UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 6-K

Report of Foreign Private Issuer
Pursuant to Rule 13a-16 or 15d-16
of the Securities Exchange Act of 1934

Date: September 5, 2017

Commission File Number 001-31528

IAMGOLD Corporation
(Translation of registrant's name into English)

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Indicate by check mark whether the registrant files or will file annual reports under cover Form 20-F or Form 40-F.

Form 20-F ☐ Form 40-F ☒

Indicate by check mark if the registrant is submitting the Form 6-K in paper as permitted by Regulation S-T Rule 101(b)(1): ☐

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Indicate by check mark whether by furnishing the information contained in this Form, the registrant is also thereby furnishing the information to the Commission pursuant to Rule 12g3-2(b) under the Securities Exchange Act of 1934.

Yes ☐ No ☒

If "Yes" is marked, indicate below the file number assigned to the registrant in connection with Rule 12g3-2(b): 82-______

Description of Exhibit

Exhibit	Description of Exhibit
99.1	NI 43-101 Technical Report on the Rosebel Gold Mine, Suriname (effective June 30, 2017) dated September 5, 2017

Signatures

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

	IAMGOLD CORPORATION	
Date: September 5, 2017	By:	/s/ Tim Bradburn Vice President, Legal and Corporate Secretary

Exhibit 99.1

IAMGOLD CORPORATION

TECHNICAL REPORT ON THE ROSEBEL GOLD MINE, BROKOPONDO DISTRICT, SURINAME

NI 43-101 Report

Qualified Persons:
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September 5, 2017
Effective Date: June 30, 2017

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1 SUMMARY

EXECUTIVE SUMMARY

This Technical Report was prepared by Rosebel Gold Mines N.V. (RGM), IAMGOLD Corporation's (IAMGOLD) subsidiary, for the Rosebel Gold Mine, located in Suriname. The purpose of this Technical Report is to support the disclosure of the June 30, 2017 Rosebel Gold Mine Mineral Resource and Mineral Reserve estimate.

IAMGOLD is a mid-tier mining company with four operating gold mines and several exploration properties on three continents. IAMGOLD, through its wholly-owned subsidiary RGM, owns 95% of the Gross Rosebel concession (RGM concession) in Suriname, with the Government of Suriname holding the remaining 5%. The mine has been operating commercially since February 2004.

Total estimated Proven and Probable Mineral Reserves at Rosebel increased by 80% to 3.7 million ounces at the end of June 2017 from 2.1 million ounces of gold at the end of 2016. The addition of 1.6 million ounces was due to the factors described below, and is partially offset by mining depletion at Rosebel during the first half of 2017. There was no change in the $1,200 per ounce gold price assumption for estimating RGM's Mineral Reserves. Total Measured and Indicated Mineral Resources (inclusive of Mineral Reserves) estimated for Rosebel increased by 55% or 3.3 million ounces to 9.3 million ounces at the end of June 2017, compared to the year-end 2016 estimate. There was also no change in the gold price assumption for estimating Mineral Resources at Rosebel ($1,500 per ounce). As at June 30, 2017, Rosebel also estimates an Inferred Mineral Resource of 2.7 million ounces, representing an increase of 2.0 million ounces from the 2016 year-end estimate. The significant factors affecting the changes to the Mineral Resource estimates are similar to the factors noted for the increased Mineral Reserve estimate.

Table 1-1 summarizes the Mineral Resource estimate for the mine as at June 30, 2017.

TABLE 1-1 MINERAL RESOURCES – JUNE 30, 2017

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	31,402	0.7	676
Indicated	275,710	1.0	8,649
Total M&I	**307,112**	**0.9**	**9,325**
Inferred	84,866	1.0	2,667

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are inclusive of Mineral Reserves.
3. Mineral Resources are estimated at average cut-off grades which vary between 0.19 g/t Au and 0.50 g/t Au depending on material type and pit.
4. Mineral Resources are estimated using an average long-term gold price of US$1,500 per ounce.
5. Bulk density is variable by rock type.
6. Numbers may not add due to rounding.
7. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

RGM is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the Mineral Resource estimate.

Table 1-2 summarizes the Mineral Reserve estimate for the mine as at June 30, 2017.

TABLE 1-2 MINERAL RESERVES – JUNE 30, 2017

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Proven	24,356	0.7	516
Probable	90,544	1.1	3,215
Total	**114,900**	**1.0**	**3,730**

Notes:

1. CIM definitions were followed for Mineral Reserves.
2. Mineral Reserves are estimated at average cut-off grades which vary between 0.16 g/t Au and 0.44 g/t Au depending on material type, pit, and time.
3. Mineral Reserves are estimated using an average long-term gold price of US$1,200 per ounce.
4. Bulk density is variable by rock type.
5. Numbers may not add due to rounding.

RGM is not aware of any known mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

Significant factors contributing to the revised reserve estimate include:

- New resource models for all of the Rosebel orebodies, which incorporate information from both diamond drill and reverse circulation drill hole data, extensive geologic mapping completed in recent years and a comprehensive geostatistical review by internal and external experts. The new models incorporate some new ore in the saddle zones between existing pits; however, the amount from these zones is limited as the program was incomplete at the time of the cut-off date for the resource modelling exercise. Exploration of the saddle zones is still ongoing and additional data obtained from the drilling program will be incorporated into future reserve and resource estimates.
- The positive impact of changes in the cost model for Rosebel, based on major cost improvements over the past few years due to significantly improved mine and mill productivity, reduced fuel prices, a favourable change in the local currency exchange rate, significantly reduced General and Administrative costs, and higher mill throughput for hard ore as a result of improvements and investments in the crushing and grinding circuit in the mill.
- A revised mine planning approach based on a detailed pit phasing scheme complemented by an optimized mine sequencing algorithm to maximize the net present value of the mine schedule, including the use of variable cut-off grades over time. The Rosebel technical team was supported by external consultants in the development and validation of this revised approach.
- Improved confidence in the current pit slope design angles, based on a detailed geotechnical review completed in prior years by a third party consultant.
- The new Mineral Reserve includes a waste dilution assumption of 8% for saprolite ore and 10% for both transition and fresh rock (hard) ore. Despite the applied dilution assumption, the average grade of the Mineral Reserve remains unchanged at 1.0 g/t Au, as the new pit designs are mining deeper into higher grade ore zones of several of the orebodies.

INTERPRETATION AND CONCLUSIONS

IAMGOLD has the following conclusions and observations:

- Mineral Resources and Mineral Reserves have been prepared in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral reserves (CIM definitions).
- Work completed to date by the geological staff is appropriate.
- The geological model employed by RGM geologists is reasonably well understood and is well supported by field observations in both outcrop, pit mapping, and drill intersections.
- The resource model has been prepared using appropriate methodology and assumptions. These parameters include:
    - Treatment of high assays;

  - Compositing length;
  - Search parameters;
  - Bulk density;
  - Cut-off grade;
  - Classification.
- The block model has been validated using a reasonable level of rigour consistent with common industry practice.
- The resource evaluation reported herein is a reasonable representation of the Mineral Resources delineated at the Rosebel Gold Mine as of June 30, 2017.
- The current drill spacing in all deposits is judged adequate to develop a reasonable model of the mineralization distribution and to quantify its volume and quality with a good level of confidence in all areas of the project.
- Based on visual verification, the models (Rock Type, Density, and Au Grade) were found to be globally representative of the known geological and structural controls of mineralization of the RGM deposit.
- Statistical analysis demonstrates that the block model provides a reasonable estimate of the Mineral Resources of the RGM deposit.
- Validation of the block model, using different interpolation methods, indicated that tonnages, grades, and gold contents are similar.
- Block models were also compared and reconciled with production data and are considered as being appropriate.
- Swath plots for Indicated and Inferred Mineral Resources, by vertical sections for the RGM pits, indicate that peaks and lows in gold content generally match peaks and lows in composite frequency; no bias was found in the resource estimate in this regard.
- A review of the information stored in the RGM database found it to be in good standing.
- Sampling and assaying have been carried out following standard industry quality assurance/quality control (QA/QC) practices. These practices include, but are not limited to, sampling, assaying, chain of custody of the samples, sample storage, use of third-party laboratories, standards, blanks, and duplicates.
- The mine design and Mineral Reserve estimate have been completed to a level appropriate for an operating mine.
- The economic assumptions and methodology used for estimation of the Mineral Reserves are appropriate.
- The Mineral Reserve estimate is consistent with the CIM definitions and is suitable for public reporting. As such, the Mineral Reserves are based on Measured and Indicated Mineral Resources and do not include any Inferred Mineral Resources.

- Current production statistics indicate that the process flow sheet is adequate and suitable for processing the Rosebel Gold Mine ore types.

RECOMMENDATIONS

IAMGOLD has the following recommendations:

- Continue the process of updating the resource models to incorporate the remaining deposits and update of the geological models of the current orebodies.
- Continue upgrading the Inferred Mineral Resources to Indicated Mineral Resources.
- Implement a stringent planning and operations process for following the variable cut-off grades in production, and closely monitor the reconciliation between planning and production.
- Further refine the mine cost model for future input to the long term planning and scheduling designs.

ECONOMIC ANALYSIS

This section is not required as the Rosebel Gold Mine is currently in production and there is no material expansion of current production.

TECHNICAL SUMMARY

PROPERTY DESCRIPTION AND LOCATION

The Rosebel property is located in Suriname, South America, approximately 80 km south of the city of Paramaribo, the capital of Suriname. Suriname is a former Dutch colony located on the northeastern coast of South America.

LAND TENURE

The Rosebel mining concession covers 17,000 ha in the District of Brokopondo, between the Suriname River to the East and the Saramacca River to the West, and is surrounded by exploration concessions covering an additional surface area of 99,633 ha. The property is held by RGM, a 95% owned subsidiary of IAMGOLD, while the Republic of Suriname has a 5% free-carried interest.

The Right of Exploitation of the RGM concession property is governed by the following major Instruments, Agreements, and National Laws:

1. The Instrument granting the Right of Exploitation to RGM under GMD no. 468/02
2. Approval Instrument issued by the Ministry of Natural Resources to transfer the Right of Exploration from Golden Star Resources Ltd.(Golden Star) to RGM
3. The Second amendment to the Mineral Agreement, June 6, 2013
4. The Mineral Agreement April 7, 1994, as amended and supplemented on March 13, 2003
5. The Mining Decree of Suriname May 8, 1986
6. National Institute for Environment and Development in Suriname (NIMOS) for the Environmental and Social Impact Assessment (ESIA)

The Right of Exploration for Minerals (ROE) are granted by the Ministry of Natural Resources subject to terms and conditions stipulated in the Mining Decree 1986. Following issuance of such a right, the holder is required to file quarterly and annual reports with the Geological Mining Department (GMD).

Furthermore, the instrument granting the Right of Exploration enumerates all the conditions which need to be considered and complied with during the exploration phase. There are no specific pre-environmental requirements in this phase, however, the Right of Exploration stipulates that exploration activities should be conducted in conformance with Environmental standards of the World Bank.

HISTORY

Golden Star was granted the ROE for the Rosebel property for five years in 1994, pursuant to a Mineral Agreement signed between Golden Star, Grassalco, and the Government of Suriname on April 7, 1994.

Golden Star entered into an agreement with Cambior Inc. (Cambior) on June 7, 1994, granting Cambior the option to earn an undivided 50% of Golden Star’s interest in the 1994 Mineral Agreement and the Rosebel property. This agreement provided that Cambior shall exercise its option by funding approximately $6.1 million in exploration and development expenditures on the Rosebel property by June 30, 1996.

A Feasibility Study and an Environmental Impact Statement were filed with the Government of Suriname in May 1997. Following additional drilling on the property, a revised Feasibility Study was submitted to the Government of Suriname in December 1997. In 1998, 1999, and 2000, the Rosebel Project remained on care and maintenance.

In December 2000, a Pre-feasibility Study was delivered to the Ministry of Natural Resources covering only the mining and processing of the soft rock and transition ore portions of the Rosebel deposits, then reducing the project's estimated capital expenditures to $80 million from the $175 million contemplated in the original 1997 Feasibility Study. The Feasibility Study completed in August 2002 replaced both the November 1997 and December 2000 studies.

On October 26, 2001, Golden Star sold its 50% interest in the Rosebel property to Cambior for a cash consideration of $8 million and a gold price participation right on future production from Rosebel. Under its gold price participation right, Golden Star would receive a quarterly payment of an amount equal to 10% of the excess, if any, of the average quarterly market price above $300 per ounce for gold production from RGM's soft and transitional rock portions and above $350 per ounce from RGM's hard rock portion, up to a maximum of seven million ounces produced. In addition, Golden Star transferred its rights in the Headley's Reef and Thunder Mountain exploration properties adjacent to Rosebel.

Commercial production at Rosebel Gold Mines began in February 2004. In 2004, Golden Star sold the royalty interest in production at the Rosebel property to Euro Resources SA (Euro Resources - formerly Guyanor Resources SA).

In November 2006, IAMGOLD acquired a 100% interest in Cambior (the previous owner of RGM), thereby acquiring 95% of RGM.

In December 2008, IAMGOLD acquired 84.55% of the current share capital of Euro Resources.

In June 2013, IAMGOLD, RGM, Grasshopper Aluminum Company N.V., and the Republic of Suriname executed the Second Amendment to the Mineral Agreement. The Second Amendment created a new Unincorporated Joint Venture vehicle (UJV) in which the Republic of Suriname would hold, through NV1, a wholly owned subsidiary of the Republic, a paid 30% interest and RGM would hold a 70% interest. Under the terms of the Second Amendment, NV1 has been granted an option to acquire an increased interest in production from the RGM concession if RGM approves a Significant Expansion of the existing mill and if NV1 elects to participate in the Significant Expansion by funding 30% of the capital required for the expansion. A Significant Expansion is defined in the Second Amendment as an increase in the milling capacity of the Rosebel mill of three million milled tonnes per annum (MTPA) or as otherwise agreed by the UJV partners, NV1, and RGM. At the present time, RGM has not approved a Significant Expansion and the UJV partners are not actively evaluating a potential Significant Expansion of the Rosebel mill.

In December 2015, IAMGOLD announced the closing of a simplified tender offer for Euro Resources through the Euronext Paris exchange. At the closing of the simplified tender, in conjunction with purchases made by IAMGOLD through the facilities of the Euronext Paris exchange since the submission of the draft offer to the French Autorité des Marchés Financiers, IAMGOLD owns and controls approximately 90% of the outstanding common shares of Euro Resources.

GEOLOGY AND MINERALIZATION

The Rosebel concession lies within the Paleoproterozoic Guiana Shield. The Suriname portion of the shield is characterized by discrete corridors of low grade metamorphic rocks (greenstone belts) separated by large granite-gneiss terranes.

Rosebel deposits are hosted by a volcano-sedimentary sequence of the Marowijne Supergroup and by the overlying detrital sedimentary sequence of the Rosebel formation. Five types of rocks occurring there are distinguishable: felsic to mafic volcanic rocks, deep-water sediments, shallow-water sediments, felsic intrusion, and late diabase dikes. Economic gold mineralization has been recognized in sedimentary and volcanic rocks while the intrusion only shows rare gold occurrences and the dykes are totally devoid of any mineralization. The regional metamorphism is restricted from low-greenschist to greenschist facies. The main regional fabric varies from east-west in the southern part of the property to west northwest east southeast to the north and follows the regional tectonic grain as seen on an aeromagnetic survey. Two phases of deformation differing in style are recognized on the property. The first phase (D1) has affected deep-water sediments and volcanic rocks only and the second phase (D2) has affected all rock units (except diabase dykes). Gold mineralization is late regarding this second phase of deformation; shear veins are emplaced within faults and tension veins that are nearby, but none of the two show signs of subsequent deformation.

Three domains of mineralization are found on the property; North, Central and South. The northern domain includes J Zone and Koolhoven pits along a trend to the north of volcanic rocks and the West Pay Caro-Pay Caro-East Pay Caro pits along a trend at the southern contact between volcanic rocks and detrital sedimentary rocks. The two trends follow a west northwest east southeast orientation. The central domain only includes one pit, Rosebel, which is striking east-west. The southern domain is made of one structural trend roughly oriented east-west along which the Mayo, Roma, and Royal Hill pits are lying.

Mineralization is hosted in both shear and tension veins which are tightly associated in space and time. The association of those two vein systems at the Rosebel mine is in fact a common aspect of orogenic gold deposits where tension veins are formed into extensional fractures that have accommodated deformation. In terms of volume of gold and quartz, tension veins are more important at the Rosebel mine, although shear veins also carry a considerable amount of gold (i.e. Pay Caro Deposit) and play a primordial role for fluid circulation. The North and the South domains show disparity in veining style; one type of shear vein and three types of tension veins have been recognized in each domain.

In the South domain, the shear veins are developed parallel to the main shear zone and are in general confined to the footwall of this main structure. Texture of shear veins is usually banded with, most of the time, tourmaline alternating with quartz near the border of the vein. Thickness of those veins varies from a few decimetres to more than three metres. Disposition of shear veins systematically follows the bedding. The more important shear veins are emplaced along the contact between volcanic and sedimentary rocks or along conglomeratic levels within the arenitic sequence.

Shear veins in the North domain are sub-vertical to steeply dipping south and are oriented west north-west-east south-east. These veins show variability in structural style and intensity depending on their localization from the main shear zone.

Two other sets of tension vein spatially associated to shear veins are present in the South domain: flat veins and north-dipping veins. Their emplacement is attributed to the presence of the anticline that has acted as a structural trap for fluids.

Two more sets of tension veins are identified in the North domain as well: east-west sub-vertical veins and stacks of north-dipping veins. East-west veins are sub-vertical to steeply dipping to the north and are only found in the Pay Caro deposit near the main shear zone. North-dipping tension veins form west north-west-east south-east trending stacks dipping around 45° to the north north-east in the nearby shear veins and these are related to the latest normal movement undergone by the fault zone.

EXPLORATION STATUS

Historically, the RGM concession has been explored for gold with stream sediment programs (pan sampling). Anomalies encountered were subsequently covered with large-spaced shallow auger grids. Limited infill auger grids (at closer spacing) were carried out, as a third step, to better delineate the anomalies. Further deep augering was used to refine the best targets by collecting and evaluating the in-situ material. Banka drilling served to test the alluvial material. Trenches were excavated across the strike of deep auger anomalies to better understand the geology and local deep augering was carried out at the bottom of the trenches.

Intensive drilling was completed from 1992 to 1997 and from 2002 to present, which led to the development of the pits and reserve extensions. Outside of the direct pit extensions, the mining concession remains underexplored with basic data still to be acquired (multi-element analysis for geochemical characterization, induced polarization (IP) survey, etc.).

In 2016, the Mine Exploration group focused mainly on areas that were prioritized from common targeting from the MinEx and Resource departments. The objectives were: 1) Pit expansion: increase soft-trans resources proximal to actual pits, and 2) Identify new potential areas for economical soft-trans oxide resources.

Field work for pit expansion mainly consisted of pit mapping and sampling in the vicinity of known deposits. Pit extension work has been carried on in West Pay Caro, Pay Caro, East Pay Caro, Royal Hill, Roma, Mayo, and Overman deposits.

MINERAL RESOURCES

The Mineral Resource estimate is based on open pit mining methods and includes 307.1 Mt at an average grade of 0.9 g/t Au, containing 9.3 Moz in the Measured and Indicated category. There is an additional 84.9 Mt at an average grade of 1.0 g/t Au, containing 2.7 Moz in the Inferred category.

The Mineral Resource is reported at a cut-off grade based on a gold price of $1,500 per ounce. High-grade gold assays are capped at various grades ranging from 12 g/t Au to 29 g/t Au.

The Mineral Resource estimate is constrained by a preliminary pit optimization shell. The Mineral Resources are classified as Measured, Indicated, and Inferred and follow CIM definitions.

MINERAL RESERVES

The Mineral Reserve estimate is based on open pit mining methods and includes 114.9 Mt at an average grade of 1.0 g/t Au, containing 3.7 Moz in the Proven and Probable category.

The June 30, 2017 Mineral Reserves were determined based on the latest Life-of-Mine (LOM) plan, which was developed using the Whittle Enterprise Optimization methodology, combining activity-based cost accounting, theory of constraints, pit phasing, and multi-pit scheduling in order to maximize value and bring forward cash production. Whittle Consulting and BBA Inc. were mandated, respectively, to provide support to RGM in the development of this process.

The June 30, 2017 Mineral Reserve estimate is based on updated resource models at year-end 2016 for all pits. The resource models were updated by RGM in GEMS format.

The Mineral Reserve estimate and cut-off grades include a mining dilution provision of 8% for saprolite and 10% for transition and fresh rock (hard) ore. The lower dilution for saprolite is due to the fact that limited blasting does not displace the ore zones compared to that required for transition and fresh rock. The dilution tonnage is estimated at zero grade.

The dilution is applied in the model directly in the Whittle shell selection. In addition to this dilution, a 10% adjustment factor, consistent with historical reconciliation data since 2004, is applied to the final tonnage, thus increasing the tonnage by 10%, and reducing the grade by an equivalent percentage, with no change to final in-situ gold reserves.

The ore extraction rate or mining recovery is assumed to be 100%.

The reserve gold price assumption for estimating Mineral Reserves at June 30, 2017 is $1,200/oz.

MINING METHOD

The mining operation at RGM is a conventional truck and shovel, drill and blast, open pit operation, with an owner fleet. In 2017, the annual mining rate is 62.8 Mt, with a stripping ratio of 4.15, including 12.1 Mt of ore at an average grade of 0.97 g/t Au for a total of 317 koz of recovered gold.

The loading fleet consists of five CAT 6030 shovels, four CAT 5130 shovels using both the excavator and front shovel configuration, and one CAT 993 loader which is used for run of mine (ROM) stockpile reclaim. The hauling fleet consists of 36 CAT 777 and 18 CAT 785 haul trucks. The drilling fleet consists of a mixed fleet of 11 drills. Dust control is accomplished with four CAT 777 converted haulage trucks and one CAT 769 water truck.

Drill and blast parameters vary for each pit due to different material type and pit designs. All drill holes are 165 mm diameter. All blasting activities on site are executed by an explosives supplier. Holes are loaded with bulk explosive matrix and initiated with non-electric detonators.

Reverse circulation (RC) grade control drilling is planned on a 10 m by 10m or 12 m by 6 m pattern using inclined holes. Due to the inconsistence in ore appearances, 100% of the benches are drilled with RC (ore and waste) for 2017. Blast hole sampling is used for grade control in areas where RC grade control drilling is not completed. A fleet of four to five Foremost Prospector W750 Buggy rigs are used for RC drilling.

