for Chama and Fibolele comes from production data the open-pit mining operations • Two bulk sampling pits are currently in operation in the Libwente deposit area: Libwente South and Ishuko. • SRK considers that the sample size recovered from the open-pit mining and bulk sampling operations at Chama, Fibolele and Libwente, and the spatial arrangement of the pits is sufficient to produce emerald grade and quality data which is sufficiently representative (within an area of reasonable geological continuity from the trial pits) to derive Mineral Resources. • Drilling to date across the three deposit areas comprises a total of 707 drillholes for a meterage of 67,457.60 m

3	JORC Code explanation	Commentary
		• Diamond drilling is primarily aimed at determining the nature and geometry of the talc-magnetite schist units, pegmatite dykes / quartz-tourmaline veins and associated emerald-bearing reaction zones.
Sample treatment	• *Type of facility, treatment rate, and accreditation.* • *Sample size reduction. Bottom screen size, top screen size and re-crush.* • *Processes (dense media separation, grease, X-ray, hand-sorting, etc).* • *Process efficiency, tailings auditing and granulometry.* • *Laboratory used, type of process for micro diamonds and accreditation.*	• The washing plant at the Kagem Mine consists of a series of comminution, screening, washing and sorting facilities which are located close to the current mining activities at the Chama Pit. • The recovered stones from the wash plant are sorted by hand and split into numerous quality classifications based on colour, clarity, size, shape and cleanliness. The total weight (in carats) for each classification is recorded on a monthly basis.
Carat	• *One fifth (0.2) of a gram (often defined as a metric carat or MC).*	• This is the definition of a carat used throughout.
Sample grade	• *Sample grade in this section of Table 1 is used in the context of carats per units of mass, area or volume.* • *The sample grade above the specified lower cut-off sieve size should be reported as carats per dry metric tonne and/or carats per 100 dry metric tonnes. For alluvial deposits, sample grades quoted in carats per square metre or carats per cubic metre are acceptable if accompanied by a volume to weight basis for calculation.* • *In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive sample grade (carats per tonne).*	• The sample grades presented throughout are in carats per tonne of material. This is derived from the bulk sampling of bulk samples in the wash plant. • The grade is derived from processing in the sort house, and reported in the Mineral Resources as total carats recovered. • Stone frequency work has not been undertaken at the mine. This is due to the large number of gemstones produced.
Reporting of Exploration Results	• *Complete set of sieve data using a standard progression of sieve sizes per facies. Bulk sampling results, global sample grade per facies. Spatial structure analysis and grade distribution. Stone size and number distribution. Sample head feed and tailings particle granulometry.* • *Sample density determination.* • *Per cent concentrate and undersize per sample.* • *Sample grade with change in bottom cut-off screen size.* • *Adjustments made to size distribution for sample plant performance and performance on a commercial scale.* • *If appropriate or employed, geostatistical techniques applied to model stone size, distribution or frequency from size distribution of exploration diamond samples.* • *The weight of diamonds may only be omitted from the report when the diamonds are considered too small to be of commercial significance. This lower cut-off size should be stated.*	• The densities reported are a dry basis, and so all tonnages are reported dry. No moisture content is reported. • Bulk density measurements of relevant rock types are completed by the Company, and bench marked against production tonnages. • All sampling undertaken at the Project has been using the production plant, and so no scaling adjustments are appropriate. • No geostatistical analyses have been applied to the data. The results of the production / bulk sampling have been applied to the reaction zone volumes with appropriate adjustments. • Material recovered from the wash plant is split by hand into three categories, namely premium emerald. Emerald, beryl-1 and beryl-2. The waste is discarded, whilst the recovered emerald and beryl gemstones are further split into various quality and size categories.
Grade estimation for reporting Mineral	• *Description of the sample type and the spatial arrangement of drilling or sampling designed for grade estimation.* • *The sample crush size and its relationship to that achievable in a commercial treatment plant.*	• Emerald grade and quality data is derived from the open-pit mining and bulk sampling operations.

3	JORC Code explanation	Commentary
Resources and Ore Reserves	• *Total number of diamonds greater than the specified and reported lower cut-off sieve size.* • *Total weight of diamonds greater than the specified and reported lower cut-off sieve size.* • *The sample grade above the specified lower cut-off sieve size.*	• The resource volume and geometry is modelled on the basis of geological logging of the diamond drillholes. These are drilled on a variable grid of between 25 m by 25 m and 100 m by 200m at Chama; typically 50 m by 50 m at Fibolele; and a variable grid typically between 50m by 50 m and 100 m by 100 m at Libwente.
Value estimation	• *Valuations should not be reported for samples of diamonds processed using total liberation method, which is commonly used for processing exploration samples.* • *To the extent that such information is not deemed commercially sensitive, Public Reports should include:* ○ *diamonds quantities by appropriate screen size per facies or depth.* ○ *details of parcel valued.* ○ *number of stones, carats, lower size cut-off per facies or depth.* • *The average $/carat and $/tonne value at the selected bottom cut-off should be reported in US Dollars. The value per carat is of critical importance in demonstrating project value.* • *The basis for the price (eg dealer buying price, dealer selling price, etc).* • *An assessment of diamond breakage.*	• Valuation of the stones from Kagem has been made by taking the rough from the production and bulk sampling programmes and selling it at public auction. These auctions have raised significant funds for the Project over a prolonged period of time • A formal assessment of stone breakage due to the washing plant has not been undertaken. However, due to the apparent absence of broken gemstones recovered during sorting, this is not considered to be material.
Security and integrity	• *Accredited process audit.* • *Whether samples were sealed after excavation.* • *Valuer location, escort, delivery, cleaning losses, reconciliation with recorded sample carats and number of stones.* • *Core samples washed prior to treatment for micro diamonds.* • *Audit samples treated at alternative facility.* • *Results of tailings checks.* • *Recovery of tracer monitors used in sampling and treatment.* • *Geophysical (logged) density and particle density.* • *Cross validation of sample weights, wet and dry, with hole volume and density, moisture factor.*	• All material recovered from the open-pit and bulk sampling operations is transported to the wash plant and sort house via a security escort. • The emerald sort house is located on-site, in close vicinity of the wash plant, and permanently guarded by multiple security staff.
Classification	• *In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive grade (carats per tonne). The elements of uncertainty in these estimates should be considered, and classification developed accordingly.*	• SRK consider there to be a degree of uncertainty in the grade estimates, with the confidence being gained through the production and bulk sampling and sorting process. This records the distribution of stone qualities being recovered. • SRK has supplied a list of recommendations which can improve the data gathered, and so the confidence in the geological and grade

APPENDIX

B JORC TABLE 2 - MRM

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• The main exploration tool used to determine ruby grade at the Montepuez Project is through bulk sampling and production (note that some of these have since merged into single, larger pits). • Localised soil geochemistry data has been collected on a 100m grid for a total of 270 samples analysed for a suite of 32 elements. Elemental analysis was conducted on site, using a handheld XRF. However, the application of this data has been limited to non-quantitative use. • Drilling (auger and diamond) and exploration pits have also been used to define the morphology of the mineralisation.
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• Drilling to date at the MRM area comprises 3,385 drill holes for a total meterage of 42,377 m. 2,972 auger holes for 21,232 m and 413 diamond holes for 21,145 m. • To date, all of the auger drilling and 85 of the diamond holes have been completed using a heavy duty Sandvik DE700 core drill, specially modified with an auger drill bit attachment for auger drilling. The in-house drilling was carried out using an RD30; a simple, trolley mounted wireline rig manufactured by Rock Drill India. • The majority of diamond core is drilled at HQ hole diameter, with a small minority of NQ diameter core. • All holes are drilled in a vertical direction. No down hole surveying has been undertaken and none of the holes have been structurally oriented. • The drill database is supplemented by close spaced exploration pitting in a number of key areas. The exploration pits are shallow holes with an average depth of 3.9m and typical dimensions of 1 m2 in cross section, excavated by manual labour. A total of 823 exploration pits were completed between early 2012 and November 2013, for a total depth of 3,224 m. Note that a total of 200 of the 823 exploration pits were not completed to the planned depth due to various problems relating to water influx, pit collapse, artisanal activity and inordinately consolidated laterite material.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• Core is marked by 'From' and 'To' and the length recovered. Core blocks are inserted where loss has occurred to retain the position and quantum of any losses.

Criteria	JORC Code explanation	Commentary
		• Core recovery of the overburden material was typically poor in the first phase of drilling, rendering estimation of the thickness of the secondary gravel bed mineralization from core intercepts problematic. • During Phase 2, core recovery in the overburden sequence was significantly improved. The Company consider that the sample representation issues encountered during the drilling of the gravel bed, during Phase 1, have been significantly improved upon and that the core samples recovered in this phase do not have the same degree of "washing out" type issues as encountered previously • Samples are not taken from core, due to the inherently nugget nature of ruby mineralization. Grade data from bulk sampling and production is the main exploration tool used to determine ruby and corundum grade As a result, it is not possible to determine whether a relationship exists between sample recovery and grade, and any bias would not be of great relevance to the MRE process.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• For diamond core, geological logging is carried out by an MRM geologist. Geological data is recorded in a detailed log spreadsheet designed to capture key geological information for each interval. • A new interval is started at each lithological contact, with a minimum logging thickness of 1m. • The presence of any key minor or trace minerals of interest, including rubies, corundum, garnet and pyrite are also recorded in an Index Mineral spreadsheet. • Basic geotechnical data is also recorded by the logging geologist • For auger drilling, geological logging of the overburden material and the top of the weathered basement is recorded in a custom log sheet by an MRM geologist at the rig. • Geological logging was undertaken for all drillholes, from start to end of hole. • All logging is carried out by MRM geologists, and SRK considers the methodologies in place to be consistent with normal industry practice for this commodity type. .
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.*	• The main source of ruby and corundum grade data is from the mining and bulk sampling operations. approximately 21.5 Mt of material has been removed from the pits, including approximately 3.8 Mt of mineralised material SRK considers this sample size to be representative (within an

Criteria	JORC Code explanation	Commentary
	• *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.* • *Whether sample sizes are appropriate to the grain size of the material being sampled.*	area of reasonable geological continuity from the trial pits) to derive Mineral Resources. • No samples are taken from core, and no assays were undertaken. • For each auger hole, a representative ~2kg sample of the secondary gravel bed material is taken for future reference and the rest of the material is sent for washing. • At the wash plant, the gravel bed material recovered from the auger drilling is weighed, before being put through a small, portable mineral jig. The washed material is re-weighed and then sorted by hand to record any recovered rubies. The gravel bed sample weight, washed sample weight and recovered ruby and corundum weight is then recorded.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	• No elemental assaying has been undertaken. • Washed ore material recovered from the bulk sampling pits is sorted by hand in order to provide ruby and corundum grade and quality values for each pit. • The recovered rubies are slit into numerous quality classifications based on size, weight, colour, clarity and shape, and the total weight (in carats) for each classification recorded on a monthly basis for each pit. • SRK considers the ruby classification process put in place by MRM to be consistent with industry standard.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• At the sort house, the material recovered from the wash plant is initially split by hand into 3 categories: waste, garnet and rubies. This is routinely checked by a qualified expert. All subsequent sorting of ruby stones is conducted by a qualified expert. • No down hole elemental assaying has been undertaken.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• Collar X and Y values collected by GPS. • Collar elevation values are taken from the SRTM topography surface. • The highest resolution topographic data available is the digital elevation model from the Shuttle Radar Topography Mission (SRTM), at a resolution of 90mX by 90mY. • In 2015, an airborne geophysical survey was completed at an accuracy of +/-0.3 m. • There are significant errors and inconsistencies between the topographic data supplied, the drillhole collars, and the ongoing operation pit surveying as completed by MRM