The mining schedule and production rate for the LOM have been established to feed the mill to its power capacity while respecting annual mining rate constraints, phase drop down rates, and minimizing truck peak requirements.

The production starts at a rate of 64.3 Mtpa in 2017 and steadily increases to a rate of 74.0 Mtpa until 2021. The production rate stays relatively constant until 2024, then it starts to decline until the end of production in 2028. In the later years, production rates are reduced, constrained by the longer hauls and the available working area at the pit bottoms, which are not as productive as on the upper benches.

MINERAL PROCESSING

The metallurgical process is conventional grinding followed by leach, carbon in leach (CIL) with a gravity circuit installation for the recovery of gravity recoverable gold. Gold recovery facilities include acid washing, carbon stripping, and electro winning, followed by bullion smelting and carbon regeneration. The process was developed to accommodate varying ratios of soft rock, transition, and hard rock ores. The process used at RGM was developed through various pilot plant programs and through additional initiatives by mill personnel to improve the process further since commissioning. Further process optimization continues to target constraints and opportunities to further increase plant capacity and performance.

SITE INFRASTRUCTURE

Site infrastructure includes:

- Site roads;
- Mine facilities, such as the truck shop, warehouse, and administration services;
- Administration building which includes:
  - Security, Health, and Safety;
  - Engineering and Geology;
  - Accounting, Information Technology (IT), Human Resources, Procurement, and Logistics;
  - Mine offices;
  - Mine Dry/Lunchroom;
- Processing plant buildings which includes:
  - Mill administration building;
  - Refinery;
  - Process control;
  - Mill workshop;
  - Reagent storage;
  - Laboratory facility;
- Truck shop which includes:
  - Heavy truck maintenance;
  - Heavy welding shop;

  - Haul truck tire change;
  - Dozer/shovel bay for tracked equipment;
  - Mine auxiliary equipment maintenance and repair;
  - Maintenance personnel offices;
- Warehouse;
- Fuel storage;
- Municipal services including:
  - Potable water;
  - Fire protection;
  - Sewage and waste disposal;
- Aggregate plant;
- Camp complex;
- Grid power supply with installed capacity of 189 megawatts (MW) with RGM power demand at 31.9 MW in 2017;
- 5 MW solar power plant;
- Emergency generators;
- Communications and IT systems;
- Tailings storage facility.

MARKET STUDIES AND CONTRACTS

Gold is the principal commodity produced at RGM and is freely traded at prices that are widely known, so that prospects for sale of any production are virtually assured. All gold produced by IAMGOLD is in the form of doré bars, which is then shipped to a refiner who refined the doré into bullion. The bullion is then sold directly on the open market to gold trading institutions at prevailing market prices.

RGM has signed contracts which are directly linked to the operations. Contracts are negotiated by going out for tenders on an annual or bi-annual basis. Contracts with values higher than $5 million per year include fuel and lubricants, major equipment parts, process plant reagents and grinding media, and reverse circulation drilling.

ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

The project-specific Mineral Agreement dated April 7, 1994, between Suriname, Grassalco, and Golden Star stipulated that prior to the construction of the Gross Rosebel project, an Environmental Impact Assessment (EIA), or an Environmental and Social Impact Assessment (ESIA) be conducted, including public enquiry and a mitigation and/or an enhancement plan of negative or positive impacts.

An ESIA was conducted by Rescan and submitted to the Government of Suriname in September 2002. This study included an Environmental and Social Management Plan (ESMP) for the project. The ESIA was completed following a public consultations in 2002 with key stakeholders.

Following this process, on December 16, 2002, the Rosebel Gold Mine was approved by the Suriname authorities and the Right of Exploitation of Gold, Diamond, and other Minerals over a 170 km² area (G.M.D. No.: 468/02) was granted to IAMGOLD Rosebel Gold Mines.

In order to maintain the 2012 gold production levels, a tailings expansion Feasibility Study (the 2011 FS) was initiated in 2012 by RGM personnel and Golder Associates.

The proposed expansion Project included the expansion of the existing tailings facility to the east by the construction of seven additional dams, raising the total vertical containment by 45 m at completion, for an additional storage capacity of 100 Mm ^{3} . As required by this expansion work, a limited ESIA was completed in May 2013 to assess the environmental and social impacts of the tailings expansion project. The final ESIA and supporting documents were submitted on August 22, 2013, a subsequent permit was delivered by the Minister of Natural Resources on September 10, 2013 (No: NH 13/791).

A Community Relations Plan with supporting guideline and procedures was developed to minimize the mine’s impact on communities and the environment.

There is one active community, Nieuw-Koffiekamp, within the boundaries of the mine concession. In the immediate surroundings of the RGM concession, six more villages were identified as communities of interest that may be directly impacted by or have influence on the mine. These villages are Marshallkreek, Klaaskreek, Nieuw-Lombe, Balingsoela, Brownsweg, Kwakugron, and along with Nieuw-Koffiekamp are considered the direct area of influence of the company's operations.

Although mining activities may not directly impact these communities, their inhabitants have high expectations towards RGM in terms of employment, social, and financial support. Communication Committees and key stakeholders are identified and a community development program is implemented for these villages.

Accordingly, community information and consultation programs, community visits from mine representatives and management, and participation in concerted action frameworks at a regional and national level are carried out regularly.

In addition, inter communication committee meetings are held on a quarterly basis to review community concerns and advancement of community investment projects and other engagements.

As part of the community investment plan, socio-educational infrastructures were being built and upgraded (medical centres, schools, etc.). Programs to boost the overall health are implemented, with focus on healthy lifestyle, HIV/AIDS, non-communicable diseases, and increased environmental awareness, were developed for the benefit of neighbouring populations.

Rural development activities (agriculture, poultry projects, etc.) are primarily undertaken as part of income generating program. Since 2004, a community investment program has been financing community projects through communal development plans.

The community engagement program encompasses all engagement actions and community development projects of the Community Relation Department. On a biannual basis performance of the Community Relations team is reviewed through village meetings.

CAPITAL AND OPERATING COST ESTIMATES

A total of $629 million of capital is planned to be spent over the remaining LOM, which equates to $5.89/t milled or $197/oz of Au.

The mine operating costs are estimated on the basis of the physical quantities of the mine plan, realistic equipment productivity assumptions, overall equipment efficiencies, and updated consumable prices.

Average mine operating costs over the LOM are estimated at $1.67/t mined and average $1.90/t mined over the next two years.

The average LOM milling cost is estimated to be $8.47/t milled and an average of $7.21/t milled over the next two years.

The average LOM general and administrative (G&A) cost is $2.03/t milled and assumes an annual spend of $25 million until 2023, after which G&A costs will gradually decrease as the operation will approach the end of life.

The average total cash cost per ounce is $707/oz Au while the all-in sustaining cost (AISC) averages $923/oz Au over the LOM.

2 INTRODUCTION

INTRODUCTION AND TERMS OF REFERENCE

This Technical Report was prepared by Rosebel Gold Mines N.V. (RGM), IAMGOLD Corporation's (IAMGOLD) subsidiary, for the Rosebel Gold Mine, located in Suriname. The purpose of this Technical Report is to support the disclosure of the June 30, 2017 RGM Mineral Resources and Reserves estimate.

IAMGOLD is a mid-tier mining company with four operating gold mines and several exploration properties on three continents. IAMGOLD, through its wholly-owned subsidiary RGM, owns 95% of the RGM concession in Suriname, with the Government of Suriname holding the remaining 5%. The mine has been operating commercially since February 2004.

All currency is in US dollars unless noted otherwise.

SOURCES OF INFORMATION

This Technical Report was prepared by RGM personnel. The Qualified Persons (QPs) for this Technical Report, their responsibilities, and dates of personal inspections of RGM are provided in Section 29.

The documentation reviewed, and other sources of information, are listed at the end of this report in Section 27 References.

LIST OF ABBREVIATIONS

Units of measurement used in this report conform to the metric system.

Au	gold
a	annum
A	ampere
AEM	airborne electromagnetic
Ai	Bond abrasion testing
AISC	all-in sustaining cost
bbl	barrels
btu	British thermal units
BWI	Bond ball mill grindability
°C	degree Celsius
C$	Canadian dollars
cal	calorie
CAPEX	capital expenditure
CEET	Comminution Economic Evaluation Tool
cfm	cubic feet per minute
CIL	carbon in leach
cm	centimetre
cm^2	square centimetre
CoG	cut-off grade
CWI	Bond Crusher Work Index
CWS	capitalized waste stripping
d	day
D1	first phase of deformation
D2	second phase of deformation
DD	diamond drill
dia	diameter
dmt	dry metric tonne
dwt	dead-weight ton
DWT	JK Drop-Weight Test
°F	degree Fahrenheit
ft	foot
ft^2	square foot
ft^3	cubic foot
ft/s	foot per second
g	gram
G	giga (billion)
Ga	billion years
Gal	Imperial gallon
g/L	gram per litre
GMD	Geological Mining Department
Gpm	Imperial gallons per minute
g/t	gram per tonne
gr/ft^3	grain per cubic foot
gr/m^3	grain per cubic metre
G&A	general and administrative
ha	hectare
kW	kilowatt
kWh	kilowatt-hour
L	litre
lb	pound
LIMS	Laboratory Information Management System
LOM	life of mine
L/s	litres per second
m	metre
M	mega (million); molar
m^2	square metre
m^3	cubic metre
μ	micron
MASL	metres above sea level
μg	microgram
m^3/h	cubic metres per hour
mi	mile
min	minute
μm	micrometre
mm	millimetre
MMI	mobile metal ions
mph	miles per hour
MVA	megavolt-amperes
MW	megawatt
MWh	megawatt-hour
NQ	47.6 mm drill core size
oz	Troy ounce (31.1035g)
oz/st, opt	ounce per short ton
PAL	Pulverize and Leach
pH	potential of hydrogen
ppb	part per billion
ppm	part per million
psia	pound per square inch absolute
psig	pound per square inch gauge
QA/QC	quality assurance/quality control
Qemscan	Quantitative Evaluation of Minerals by SCANning electron microscopy
UJV	Unincorporated Joint Venture
RC	reverse circulation
RL	relative elevation
ROE	Right of Exploration
RQD	rock quality designation
s	second
SAG	Semi Autogenous Grinding Mill
SMC	drop-weight testing
SPI	Semi Autogenous Grinding Mill Power Index
SRM	standard reference material
st	short ton

hp	horsepower
hr	hour
HQ	63.5 mm drill core size
Hz	hertz
IASB	International Accounting Standards Board
IFRIC	International Financial Reporting Interpretations Committee
in.	inch
in^2	square inch
J	joule
IP	Induced polarization
k	kilo (thousand)
kcal	kilocalorie
kg	kilogram
km	kilometre
km^2	square kilometre
km/h	kilometre per hour
kPa	kilopascal
kVA	kilovolt-amperes
stpa	short ton per year
stpd	short ton per day
t	metric tonne
tpa	metric tonne per year
tpd	metric tonne per day
TTG	tonalite-trondjhemite-granodiorite
US$	United States dollar
USg	United States gallon
USgpm	US gallon per minute
V	volt
W	watt
wmt	wet metric tonne
wt%	weight percent
w/v	Weight per volume
w/w	weight per weight
yd^3	cubic yard
yr	year

3 RELIANCE ON OTHER EXPERTS

This report has been prepared by IAMGOLD.

For the purpose of this report, the QP has relied on ownership information provided by Ms. Sharmila Jadnanansing, IAMGOLD's legal counsel in Suriname, regarding title to the RGM concession. Ms. Jadnanansing provided a legal review and opinion dated August 31, 2017. This information was used in Sections 1 and 4 of this report.

4 PROPERTY DESCRIPTION AND LOCATION

The Gross Rosebel concession (RGM concession) (Geological Mining Department (GMD) no. 468/02) covers an area of 170.0 km² in north central part of the Republic of Suriname at a latitude of 5 º 25’ North and a longitude of 55 º 10’ West. The Gross Rosebel concession lies in the district of Brokopondo, between the Suriname River to the east and the Saramacca River to the west, approximately 80 km south of the capital city of Paramaribo (Figure 4-1).

LAND TENURE

The Rosebel Gold mine area consists of the RGM concession, which contains the Royal Hill, Mayo, Roma, Rosebel, Koolhoven, Pay Caro, East Pay Caro, and J Zone deposits, and seven exploration concessions, all located on contiguous ground (Figure 4-2).

All these concessions are owned by RGM which is a Surinamese company created for the purpose of developing and operating the Rosebel Gold Mine. IAMGOLD owns a 95% interest in RGM, while the Republic of Suriname has a 5% free-carried interest.

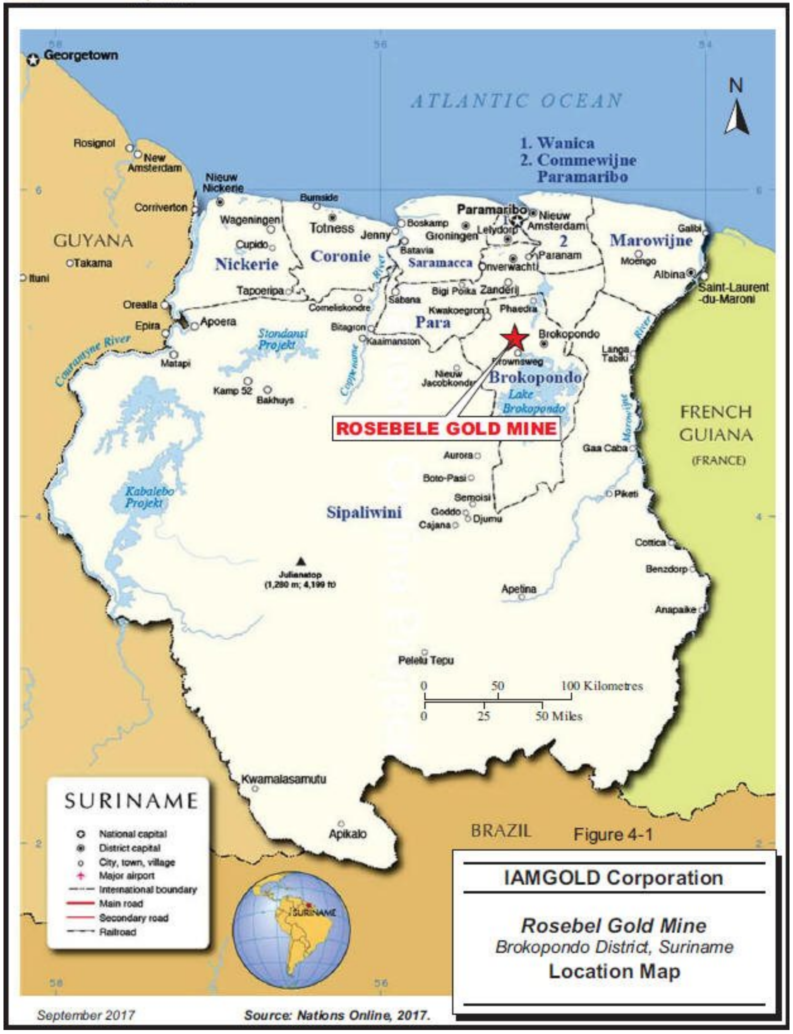

Georgetown
ATLANTIC OCEAN
N
1. Wanica
2. Commewijne
Paramaribo
Rosignol
New Amsterdam
Nieuw Nickerie
Burnside
Corriverton
Wageningen
Totness
Jenny
Boskamp
Groningen
Paramaribo
Nieuw Amsterdam
Lelydorp
Galibi
GUYANA
Cupido
Nickerie
Coronie
Batavia
Saramacca
Onverwacht
Paranam
2
Marowijne
Moengo
Albina
Takama
Ituni
Tapoeripa
Coppename River
Bigi Poika
Zanderij
Saint-Laurent -du-Maroni
Orealla
Coeliskondre
Sabana
Kwakoegron
Phaedra
Epira
Apoera
Stondansi Projekt
Bitagron
Para
Brokopondo
Kaaimanston
Langa Tabiki
Courantyne River
Matapi
Brownsweg
Nieuw Jacobkondre
Brokopondo
Kamp 52
Bakhuys
Lake Brokopondo
Marowijne River
FRENCH GUIANA
(FRANCE)
ROSEBELE GOLD MINE
Gaa Caba
Aurora
Boto-Pasi
Kabalebo Projekt
Semoisi
Piketi
Sipaliwini
Goddo
Djumu
Cajana
Cottica
Julianatop (1,280 m; 4,199 ft)
Benzdorp
Apetina
Anapaike
Pelelu Tepu
0
50
100 Kilometres
0
25
50 Miles
Kwamalasamutu
SURINAME
National capital
District capital
City, town, village
Major airport
International boundary
Main road
Secondary road
Railroad
SURINAME
Apikalo
BRAZIL
58
56
54
6
4
2

Figure 4-1

IAMGOLD Corporation

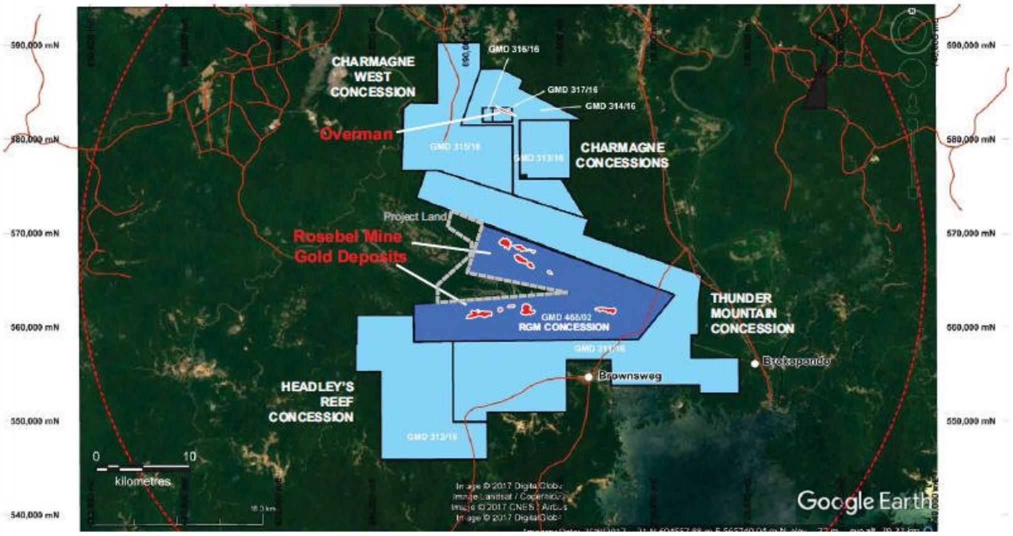
Rosebel Gold Mine

Brokopondo District, Suriname

Location Map

September 2017

Source: Nations Online, 2017.


590,000 mN
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540,000 mN
CHARMAGNE
WEST
CONCESSION
GMD 316/16
GMD 317/16
GMD 314/16
Overman
GMD 315/16
GMD 313/16
CHARMAGNE
CONCESSIONS
Project Land
Rosebel Mine
Gold Deposits
GMD 468/02
RGM CONCESSION
GMD 311/16
THUNDER
MOUNTAIN
CONCESSION
Brokopondo
Brownsweg
HEADLEY'S
REEF
CONCESSION
GMD 312/16
0
10
kilometres
Image © 2017 DigitalGlobe
Image Landsat / Copernicus
Image © 2017 CNES / Airbus
Image © 2017 DigitalGlobe
Google Earth

Figure 4-2

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Rosebel Mine
RGM Concession and
Exploration Concessios

September 2017

Source: Google Earth/IAMGOLD, 2017.

MINING PERMIT

The rights to the Rosebel mine property were initially held through a Right of Exploration (ROE) granted by the Ministry of Natural Resources, valid and renewable for two-year periods. The ROE was renewed and extended for two years as from February 25, 2002, in favour of Golden Star. On May 16, 2002, Golden Star assigned, conveyed, and transferred its Gross Rosebel ROE to RGM. Finally on December 16, 2002, RGM was granted a 25-year renewable Right of Exploitation for the Rosebel mine from the Republic of Suriname, following the Government's approval of the updated feasibility study and environmental impact assessment.

In addition to the 5% interest in RGM, the Republic of Suriname receives, through a Government owned company, a 2% fixed royalty of production paid in-kind. Further, RGM pays an excess royalty of 6.5% in case of gold price is in excess of US$425/oz. Royalties on production are also paid out to EURO Resources S.A. The royalty is applicable to the first seven million ounces of gold produced, with payments based on 10% of the excess gold market price above US$300 per ounce for soft and transitional ore, and above US$350 per ounce for hard rock ore, after deduction of royalties to the Republic of Suriname.

The Republic of Suriname also collects various taxes and duties as specified by the Mineral Agreements and its Amendments, Mining Code, and the applicable Tax Laws, such as corporate taxes, payroll taxes, consent and static rights, as well as surface rights.

EXPLORATION PERMITS

The RGM concession is surrounded by seven ROEs which currently cover a total area of 797.51 km^2 and by Project Lands covering a total area of 10.2 km^2 (Figure 4-2).

Two exploration concessions are directly adjacent to the RGM concession and include Headley's Reef and Thunder Mountain concessions which were in the past renewed in favour of Golden Star and thereafter assigned, conveyed and transferred to RGM simultaneously with the RGM concession. The total area of the two ROEs is 424.15 km^2 and surrounds the RGM concession.

The Overman project is located within the Charmagne property, located about 12-15 km north of RGM concession. The Charmagne property consists of four concessions that involve two companies: Charmagne Mining Company who was the registered owner of three ROEs and

LEF Resources who was the registered owner of one ROE. RGM negotiated the option to acquire 100% interest in the mineral rights of the two companies and option agreements were signed in January 2008. The options were exercised by RGM and duly filed with the relevant Government Authorities, followed by issuance of rights of exploration to RGM as mentioned under the Second Amendment.

Another ROE has been granted to RGM directly to the west of the Charmagne property and is referred to Charmagne West.

Information related to the exploration concessions are listed in Table 4-1. The Minister of Natural Resources has recently re-issued the seven exploration rights as agreed in the Second Amendment 2013. The seven ROEs are in good standing and valid till August 2020 subject to two extensions of two years as provided in the Mining Decree 1986 of the Republic of Suriname.