Criteria	JORC Code explanation	Commentary
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• The auger drilling is primarily on an approximate 140 m grid throughout most of the deposit, with areas of wider spaced drilling on a 200 m grid in the far west of the project. • Diamond drilling is sporadic. Spacing varies from very close spaced (5 m to 75 m) to much wider spaced (750 m x 250 m) • No down hole compositing has been applied to the auger hole, diamond hole or exploration pit logging. • SRK consider the data spacing and distribution to be appropriate to the Mineral Resource classifications applied.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• All holes are drilled vertically. • Vertical drilling is unlikely to have introduced any bias into the modelling of the secondary gravel bed mineralisation, or the primary Maninge Nice amphibolite, which are both broadly flat-lying. • SRK recommend that MRM complete some structurally oriented, inclined holes to provide down hole structural data to assist in the interpretation of the wider subsurface bedrock geology.
Sample security	• *The measures taken to ensure sample security.*	• MRM employ security staff to police the illegal removal of ruby and corundum stones from the bulk sampling operations. • All members of staff and visitors are searched both when leaving any bulk sampling pit, and when leaving the wider Project-site. This also applies to the wash plant and sort house. • All material recovered from the production and bulk sampling operations is transported to the wash plant and sort house via a security escort. • Initial sorting of the washed material by local workers into waste, garnet and ruby categories is completed through a glass screen and each category placed into a locked container. • After sorting the rubies into the various classifications by the expert sorting staff, the sorted ruby stones are stockpiled in a secure location, cordoned and permanently guarded by multiple security staff.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• SRK is unaware of any audits or reviews which have been completed on the Montepuez project

Section 2 Reporting of Exploration Results
(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• In February 2012, the Mozambican government granted MRM mining and exploration concessions for the two adjoining mining concessions 4702C and 4703C, which cover an area of approximately 33,600 ha. These were dated 11 November 2011 and valid for 25 years. Bulk sampling began in August 2012. In December 2015, MRM was granted a consolidated Mining Concession which combined the two concession areas under 4703C (ref 1588/CM/INAMI/2015) valid until 11 November 2036. • SRK is not aware of any material issues with licence tenure or third parties.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	• No data sourced from third parties, unless otherwise stated, has been used in the generation of the Mineral Resource estimate.
Geology	• *Deposit type, geological setting and style of mineralisation.*	• The Montepuez ruby and corundum deposit is hosted by the Montepuez Complex, a strongly ductile-deformed, wedge-shaped, metamorphic terrane. Intense deformation has resulted in a highly complex structural framework, the local units folded into tight and isoclinal folds dissected by a suite of mainly northeast to southwest trending shear zones. • The local deposit geology mirrors the regional setting, complexly deformed sequence of granitic to amphibolitic orthogneisses and carbonate, quartzite, biotite and hornblende gneisses, • Ruby and corundum mineralisation at Montepuez occurs in two settings, namely the underlying primary mineralisation, associated with an in-situ gneissic amphibolite unit, and the overlying secondary mineralisation, hosted by an overburden gravel bed horizon. • The primary rubies sourced from the amphibolite unit typically form pink – light-red coloured tabular hexagonal crystals, which are often highly fractured, with common amphibole, mica and feldspar inclusions. • Secondary rubies, confined to the overburden gravel bed horizon, are typically more transparent, less included and often of a darker red colour than primary rubies in the in-situ amphibolite. • The current focus for exploration and production is the secondary mineralisation, which historically has been the source of higher quality gemstones • The current genetic model for the secondary ruby deposit proposes initial deposition within one or more major flooding events, followed by redistribution of the rubies by alluvial processes, such as those in a braided river system.

Criteria	JORC Code explanation	Commentary
Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:* ○ *easting and northing of the drill hole collar* ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar* ○ *dip and azimuth of the hole* ○ *down hole length and interception depth* ○ *hole length.* • *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*	• Listing this material would not add any further material understanding of the deposit, Exploration Target and Mineral Resource. Appropriately detailed plans and sections are detailed herein.
Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• Not applicable. No Exploration Results are specifically reported. • No metal equivalents have been used.
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Not applicable. The grade data used to derive the Mineral Resources is derived from bulk sampling and production, rather than drillhole intercepts. In any case, no Exploration Results, including mineralisation widths, are specifically reported. • The gravel bed and amphibolite units are known to be near flat-laying and broadly perpendicular to the diamond and auger drillholes and exploration pits, which are all vertical.
Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• Various maps, sections and technical figures are presented herein.
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• Minimum, maximum and average logged gravel bed thickness values, divided by data type (auger holes, diamond holes and exploration pits) are presented herein.
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• Geological mapping conducted by a consortium of the British Geological Survey, Norges Geolgiske Undersakelse, and NorConsult AS an Eteng, between 2003 and 2005 • GeoEye: high spatial resolution radiometric data at various bands within the visible and near infrared part of the electromagnetic spectrum, commissioned specifically for the Project in November 2012.

Criteria	JORC Code explanation	Commentary
		• Landsat ETM Data: multispectral radiometric data, incorporating one satellite scene with seven bands in the visible, near infrared, shortwave infrared and thermal part of the electromagnetic spectrum, and a panchromatic band of the visible spectrum. • ASTER Data: high resolution images across 14 bands of the electromagnetic spectrum, including the visible and very near infrared, the short-wave infrared and the thermal infrared. • SRTM Data: near-global digital elevation model data at a 90 m resolution. • GaiaPix to conduct photogeological mapping of the Montepuez area at both regional and local scales. • GPR, magnetic and airbourne geophysical surveys were conducted between 2013 and 2015 • Geochemical soil sampling was conducted across a limited part of Maninge Nice and Glass A. A total of 270 samples were collected and analysed for a suite of 32 elements. Elemental analysis was conducted on site, using a handheld X-ray fluorescence analyser. • Bulk and in situ density measurements of the top soil, clay, gravel bed and weathered basement are routinely recorded once a month in the bulk sampling pits, concurrently with the mining. During Phase 2 of the diamond drilling, density measurements were taken routinely from the diamond core.
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• No exploration is currently planned at MRM, or in neighbouring licences

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Database integrity	• *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.* • *Data validation procedures used.*	• SRK have validated the exploration pitting, diamond and auger drillhole data provided by MRM through standard validation checks in Microsoft Excel and subsequently through import via the ARANZ Leapfrog Geo drillhole data validation routine. • Any overlapping intervals, from depths > to depths, duplicate locations, out of place non-numeric values, missing collar and survey data, and any down hole intervals that exceeded the collar max depth were conveyed to MRM and fixed on-site by the database manager, prior to the data being used by SRK.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Site visits to MRM were conducted by SRK personnel: ○ 18 to 24 August 2014 ○ 20 to 27 March 2015 ○ 30 March to 4 April 2015 ○ September / October 2017 ○ 7 to 12 October 2019
Geological interpretation	• *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* • *Nature of the data used and of any assumptions made.* • *The effect, if any, of alternative interpretations on Mineral Resource estimation.* • *The use of geology in guiding and controlling Mineral Resource estimation.* • *The factors affecting continuity both of grade and geology.*	**Gravel Bed Secondary Mineralisation:** • The gravel bed model is based on logged gravel bed in the auger holes and exploration pits. A basement surface was modelled, based on the logged base of overburden in all auger holes and exploration pits. • To construct the gravel bed model, hangingwall and footwall surfaces of the gravel bed horizon were generated from the logged gravel bed intersections in the auger holes and exploration pits. Between drill holes, the trend of the footwall and hangingwall surfaces was guided by the geometry of the basement model. • Bulk sampling ruby recovery data suggests that the grade distribution is, in part, controlled by position with the paleochannels, with ruby quality and size decreasing and grade increasing downstream. **Primary Amphibolite Mineralisation:** • The Maninge Nice amphibolite model is predominantly based on logged amphibolite in the diamond drill database, supplemented by exploration pits that terminate in fresh rock. • The geometry of the model is controlled by the local geological interpretation (gentle-open, E-W trending synform), largely based upon visual trends in the down hole lithological logging and the known regional structural framework.

Criteria	JORC Code explanation	Commentary
		• Confidence would be improved by down hole structural data to help guide the orebody interpretation between drill holes.
Dimensions	• *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.*	• Numerous images and plots are included that adequately describe the dimensions and geometry of the deposit, and variations in ruby and corundum grade and quality across the deposit.
Estimation and modelling techniques	• *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* • *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* • *The assumptions made regarding recovery of by-products.* • *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).* • *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* • *Any assumptions behind modelling of selective mining units.* • *Any assumptions about correlation between variables.* • *Description of how the geological interpretation was used to control the resource estimates.* • *Discussion of basis for using or not using grade cutting or capping.* • *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.*	• Ruby recovery data from the bulk sampling pits is estimated into in-situ primary mineralisation (Maninge Nice amphibolite) and secondary mineralisation (gravel bed) wireframe models developed in Leapfrog Geo software. • Surface interpolations (using a trend based on the basement surface model) of the logged gravel bed hangingwall and footwall surfaces were combined to generate a 3D gravel bed solid. • A gravel bed "skin" model was also created to reflect the combined gravel bed and overburden waste mined as part of the same face. This was based on the standard MRM mining practice (gravel bed +0.3 m above and below, or a standard 1.5 m thickness where the gravel bed model is <0.9 m thick). • The Maninge Nice amphibolite was modelled through sectional polyline interpretations and cropped below the basement surface.
Moisture	• *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.*	• The densities reported are a dry basis, and so all tonnages are reported dry. No moisture content is reported.
Cut-off parameters	• *The basis of the adopted cut-off grade(s) or quality parameters applied.*	• Mineral Resources / Ore Reserves are quoted with a bottom cut-off size of 1.6 mm, which is consistent with what can be recovered in the plant, and processed in the sort house.
Mining factors or assumptions	• *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.*	• The Modifying Factors considered by SRK to be appropriate for the secondary mineralisation is based the greater of (1) a 0.3 m dilution skin to both the roof and floor contacts or (2) a minimum total thickness of 1.5 m. Owing to the application of historical factors to derive RoM grades, no dilution or other grade adjustments factors are deemed necessary for the primary mineralisation.
Metallurgical factors or assumptions	• *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this*	• Beneficiation of rubies and corundum from MRM is based on washing, screening, and separation using a DMS plant. Gemstones are recovered using UV light