TABLE 4-1 EXPLORATION PERMIT DETAILS

Concession Name	GMD no.	Expiry Date (date of validity)	Surface Area (ha)	Surface Area (km ^{2})
ROSEBEL MINE Area				
Gross Rosebel Mine	Exploit. Conc. GMD 468/02	2027-12-16	17,000	170.00
		Total	17 000	170.00
Thunder Mountain	Explor. Conc. GMD 311/16	2020-08-25	28,850	288.50
Headley's Reef	Explor. Conc. GMD 312/16	2020-08-25	13,565	135.65
		Total	42,415	424.15
CHARMAGNE Property				
Charmagne - LEF	Explor. Conc. GMD 317/16	2020-08-25	300	3.00
Charmagne 1	Explor. Conc. GMD 314/16	2020-08-25	5,831	58.31
Charmagne 2	Explor. Conc. GMD 313/16	2020-08-25	3,281	32.81
Charmagne - Anjoemara	Explor. Conc. GMD 316/16	2020-08-25	156	1.56
		Total	9,568	95.68
CHARMAGNE WEST Property				
Charmagne West	Explor. Conc. GMD 315/16	2020-08-25	10,768	107.68
		Total	10,768	107.68
		TOTAL SURFACE	**79,751**	**797.51**

The Mining Decree 1986 of Suriname states that, exploration concessions are held for a maximum of seven years (an initial term of three years, a first extension of two years, and a second extension of two years). After the initial three years, 25% relinquishment is required followed by 25% in the subsequent extension and then a final relinquishment after the 7 th year. Some exploration concessions are currently in the renewal process. The Mining Decree 1986 gives the ROE holder the exclusive right to explore for the minerals requested on the surface and subsurface within the boundaries of the exploration concession.

The Mining Decree 1986 of Suriname also provides for the holder of the ROE to apply for a Right of Exploitation.

The different ROEs fall also within the Area of Interest or the new Unincorporated Joint Venture (UJV) area as defined in The Second Amendment of the Mineral Agreement with the Republic of Suriname of June 6, 2013. The Second Amendment establishes a UJV vehicle under which RGM holds a 70% participating interest and the Republic of Suriname could acquire a 30% participating interest on a fully-paid basis, via a fully owned designated company.

SURFACE RIGHTS

Surface rights in the area of the Gross Rosebel Mining Concession belong to the Republic of Suriname. Utilization of the surface rights is granted by the RGM concession under certain conditions. All the annual fees and taxes relating to Gross Rosebel and other ROEs have been paid to date and the concessions are in good standing.

PERMITTING REQUIREMENTS AND STATUS OF PERMITS

The Right of Exploitation of the RGM concession property is governed by the following major Instruments, Agreements, and National Laws:

1. The Instrument granting the Right of Exploitation to RGM under GMD no. 468/02
2. Approval Instrument issued by the Ministry of Natural Resources to transfer the Right of Exploration from Golden Star to RGM
3. The Second amendment to the Mineral Agreement, June 6, 2013
4. The Mineral Agreement April 7, 1994, as amended and supplemented on March 13, 2003
5. The Mining Decree of Suriname May 8, 1986

6. National Institute for Environment and Development in Suriname (NIMOS) for the Environmental and Social Impact Assessment (ESIA)

The Right of Exploration for Minerals are granted by the Ministry of Natural Resources subject to terms and conditions stipulated in the Mining Decree 1986. Following issuance of such a right the holder is required to file quarterly and annual reports with the Geological Mining Department (GMD).

Furthermore, the instrument granting the Right of Exploration enumerates all the conditions which need to be considered and complied with during the exploration phase. There are no specific pre-environmental requirements in this phase, however, the Right of Exploration stipulates that exploration activities should be conducted conform to Environmental standards of the World Bank.

DISCUSSION

Other than the royalty on the revenues from mineral production to the Republic of Suriname as well as royalties to EURO Resources S.A., IAMGOLD is not aware of any royalties, back-in rights, payments, or other agreements and encumbrances to which the property is subject.

IAMGOLD is not aware of any environmental liabilities on the property. IAMGOLD has all required permits to conduct the proposed work on the property. IAMGOLD is not aware of any other significant factors and risks that may affect access, title, or the right or ability to perform the proposed work program on the property.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

TOPOGRAPHY, ELEVATION, AND VEGETATION

The physical geography of Suriname is divided into three areas: the Coastal Plain, the Savannah Belt, and the Guiana Shield. The Guiana Shield comprises approximately 80 to 85% of the total land area of Suriname, and extends into French Guiana to the east, Brazil to the south, and Guyana, Columbia and Venezuela to the west. RGM is located within the Guiana Shield.

The Guiana Shield is mostly low-lying (below 250 m) and hilly (with discrete ranges reaching 1,200 metres above sea level (MASL). Most of Guiana Shield is pristine and covered with dry land forest, except where poor soil or repeated burning of the vegetation have led to the creation of savannas.

ACCESS AND PROXIMITY TO POPULATION CENTRES

There are presently two access routes from Paramaribo to the Rosebel project. One route utilizes a 30 km paved road which connects Paramaribo to Paranam. From Paranam, a paved road courses south following the Afobaka road. From there an unpaved road travels south and west to reach the property. The other route is a paved road which connects Paramaribo to the international airport at Zanderij. A newly paved road connects Zanderij to the Afobaka road halfway between Paranam and Afobaka. The route then follows the Afobaka, Brownsweg, and Nieuw-Koffiekamp roads until reaching the property access road. Travel distance for both routes from Paramaribo is approximately 100 km.

CLIMATE AND LENGTH OF OPERATING SEASON

The climate of Suriname is classified as tropical, i.e. warm during the entire year with the mean temperature of the coldest month being higher than 20°C. The average monthly rainfall is greater than 60 mm in the driest month(s). Like much of Suriname, the Rosebel property is characterized by consistently warm temperatures and high humidity with little seasonal variation.

Suriname weather is dictated mainly by a north-east and south-east wind called the Inter-Tropical Convergence Zone (“ITC” zone, also known as the “Equatorial Trough”). The ITC zone passes over Suriname twice a year and results in four seasons:

- Late February to late April, a short dry season;
- Late April to mid-August, a long rainy season;
- Mid-August to early December, a long dry season;
- Early December to late February, a short rainy season.

Weather data is collected on the Rosebel property on a regular basis since 2003 using a manual weather station (Old Camp) and since 2005 using an automated weather station (tailings area).

Based on Old Camp data from 2004 to 2016, the average annual precipitation was estimated to be 2,288 mm per year, while the mean annual temperature for Rosebel is 25.0°C. The daily fluctuation in temperature in the interior of Suriname, including the Rosebel area, is approximately 10 to 12°C. The average monthly relative humidity at Rosebel ranges from 84.8% in February to 93.5% in June, with an annual average of 89%. This relative humidity trend results from rainfall and temperature changes.

The most common wind direction is from the east (approximately 20% of the time) followed by the south-east (approximately 9% to 14% of the time). Based on data, the Rosebel site does not experience sustained strong winds, i.e. hourly average wind speeds greater 5.0 m/s. The most common wind speed range is 1.0 m/s to 2.5 m/s.

SURFACE AREA AND PHYSICAL RESOURCES

The Rosebel area currently hosts the small village of Nieuw-Koffiekamp, located approximately 2 km from the old exploration base camp and about 1 km from the Royal Hill pits. The village consists of approximately 500 permanent inhabitants belonging primarily to the Maroon group, who are descendants of African slaves.

The economy of the village remains dependent on the Surinamese coastal economy. Main activities include subsistence agriculture on relatively poor land, small-scale gold mining, forestry, and trade.

The village, originally named Koffie Kamp, relocated to its present site in 1964 when the previous site was flooded as a result of the development of the Brokopondo hydroelectric project. Relations between the project management and the villagers have occasionally been strained due primarily to the conduct of illegal mining activities on the Rosebel property by the villagers and others.

Other than the road between Paramaribo and the mine site, the local infrastructure consists of site roads that include access from the main gate to the camp, pits, tailing area, the process plant area, and administration building area. These roads are constructed using laterite and are typically between 10 m and 30 m wide, depending on the equipment in use. Culverts are installed and ditching is installed to provide adequate drainage.

An existing airstrip with an approximate length of 1.2 km is used for emergency evacuation. The airstrip is located 6 km from the administration building.

The camp complex is located approximately 0.5 km to the south of the process plant and truck shop/administration building. The camp complex includes a kitchen, recreation area, camp offices, and different types of dormitories.

Miscellaneous outbuildings such as core storage, laboratories, security gates, lunchrooms, and solar panels are found throughout the concession.

6 HISTORY

OWNERSHIP, EXPLORATION, AND DEVELOPMENT HISTORY

Documentation on the history of gold production on the Rosebel property is fragmentary. Records were either not kept or, in most cases, have disappeared. Gold was first discovered in the area in 1879, when approximately 600 small scale miners were reported to be working on the property, and since that time approximately half of the recorded production of Suriname has been produced from the district.

Between 1885 and 1939, several large companies exploited alluvial material, surface deposits, and veins. Various methods of mechanized mining were tried, including dredges, stamp mills, and hydro-sluicing, with varying degrees of success. The larger companies eventually sub-leased concessions to miners, who continued exploitation using manual recovery methods. Some of the more prominent companies that operated in the area, and for which records still exist, are listed below.

Guyana Gold Placer Company operated dredges in Nieuw Foto and Groote Louis Kreeks of the Koolhoven area circa 1910. That company sub-leased some ground in the Koolhoven area to an American group, who underground-mined on a series of quartz veins up to 5 m wide. Production was said to include a “nugget” of nearly eight ounces.

De Jong Brothers owned the Royal Hill area, which was mined manually by adits, shafts, and open cuts during the 1920’s and early 1930’s. Records indicate that from 1924 to 1933 the average output was 1,600 ounces of gold a year.

White Water Mines Ltd. acquired the aforementioned area from De Jong in 1935. Widespread veins were mined by shafts and adits, ore being carried to a central mill by narrow-gauge railway. Production ceased in 1939, at the start of the Second World War, and no record is available.

Van Emden Gold Mines Ltd. operated three mines in the area in the 1930’s: Mayo, Koolhoven, and Donderbari. These were the best-planned, operated, and capitalized operations to date, using large-size ball and stamp mills and extensive narrow-gauge railway systems.

The Suriname Government, who operated the deposit intermittently from 1950 to 1952, reports some production from Royal Hill. Since that time, several companies or individuals have carried out resource estimations on the Rosebel gold deposits, to various levels of reliability.

SURPLACER – 1976

In 1974, the present property was granted to Surplacer, a joint venture between Placer Development Ltd. (Placer) of Vancouver, and the Surinamese Government. The exploration program identified several kilometre-long gold anomalies, located along two major trends, one in the North and the other in the South of the area. Detailed follow-up work, involving 900 hand auger holes, 4 km of bulldozer trenches and 43 reverse circulation (RC) drill holes, partially delineated surficial and near-surface gold mineralization: the Royal Hill, Mayo, and Rosebel areas in the south and Pay Caro in the north. When Placer terminated the joint venture and left Suriname in 1977, the resource estimate indicated nearly 700,000 ounces of gold.

GRASSALCO – 1984

On July 26, 1979 the Rosebel property was awarded to NV Grassalco (Grassalco), which carried out a new resource estimate using 1,500 hand auger holes, and excluded the Placer data. Grassalco was forced to abandon operations in the middle of 1985, due to an unstable political situation.

SMITH – 1987

The last work performed in respect of the Rosebel property and prior to its acquisition by Golden Star Resources Ltd. (Golden Star), was a Ph.D. thesis by I.H. Smith, of the University College of Cardiff, Wales in 1987. That thesis evaluated resources from several gold deposits in Suriname using a statistical interpretation of results.

OWNERSHIP

Golden Star acquired the Right of Exploration (ROE) to the Rosebel property pursuant to a Preliminary Mineral Agreement between Golden Star, Grassalco, and the Government of Suriname dated May 8, 1992. The 1994 Mineral Agreement between Golden Star, Grassalco, and the Government of Suriname was signed on April 7, 1994 and replaced the 1992 agreement; in accordance with the 1994 Mineral Agreement, Golden Star was granted the ROE for the Rosebel property for five years.

Golden Star entered into an agreement with Cambior Inc. (Cambior) on June 7, 1994, granting Cambior the option to earn an undivided 50% of Golden Star's interest in the 1994 Mineral Agreement and the Rosebel property. This agreement provided that Cambior shall exercise its option by funding approximately $6.1 million in exploration and development expenditures on the Rosebel property by June 30, 1996.

A Feasibility Study and an Environmental Impact Statement were filed with the Government of Suriname in May 1997. Following additional drilling on the property, a revised Feasibility Study was submitted to the Government of Suriname in December 1997. In 1998, 1999, and 2000, the Rosebel Project remained on care and maintenance.

In December 2000, a Pre-feasibility Study was delivered to the Ministry of Natural Resources covering only the mining and processing of the soft rock and transition ore portions of the Rosebel deposits, then reducing the project's estimated capital expenditures to $80 million from the $175 million contemplated in the original 1997 Feasibility Study. The Feasibility Study completed in August 2002 replaces both the November 1997 and December 2000 studies.

On October 26, 2001, Cambior agreed to acquire Golden Star's 50% interest in the Rosebel property. Golden Star agreed to sell its 50% interest in Rosebel for a cash consideration of $8 million and a gold price participation right on future production from Rosebel; $5 million was paid at closing (May 2002) and the remainder in three equal installments were paid over a three-year period. Under its gold price participation right, Golden Star would receive a quarterly payment of an amount equal to 10% of the excess, if any, of the average quarterly market price above $300 per ounce for gold production from RGM's soft and transitional rock portions and above $350 per ounce from RGM's hard rock portion, up to a maximum of seven million ounces produced. In addition, Golden Star transferred its rights in the Headley's Reef and Thunder Mountain exploration properties adjacent to Rosebel.

Commercial production at Rosebel Gold Mines began in February 2004. In 2004, Golden Star sold the royalty interest in production at the Rosebel property to Euro Resources SA (Euro Resources - formerly Guyanor Resources SA).

In November 2006, IAMGOLD acquired a 100% interest in Cambior (the previous owner of RGM, thereby acquiring 95% of RGM.

In December 2008, IAMGOLD acquired 84.55% of the current share capital of Euro Resources.

In June 2013, IAMGOLD, RGM, Grasshopper Aluminum Company N.V., and the Republic of Suriname executed the Second Amendment to the Mineral Agreement. The Second Amendment created a new Unincorporated Joint Venture vehicle (UJV) in which the Republic of Suriname would hold, through NV1, a wholly owned subsidiary of the Republic, a paid 30% interest and RGM would hold a 70% interest. Under the terms of the Second Amendment, NV1 has been granted an option to acquire an increased interest in production from the RGM concession if RGM approves a Significant Expansion of the existing mill and if NV1 elects to participate in the Significant Expansion by funding 30% of the capital required for the expansion. A Significant Expansion is defined in the Second Amendment as an increase in the milling capacity of the Rosebel mill of three million milled tonnes per annum (MTPA) or as otherwise agreed by the UJV partners, NV1, and RGM. At the present time, RGM has not approved a Significant Expansion and the UJV partners are not actively evaluating a potential Significant Expansion of the Rosebel mill.

In December 2015, IAMGOLD announced the closing of a simplified tender offer for Euro Resources through the Euronext Paris exchange. At the closing of the simplified tender, in conjunction with purchases made by IAMGOLD through the facilities of the Euronext Paris exchange since the submission of the draft offer to the French Autorité des Marchés Financiers, IAMGOLD owns and controls approximately 90% of the outstanding common shares of Euro Resources.

PAST PRODUCTION

Table 6-1 summarizes production from 2004 through 2016.

TABLE 6-1 PAST PRODUCTION

		Total	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ore	Mt	146.3	6.3	6.9	7.0	7.8	8.9	12.4	13.4	13.3	14.1	13.6	13.9	14.1	14.7
Grade	g/t		1.73	1.57	1.40	1.27	1.26	1.22	1.05	0.98	0.97	0.89	0.80	0.74	0.78
Waste	Mt	469.6	10.6	15.1	21.6	28.2	35.5	41.0	38.9	39.8	43.1	47.8	49.2	49.4	49.4
Total	**Mt**	**615.9**	**16.9**	**21.9**	**28.6**	**36.0**	**44.4**	**53.4**	**52.3**	**53.1**	**57.2**	**61.4**	**63.1**	**63.5**	**64.1**
Strip Ratio		3.2	1.7	2.2	3.1	3.6	4.0	3.3	2.9	3.0	3.1	3.5	3.6	3.5	3.4
Milled	Mt	135.5	5.1	7.2	7.7	7.5	8.3	11.1	12.8	12.9	12.8	12.3	12.9	12.3	12.6
Ounces Produced	‘000 oz	4,508	282	339	300	277	331	412	416	406	401	386	344	302	312

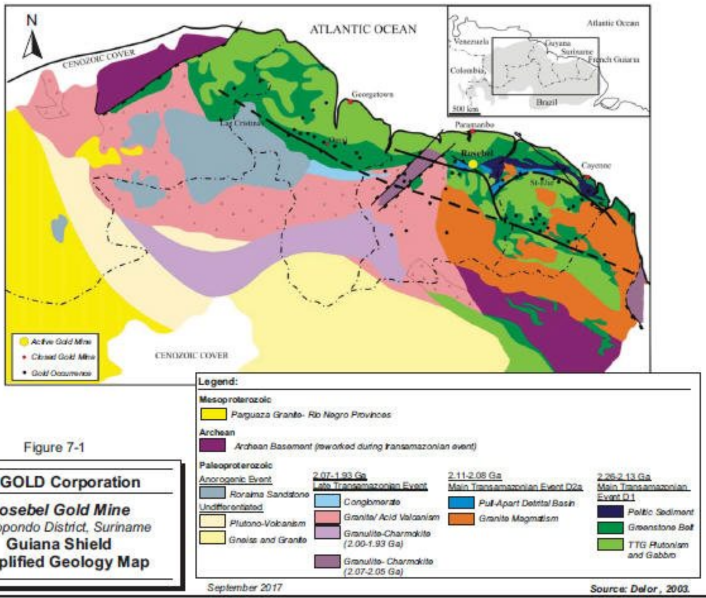
7 GEOLOGICAL SETTING AND MINERALIZATION

REGIONAL GEOLOGY

The RGM concession lies within a greenstone belt of the Paleoproterozoic Guiana Shield which stretches from the Amazon River in Brazil to the Orinoco River in Venezuela and covers an area of more than 900,000 km ^{2} . Most of the rocks of the Guiana Shield have been formed during the Paleoproterozoic Transamazonian or Late-Transamazonian orogeny. In its general distribution, the Proterozoic part of the Guiana Shield shows a south-westward younging of units with: tonalite-trondjhemite-granodiorite (TTG) greenstone belt to the North, granitoid succession mainly in the central part, and Late Paleoproterozoic to Mesoproterozoic volcanic, intrusive, and sedimentary rocks in the southernmost part (Figure 7-1). The geological evolution of the Guiana Shield is divided in four distinct stages which are either related to formation or reworking of in-place rocks. The four stages are: Formation of the Archean basement – Main Transamazonian orogeny – Late Transamazonian orogeny – subsequent Proterozoic and Paleozoic anorogenic events.

The main Transamazonian orogeny (D1), constrained between 2.26-2.08 Ga, consisted of a crustal growth event that generated the TTG – greenstone belts found North of the Guiana Shield. The evolution of the orogeny has led to the development of strike-slip structures forming pull-apart basins along the North Guiana Trough. The lithostratigraphic succession of the greenstone belts is defined by:

- a lower unit of oceanic tholeitic basalts overlain by
    - mainly calc-alkaline volcanic suite including felsic to mafic members, and
    - various types of sedimentary rocks such as greywacke, pelite, chert, and conglomerate.


N
ATLANTIC OCEAN
CENOZOIC COVER
Atlantic Ocean
Venezuela
Guyana
Suriname
French Guiana
Colombia
Brazil
500 km
Georgetown
Las Cristinas
Omai
Paramaribo
Rosebel
Cayenne
St-Elie
CENOZOIC COVER
Active Gold Mine
Closed Gold Mine
Gold Occurrence
Legend:
Mesoproterozoic
Parguaza Granite- Rio Negro Provinces
Archean
Archean Basement (reworked during transamazonian event)
Paleoproterozoic
Anorogenic Event
Roraima Sandstone
Undifferentiated
Plutono-Volcanism
Gneiss and Granite
2.07-1.93 Ga
Late Transamazonian Event
Conglomerate
Granite/ Acid Volcanism
Granulite-Charnockite (2.00-1.93 Ga)
Granulite- Charnockite (2.07-2.05 Ga)
2.11-2.08 Ga
Main Transamazonian Event D2a
Pull-Apart Detrital Basin
Granite Magmatism
2.26-2.13 Ga
Main Transamazonian Event D1
Pelitic Sediment
Greenstone Belt
TTG Plutonism and Gabbro

September 2017

Source: Delor , 2003.

Figure 7-1

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Guiana Shield
Simplified Geology Map

In Suriname, sedimentary and volcanic units of the greenstone belt are grouped into the Marowijne Supergroup which is divided itself into two formations: the Paramaka Formation and the Armina Formation. The Paramaka Formation is constituted of volcanic rocks, whereas the Armina Formation is constituted of flysch sequences represented by greywacke, mudstone, and conglomerate. The volcanic succession is associated in time and space to TTG plutonism.

In Suriname the plutonic and volcanic rocks are unconformably overlain by the upper detrital series of the Rosebel Formation which consists of arenitic quartz-rich sequences interlayered with conglomerates. This sedimentary sequence is interpreted as being deposited in the intracontinental pull-apart basins during the latest stages of the Main Transamazonian Orogeny between 2.11 Ga and 2.08 Ga. Synchronously with the formation of those basins, granitic magmatism took place in the eastern part of the Guiana Shield (Suriname, French Guiana, and Brazil).

The whole Guiana Shield has undergone prolonged chemical weathering, reflecting a humid, tropical paleo-climate that may have started as far back as the Cretaceous period. The chemical weathering has produced a laterite/saprolite profile which locally reaches up to 100 metres below surface. In the Rosebel area, fresh rock can be observed around 30 m depth in valleys, where the water table is less affected by seasonal fluctuations. The thick cover of rain forest vegetation has protected the soil from erosion, and the thin soil profile is generally preserved. The chemical effects of the deep weathering include leaching of mobile constituents (alkali and alkali earths), partial leaching of SiO_2 and Al_2O_3, formation of stable secondary minerals (clays, Fe-Ti, and Al-oxides), mobilization and partial precipitation of Fe and Mn, and concentration of resistant minerals (zircon, magnetite, and quartz).

PROPERTY GEOLOGY

The Rosebel deposits are hosted by a volcano-sedimentary sequence of the Marowijne Supergroup and by the overlying detrital sedimentary sequence of the Rosebel Formation. Five types of rocks are distinguished on the property: felsic to mafic volcanic rocks, flysch sequence, arenitic sedimentary rocks, felsic intrusion, and late diabase dykes. Economical gold mineralization has been recognized in sedimentary and volcanic rocks while the intrusion only shows rare gold occurrences and the late diabase dykes are devoid of any mineralization.

The regional metamorphism is restricted from low-greenschist to greenschist facies. The main regional fabric varies from east-west in the Southern part of the property to WNW-ESE to the North and follows the regional tectonic grain as seen on the aeromagnetic survey of the area (Figure 7-2). Two phases of deformation are recognized on the property. The first one has affected the older volcanic rocks only, while the second phase of deformation has affected the volcanic rocks and both sedimentary sequences. The veins show no signs of deformation and so the mineralization is interpreted as being emplaced during the latest stage of the last deformation event (Daoust *et al* ., 2011).

Volcanic rocks are found to the north and in the southern part of the mining concession. In the southern part they surround the tonalite intrusion (Brinks intrusion), while in the northern part, up to Charmagne concession, they form bands a few kilometres thick alternating with the sedimentary rocks of the Armina Formation (Figure 7-3).

The arenitic sequence of the Rosebel Formation forms the central sedimentary basin which unconformably overlays the volcanic rocks. The whole sequence is folded into a syncline and is crosscut by several major faults (Figure 7-4). On the eastern part of the concession (near the Rosebel deposit) the rocks are intruded by three post mineralization north-south diabase dykes, pertaining to the Permo-Triassic Apatoe dyke swarm.

Three mineralized domains are found on the property: the North, Central, and South domains. The northern domain includes the J Zone and Koolhoven deposits along a trend to the north of the volcanic rocks and the Pay Caro-East and Pay Caro deposits along a trend south of the volcanic rocks. The two trends follow a WNW-ESE orientation. The central domain only includes one deposit, Rosebel, which is striking east-west. The southern domain is also striking east-west and hosts the Mayo, Roma, and Royal Hill deposits.

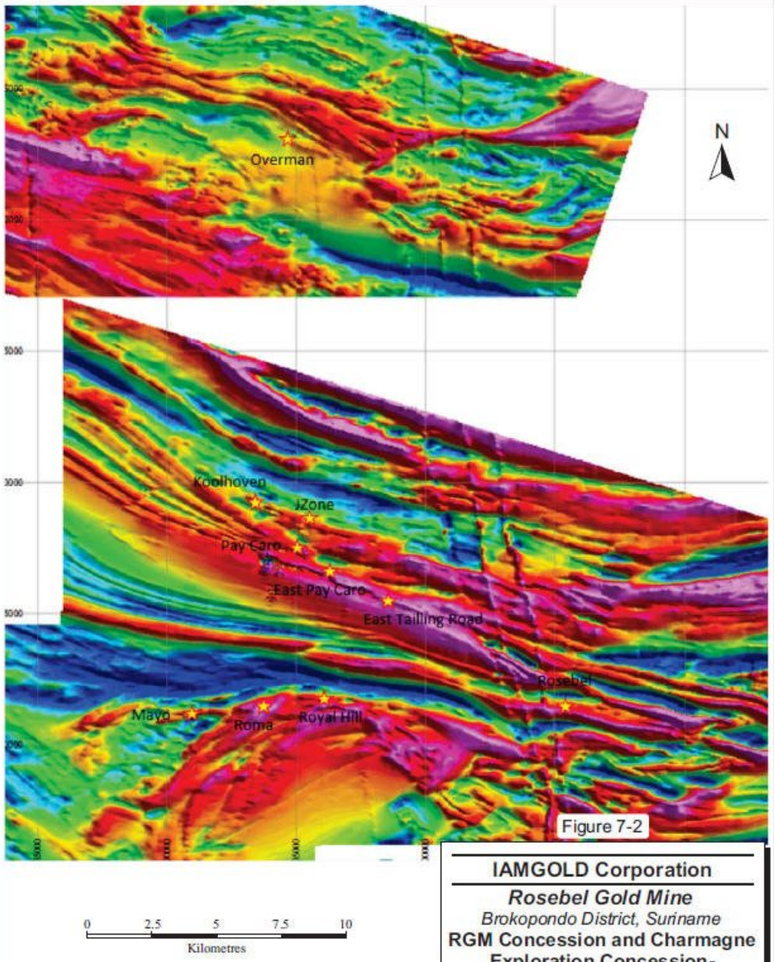

N
Overman
Koolhoven
JZone
Pay Caro
East Pay Caro
East Tailling Road
Rosebel
Mayo
Roma
Royal Hill
0
2.5
5
7.5
10
Kilometres

Figure 7-2

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

RGM Concession and Charmagne Exploration Concession-Airborne Magnetic Survey

September 2017

Source: IAMGOLD, 2017.

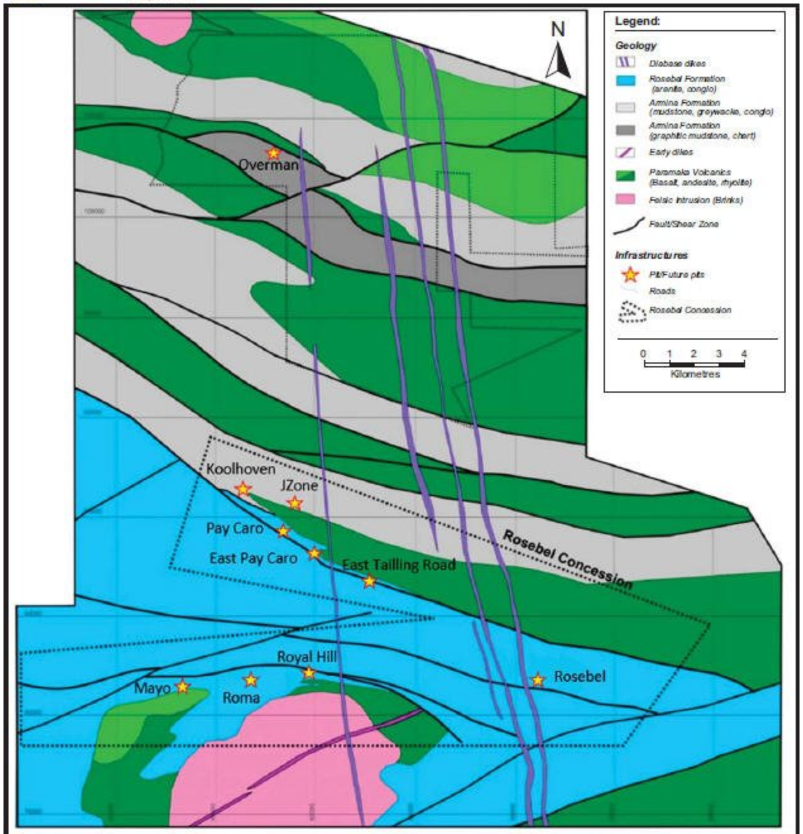

N
Legend:
Geology
Diabase dikes
Rosebel Formation (arenite, conglo)
Armina Formation (mudstone, greywacke, conglo)
Armina Formation (graphitic mudstone, chert)
Early dikes
Paramaka Volcanics (Basalt, andesite, rhyolite)
Felsic Intrusion (Brinks)
Fault/Shear Zone
Infrastructures
Pit/Future pits
Roads
Rosebel Concession
0 1 2 3 4
Kilometres
Overman
Koolhoven
JZone
Pay Caro
East Pay Caro
East Tailling Road
Rosebel Concession
Royal Hill
Mayo
Roma
Rosebel

Figure 7-3

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
RGM Concession and Charmagne Exploration Concession-Geological Map

September 2017

Source: IAMGOLD, 2017.

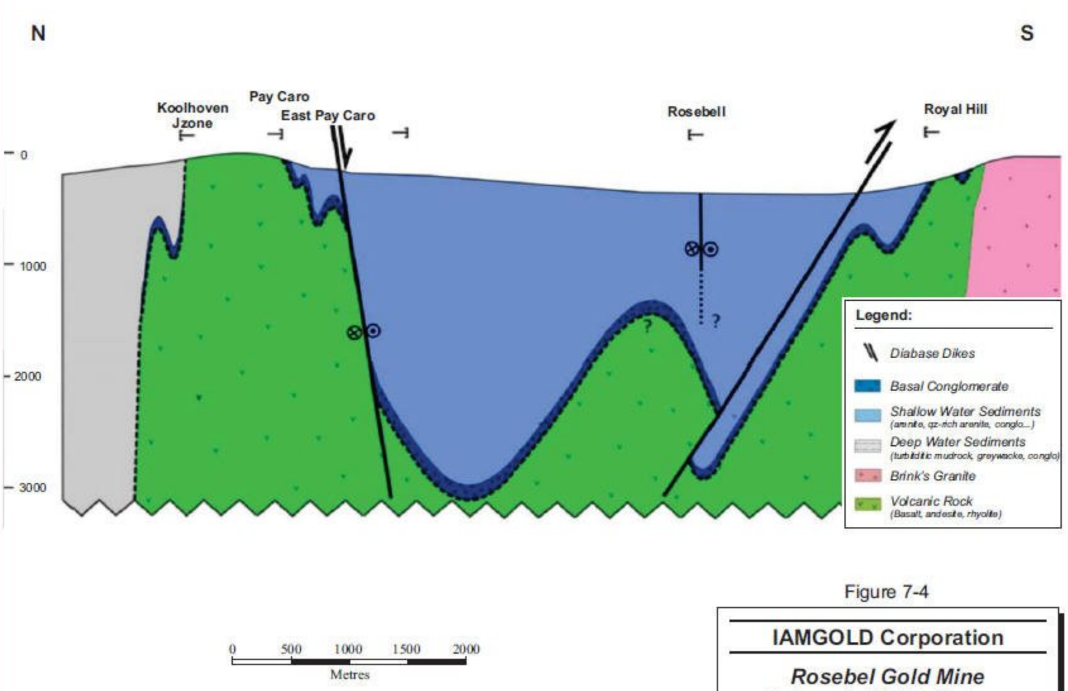

N
S
Koolhoven
Jzone
Pay Caro
East Pay Caro
Rosebell
Royal Hill
0
1000
2000
3000
?
?
?
Legend:
Diabase Dikes
Basal Conglomerate
Shallow Water Sediments
(arenite, qz-rich arenite, conglo...)
Deep Water Sediments
(turbiditic mudrock, greywacke, conglo)
Brink's Granite
Volcanic Rock
(Basalt, andesite, rhyolite)
0
500
1000
1500
2000
Metres

Figure 7-4

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Rosebel Property
N-S Geological Cross Section

September 2017

Source: Daoust, C., 2016.

LITHOLOGY

As shown on the stratigraphic columns of Figure 7-5, the base of the stratigraphic sequence consists of volcanic rocks which are present in every deposit except Rosebel. The volcanic rocks have a wide range of composition including basalt, andesite, rhyolite, and felsic to intermediate tuff. Intermediate to mafic volcanic are the more abundant rocks and are found throughout the property, while rhyolite and felsic tuff are restricted to the south part of the property. Andesite and basalt generally show an aphanitic texture and form massive flow or occasionally pillow lavas. Primary textures and mineralogy are not well preserved in the mafic-intermediate volcanic rocks, which commonly show a strong carbonate and chlorite alteration. The rhyolite has a typical aphanitic glassy aspect and forms massive flow or flow breccias. The tuffs are usually very fine grained with a massive or laminated texture, locally showing millimetric quartz eyes or lapillis. The intrusion present in the southern part of the property has a mineralogy represented by a quartz-plagioclase-biotite assemblage, where equigranular texture is dominant, with crystals generally of 3 to 5 mm width. The contact between the intrusion and the volcanic rock is intrusive while the contact with the sedimentary rocks of the Rosebel Formation is depositional. Overall, the intrusive rock doesn’t exhibit a deformation fabric, but shear zones are observed locally. Some metric quartz-carbonate-tourmaline-pyrite veins are observed in association with the shear zones, but those veins are generally barren; only a few low gold values have been found within the intrusion in association with veinlets and minor veins of quartz.

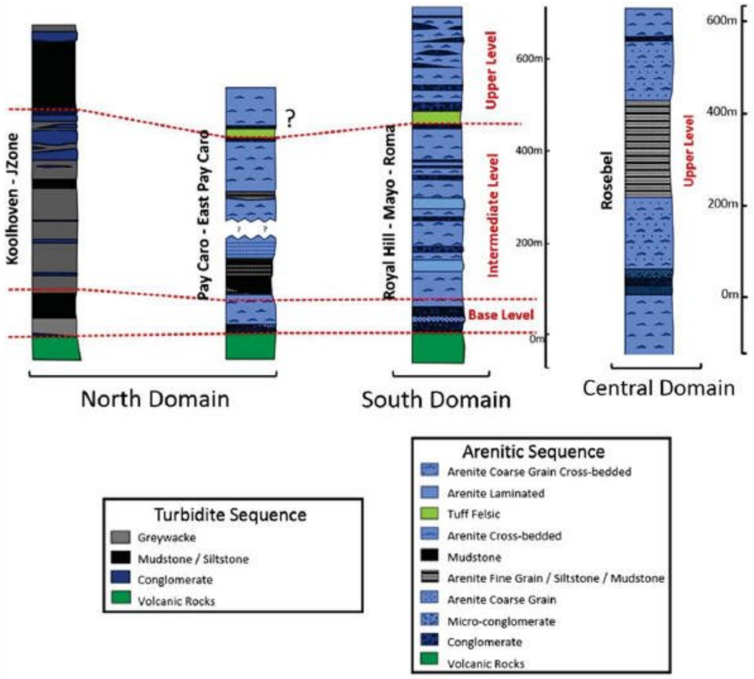

Koolhoven - JZone
Pay Caro - East Pay Caro
?
Royal Hill - Mayo - Roma
Upper Level
Intermediate Level
Base Level
600m
400m
200m
0m
Rosebel
Upper Level
600m
400m
200m
0m
North Domain
South Domain
Central Domain
Turbidite Sequence
Greywacke
Mudstone / Siltstone
Conglomerate
Volcanic Rocks
Arenitic Sequence
Arenite Coarse Grain Cross-bedded
Arenite Laminated
Tuff Felsic
Arenite Cross-bedded
Mudstone
Arenite Fine Grain / Siltstone / Mudstone
Arenite Coarse Grain
Micro-conglomerate
Conglomerate
Volcanic Rocks

Figure 7-5

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Rosebel Property
Stratigraphic Syntheses

September 2017 ***Source: Modified from Daoust, C., 2016.***

The turbidite sequence of the Armina formation forms a continuous kilometre-thick horizon striking WNW overlying the volcanic rocks in the northern part of the property. This assemblage is also found to the north of the property up to the Charmagne concession. The rocks consist of a thick pile of turbiditic mudstone, siltstone, and greywacke intercalated with conglomeratic units. The conglomerate units are present into the upper part (north of Koolhoven and J Zone) of this sedimentary sequence where they are laterally continuous on several kilometres. The conglomerate is polymictic and fragment composition includes mudstone, siltstone, chert, felsic to mafic volcanic rocks, and felsic intrusive. Those fragments are sub-rounded to sub-angular and have heterogeneous sizes varying from a few millimetres to centimetres. The apparent thickness of the flysch sequence on the property is about one or two kilometres, but since the sequence is tightly folded this thickness might be overestimated.

The arenitic sequence of the Rosebel Formation unconformably overlies the volcanic rocks. The contact between the sedimentary basin and the turbidite sequence, although locally faulted, is clearly depositional. The whole sedimentary sequence is characterized by the base level, intermediate level, and upper level. The base level and the intermediate level (Pay Caro, East Pay Caro, West Pay Caro, Mayo, Roma, and Royal Hill) are composed by arenitic sandstones interlayered with conglomerates, with local occurrences of finer grain siltstone/mudstone units. A compositional evolution is observed from the base to the top of the sequence where at the base of the sequence a poorly sorted lithic arenite (i.e. Royal Hill) evolve upward to a more mature quartz-rich arenite (i.e. Rosebel). Cross-bedding and laminations, commonly outlined by magnetite, are present in the whole sedimentary sequence, evocative of continental/shallow-water sedimentation. One or two conglomerate levels are systematically found at the base of the sequence. In the South domain the basal conglomerates tend to be monogenic and reflect the composition of underlying volcanic rocks. In the North domain the fragment composition of the basal conglomerate varies between mafic volcanic, quartz pebble, siltstone, mudstone, and chert, indicating various sources of sedimentation. Other levels of conglomerate are found within the arenitic sequence; those are more heterogeneous as demonstrated by the presence of different types of volcanic, sedimentary, and possibly intrusive rock fragments. The Upper level represents the sequence which starts with the tuff unit. This tuff unit is observed only in the south domain. Above the tuff unit the sediments are composed by layers of conglomerates and cross-bedded arenites. The Central Domain (Rosebel) lies on the top of the upper level of the arenitic sequence of the

Rosebel Formation where the sediments evolve from conglomerates to a more mature quartz-rich arenite and some fine arenite inter-bedded with siltstone / mudstone.

STRUCTURE

The RGM concession is marked by two major faults that have affected the volcanic and the sedimentary sequences. The fault present to the north is striking WNW-ESE and is interpreted as a dextral strike-slip shear zone which has undergone a late normal movement that has juxtaposed the volcanic units to the upper part of the sedimentary sequence of the Rosebel Formation. The fault present to the south is interpreted as a major reverse fault (Daoust *C* ., 2016). Two episodes of folding are recognized on the concession: the first phase of deformation (D1) has affected the volcanic rocks only, and is characterized by the development of an early fabric and ductile shear zones. The second phase (D2) is characterized by the development of the regional foliation, the presence of open to closed folds, and to the formation of the main faults. Folding related to this second phase of deformation shows various shape and type of folds. The folds located close to the main dextral shear zone tend to show a very steep plunge and a very tight closure coherent with a strike-slip movement on the fault. Those are mainly observed in the mudstone sequence of the North domain. The other fold types are recognized throughout the property and are characterized by a shallow to moderate plunge and more open shape. A regional fabric oriented east-west to WNW-ESE affects all rocks units and is assumed to be related to the D2 deformation event.

The South domain (Royal Hill) shows an alternation of slightly west or east plunging syncline and anticline forming a pattern similar to a dome and basin folding pattern. The mineralization (Royal Hill, Mayo, and Roma deposits) is distributed within the footwall of a major east-west shear zone. This shear zone is dipping 60°N in Royal Hill deposit, but tends to flatten going west, dipping less than 35°-45° in Mayo pit. The main shear zone marks the contact between the Rosebel Formation to the south and a thin lens of felsic tuffs to the north. The shear mainly affects the felsic tuffs in the hanging wall which display ductile deformation, as demonstrated by the presence of banded texture and extreme elongation of some lapillis. Those volcanic rocks are overlain by two units of conglomerate similar to the basal conglomerate found on the top of the volcanic basement. This sequence is interpreted as representing the stratigraphic equivalent of the volcanic unit present to the south, implying that those rocks have been brought to surface along a major reverse fault. Subsidiary shears are present in the footwall of this main structure and tend to be emplaced parallel to the lithological contacts where the bedding is north-dipping.

The North domain is formed of two mineralized trends; the South trend is located near, or at the contact between volcanic rocks and the Rosebel Formation (East Pay Caro and Pay Caro deposits), and the North trend is located in the Armina formation near the contact with volcanic rocks (Koolhoven and J Zone deposits). The areas show several folds plunging about 40° to the WNW, folding is apparent at the contact between the volcanic rocks and the arenitic sequence where it forms z-type parasitic folds in the South trend and s-type folding in the North trend. Those folds indicate the presence of an anticline between the two trends in which the volcanic rocks are outcropping. The North domain is crossed by a major structural break which has juxtaposed the older volcanic rocks to the upper levels of the arenitic sequence. The main shear is characterized by its abundance of quartz and its brecciated texture associated with a strong foliation developed in the highly chloritized and sericitized matrix. Based on a vein structural analysis, two movements are inferred to the main fault; the first one is a dextral strike-slip movement developed in a transpressional regime, while the second one is a normal movement with the south block going down. The first movement has been deduced from the presence of a set of north-south veins locally showing a sigmoid shape indicating the presence of a north-south compression. The second movement, normal, is based on the presence of a set of north-dipping veins.

Figure 7-6 presents the interpreted kinematic evolution of the whole property, integrating veining, faulting, and folding. This model implies the presence of a transpressional system associated to the onset of the mineralization during the latest stages of the main Transamazonian orogeny (Daoust *et al* ., 2011).

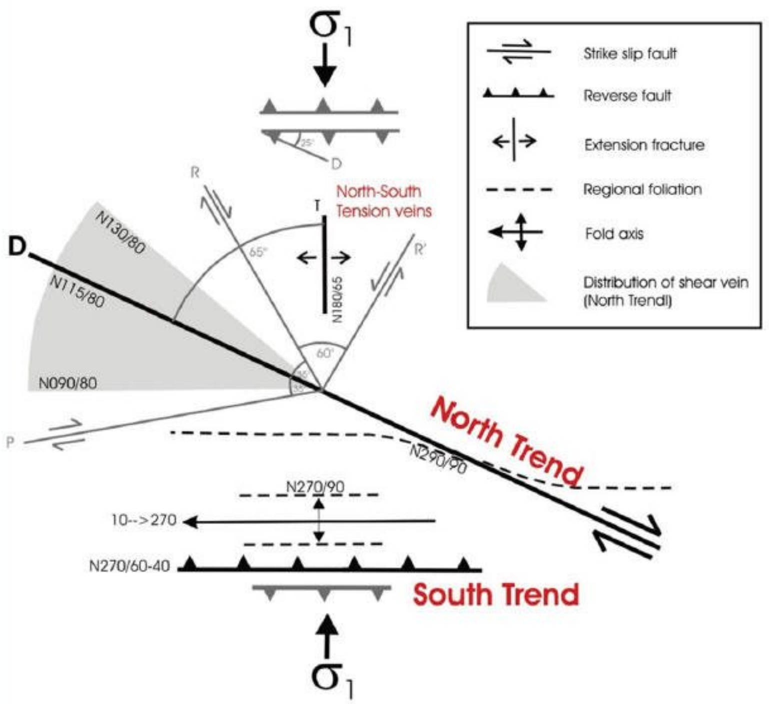

σ1
25°
D
R
North-South
Tension veins
T
N130/80
D
N115/80
65°
N180/65
R'
60°
N090/80
P
North Trend
N290/90
N270/90
10-->270
N270/60-40
South Trend
σ1
Strike slip fault
Reverse fault
Extension fracture
Regional foliation
Fold axis
Distribution of shear vein (North Trendl)

Figure 7-6

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Rosebel Property

Schematic Structural Syntheses

September 2017

Source: Daoust et al., 2011.