Criteria	JORC Code explanation	Commentary
	should be reported with an explanation of the basis of the metallurgical assumptions made.	
Environmental factors or assumptions	• *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.*	• The coarse DMS rejects and waste material are collected from the respective stockpiles and loaded onto haul trucks for transport back to the waste stockpiles adjacent to each pit, to be used as backfill material when mining operations permit. • The collected silt and sand tailings fractions are periodically cleaned from the tailings settlement ponds by excavator and trucked to open pit areas for disposal. Any tailings supernatant water is collected via channels and pumped back to the plant for reuse.
Bulk density	• *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* • *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* • *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.*	• The densities reported are a dry basis, and so all tonnages are reported dry. No moisture content is reported. • Density measurements are taken from the core sampling. The density measurements recovered from core samples cover the total project area, while the bulk density measurements are restricted to the mining areas only and were reportedly based on samples that were not thoroughly dried. • Only the drill core density measurements were used to derive the tonnage estimates

Classification	• *The basis for the classification of the Mineral Resources into varying confidence categories.*
	• *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).*
	• *Whether the result appropriately reflects the Competent Person's view of the deposit.*
		• The approach to classification is as follows:
		  ○ quantity and quality of the underlying data, the level of geological understanding for each type of mineralisation, and across the property as a whole;
		  ○ confidence in the geological continuity of the host mineralisation;
		  ○ confidence in the grades, as derived from the production and the understanding of the grade variation at a given production scale; and
		  ○ the perceived level of risk associated with deviations from the assumptions made.
		• The mineralisation has been classified into a combination of Inferred and Indicated Mineral Resources.
		• SRK notes that gemstone deposits, owing to the distribution of economic concentrations of mineralisation are notoriously difficult to sample, estimate and classify as current drilling techniques are inappropriate to provide sufficient data density to enable direct estimation of tonnages and grades.

Audits or reviews	• *The results of any audits or reviews of Mineral Resource estimates.*	• To SRK's knowledge, no external audits or reviews have been completed.

Criteria	JORC Code explanation	Commentary
Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* • *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* • *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*	• SRK have had to make a series of assumptions regarding the grade and quality distribution within both the primary and secondary mineralisation styles. • No statistical or geostatistical analyses have been completed, and so cannot be used to quantify the relative accuracy or confidence of the grade estimates. • The confidence in the grade estimates is derived from bulk sampling and the ongoing production from the mine. • SRK has supplied a series of recommendations for improving knowledge and confidence in the geological and grade estimates.

Section 4 Estimation and Reporting of Ore Reserves

(Criteria listed in section 1, and where relevant in sections 2 and 3, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral Resource estimate for conversion to Ore Reserves	• *Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.* • *Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.*	• SRK developed a comprehensive estimate of the Mineral Resources that served as a starting point for Ore Reserve estimation • The Mineral Resources are reported inclusive of the Ore Reserves.
Site visits	• *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* • *If no site visits have been undertaken indicate why this is the case.*	• Site visits to MRM were conducted by SRK personnel: o 18 to 24 August 2014 o 20 to 27 March 2015 o 30 March to 4 April 2015 o September / October 2017 o 7 to 12 October 2019
Study status	• *The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves.* • *The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.*	• MRM is an operating mine, hence quality data from operations exists for operational and financial planning. SRK completed a thorough review of all aspects of the operation covering all relevant disciplines.
Cut-off parameters	• *The basis of the cut-off grade(s) or quality parameters applied.*	• The assumed prices for the different products, as provided by Gemfields, are as follows: o Premium Ruby - USD975.56 /ct; o Ruby - USD37.93 /ct o USD 0.75/ct for the Other category of low-quality stone • The Mineral Resource grades are quoted with a bottom cut-off stone size of 1.6mm;
Mining factors or assumptions	• *The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).* • *The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.* • *The assumptions made regarding geotechnical parameters (eg pit slopes, stope sizes, etc), grade control and pre-production drilling.* • *The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate).* • *The mining dilution factors used.* • *The mining recovery factors used.* • *Any minimum mining widths used.* • *The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.* • *The infrastructure requirements of the selected mining methods.*	• A dilution skin is applied to the modelled secondary mineralisation based on the greater of (1) a 0.3 m dilution skin to both the roof and floor contacts or (2) a minimum total thickness of 1.5 m. This selective mining unit is compatible with the mining fleet. Owing to the application of historical factors to derive Run of Mine grades, no dilution or other grade adjustments factors are deemed necessary for the primary mineralisation. • The mining method comprises conventional open-pit operations: excavate, load and haul to in-pit backfill, waste rock stockpile locations and stockpiles at the wash plant facility. • Primary deposits. Based on the logging of the primary mineralisation, the weathered zones were found to extend to a depth of 40 m. This assumes that no drilling and blasting will be required for the primary mineralisation either.