MINERALIZATION

A significant part of the lateritic cover is enriched in gold that has been remobilized from the underlying saprolite and rock by groundwater fluctuations. In the upper parts of the lateritic profile gold usually occurs as coarse grains of free gold often attached to goethite or hematite, or lining cubic voids left by the weathering of pyrite crystals. Nuggets up to 8 mm in diameter have been found lying on the surface after heavy rain. Extensive small scale mining over the years has created a significant amount of tailings and “dumps” still containing a fair amount of gold. Alluvial containing a considerable amount of gold is also found in every pit in production (Royal Hill, Pay Caro, Mayo, Koolhoven, Rosebel, and Roma).

Vein mineralogy consists of a quartz - carbonate - tourmaline – plagioclase – pyrite/pyrrhotite assemblage. However, the proportion of principal minerals and the nature of secondary and trace minerals vary between the North and South domains.

In the South domain, the common vein mineralogical assemblage is quartz + carbonate (calcite) + tourmaline ± chlorite ± sericite ± pyrrhotite ± pyrite where accessory mineral comprises sphalerite, plagioclase, and magnetite. Although tourmaline is not present in all veins, it can commonly reach more than 50% in some veins and it seems to be more abundant in the veins near the Brinks intrusion. Alteration aureoles are defined by the presence of chlorite, carbonate (mostly calcite), sericite, pyrrhotite and locally tourmaline and pyrite. As for tourmaline, pyrrhotite appears to be more abundant in the Royal Hill area than in Mayo area. In the North domain, the vein mineralogy consists of an assemblage of quartz + carbonate (calcite - ankerite) + plagioclase + hematite + chlorite ± sericite ± pyrite ± tourmaline. A zonation of vein mineralogy occurs at the deposit scale, with plagioclase and hematite constrained to the main shear zone, while all other minerals are distributed throughout the deposits. Pyrite occurs in concentrations of around 5% in the vicinity of highly mineralized zones, but is absent in domains devoid of gold. In contrast to the South domain, tourmaline and pyrrhotite are rare. Alteration selvages also record a deposit-scale zonation: near the main shear zone, host rocks are pervasively altered to a chlorite + sericite + plagioclase + hematite + carbonate ± pyrite assemblage. Alteration intensity decreases with distance from the main alteration zone to a distal alteration assemblage characterized by chlorite + carbonate (calcite).

VEIN GEOMETRY

Mineralization is hosted in both shear and tension veins which are tightly associated in space and time. The association of these two vein systems at Rosebel is a common aspect of orogenic gold deposits where tension veins form extensional fractures due to accommodating the deformation event. In terms of volume of gold and quartz, tension veins are more important at the Rosebel property, although shear veins also carry a considerable amount of gold (i.e. Pay Caro deposit) and play a primordial role for fluid circulation. All vein types display no sign of significant deformation, which indicates that they were emplaced during later deformation related to the Transamazonian Orogeny. Relation between veining and folding demonstrates that veining took place after folding and has commonly borrowed the pre-existent structures, the extensional fractures, or the rock heterogeneity. As a consequence, elements such as an anticline hinge, lithological contact and conglomeritic levels have provided good structural traps for fluids. The presence of a lithological contact (i.e. volcanic *vs* sediment) acts as a plane of weakness and thus leads to stratigraphic detachment that facilitates the onset of shear and tension veins. As well, the abundance of veins associated with conglomerates can be attributed to the contrasting competence between the conglomerates and surrounding finer grain rocks which are less competent. The conglomerates are mostly affected by brittle deformation and tend to crack and fill with mineralized fluids. Chemically, the lithological contrast between the sediment and volcanic rock composition has probably supplied an excellent chemical trap for gold precipitation as demonstrated by the fact that seven of eight deposits are located at/near a lithological contact.

The North and the South domains show disparity in veining style: one type of shear vein and three types of tension veins have been recognized in each domain (Figure 7-7 - South Domain, Figure 7-8 - North Domain, Figure 7-9 - Example of veins in the field).

In the South domain the shear veins are developed parallel to main shear zone and are in general confined to the footwall of this main structure. The texture of shear veins is usually banded with tourmaline alternating with quartz near the border of the vein. Vein thicknesses vary from a few decimetres to more than three metres. Disposition of shear veins systematically follows the bedding; in the Royal Hill area where rocks have been folded, shear veins are emplaced along the northern flank of anticlines and are dipping around 60°N. Going west to the Mayo deposit, the bedding is dipping around 40°N, and shear veins are flattened and follow this dip. The more important shear veins are emplaced along the contact between volcanic and sedimentary rocks or along conglomerates within the arenitic sequence. Shear veins in the North domain are sub-vertical to steeply dipping south and are oriented WNW-ESE. They are showing variability in structural style and intensity depending on their localization from the main shear zone. In Pay Caro, the shear veins can be several metres thick with a typical brecciated texture. They are associated to a strong fabric and an intense alteration envelop developed in the host rocks. In the Koolhoven and J Zone pits, where shears are more discrete, shear veins are usually centimetric to decimetric and are not associated with a well-developed fabric, nor to strong alteration aureoles.

The north-south tension veins are dipping between 60° and 75°W and are present throughout the property. Their chronological relationship with the other sets of veins has not been well established in the South Domain, but clear crosscutting relationships are evident in the Koolhoven pit and show as generally slightly earlier than the stacks of north-dipping veins. Analysis of their gold content demonstrates that they have the same gold distribution in terms of grade as the other sets of veins, and so, probably originate from the same mineralized fluids.

Two other sets of tension veins spatially associated to shear veins are present in the South domain; flat veins and north-dipping veins. Flat veins are present in the northernmost part of Royal Hill deposit and are developed into, or near conglomerate levels in the hinge of the anticline. Their emplacement is attributed to the presence of the anticline that has acted as a structural trap for fluids. The north-dipping veins are systematically associated in space with the shear veins and form stacks in the footwall or the hanging wall of the shear veins. In Royal Hill they are dipping around 20°-30°N, but going west to Mayo Pit, these stacks of veins are mostly sub-horizontal to slightly north-dipping since the shears are less steep than in Royal Hill area. Two distinct sets of tension veins are identified in the North domain as well: east-west sub-vertical veins and stacks of north-dipping veins. East-west veins are sub-vertical to steeply dipping to the north and are only found in Pay Caro deposit near the main shear zone.

These veins are interpreted to have utilized pre-existing weakness planes along the northern flanks of east-west orientated parasitic folds. North-dipping tension veins form WNW-ESE trending stacks dipping around 45° to the NNE in the nearby of shear veins and are related to the latest normal movement undergone by the fault zone (Figure 7-8).

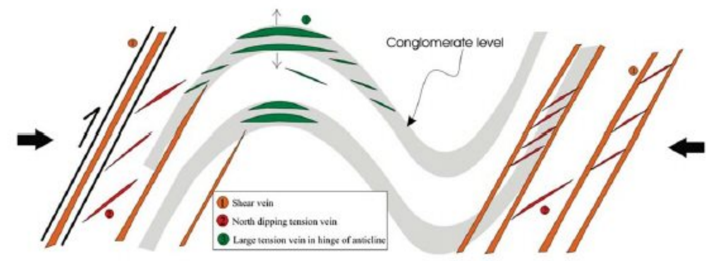

Conglomerate level
1 Shear vein
2 North dipping tension vein
3 Large tension vein in hinge of anticline

Figure 7-7: **South Domain - Schematic Representation of Vein Systems**

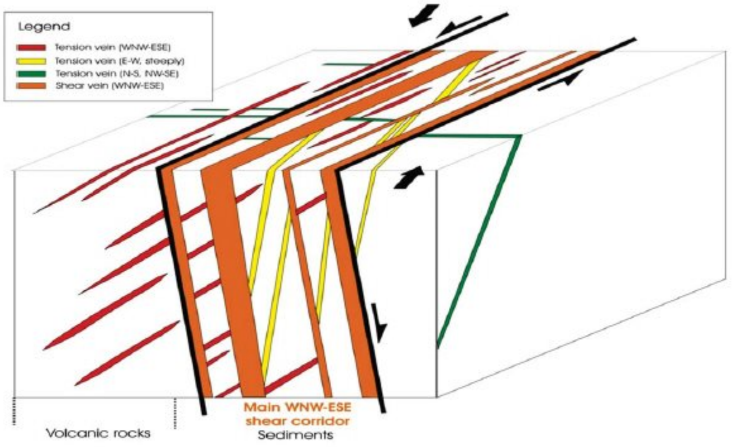

Legend
Tension vein (WNW-ESE)
Tension vein (E-W, steeply)
Tension vein (N-S, NW-SE)
Shear vein (WNW-ESE)
Main WNW-ESE
shear corridor
Volcanic rocks
Sediments

Figure 7-8: **North Domain - Schematic Representation of Vein Systems**

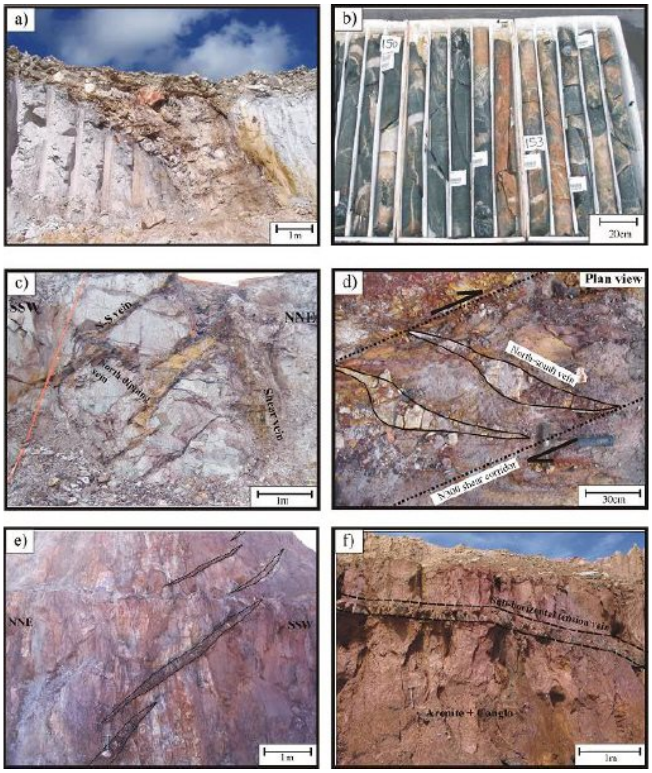
IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Schematic Representation of Vein Systems

September 2017

Source: IAMGOLD, 2017.

FIGURE 7-9 EXAMPLES OF VEIN SYSTEMS


a)
1m
b)
150
153
20cm
c)
SSW
N-S vein
NNE
North dipping vein
Shear vein
1m
d)
Plan view
North-south vein
N300 shear corridor
30cm
e)
NNE
SSW
1m
f)
Sub-horizontal tension vein
Arenite + Conglo
1m

a) north-dipping shear vein - South domain, b) brecciated hematite-rich shear vein - Pay Caro c) association of north-south and north dipping tension veins - North domain, d) north-south veins with sigmoidal shape indicative of dextral movement on the strike-slip fault in the North domain, e) stack of north-dipping veins in the North domain, f) flat tension vein hosted.

8 DEPOSIT TYPES

SOUTH DOMAIN

The South domain includes the Mayo, Roma, and Royal Hill deposits. The local geology is characterized by the presence of a volcanic basement overlain by detrital sedimentary rocks of the Rosebel Formation. The geology is continuous from east to west, although crosscut by some late brittle faults that have offset the stratigraphic sequence. The deposits are all hosted in the footwall of a major reverse fault striking east-west which is closely related to the onset of mineralization. The sequence is folded, and these are relatively open and slightly dipping (0-15°), east or west, thus forming local basin-and-dome patterns. Mineralization is found in association with the major and\or subsidiary shear zones and in the hinges of anticlines.

MAYO

Mayo deposit (Figure 8-1) lies in the western extremity of the South domain. The base of the stratigraphy is a fine-grained, generally featureless (but with local breccias flow) felsic volcanic unit. To the north, those volcanic units are unconformably overlain by a sedimentary sequence, represented by two lenses of conglomerate at the base and a thick arenitic sequence to the top, striking 260° and dipping around 40°N. The whole sequence within the pit limits represents the northern flank of an open anticline present to the south. This sequence is truncated to the north by a major reverse shear which is parallel to stratigraphy and shifted the volcaniclastic rocks (mainly felsic tuff and lapilli tuff) on top of the sedimentary sequence. Even though it is a major structure of the area, this main shear zone is practically gold-barren in Mayo area; most of mineralization is rather hosted in shear and tension veins in the footwall of this reverse fault. The stratigraphy is not complicated by folding and deformation is mainly marked by a weak foliation. The main deformation was caused by thrusting from the North, with low-angle faults and fractures developing along the contacts of the basal conglomerate units. These fractures formed the conduits for the mineralizing fluids and allowed the development of gold-bearing quartz and quartz-carbonate shear veins moderately dipping to the north. Stacks of slightly north-dipping to flat tension veins are associated to those shear veins. Another system of north-south steeply dipping vein is developed in the pit, but its extent and distribution is less well known. Sulphide mineralogy in the ore zones comprises 2 to 7%

pyrite, with traces of pyrrhotite. The best intervals are intercepted along the basal conglomerate units, near the contact with the volcanic rocks.

Mineralization is continuous laterally on more than 3.3 km up to a proven depth of at least 500 m. Drilling in the area first targets the volcano-sedimentary contact, either laterally or at depth. The mineralization at depth is still open, but is not economical for open pit mining and as such, further exploration at depth is limited.

ROMA

The Roma deposit is located between Royal Hill and Mayo deposits and is divided into an East deposit and a West deposit. The lithological succession encountered is the same as the one found in Mayo and Royal Hill with a volcanic basement overlain by conglomerates and an arenitic sequence. Both Roma West and East deposit are hosted in an anticlinal hinge on strike with the Mayo deposit. The West deposit is under the tuff unit and the west deposit is above the tuff unit. Mineralization mainly is associated with small centimetric to decimetric north-dipping to flat tension veins hosted in the hinge of the folds, and locally associated with shear zones. The veins in the West pit are usually thicker than in the east, show a greater density, and locally have higher grade. Shear veins strike east-west to ESE-WNW and are dipping 45°N and are found in the northern parts of the pits where bedding is also dipping north. A small amount of pyrite, generally less than 1%-3%, is associated with gold mineralization.

Drilling in the area is based on the presence of both anticline hinges and targets the mineralization in the central part of those anticlines. For the West pit the mineralization is continuous for a length of about 400 m and striking ENE-WSW parallel to the fold axis and has been intercepted to a depth of 250 m. In the East pit the mineralization can be followed for 650 m laterally to an average depth of 100 m.

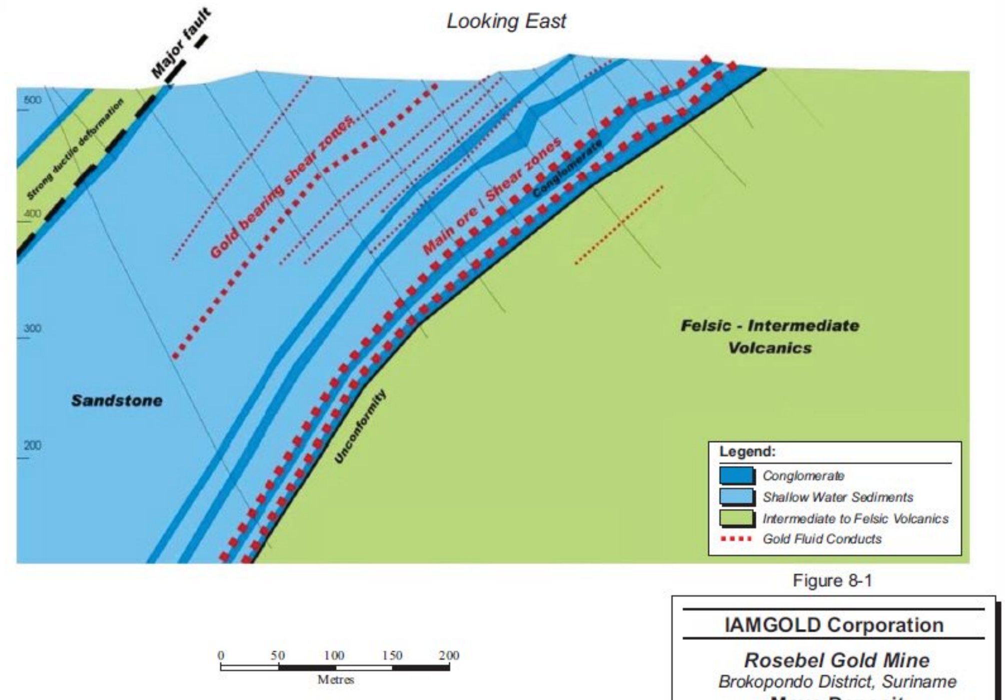

Looking East
Major fault
Strong ductile deformation
Gold bearing shear zones
Main ore / Shear zones
Conglomerate
Conglomerate
Unconformity
Sandstone
Felsic - Intermediate Volcanics
500
400
300
200
Legend:
Conglomerate
Shallow Water Sediments
Intermediate to Felsic Volcanics
Gold Fluid Conducts
0
50
100
150
200
Metres

Figure 8-1

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Mayo Deposit
Interpretative Cross Section

September 2017

Source: IAMGOLD, 2017.

ROMA

The Roma deposit is located between Royal Hill and Mayo deposits and is divided into an East deposit and a West deposit. The lithological succession encountered is the same as the one found in Mayo and Royal Hill with a volcanic basement overlain by conglomerates and an arenitic sequence. Both Roma West and East deposit are hosted in an anticlinal hinge on strike with the Mayo deposit. The West deposit is under the tuff unit and the west deposit is above the tuff unit. Mineralization mainly is associated with small centimetric to decimetric north-dipping to flat tension veins hosted in the hinge of the folds, and locally associated with shear zones. The veins in the West pit are usually thicker than in the east, show a greater density, and locally have higher grade. Shear veins strike E-W to ESW-WNW and are dipping 45°N and are found in the northern parts of the pits where bedding is also dipping north. A small amount of pyrite, generally less than 1%-3%, is associated with gold mineralization.

Drilling in the area is based on the presence of both anticline hinges and targets the mineralization in the central part of those anticlines. For the West pit the mineralization is continuous for a length of about 400 m and striking ENE-WSW parallel to the fold axis and has been intercepted to a depth of 250 m. In the East pit the mineralization can be followed for 650 m laterally to an average depth of 100 m.

ROYAL HILL

The Royal Hill deposit (Figure 8-2) is divided into two distinct areas both located near a mineralized anticline and separated by a nearly gold-barren syncline structure. The Royal Hill area exposes a similar stratigraphic sequence (volcanic - conglomerate - arenite) as the one observed in Mayo area, but folded in a succession of closed anticlines and synclines gently plunging around 10°-20°W. The pit is bordered to the south by a tonalite intrusion (Brinks pluton). The lower part of the stratigraphic sequence occurs in the SE pit and consists of andesitic to basaltic volcanic rocks. These are overlain by two lenses of conglomerate and by an immature arenite interlayered with other conglomerate levels. In the NW pit, the volcanic rocks have been intercepted in the hinge of the anticline at a depth of 460 m below surface.

In the NW pit the mineralization is hosted in tension veins emplaced in the hinge of the anticline near conglomerate levels and in stacks of north-dipping to flat veins associated with north dipping shear zones. The NW pit is bounded to the north by a 55°-60° north-dipping shear zone marking the contact between the arenitic sequence (south) and a thin horizon of highly sheared felsic tuff (north). Unlike the Mayo area, this shear zone is mineralized. The hanging wall of the shear has minor amounts of gold, as most of the mineralization is hosted in the footwall. In the SE pit the mineralization is hosted in east-west shear veins dipping 60°N with associated stacks of gently north-dipping tension veins. These shears are more abundant near the contact between sedimentary and volcanic rocks. North-south veins are also observed locally.

In general, drilling targets are either the volcano-sedimentary contact or the hinge of the anticline. Some good mineralized intercepts have been encountered at a depth of 500 m in the NW pit at the contact between the volcanic rocks and the sedimentary sequence. But the mineralization is not continuous vertically since the mineralized zones in the hinge of the anticline are sub-horizontal and rely on the presence of conglomerates, and has not been drilled extensively. The extension at depth of the mineralization in the volcanic rock of the NW pit is not known. In the SE pit mineralization is encountered up to a depth of 450 m along the north-dipping volcano-sedimentary contact but again remains uneconomic in an open pit context. In the NW pit the continuity of mineralization is constrained by the plunge of the anticline, but can be followed for one kilometre laterally. In the SE pit the mineralization is recognized for more than 1.7 km along the volcano-sedimentary contact.

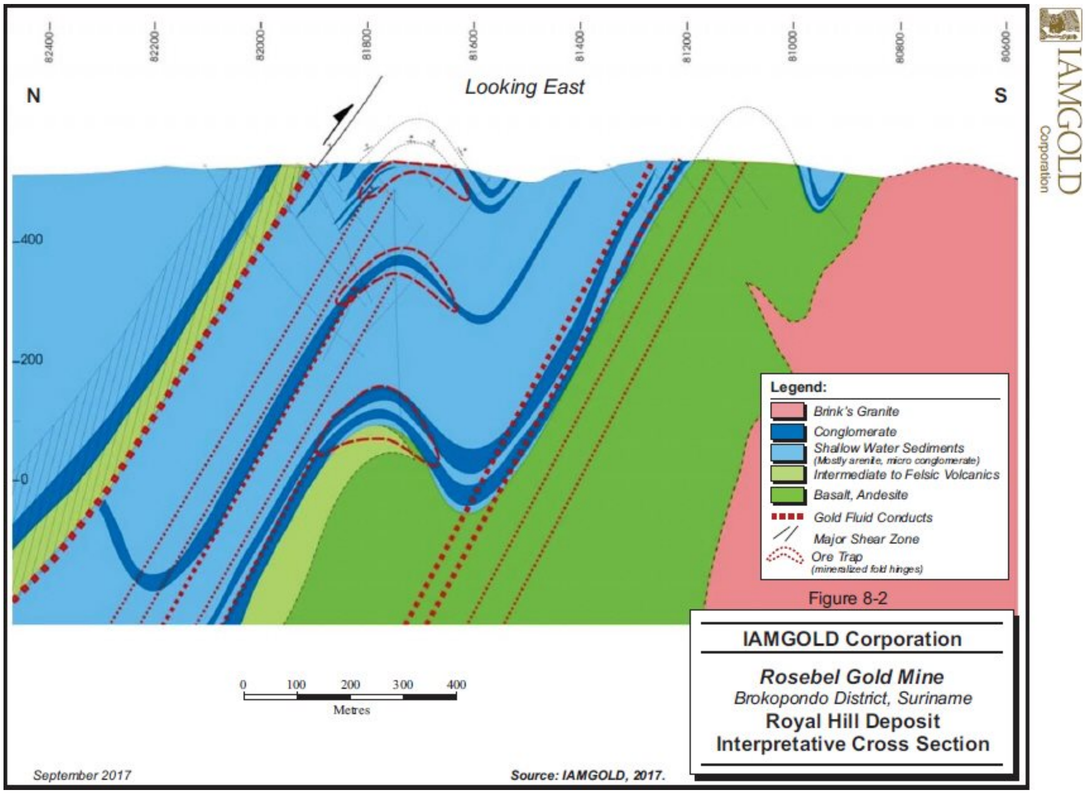

82400
82200
82000
81800
81600
81400
81200
81000
80800
80600
N
Looking East
S
400
200
0
Legend:
Brink's Granite
Conglomerate
Shallow Water Sediments (Mostly arenite, micro conglomerate)
Intermediate to Felsic Volcanics
Basalt, Andesite
Gold Fluid Conducts
Major Shear Zone
Ore Trap (mineralized fold hinges)
0
100
200
300
400
Metres
IAMGOLD
Corporation

Figure 8-2

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Royal Hill Deposit
Interpretative Cross Section

September 2017

Source: IAMGOLD, 2017.

CENTRAL DOMAIN

ROSEBEL

The Rosebel deposit (Figure 8-3) shows a sub-vertical sequence of siltstones and arenite with subordinate conglomerate lenses pertaining to the Rosebel Formation, and is the only deposit not hosted close to a volcano-sedimentary contact. The sequence shows grain size and compositional variations from south to north. The southern part of the pit exposes one interval of conglomerate hosted in a coarse-grained, quartz-rich arenite. Progressively this sequence evolves to finer-grained arenites and siltstones suggesting a general, northward polarity. The sequences strikes 100° and is sub-vertical to steeply dipping to the north. The sedimentary sequence and the mineralization are intruded by three post-mineralization, sub-vertical, north-south diabase dykes. Gold is associated with north-dipping and north-south quartz-carbonate tension veins with 1% to 3% pyrite alteration in association with sub-vertical shear corridors that are sub-parallel to bedding.

The mineralization in the main pit can be followed for more than 2.2 km, but also extends one kilometre to the east (Rosebella) and 350 m to the west (West Rosebel). Mineralization is recognized as being continuous at depth to 450 m and is still open. Since the mineralization at depth is too deep to be economical, exploration and resource extension drilling is now focusing on the lateral extensions of the deposit which are still open to the east and to the west.

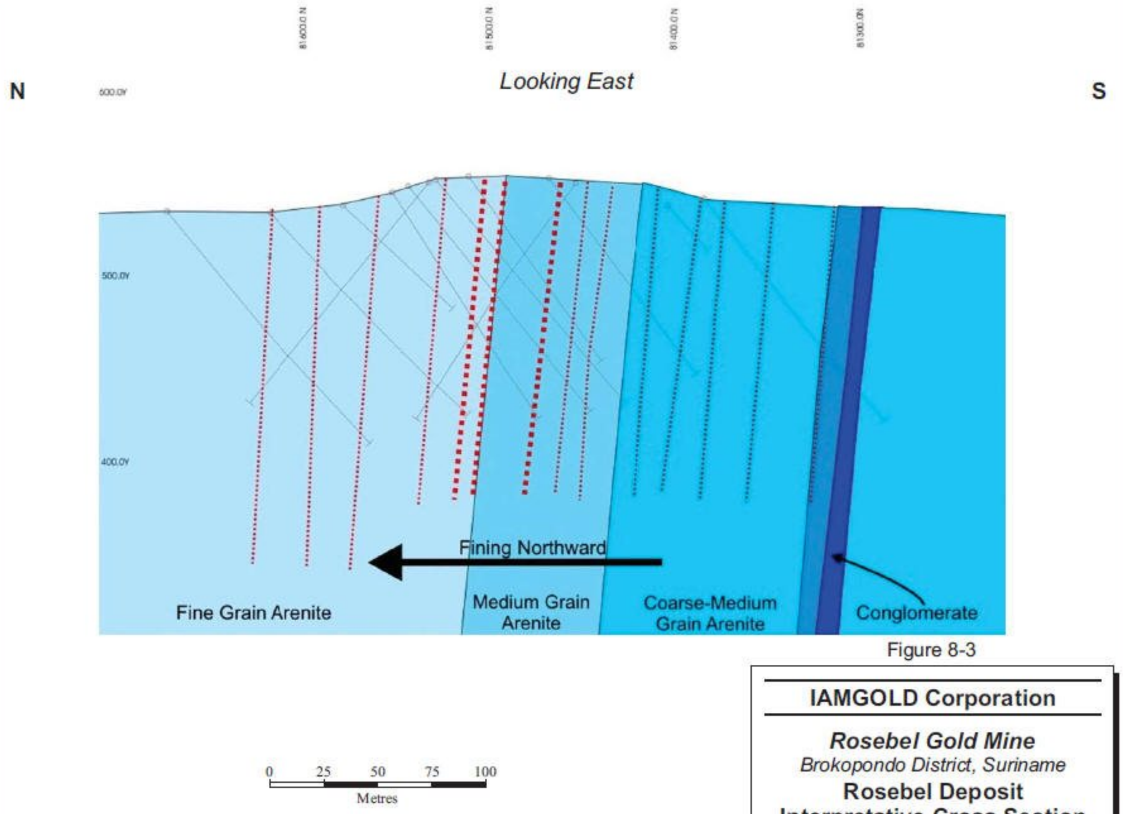

81600.0 N
81500.0 N
81400.0 N
81300.0N
N
Looking East
S
600.0Y
500.0Y
400.0Y
Fining Northward
Fine Grain Arenite
Medium Grain Arenite
Coarse-Medium Grain Arenite
Conglomerate
0
25
50
75
100
Metres

Figure 8-3

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Rosebel Deposit
Interpretative Cross Section

September 2017

Source: IAMGOLD, 2017.

NORTH DOMAIN

The North Domain is divided in two parallel mineralized trends striking WNW-ESE and showing different geological characteristics: the southernmost trend comprises Pay Caro and East Pay Caro deposits (and East Tailing Road exploration area), while the northernmost trend includes Koolhoven and J Zone deposits (and Mamakreek exploration area). The southernmost trend is located along the northern flank of the regional syncline and the stratigraphic sequence is the same as the one observed in the South domain with a volcanic basement unconformably overlain by the arenitic rocks of the Rosebel Formation. This sequence displays a series of open to tight folds plunging 35° to the WNW and hosted along the major shear of the North domain. The northernmost trend is hosted within volcanic rocks and the overlying sedimentary rocks of the Armina Formation. No major fault crosses Koolhoven-J Zone, however, there are a great amount of minor shears hosting the mineralization.

PAY CARO – EAST PAY CARO

The Pay Caro and East Pay deposits (Figures 8-4 and 8-5, respectively) are located along the strongly deformed south limb of the North domain. The stratigraphic sequence comprises, at its base, an intermediate volcanic pile, predominantly andesitic flows and minor volcanoclastic which are overlain by one level of conglomerate and a fine-grained arenite sequence with local intercalation of siltstone/mudstone. The lower sedimentary rocks are less mature with occurrences of micro-conglomerates, fine-grained arenite, and mudstone. The upper sedimentary rocks are more mature and are dominated by well-sorted fine-grained arenite. The contact between the volcanic pile and the upper arenitic sequence is depositional, except where the main fault has truncated the conglomerates and has juxtaposed volcanic rocks with the upper part of sedimentary sequence. The sequence shows z-type parasitic folding plunging approximately 30-50° to the WNW inside Pay Caro and one more important fold with a wavelength of 200 m in East Pay Caro. These folds are repeated further east in the East Tailings Road deposit. The main fault zone occurs in the central part of Pay Caro and is characterized by the abundance of shear veins, the brecciated texture, and the intense alteration of the host rock. Tension veins are of three types: N-S west-dipping veins, E-W sub-vertical to north-dipping veins and stacks of WNW-ESE moderately (30°-50°) north-dipping veins. All sets of veins appear to carry a similar grade of gold. The gold mineralization in East Pay Caro is mainly hosted in the hinge of the anticline at the volcano-sedimentary contact rather than in the main shear zone, however, a few shears transect the anticline hinge and increase the amount of gold present in the hinge and along flanks. In both deposits the sulphide content varies between 2% and 5% in the mineralized areas.

The south trend shows a prominent continuation of mineralization over more than 3.5 km from West Pay Caro to East Pay Caro. The mineralization in the central part of Pay Caro is proven to be continuous at a depth down to 550 m below surface and probably deeper along the main shear and the volcano-sedimentary contact. The mineralization at depth is already well-defined below the actual pit design and so extension drilling is now concentrated along the east and west extensions.

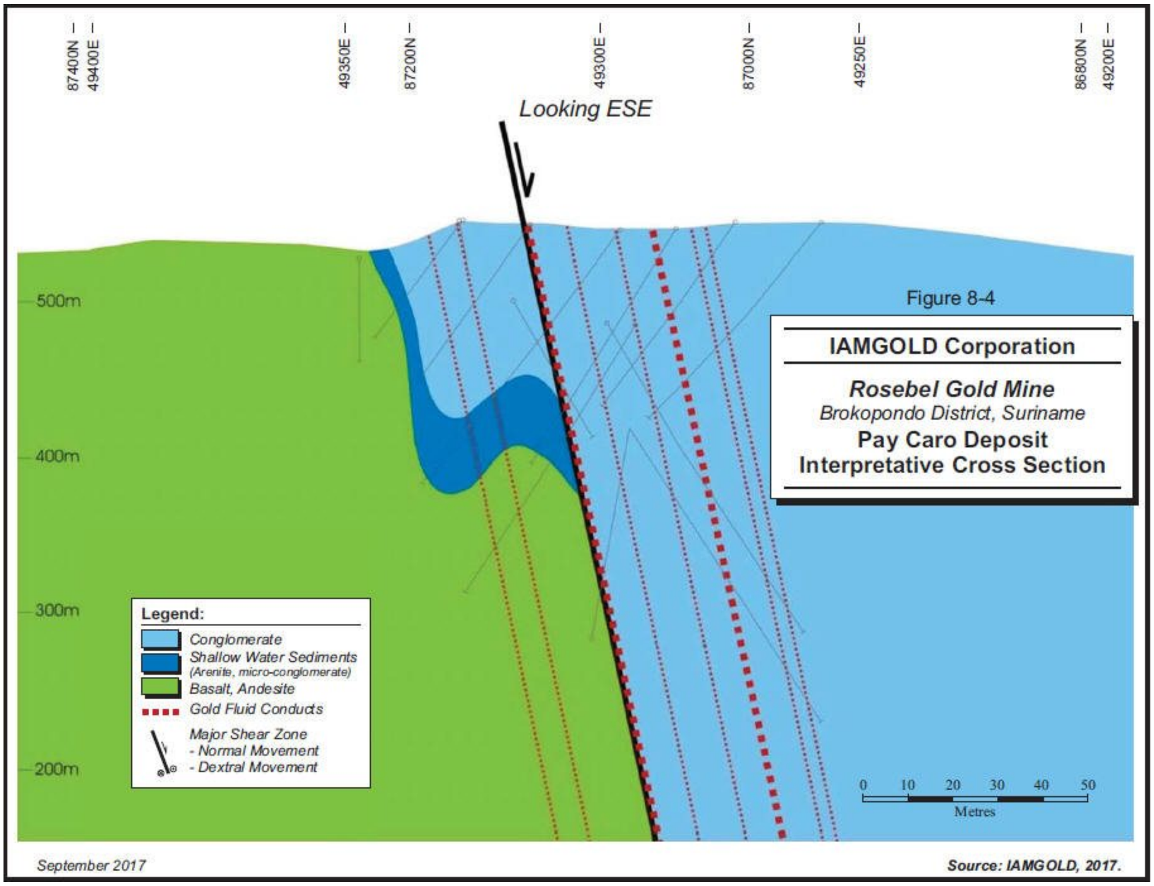

87400N
49400E
49350E
87200N
49300E
87000N
49250E
86800N
49200E
Looking ESE
500m
400m
300m
200m
Legend:
Conglomerate
Shallow Water Sediments (Arenite, micro-conglomerate)
Basalt, Andesite
Gold Fluid Conducts
Major Shear Zone
- Normal Movement
- Dextral Movement
0
10
20
30
40
50
Metres

Figure 8-4

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Pay Caro Deposit

Interpretative Cross Section

September 2017

Source: IAMGOLD, 2017.

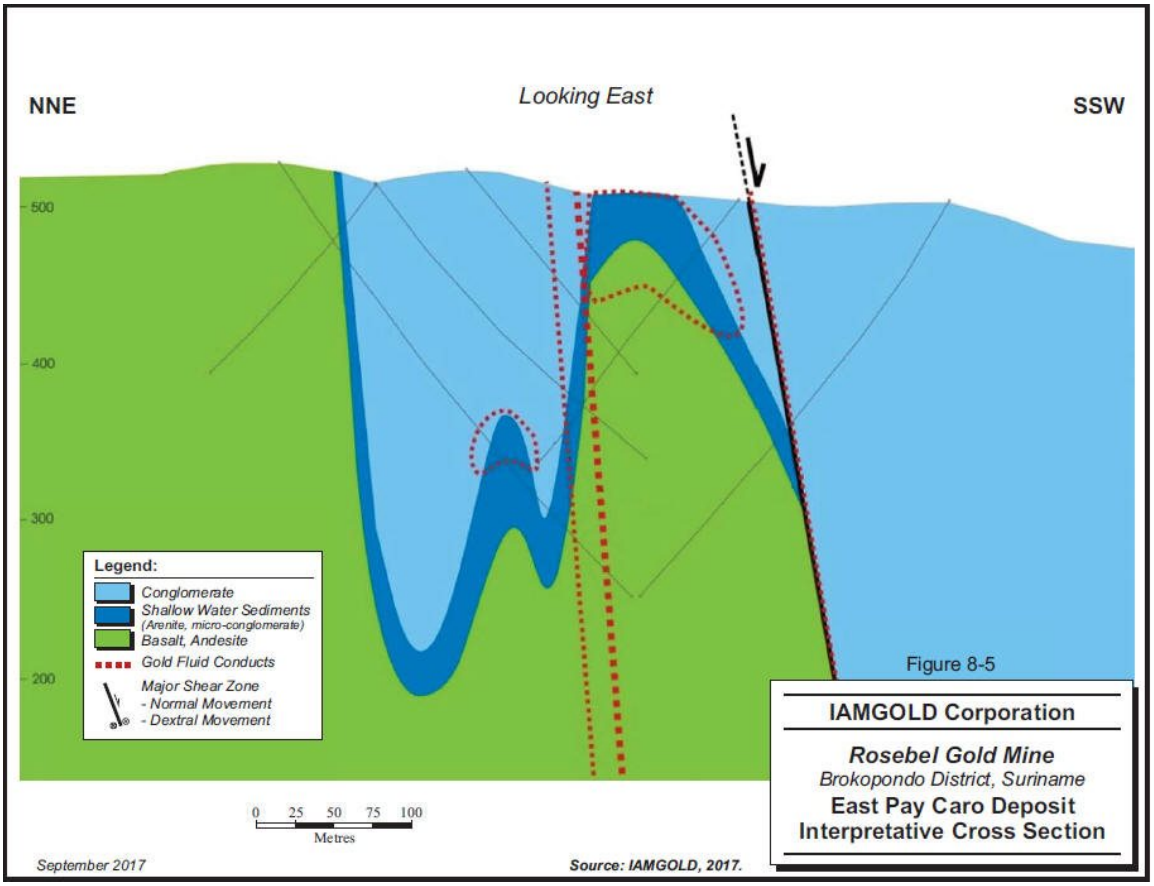

NNE
Looking East
SSW
500
400
300
200
Legend:
🟦 Conglomerate
🟦 Shallow Water Sediments (Arenite, micro-conglomerate)
🟩 Basalt, Andesite
■■■■ Gold Fluid Conducts
Major Shear Zone
- Normal Movement
- Dextral Movement
0 25 50 75 100
Metres

Figure 8-5

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
East Pay Caro Deposit
Interpretative Cross Section

September 2017

Source: IAMGOLD, 2017.

EAST TAILINGS ROAD

The East Tailings Road deposit has a geological context similar to Pay Caro – East Pay Caro and is located approximately 2 km east of those deposits. The area is characterized by the presence of folding which plunges approximately 30° to the WNW and the main shear of the North domain. Vein system emplacement appears to be chiefly controlled by the eastward prolongation of the main shear of Pay Caro – East Pay Caro which runs just south of the volcanic/sedimentary contact. The quartz vein system is associated with the fold hinge or to the main shear zone located on the southern flank of the folds.

KOOLHOVEN

The Koolhoven deposit (Figure 8-6) lies along the north limb of the North domain which strikes WNW-ESE and consists of an intermediate volcanic and volcanoclastic assemblage in the south of the deposit overlain by the turbiditic sequence of the Armina Formation to the north. The sedimentary sequence shows alternating mudstone and greywacke facies locally marked by the presence of conglomeratic lenses in the northern part of the deposit. The bedding is vertical and parallel to the local foliation and to the mineralized shear zones. The greywacke shows closed folds plunging around 45° to the WNW, while some mudstone units located near shear zones are showing isoclinal folding plunging vertically. Gold grades are associated with quartz-carbonate veins showing wall-rock alteration with 2% to 5% disseminated pyrite. The mineralization is associated with sets of discrete shear zones that are vertical to steeply dipping, south oriented WNW-ESE, and associated with two sets of tension veins. The mineralization is principally concentrated along three main zones (North, Central, and South) where the most noteworthy shear is observed in the middle of the central zone. The distribution of gold-bearing veins is strongly controlled by the host rocks. While the less competent mudstone units tend to be strongly folded and do not host significant amount of veins, the more competent greywacke and conglomerate units tend to crack more easily and so host more gold-bearing quartz veins.

The lateral extension of the Koolhoven deposit excluding the J Zone extension is about 1.6 km laterally and 800 m north-south. Mineralization is encountered down to 400 m below surface and is still open at depth. Some mineralized intervals have been found in the western extension or the deposit, but its continuity has not been proven yet.

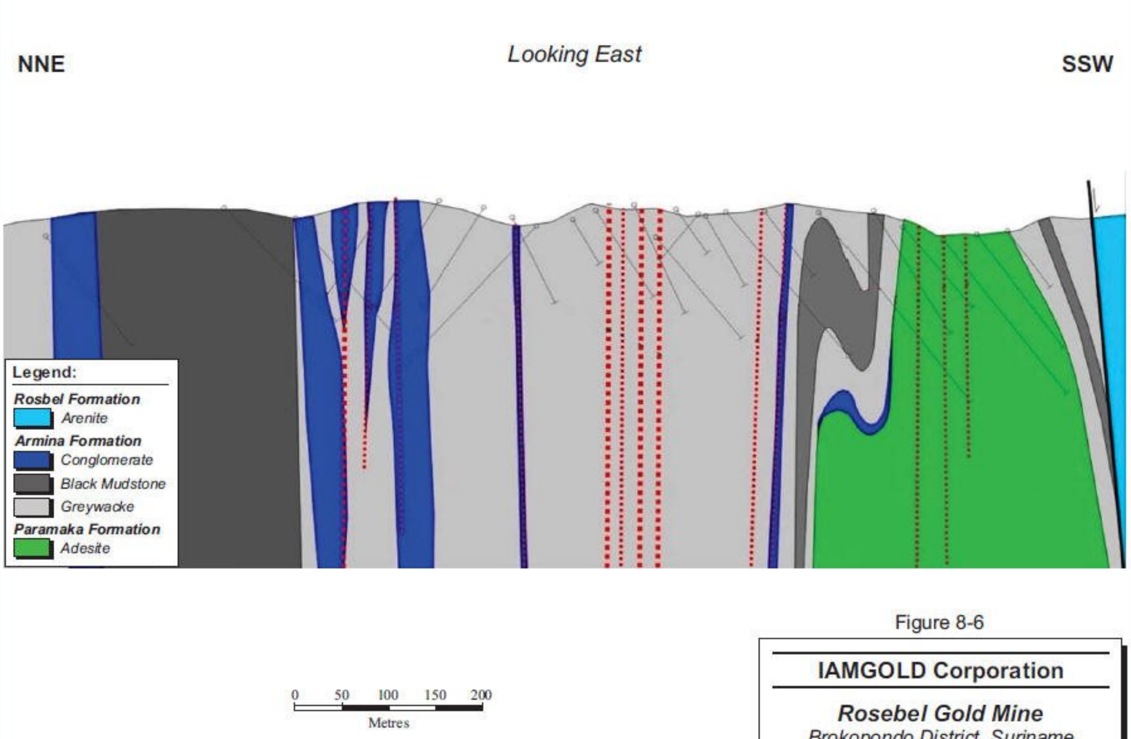

Looking East
NNE
SSW
Legend:
Rosbel Formation
Arenite
Armina Formation
Conglomerate
Black Mudstone
Greywacke
Paramaka Formation
Adesite
0
50
100
150
200
Metres

Figure 8-6

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Koolhoven (and J Zone) Deposit
Interpretative Cross Section

September 2017

Source: IAMGOLD, 2017.

J ZONE

The J Zone deposit lies in direct extension from Koolhoven. Similar to Koolhoven, J Zone is located in a sequence of thin bedded flysch greywacke and laminated siltstone/mudstone with a few polymictic conglomerate units. This assemblage pertains to the Armina Formation. An important conglomeratic sequence is found at the northern border of the mineralized corridor in line with Koolhoven conglomerate while the southern border corresponds to a mafic–intermediate volcanic sequence. Several small scale folds are observed in the host sedimentary sequence. Gold is associated with quartz-carbonate veins and disseminated pyrite in the host rocks. Pyrite has millimetric size and its dissemination halos may have plurimetric extension. Near the veins sericite and albite alteration is locally observed. The veins are related to steeply dipping south to sub-vertical discrete shears and have generally a few centimetres to a few decimetres thickness which is similar to that observed in Koolhoven. Three main gold bearing quartz vein types are identified: 1) moderately north-dipping tension veins (which are the predominant type); 2) N-S sub-vertical tension veins; 3) complex texture breccias-shear style veins filling the discrete shear discontinuities.