Criteria	JORC Code explanation	Commentary
		• There are no geotechnical considerations required for the secondary mineralisation due to their shallow nature. • No mining recovery factors are deemed applicable as reported bulk sampling production is inclusive of losses. • The pits do not require any substantial infrastructure other than temporary haulage roads. •
Metallurgical factors or assumptions	• *The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.* • *Whether the metallurgical process is well-tested technology or novel in nature.* • *The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.* • *Any assumptions or allowances made for deleterious elements.* • *The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.* • *For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?*	• Beneficiation of rubies and corundum from MRM is based on washing, screening, and separation using a DMS plant. Gemstones are recovered using UV light
Environmental	• *The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.*	• The waste products from gravel washing are sand, clay and gravel. Testwork has shown these to be benign. • No special measures or regulatory approvals are required for this material which will be placed into mined out areas as part of the mining process. • The coarse DMS rejects and waste material are collected from the respective stockpiles and loaded onto haul trucks for transport back to the waste stockpiles adjacent to each pit, to be used as backfill material when mining operations permit. • The collected silt and sand tailings fractions are periodically cleaned from the tailings settlement ponds by excavator and trucked to open pit areas for disposal. Any tailings supernatant water is collected via channels and pumped back to the plant for reuse.
Infrastructure	• *The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.*	• The Project is well served in terms of infrastructure. No significant challenges with regards to the current or planned arrangements are anticipated. • Water management is the most significant issue to address on an on-going basis. SRK notes that current and planned actions are designed to ensure that infrastructure requirements will not adversely impact on the operations performance.
Costs	• *The derivation of, or assumptions made, regarding projected capital costs in the study.* • *The methodology used to estimate operating costs.*	• Historical unit operating cost, administration, management overheads and auction fees, and capital costs were supplied by Gemfields, and reviewed by SRK

Criteria	JORC Code explanation	Commentary
	• *Allowances made for the content of deleterious elements.* • *The source of exchange rates used in the study.* • *Derivation of transportation charges.* • *The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.* • *The allowances made for royalties payable, both Government and private.*	• a corporate tax rate of 32%, prior to deduction of royalties from the taxable profit for the determination of tax payable; • royalties at a rate of 10% of revenue at the point of saleland tax at USD1/ha per year on 33,600 ha; • no historical assessed tax losses carried forward; • depreciation of capital investment on an annual fixed percentage basis as per the fiscal regime of Mozambique. It has been assumed that all capital items have been fully depreciated and at the end of the mine life there is no terminal value to consider • No deleterious elements have been found to be present • Transport charges off site are covered in the sales costs that have been applied.
Revenue factors	• *The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.* • *The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.*	• Commodity prices derived and adjusted from average prices received at auctions to date as provided by Gemfields
Market assessment	• *The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply and demand into the future.* • *A customer and competitor analysis along with the identification of likely market windows for the product.* • *Price and volume forecasts and the basis for these forecasts.* • *For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.*	• The Company has provided a detailed market study. • SRK notes that the Company has had significant success with the public auctions of ruby products since commencing operations in 2011 and has in place a very experienced management team a.
Economic	• *The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.* • *NPV ranges and sensitivity to variations in the significant assumptions and inputs.*	• The economic analysis is based upon: a Mineral Resource estimate by SRK; a mining plan produced by SRK, and commodity prices derived and adjusted from average prices received at auctions to date as provided by Gemfields. • SRK has considered all relevant technical, economic and other relevant factors which could influence the projected LoMp and associated Ore Reserve. • The economic evaluation has resulted in an NPV of USD 567 million at a discount rate of 10%. Annual cashflows remains positive for the duration of the LoM. • More detail regarding the economic inputs are reported herein.
Social	• *The status of agreements with key stakeholders and matters leading to social licence to operate.*	• MRM has made substantial efforts to establish a so called 'social licence to operate' by establishing themselves in the community with a range of initiatives.

Criteria	JORC Code explanation	Commentary
Other	• *To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves:* • *Any identified material naturally occurring risks.* • *The status of material legal agreements and marketing arrangements.* • *The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.*	• Key project risks are included herein and comprise environmental and social risks, reserve risk and permitting risk. SRK considers these to be manageable. • All the key permits required for the Project are either in place or under application. SRK considers it to be unlikely that they will not be issued. • Regarding marketing arrangements, the Company has in place a system of auction sales that have raised considerable funds for the MRM operation. • SRK considers that there are no unresolved matters upon which the extraction of the reserve is contingent.
Classification	• *The basis for the classification of the Ore Reserves into varying confidence categories.* • *Whether the result appropriately reflects the Competent Person's view of the deposit.* • *The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).*	• No Measured Mineral Resources have been estimated at the Project. Therefore no Proven Reserves can be generated. SRK considers that in order to estimate Measured Resources a far more detailed level of orebody knowledge will be required. • SRK considers the key issue to quantify accurately for Measured Resource estimation is the distribution of high value stones at the Project.
Audits or reviews	• *The results of any audits or reviews of Ore Reserve estimates.*	• To SRK's knowledge, no external audits or reviews have been completed.

Discussion of relative accuracy/ confidence	• *Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors which could affect the relative accuracy and confidence of the estimate.*
	• *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.*
	• *Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.*
	• *It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*
		• The approach to classification is as follows:
		  ○ quantity and quality of the underlying data, the level of geological understanding for each type of mineralisation, and across the property as a whole;
		  ○ confidence in the geological continuity of the host mineralisation;
		  ○ confidence in the grades, as derived from the production and the understanding of the grade variation at a given production scale; and
		  ○ the perceived level of risk associated with deviations from the assumptions made.
		  ○ The mineralisation has been classified into a combination of Inferred and Indicated Mineral Resources.
		• SRK considers the level of exploration and production to be sufficient for Probable Ore Reserves in accordance with the JORC Code. SRK notes that the key value driver is the distribution of Premium stones. It is expected that on an annual basis the Project is considered likely to achieve its overall targets in terms stone production. However, on a monthly basis there is likely to be some considerable variation (10-50%) which will be smoothed during the sorting and stockpiling giving an expected accuracy of +/-20% on an annual basis.