The mineralized corridor is thinner than in Koolhoven, but extends for more than 2.8 km. Drilling has proven the continuity of mineralization to more than 370 m at depth in the central part of the pit.

OVERMAN

The Overman deposit is part of the Charmagne exploration area located 11 km north of the RGM concession. The mineralization in the Overman deposit differs considerably in style from the gold bearing veins of the RGM concession. The main mineralized zone is associated with a siliceous tabular-lenticular body from 10 m to 50 m thick, striking WNW-ESE, and dipping between 50° and 77° to the south. This siliceous body is hosted in a mudstone-siltstone sequence bordered to the north by an intermediate volcanic sequence. The sedimentary sequence is crosscut by a felsic dyke highly altered to what are essentially argillic minerals and display very fine-grained disseminated pyrite. The presence of silicified xenoliths in the dyke indicates that its emplacement postdates the main silicification event. On the other side, the presence of argillic minerals and pyrite shows that other hydrothermal events occurred after the emplacement of the dyke. The sedimentary sequence is strongly deformed as demonstrated by the presence of an intense foliation, isoclinal folding, and boudinage developed in the more competent units.

The silica occurrences is interpreted as representing several sub-parallel silicified lenses surrounding a main silicified body. All lenses are dipping 50° to 70° to the north and are very discontinuous or boudinaged. Another interpretation would consist to say that the main silica body is folded, this possibility is under investigation by the geologist of the mine.

The gold mineralization is confined to the highly to completely silicified unit. Around the silica-body, different degrees of silicification are observed, suggesting the presence of an alteration front that has progressively overprinted the clastic-sedimentary units. Therefore, the silica-rich part of the known orebody might represent the main fluid conduit from which the fluids have spread out. The mineralized body is showing different textures resulting either from deformation, from different phases of hydrothermal circulation and/or from alteration. Three main textures are encountered: brecciated, spotted, and massive and each of those textures carries gold. The gold is always disseminated and is present within the silicified matrix in association with sulphides and oxides or occurs within stockwork-like veinlets. Although the association of gold and strong silicification is demonstrated, the distribution of gold within the main deposit is not well understood yet. Pyrite and arsenopyrite are the main sulphides found within the alteration halo and while arsenopyrite seems to show a strong association with gold it is not always the case for pyrite. This suggests that there has been more than one phase of fluid circulation and that each of those was not necessarily associated with gold emplacement. The presence of multiple phases of hydrothermal circulation is demonstrated by the occurrence of late hydrothermal breccias and of late gold-barren veins crosscutting the main silica-unit.

9 EXPLORATION

Historically, exploration work by IAMGOLD in Suriname is performed by the Mine Exploration department and the Suriname Exploration department (formerly named Regional Exploration). The Mine Exploration department (Minex) is charged with reserve development/expansion and grassroots exploration, primarily within the Rosebel mining concession. The Suriname Exploration department (Surex) focuses on exploration mainly outside the Rosebel mining concession in remote areas of Suriname.

Subject to the property exploration level, the departments use the following methods including: stream sediment sampling, soil geochemistry (augering, mobile metal ions geochemistry (MMI)), trenching, geophysical surveys, reverse circulation (RC) drilling, and diamond drilling. Due to the necessity to rapidly identify additional soft material proximal to the processing infrastructure, the Mine Exploration and the Regional Exploration teams have joined their efforts since 2013 to acquire more geological knowledge within the concession. Consequently, both teams have worked on new exploration targets located within the RGM concession, or on advanced targets located in the vicinity of known deposits.

In 2015, a Resource Geology department was created and is in charge of detailed pit mapping to assist in generating further development around the pits. The data gathered has been used by the Mine Exploration department in the Pit Extension Drilling program. In 2016, the group focused on the Pay Caro, Royal Hill, Roma, Mayo, and Overman deposits.

Historically, the RGM concession has been explored for gold with stream sediment programs (pan sampling). Anomalies encountered were subsequently covered with large-spaced shallow auger grids. Limited infill auger grids (at closer spacing) were carried out, as a third step, to better delineate the anomalies. Further deep augering was used to refine the best targets by collecting and evaluating the in-situ material. Banka drilling served to test the alluvial material. Trenches were excavated across the strike of deep auger anomalies to better understand the geology and local deep augering was carried out at the bottom of the trenches.

Intensive drilling was completed from 1992 to 1997 and from 2002 to present, which led to the development of the pits and reserves extensions. Outside of the direct pit extensions, the mining concession remains underexplored with basic data still to be acquired (multi-element analysis for geochemical characterization, induced polarization (IP) survey, etc.).

In 2016, the Mine Exploration group focused mainly on areas that were prioritized from common targeting from the MinEx and Resource departments. The objectives were: 1) Pit-expansion: increase soft-trans resources proximal to actual pits, and 2) Identify new potential areas for economical soft-trans oxide resources.

Field work for pit-expansion mainly consisted of pit-mapping and sampling in the vicinity of known deposits. Pit extension work has been carried on in West Pay Caro, Pay Caro, East Pay Caro, Royal Hill, Roma, Mayo, and Overman deposits.

Figure 9-1 shows the location of the different pits and the different development targets.

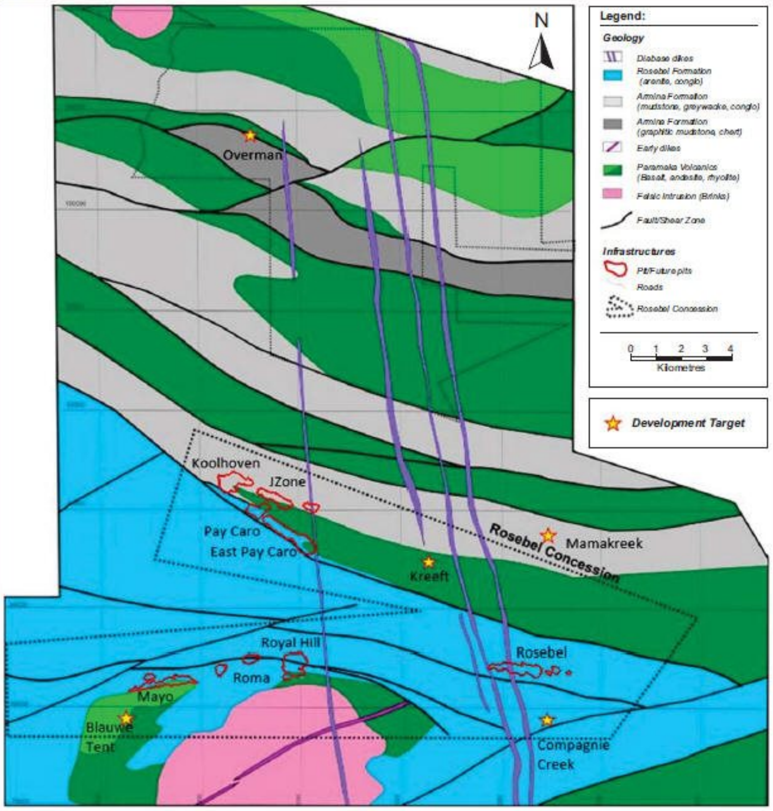

N
Legend:
Geology
Diabase dikes
Rosebel Formation (arenite, conglo)
Armina Formation (mudstone, greywacke, conglo)
Armina Formation (graphitic mudstone, chert)
Early dikes
Paramaka Volcanics (Basalt, andesite, rhyolite)
Felsic Intrusion (Brinks)
Fault/Shear Zone
Infrastructures
Pit/Future pits
Roads
Rosebel Concession
0 1 2 3 4
Kilometres
Development Target
Overman
Koolhoven
JZone
Pay Caro
East Pay Caro
Kreeft
Rosebel Concession
Mamakreek
Royal Hill
Roma
Mayo
Blauwe Tent
Rosebel
Compagnie Creek

Figure 9-1

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Location of Field Work Conducted in 2016 (Geological Interpretation Background)

September 2017

Source: IAMGOLD, 2017.

EXPLORATION PROGRAM 2016 – DEVELOPMENT TARGET

The Rosebel property includes some development targets which are not in production. A description of these targets follows. In 2016, besides the Overman project, no other work was carried out on these development targets.

DEVELOPMENT TARGET: CHARMAGNE – OVERMAN

The Charmagne/LEF concession includes the Overman project. In 2010, the Regional Exploration department completed 10,387 m of core drilling in 76 holes on this advanced project.

Following the positive results of a concept study, a program totalling 10,293 m of diamond drilling in 78 holes was completed in 2011 by the Mine Exploration department for resource development purposes. In 2011, the Regional Exploration department conducted deep augering (872 holes), line cutting, MMI geochemistry, soil sampling, field mapping, airborne magnetic survey coverage by Aeroquest, and diamond drilling (11 holes, 1,774 m) in the distant extension of the silica body hosting the gold mineralization.

In 2012, the Regional Exploration department carried out surface geochemistry, augering, and diamond drilling in Charmagne/LEF ROE.

In 2012, the Mine Exploration department performed 7,259 m of diamond drilling, specifically on the Overman project.

In 2013, the Regional Exploration department completed two deep auger programs (306 holes, 2,320 m), trenching (4), Induced Polarization (IP) ground survey (24.95 km), and diamond drilling (5 holes, 799 m) in Central Charmagne, approximately 2 km southeast of the Overman project.

In 2014, an airborne electromagnetic (AEM) and satellite photography survey was flown.

In 2016, the Mine Exploration department completed nine DD holes totalling 2,340 m. More details can be found in section 10.

DEVELOPMENT TARGET: KREEFT

The Kreeft target, formerly known as Mamakreek West is located in the RGM concession along the Koolhoven-J Zone trend. As part of the whole Mamakreek project, it has been previously explored by the Suriname Exploration department. After the 2009 drilling campaign, the project was handed over to the Mine Exploration department for more advanced exploration work.

Lithologies encountered are an intermediary volcanic unit, a thick conglomerate, and fine to coarse-grained greywacke interbedded with micro-conglomerate beds. Tops and parasitic folding indicate a synclinal hinge closure environment. An E-W fault is interpreted at the contact between the volcanic and the sedimentary rock, truncating the south limb. Most of the veins are north-dipping tension veins. The other main family consists of south-dipping tension veins. A few good grades have been intercepted, such as 2.258 g/t Au, 6.016 g/t Au, and four other values higher than 0.5 g/t Au.

In 2015, an exploration RC-reconnaissance campaign was completed in the east extension of the project in order to identify a new high potential prospect. A DD campaign was conducted as a follow up on the good results and on the 2014 campaign results. No work was carried out by the Mine Exploration department on the Kreeft project in 2016.

DEVELOPMENT TARGET: MAMAKREEK

The Mamakreek target straddles the RGM concession and is located along the Koolhoven-J Zone trend. It was previously explored by the Suriname Exploration department. After the 2009 drilling campaign the project was handed over to the Mine Exploration department for more advanced exploration work, including resource definition. For several years the area has been subject to small scale miners activities, and is currently being worked intensely by groups of small scale miners using small excavators and crushers.

The lithologies encountered in Mamakreek are turbiditic sequences of siltstone, mudstone, greywacke, and conglomerate. The units are tightly folded with a moderate plunge towards the west which is consistent with what is seen elsewhere in the North trend. In the main area, the mineralization is preferentially concentrated within the coarser sediments such as greywacke interbedded with micro-conglomerate whereas thick units of siltstone/mudstone are typically gold barren in the north trend.

No drilling occurred in 2016, however, mapping was carried in 2015. Several families of veins have been measured and sampled, in order of occurrence: north dipping, south dipping, east dipping, west dipping, and others. Results vary from barren to high grade with no preferential orientation. Many tight parasitic folds were observed. The preliminary interpretation is pointing out that part of the Mamakreek project is located on the north flank of a large scale syncline which is shallowly to moderately plunging to the west. The relation with the parasitic folding and the mineralization remains to be established. Several faults have been observed as well, amongst them a few are displacing quartz veins by a few centimetres with a reverse movement. It is still unknown if these faults are reflecting a larger scale fault that could have displaced the mineralization by a few or several metres.

DEVELOPMENT TARGET: COMPAGNIE CREEK

The Compagnie Creek target straddles the southern border of the mining concession and was first investigated by the Suriname Exploration department who carried out deep auger hole drilling and trenches between 2005 and 2007. The project is located along a geophysically defined structure traversing the Mayo, Roma, and Royal Hill deposits. Small scale mining activities are intermittent in the area, and have revealed a couple of outcrops with vein systems.

No drilling or work was carried out in 2016, however, mapping was carried out by the Mine Exploration department in October 2015. The systematic measurement of veins revealed the abundance of a west dipping tension system that could have been missed in the previous north-south oriented drill holes from previous campaigns.

Rock units encountered are fine to medium-grained arenites with magnetite cross-beds, two polymictic conglomerate units (the first is 3 m to 10m thick and the second >15 m) and an andesite. The nature of the volcano/sedimentary contact remains unclear, however, it is locally sheared.

The project is interpreted to be in the north limb of a parasitic Z fold. ENE-WSW faults transect the project and are suspected to have caused considerable displacement of the lithologies. Surex has covered the entire area with an IP ground survey (19.4 km in six lines, 300 m to 400 m spacing).

RECONNAISSANCE DRILLING (REVERSE CIRCULATION PROGRAMS)

No reconnaissance drilling was carried out in 2016.

In 2015, three reconnaissance drilling programs were designed to evaluate the potential of soft-trans material in prospective areas. Areas selected were Kreeft, Brafit, and North Rosebel. Systematic drilling programs were conducted using a small RC drill mounted on tracks to test the first 30 m to 35 m of saprolite/transition material. Holes were aligned in grids: line spacing varied from 300 m to 600 m, 186 m to 1.2 km long, 4 to 21 holes per line at ±50 m spacing and inclined at -45°. Grids were generally designed to cover favourable lithological contacts along extensions of known deposits/showings, where structural complexity or major gold-bearing structures were interpreted based on IP data and AEM. This method was applied for the first time on the concession and after receiving initial results, was considered more as a geochemical sampling method comparable to auger sampling. All of the pulp samples, from assaying, are kept in order to include them in a geochemical database of data collected closer to the deposits, which should aid to characterize the environment in Rosebel.

EXPLORATION PROGRAM 2016 – PIT EXTENSION

In 2016, the Mine Exploration department explored in the vicinity of the pits, whereas, the Resource Geology department carried out detailed mapping in some of the pits in order to have a better understanding of the geology, and to add more information to the drilling campaigns with the objective of extending the pits and/or optimizing the drilling orientations. The following sections describe the mapping work by pit area:

J ZONE

Pit mapping was completed in J Zone along all available benches. Several vein systems have been observed: here listed in decreasing order of appearance: 1) north-dipping tension, 2) west-dipping tension, 3) south-dipping tension veins, 4) other tension veins including flat veins, and 5) shear veins. All systems returned low grade to high grade gold bearing occurrences. The detailed mapping revealed domains where some vein sets are more abundant. The drilling orientation was modified from an azimuth of 198° to an azimuth of 160° to better intersect all vein systems.

WEST PAY CARO, PAY CARO, EAST PAY CARO

Detailed mapping was initiated in East Pay Caro in December 2014 and carried on until 2016. All the available faces have been mapped. The mapping has revealed several structural elements that have been used to reinterpret and remodel; these include: small (few centimetres) to large (several metres) amplitude folds plunging to the west, east-west reverse faults, and several strike-slip faults. The measurements on the veins revealed four main types of veins, here listed in decreasing order of appearance: 1) north-dipping tension, 2) shear, 3) west-dipping tension, and 4) other tension veins including flat veins. The drilling orientation has also been changed from an azimuth of 198° to an azimuth of 160° to better intersect all vein systems.

ROSEBEL

Pit mapping at Rosebel has been carried out along all accessible walls in Rosebel pit. The zonation of the veins is strongly marked throughout the pit as all vein systems are encountered: east-dipping tension veins, west-dipping tension veins, south-dipping tension veins, north-dipping tension veins, shear veins, and other tension veins. Field mapping carried out in the past years was also pointing towards this heterogeneity. Orientation of future drilling should vary depending on the domain.

An IP ground survey has been conducted as well, and covers the area. The survey consists of approximately 11.7 km on eight lines with a 200 m spacing.

MAYO

Pit mapping over several benches in the southwest, northeast, and southeast areas of the Mayo pit, has been carried out. The measurements on the veins revealed three main types of veins, here listed in decreasing order of appearance: 1) north/northwest dipping tension, 2) east-dipping tension, and 3) shear veins of various orientations. Detailed mapping indicates a strong zonation of the vein system; north/northwest dipping tension veins are common at the west end of the pit whereas the east end of the pit has more east-dipping tension veins. The orientation of the future drilling should take into consideration the different domains.

ROMA

Pit mapping has been carried on in Roma in 2016. Surex completed an IP ground survey covering the area between Roma East and Roma West and on the south and west extension of Roma West. Approximately 16 km on 15 lines with a 200 m spacing has been completed.

ROYAL HILL

Pit mapping has been completed on accessible faces in Royal Hill North West, and Royal Hill South East pits. Both pits show a zonation of the vein systems encountered. The measurements on the overall veins revealed five main types of veins: 1) north-dipping tension, 2) south-dipping tension, 3) east-dipping tension, 4) west-dipping tension, and 5) flat tension.

In 2015, the Mine Exploration department completed a small, shallow auger program on the small scale miner tailings located immediately south of the South East pit. Sixty-six holes were drilled. Results are sub-economical, however, further work remains to be completed before concluding.

REGIONAL EXPLORATION

Surrounding the RGM concession are Thunder Mountain, Headley's Reef, Charmagne, LEF, Charmagne West, Moeroekreek, and Saramacca ROEs all of which are held by RGM (Figure 9-2). RGM has been engaged in a long-term exploration effort on these exploration concessions up until 2015 when the focus of exploration work shifted to the Moeroekreek concession which was explored under an agreement with a third party and the Saramacca ROE acquired by RGM in 2016.

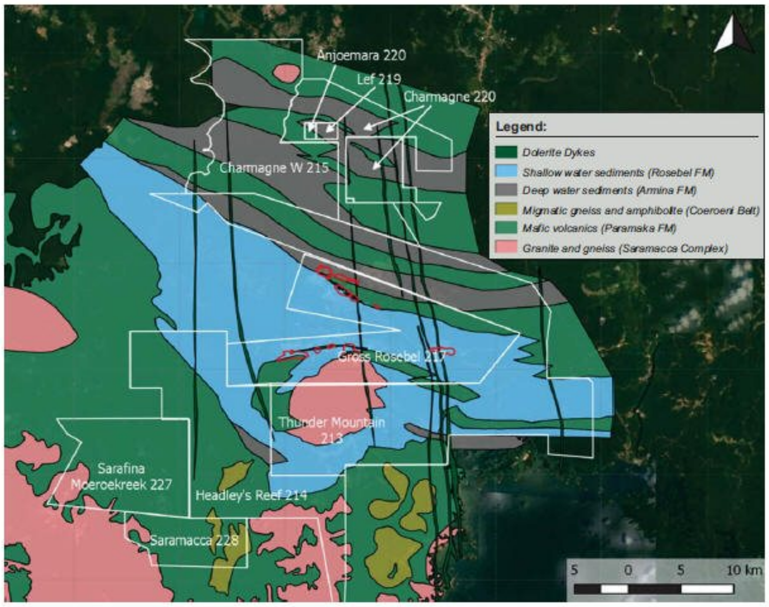

Anjoemara 220
Lef 219
Charmagne 220
Charmagne W 215
Legend:
Dolerite Dykes
Shallow water sediments (Rosebel FM)
Deep water sediments (Armina FM)
Migmatic gneiss and amphibolite (Coeroeni Belt)
Mafic volcanics (Paramaka FM)
Granite and gneiss (Saramacca Complex)
Gross Rosebel 217
Thunder Mountain 213
Sarafina Moeroekreek 227
Headley's Reef 214
Saramacca 228
5 0 5 10 km

Figure 9-2

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
RGM Mine Concession and Adjacent Exploration Properties

September 2017

Source: IAMGOLD, 2017.

THUNDER MOUNTAIN RIGHT OF EXPLORATION

The Thunder Mountain concession covers a V-shaped area that is continuous with the northern, eastern, and southern boundaries of the RGM concession. Exploration targets occur within a similar geological setting and in part, cover the extensions of the Rosebel mineralized trends.

Exploration activities completed by RGM since 2004 have included; geochemical surveys, ground magnetic surveys and IP surveys, the latter focused in the northern part of the concession. Detailed geological mapping has also been carried out over outcrops found along cut lines or exposed in small scale miner's areas. In 1990, an airborne magnetic survey flown by Golden Star, covering the whole concession, has since been reprocessed. In 2011 another airborne magnetic survey was flown by Aeroquest over the RGM concession with partial coverage of Thunder Mountain.

In 2013, IP surveys commenced utilizing in house IP equipment and this has become a systematic exploration tool.

An AEM survey (2,775 km) was completed in 2014 covering the RGM concession, Thunder Mountain concession, and parts of Charmagne West, Charmagne, and Headley's Reef concessions. IP surveys were also completed on several prospects in Thunder Mountain and RGM concession. Geochemistry was also undertaken on these prospects utilizing contractor crews for manual augering and mechanical augering in areas of savannah.

Systematic augering surveys utilizing manual and mechanical augers were used to assess priority areas selected for their favourable geological setting and location relative to the known mineralized trends extending from the RGM concession. These priority areas are: Mamakreek, Dabikwen Drainage, Compagnie Creek, and Afobaka.

Mamakreek is on the same trend as the Koolhoven and J-Zone deposits and straddles RGM concession and Thunder Mountain concession. In 2009, 35 DD holes totalling 4,850 m and 25 RC drill holes totalling 1,675 m were completed between March and November. The majority of drilling performed was within the Thunder Mountain concession and tested known near-surface mineralization, structural targets, geochemical anomalies, and anomalous geophysical responses (magnetic and IP). Drilling identified an envelope with poorly confined, scattered quartz veins. Quartz veining generally returned low levels of gold, reducing the likelihood of resource development but mineralization remains open along strike and at depth. In 2013 and 2014, the Mine Exploration department carried out brief drilling programs in the southern part of the area where previous diamond holes were drilled (see Section 10).