Criteria	JORC Code explanation	Commentary
		• SRK expects that on-going mining operations will allow the accuracy of resource estimates to be refined by additional reconciliation work on a monthly basis.

Section 5 Estimation and Reporting of Diamonds and Other Gemstones

(Criteria listed in other relevant sections also apply to this section. Additional guidelines are available in the 'Guidelines for the Reporting of Diamond Exploration Results' issued by the Diamond Exploration Best Practices Committee established by the Canadian Institute of Mining, Metallurgy and Petroleum.)

Criteria	JORC Code explanation	Commentary
Indicator minerals	• *Reports of indicator minerals, such as chemically/physically distinctive garnet, ilmenite, chrome spinel and chrome diopside, should be prepared by a suitably qualified laboratory.*	• MRM record the down hole from-to depths in diamond core of garnet and corundum (non-gem quality) mineralisation in a mineral occurrence log. However, no technical reports on indicator minerals proven to show a clear correlation with ruby mineralisation have been prepared. • At this stage, this is not considered necessary, as the ruby and corundum grade data applied to the resource statement is taken from direct ruby recovery data from bulk sampling and production.
Source of diamonds	• *Details of the form, shape, size and colour of the diamonds and the nature of the source of diamonds (primary or secondary) including the rock type and geological environment.*	• Ruby and corundum mineralisation at MRM occurs in two settings, namely the underlying primary mineralisation, associated with an in-situ gneissic amphibolite unit, and the overlying secondary mineralisation, hosted by a gravel bed horizon. • The primary rubies sourced from the amphibolite unit typically form pink – light-red coloured tabular hexagonal crystals, which are often highly fractured, with common amphibole, mica and feldspar inclusions. • Secondary rubies, confined to the overburden gravel bed horizon, are typically more transparent, less included and often of a darker red colour than primary rubies in the in-situ amphibolite. • The current genetic model for the secondary ruby deposit proposes initial deposition within one or more major flooding events, followed by redistribution of the rubies by alluvial processes within a braided river system.
Sample collection	• *Type of sample, whether outcrop, boulders, drill core, reverse circulation drill cuttings, gravel, stream sediment or soil, and purpose (eg large diameter drilling to establish stones per unit of volume or bulk samples to establish stone size distribution).* • *Sample size, distribution and representivity.*	• To date, approximately 21.5 Mt of material has been removed from the pits, including approximately 3.8 Mt of mineralised material. This is the main source of information regarding the grade of the deposit. • MRM have completed a total of 3,385 drill holes for a total meterage of 42,377 m. This includes 2,972 auger holes for 21,232 m and 413 diamond holes for 21,145 m. The auger drilling is primarily on an approximate 140 m grid, increasing to 200m in the west of the deposit • The drillhole database is supplemented by data from exploration pitting (shallow, manually excavated holes with an average depth of 3.9m). Note that a total of 200 of the 823 exploration pits were not completed to the planned depth due to various problems relating to water influx, pit collapse, artisanal activity and inordinately consolidated laterite material.

Criteria	JORC Code explanation	Commentary
		• The primary purpose of the auger drilling and exploration pitting is to target the secondary mineralisation with the aim of determining the thickness and nature of the gravel bed and the overlying material. • Diamond drilling is predominantly aimed at determining the nature of the basement geology with the aim of defining the primary resource at Maninge Nice and eventually for targeting additional sources of primary mineralisation.
Sample treatment	• *Type of facility, treatment rate, and accreditation.* • *Sample size reduction. Bottom screen size, top screen size and re-crush.* • *Processes (dense media separation, grease, X-ray, hand-sorting, etc).* • *Process efficiency, tailings auditing and granulometry.* • *Laboratory used, type of process for micro diamonds and accreditation.*	• •Beneficiation of rubies and corundum from MRM is based on washing, screening, and separation using a DMS plant. Gemstones are recovered using UV light • The recovered stones from the wash plant are sorted by hand and split into numerous quality classifications based on size, weight, colour, clarity and shape, and the total weight (in carats) for each classification recorded on a monthly basis for each pit.
Carat	• *One fifth (0.2) of a gram (often defined as a metric carat or MC).*	• This is the definition of a carat used throughout.
Sample grade	• *Sample grade in this section of Table 1 is used in the context of carats per units of mass, area or volume.* • *The sample grade above the specified lower cut-off sieve size should be reported as carats per dry metric tonne and/or carats per 100 dry metric tonnes. For alluvial deposits, sample grades quoted in carats per square metre or carats per cubic metre are acceptable if accompanied by a volume to weight basis for calculation.* • *In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive sample grade (carats per tonne).*	• The sample grades presented throughout are in carats per tonne of material. This is derived from the production records maintained for the mine, as recorded at the wash plant and sort house. • The grade is derived from processing in the sort house, and reported in the Mineral Resources as total carats recovered. • Stone frequency work has not been undertaken at the Project. This is due to the large number of gemstones produced. SRK understands that MRM is planning to undertake this in the future.
Reporting of Exploration Results	• *Complete set of sieve data using a standard progression of sieve sizes per facies. Bulk sampling results, global sample grade per facies. Spatial structure analysis and grade distribution. Stone size and number distribution. Sample head feed and tailings particle granulometry.* • *Sample density determination.* • *Per cent concentrate and undersize per sample.* • *Sample grade with change in bottom cut-off screen size.* • *Adjustments made to size distribution for sample plant performance and performance on a commercial scale.* • *If appropriate or employed, geostatistical techniques applied to model stone size, distribution or frequency from size distribution of exploration diamond samples.* • *The weight of diamonds may only be omitted from the report when the diamonds are considered too small to be of commercial significance. This lower cut-off size should be stated.*	• The densities reported are a dry basis, and so all tonnages are reported dry. No moisture content is reported. • Density measurements are taken from the core sampling. The density measurements recovered from core samples cover the total project area, while the bulk density measurements are restricted to the mining areas only and were reportedly based on samples that were not thoroughly dried. • Only the drill core density measurements were used to derive the tonnage estimates • Bulk and in-situ density measurements of the top soil, clay, gravel bed and weathered basement are routinely recorded once a month in the bulk sampling pits, concurrently with the mining process. • Production records are sourced from the plant, and as such, no scaling adjustments are appropriate.

Criteria	JORC Code explanation	Commentary
		• No geostatistical analyses have been used to directly produce grade or quality estimates. The production results have been applied to the gravel bed volumes with appropriate factors and adjustments. • Wash plant concentrate is split by hand into three categories, namely waste, garnet and rubies. The waste is discarded, and garnets stockpiled for future use, whilst the rubies are further split into various quality and size categories. This initially involves sieving the material to remove any stones less than 2.8 mm (classified as waste fines) and subsequently re-sieving to remove any stones less than 4.6 mm (classified as <4.6 mm). The remaining stones are then subdivided into five broad quality categories Premium, Ruby, Low Ruby and -4.6mm.
Grade estimation for reporting Mineral Resources and Ore Reserves	• *Description of the sample type and the spatial arrangement of drilling or sampling designed for grade estimation.* • *The sample crush size and its relationship to that achievable in a commercial treatment plant.* • *Total number of diamonds greater than the specified and reported lower cut-off sieve size.* • *Total weight of diamonds greater than the specified and reported lower cut-off sieve size.* • *The sample grade above the specified lower cut-off sieve size.*	• The ruby grade and quality data applied to the Mineral Resource estimate is derived from production data derived from the ongoing operation. To date, >3.8Mt of mineralised material has been been mined and processed. SRK considers that the sample size and spatial arrangement of the production areas is sufficient to produce ruby and corundum grade and quality data of sufficient representivity (within an area of reasonable geological continuity from the trial pits) to derive Mineral Resources. • The gravel bed model used to determine the volume of the secondary gravel bed resource is largely derived from auger drilling and exploration pitting data. • MRM have completed a total of 3,385 drill holes for a total meterage of 42,377 m. This includes 2,972 auger holes for 21,232 m and 413 diamond holes for 21,145 m. The auger drilling is primarily on an approximate 140 m grid, increasing to 200m in the west of the deposit • The drillhole database is supplemented by data from exploration pitting (shallow, manually excavated holes with an average depth of 3.9m). Note that a total of 200 of the 823 exploration pits were not completed to the planned depth due to various problems relating to water influx, pit collapse, artisanal activity and inordinately consolidated laterite material. • The volume of the primary amphibolite Mineral Resource is based on a total of 11 diamond drillholes and 4 exploration pits in the Maninge Nice area. Here, diamond drilling is on an approximate 100mX by 50mY grid.

Value estimation	• *Valuations should not be reported for samples of diamonds processed using total liberation method, which is commonly used for processing exploration samples.*
	• *To the extent that such information is not deemed commercially sensitive, Public Reports should include:*
	  ○ *diamonds quantities by appropriate screen size per facies or depth.*
	  ○ *details of parcel valued.*
		• Valuation of the stones from MRM has been made by taking the rough from the bulk sampling programmes and selling it at public auction. These auctions have raised significant funds for the Project. Details are provided herein.

Criteria	JORC Code explanation	Commentary
	○ *number of stones, carats, lower size cut-off per facies or depth.* • *The average $/carat and $/tonne value at the selected bottom cut-off should be reported in US Dollars. The value per carat is of critical importance in demonstrating project value.* • *The basis for the price (eg dealer buying price, dealer selling price, etc).* • *An assessment of diamond breakage.*	• An formal assessment of stone breakage due to the washing plant has not been undertaken. However, due to the lack of a crushing circuit and the apparent absence of broken stones during sorting this is not considered to be material.
Security and integrity	• *Accredited process audit.* • *Whether samples were sealed after excavation.* • *Valuer location, escort, delivery, cleaning losses, reconciliation with recorded sample carats and number of stones.* • *Core samples washed prior to treatment for micro diamonds.* • *Audit samples treated at alternative facility.* • *Results of tailings checks.* • *Recovery of tracer monitors used in sampling and treatment.* • *Geophysical (logged) density and particle density.* • *Cross validation of sample weights, wet and dry, with hole volume and density, moisture factor.*	• All material recovered from the production and bulk sampling operations is transported to the wash plant and sort house via a security escort. • The sort house is located on-site, in close vicinity of the wash plant, and permanently guarded by multiple security staff. Tailings checks have been carried out by re-washing gravel in a small jig. Tracer stones have also been used to monitor plant performance. MRM also stockpiles processed material to carry out some bulk reprocessing which is planned for the future.
Classification	• *In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive grade (carats per tonne). The elements of uncertainty in these estimates should be considered, and classification developed accordingly.*	• SRK consider there to be a degree of uncertainty in the grade estimates, with the confidence being gained through the production and bulk sampling and sorting process. This records the distribution of stone qualities being recovered. • SRK has supplied a list of recommendations which can improve the data gathered, and so the confidence in the geological and grade