South of RGM concession, the Koemboe Creek anomaly is located near the south border of the Brinks pluton. In 2010 and 2011 this gold anomaly was drilled. In 2011, DD drilling (20 holes, 3,135 m) and RC drilling (33 holes, 1,341 m) were performed in this area. In 2012, a second phase of the DD drilling campaign was performed (21 holes, 3,043 m). Between 2012 and 2013 an additional nine holes were completed for 1,275 m. A Gemcom geological and weathering model was developed in 2013 to complete an initial resource estimate based on the 50 DD holes (7,453 m total diamond drilling). Detailed geological mapping was also carried out over outcrops found along exposed small scale miners areas. Small scale mining has increased dramatically in the Koemboe area over 2012-2013. This mining is destroying outcrops and mining saprolite where gold-bearing structures had been discovered. Surface resources have been affected. Mapping and channel sampling in small scale mine workings identified an anomalous area east of Koemboe. In 2012, three reconnaissance drill holes were completed in East Koemboe for a total of 510 m.

The Compagnie Creek prospect is located at the south-east limit of the RGM concession. In 2012, surface geological mapping and a first phase of DD drilling (13 holes, 622.5 m) were carried out. In 2013, a second phase of diamond drilling consisting of 13 holes totalling 1,326 m was completed on the Companie Creek prospect. Part of this 2013 drilling campaign included completing two holes totalling 204 m on the Rosebella prospect and an additional two holes on the Intersection target totalling 196 m.

In 2012, a DD campaign (16 holes, 4,000 m) was also performed on the eastern extension of the actual Rosebel pit, outside the RGM concession in an area known as East Rosebel.

Exploration in 2014 was completed on the Afobaka and Dabikwen prospect areas. Exploration occurred along the Royal Hill trend where it extends outside the RGM concession towards the Afobaka dam. The prospect is 8 km long and was highlighted by historical anomalous geochemistry.

Exploration activities in 2014 included deep auger (1,325 holes for 8,610 m), IP (31 line km), RC drilling (11 holes for 1,690 m), and DD drilling (11 holes for 1,767 m).

In 2015, exploration activities focused on the West Afobaka prospect and the Dabikwen prospect, both of which are located on the Royal Hill trend, an area where significant small scale mining is being undertaken. These prospects are located on the contact of the Paramaca volcanics and sediments of the Rosebel Formation, in the vicinity of late cross cutting dykes

Exploration activities in 2014 included deep auger (254 holes for 1,614 m), mechanical auger (75 holes for 765 m), and RC drilling 14 holes for 1,740 m).

No exploration, other than target generation activities, has been completed since 2015.

HEADLEY’S REEF RIGHT OF EXPLORATION

The Headley’s Reef concession lies to the south-west of the RGM concession and borders the Thunder Mountain concession to the east. Exploration activities have revealed that the northern part of the concession, covering the western extension of the mineralized trend, which hosts the Royal Hill, Roma, and Mayo deposits, is underlain by a similar geology to the RGM concession. The southern part is underlain, at least in part, by volcanic and sedimentary units of the older Paramaka Formation and the granite-gneiss units of the younger Saramacca Complex.

Exploration work carried out by RGM since 2004 has involved geochemical auger sampling and geological mapping over outcrops found along lines cut or exposed in small-scale mining areas. The Golden Star airborne geophysical survey carried out in 1990 covers the entire concession. The new airborne magnetic survey flown in 2011 by Aeroquest covers partly Headley’s Reef.

The principal targets, the Kraboe Doin “A” and “B” areas, were initially defined by anomalous stream sediment sampling results and lie close to the largest known area of small-scale mining activity located at the common boundary of Headley’s Reef and Thunder Mountain concessions. Systematic deep auger sampling and detailed geological mapping defined several targets for diamond drilling. The southern extension of the Blauwe Tent trend (from the RGM concession) and the Koemboe Creek area of Headley’s Reef (direct extensions of

Koemboe Creek area of the Thunder Mountain concession and north of Kraboe Doin) are additional areas where deep auger sampling and mapping have been carried out. In 2011, at Kraboe Doin, diamond drilling (24 holes, 3,605 m) and line cutting (32 km) were performed in the Kraboe Doin “A” and “B” targets. In 2012, a single hole (130 m) was completed in the Kraboe Doin “A” target as a follow-up, in late 2013, an additional two diamond drill holes were completed In Kraboe Doin “A”, for a total of 320.4 m.

Drilling was completed at the Saisamauw project where 2,500 m of DD drilling was completed, targeting similar geological structures as the Mayo Pit. In 2012, a total of 2,500 m in 10 holes was drilled to test this geological contact.

In 2014, satellite photography and AEM was flown over Headley’s Reef concession.

No exploration, other than target generation activities, has been completed since 2014.

CHARMAGNE

The Charmagne/LEF concession includes the Overman advanced project (as part of RGM resources, thus included in more detail in Section 9 of this report). In 2010, the Regional Exploration department completed 10,387 m of core drilling in 76 holes on this advanced project.

Following the positive results of a concept study, a program totalling 10,293 m of diamond drilling in 78 holes was completed in 2011 by the Mine Exploration department for resource development purposes. In 2011, the Regional Exploration department conducted deep augering (872 holes), line cutting, MMI geochemistry, soil sampling, field mapping, airborne magnetic survey coverage by Aeroquest, and diamond drilling (11 holes, 1,774 m) in the distant extension of the silica body hosting the gold mineralization.

In 2012, the Regional Exploration team carried out surface geochemistry, augering, and diamond drilling in Charmagne/LEF ROE. In 2012, the Mine Exploration team performed 7,258.5 m of diamond drilling, specifically on the Overman project.

In 2013, the Regional Exploration team completed two deep auger programs (306 holes, 2,320 m), trenching (4), an IP ground survey (24.95 km), and diamond drilling (5 holes, 799 m) in Central Charmagne approximately 2 km southeast of the Overman project.

In 2014 an AEM and satellite photography survey was flown.

CHARMAGNE WEST

The Charmagne West concession borders the Thunder Mountain and the Charmagne concessions to the South and to the East respectively. An aeromagnetic and radiometric survey was conducted in 2011 over both Charmagne and Charmagne West concessions. SRK Consulting (Canada) Inc. (SRK) was commissioned to develop a lithological and structural interpretation of the data; to define key controls on the distribution of gold mineralisation to aid regional exploration; and to delineate target areas for follow-up exploration. One of the identified targets, interpreted as a strained intrusive, lies within the Charmagne West concession.

In 2012, the Regional Exploration team completed a concession wide stream sediment and pan sampling program (112 samples), a deep auger campaign on the strained intrusive (1008 holes, 4,499 m), geological mapping, and an IP/Resistivity ground survey (19.8 km).

In 2013, the IP anomaly identified in 2012 was followed up by deep auger (187 holes, 1,442 m), mechanized auger (126 holes, 327 m), trenching (1), and IP/resistivity (3.5 km) programs.

In 2014, an AEM and satellite photography survey was flown.

No exploration, other than target generation activities, have been completed since 2015.

MOEROEKREEK (SARAFINA)

The Moeroekreek (Sarafina) concession borders the Saramacca and the Headley's Reef concessions to the southeast and to the east respectively. It is a right of small scale exploitation owned by a third party with which IAMGOLD has an agreement to conduct exploration activities. The concession had been explored previously by Golden Star.

In March 2014, IAMGOLD initiated several programs on the property, such as geochemistry, field mapping, IP surveys, trenching, and drilling.

A deep and manual auger program was first started in 2014 along the Brokolonko ridge. Sampling was mainly concentrated near the vicinity of the historical Anomaly B small scale mine pit and in the interpreted extension of Anomaly M (now referred to as the Tigri prospect). Sampling was completed on 800 m lines, at a 50 m spacing, which was then infilled by additional sampling at 400 m and then 200 m spacing. A total of 580 holes have been augered totalling 4,067 m. A mechanized auger program was performed on existing roads to expand the sampling coverage. Sampling was completed every 50 m with a maximum depth of 13.5 m. A total of 178 holes were completed for a total of 1,263 samples which helped define new drilling targets referred to as Puma, Ocelot, and Lynx.

In 2014, a 31.75 km IP survey covered the Brokolonko ridge. All deep auger and IP lines were used for geological mapping.

In 2015 and 2016, additional deep augering was carried out to expand the four main targets with 1,074 holes totalling 8,041.6 m and 128 holes for 967 m respectively.

In 2016, a total of 7.41 km of IP was conducted on the Ocelot prospect. To increase the geological interpretation, XRF analysis have been conducted on 7,573 deep auger and drilling pulps.

A total of 28 trenches have been excavated between 2014 and 2016 on selected deep auger and IP anomalies.

The four new anomalies were drilled in several phases between 2014 and 2016.

Puma was first tested with ten RC holes in 2014 (1,468 m) then with follow-up by six RC holes (750 m) and six DD holes (969 m) in 2015.

Tigri was tested by 11 DD holes (1,614 m) in 2014, followed by three DD holes (501 m) and 10 RC holes (1,470 m) in 2015.

Lynx was drilled in one phase in 2014 with 10 RC holes (1,432 m).

Ocelot was the most intensively tested, with 20 DD holes in 2015 (2,470.5 m) and 19 DD holes in 2016 (2,700 m), conducted in two phases.

SARAMACCA

The Saramacca concession borders the Moeroekreek and the Headley's Reef concessions to the northwest and to the northeast, respectively. Exploration activities conducted by IAMGOLD started in September 2016 with the review of historical data from previous explorers, Golden Star, and Newmont.

IAMGOLD-RGM drilled a total of 180 DD holes (34,225 m) and 37 RC holes (4,506 m) between October 2016 and April 2017. The drilling campaign was divided into two phases.

From October 2016 to December 2016, IAMGOLD-RGM twinned 17 out of the 90 historical diamond drill holes as part of a due diligence process. Diamond drilling also tested the continuity of the mineralization footprint along strike at a 50 m x 100 m spacing. The periphery of the mineralized footprint was investigated with an RC drill program spaced at 50 m x 100 m on the northeast and southwest outskirts of the mineralization.

From January 2017 to April 2017, IAMGOLD-RGM followed up with an infill diamond drilling program at a 50 m x 50 m spacing with a focus on delineating a potential saprolite resource. One extra historical hole was twinned to ensure good spatial distribution of IAMGOLD-RGM holes across the mineralized footprint.

An initial resource estimate is expected for Saramacca in late 2017.

10 DRILLING

INTRODUCTION

Intensive diamond drilling programs were carried out on the RGM concession between 1992 and 1997. Between 1998 and 2000, the Rosebel Project remained on care and maintenance and no additional drilling was undertaken. Drilling resumed in 2002 with the objective of sterilizing the waste dump at Pay Caro and with additional geotechnical drilling at the mill site and tailings pond. Exploration/definition drilling resumed in 2004. Table 10-1 lists the DD drilling and RC drilling quantities by year from 2004 to 2016. Since 2004, a total of 755,369 m of DD drilling and 30,562 m of RC drilling has been carried out.

TABLE 10-1 2004 - 2016 DIAMOND DRILLING AND REVERSE CIRCULATION DRILLING

Year	DD (m)	RC (m)*
2004	33,803	—
2005	54,854	—
2006	64,553	—
2007	52,914	—
2008	64,758	—
2009	85,843	—
2010	94,537	—
2011	88,706	—
2012	104,061	—
2013	65,557	—
2014	14,488	13,566
2015	12,229	6,234
2016	19,066	10,762
Total	**755,369**	**30,562**

* excluding grade control drilling

Several types of drill rigs were used in the past. Major Drilling International Inc. (Major Drilling) has been the drilling contractor on the Rosebel property since 2004. Major Drilling uses UDR-200D track mounted rigs. Production is generally 50 m per shift at an average recovery rate higher than 90%. Since 2016, a RC rig has been used by Major Drilling for expansion and exploration drilling. Others types of drilling were used in the past mostly for geochemical exploration work, including: Auger and RC Scout. During 2016, one diamond drill rig and one RC drill rig were running, for alternating periods of time.

PLANNING

The drill planning takes into consideration four different purposes; infill/development, expansion, exploration, and condemnation.

The infill or development drilling is targeting a better definition of the resources or reserves within the whittle shells or pit design. The spacing for infill drilling is usually 50 m or 25 m, depending on the level of geological comprehension of the deposits or on the geological complexities related to the mineralization.

The expansion and/or exploration drilling are targeting the extension of mineralization outside the pit designs, either laterally or at depth. Some exploration/reconnaissance drilling also occurs in new or less advanced exploration areas; in that case there are no reserves defined and the drilling is based on preliminary geological interpretation rather than on extension of known ore zones. There is no particular spacing in that case, as the drilling can be tight in order to make a follow up on good results, or it can be more spread out in order to cover a larger area.

The condemnation drilling is carried out to ensure that there is no mineralization where the waste dumps are planned to be located. The spacing is about 150 m to 200 m using staggered patterns or continuous fences, although sometimes the condemnation drilling can be useful in getting a better comprehension of the geology surrounding the deposits, and in such a situation the drilling pattern may differ.

Even though in the past three years the amount of drilling has decreased, most of the pits are being drilled every year with respect to the three main purposes presented above. The distribution of metres and targets for each pit depends on the amount of historical drilling in each pit, on the infill needed according to the geological complexity, and the potential at depth and laterally, or the open exploration.

Figure 10-1 shows a typical vertical section representing the grid of dill holes at the Royal Hill pit.

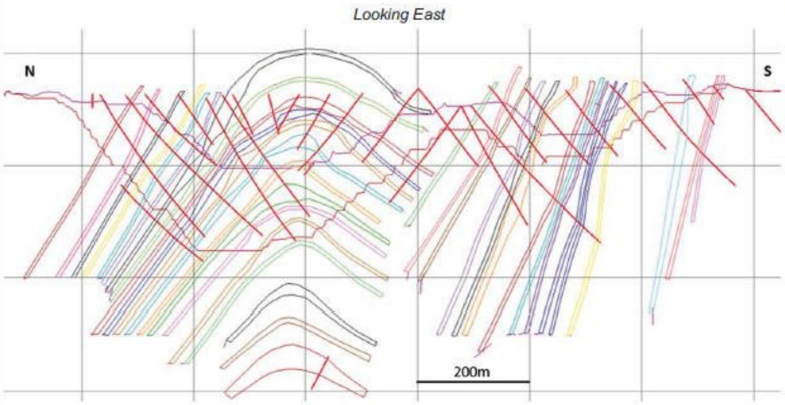


Figure 10-1

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Typical Section Representing the Grid of Drill Holes in Royal Hill

(49790 E, influence of 12.5 m on both sides)

September 2017

Source: IAMGOLD, 2017.

METHODOLOGY - DIAMOND DRILLING

Before drilling a hole, the field technicians spot the planned hole by using old drill holes, as a reference, and a hand GPS. The Minex field technicians survey the planned locations using a ground-based high-precision Leica GPS unit. Under supervision, the contractor sets the diamond drill onto the collar and the field technician aligns the drill with the help of the front sights.

Holes are drilled using HQ size wireline equipment in saprolite, usually reducing to NQ size in transitional to hard rock. The recovery being usually very good (>90%), drill-holes with unacceptably low recovery in mineralized zones are re-drilled until reaching an acceptable level of representativeness (minimum of 65% on short intervals and an average of 75-80%). Core recovery in saprolite and transition material is improved by using polymer additives combined with high concentrations of bentonite.

Drill-hole surveys are completed using Flex-IT/Reflex singleshot/multishot instrument which can also provide magnetometric data down the length of the hole. A single shot (one measurement) is always taken at a depth of 10 m to 15 m to make sure that the orientation and the dip are in line with the planned hole. If the deviation is higher (as decided by the geologist) the hole is stopped and re-started a couple of metres next to the first hole. For drill-holes longer than about 150 m, a single shot is also taken every 50 m, while drilling, to ensure that the hole will meet the target. When a hole is completed, a multi shot survey is carried out starting at the bottom of the hole, by taking a measurement every three metres. For the interval of survey taken inside the magnetic casing (generally less than 50 m), the trace is estimated from the last measurement before entering the casing and on the single-shot measurement that was taken after the first 15 m of the hole.

When the diamond drill leaves the location, the drillhole collar is identified by a 75 mm X 75 mm wood post that is placed in the hole left by the steel rods and the hole is re-surveyed. The sump containing the cutting rejects generated by the drilling processes is closed and the pad is leveled with a dozer.

Core is packed in corrugated plastic boxes at the drill site, prior to being transported to the Core Shack. At the Core Shack, the core is washed to remove the drilling fluids and to expose structures in the soft saprolite material. Geotechnical logging is carried out afterwards by recording the core recovery, RQD, rock hardness, and fracture density. The core is then logged in detail (lithology, alteration, veins, etc.) and samples are identified. The drill-holes are sampled continuously from top to bottom of the hole with a length generally between 1.0 m and 1.5 m. Pictures of the core are systematically taken before splitting and then the samplers start splitting the core and sampling the intervals. The second half of the core is always kept in the core racks for reference and/or further testing.

The workflow for the diamond drilling program is presented in Figure 10-2.

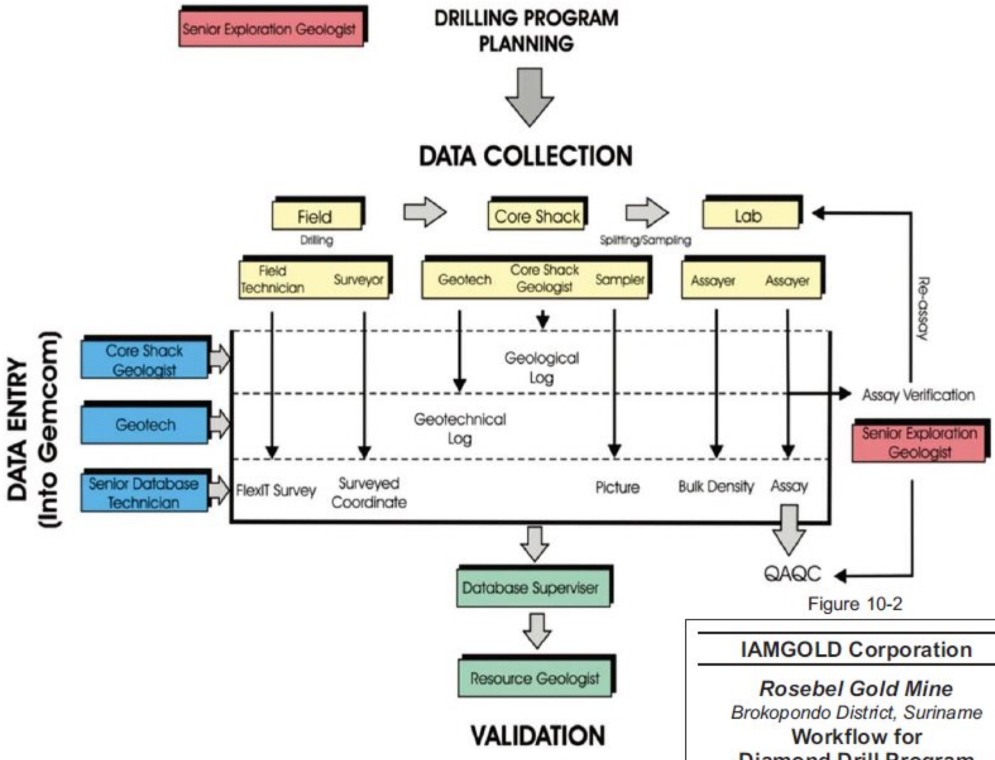

Senior Exploration Geologist
DRILLING PROGRAM PLANNING
DATA COLLECTION
Field
Drilling
Core Shack
Spitting/Sampling
Lab
Field Technician
Surveyor
Geotech
Core Shack Geologist
Sampler
Assayer
Assayer
Re-assay
DATA ENTRY (Into Gemcom)
Core Shack Geologist
Geotech
Senior Database Technician
Geological Log
Geotechnical Log
Assay Verification
Senior Exploration Geologist
FlexIT Survey
Surveyed Coordinate
Picture
Bulk Density
Assay
QAQC
Database Supervisor
Resource Geologist
VALIDATION

Figure 10-2

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Workflow for
Diamond Drill Program

September 2017

Source: IAMGOLD, 2017.

METHODOLOGY - RC DRILLING

RC drilling follows similar procedure as for diamond drilling. Before executing a hole, the field technicians spot the planned hole by using existing drill holes, as reference, and a hand GPS. The rig operator sets the RC drill onto the collar and the field technician aligns the drill with the help of the front sights. Holes are drilled using a 114 mm or 136 mm rod size. The recovery is variable and tends to increase with the depth. The RC rig can drill holes up to 150 m using a compressor to collect good quality of dry samples. Down holes surveys are taken at the end of the hole.

When the RC rig leaves the location, a wooden stick with flagging tape is used to identify the hole. The holes are surveyed with a Leica GPS. As the rig is not using water, no sumps are required.

The cuttings are going through a cyclone, a rotary splitter, and two plastic bags placed at the end for sampling. Samples are taken every 2 m and generally consist of two 5 kg bags: one bag for assaying and the other one for logging the samples and as a field duplicate and/or for re-assay. A small amount of the logging sample bag is placed on the logging table where the geologist describes the material (alteration, lithology, presence of quartz, pyrite). Pictures of cuttings are taken before placing the material in chip trays. If no picture of the cutting is taken, a picture of the chip tray is taken instead. For each interval, the sample bag for assaying is sent to the laboratory for analysis, the other bag being kept at the core shack until results are obtained and no further sampling is required.

METHODOLOGY - RC-SCOUT DRILLING

Before executing a diamond drill hole, the field technicians spot the planned hole by using old drill holes, as reference, and a hand GPS. The contractor sets the RC-Scout drill onto the collar and the field technician aligns the drill with the help of the front sights. Holes are drilled using an 88 mm rod size. The recovery is variable and tends to increase with the depth.

As these holes are short (51 m and less) and are not meant to be used for the resource calculation, no downhole survey is taken.

When the RC-Scout leaves the location, a wooden stick with flagging tape is used to identify the hole. The holes are surveyed with a Leica GPS or using a hand GPS. As the rig is not using water, no sumps are required.

The cuttings are going through a cyclone and a plastic bag is placed at the exit for sampling. A sample is taken every 1.5 m and can consist of a bag or two depending of the recovery. The bags are tied and brought from the field to the core shack. A small amount of each sample is placed on a logging table and the geologist describes the material (presence of chips, alteration, lithology, presence of quartz). Pictures of the logging table with the cutting are taken before placing the material in chip trays. Each sample is homogenized and split with a riffle splitter until a quantity between 3 kg and 4 kg is obtained. All the samples are sent to the laboratory. The remaining is kept at the core shack until results are obtained and no further sampling is required then it is discarded.

DRILLING PROGRAM 2016

An overview of the 2016 drilling program, by projects and purposes, is shown in Table 10-2.

TABLE 10-2 2016 DRILLING PROGRAM BY PROJECT AND PURPOSE

	#holes	Development (m)	Expansion (m)	Condemnation (m)	Exploration (m)	Others (m)	Total (m)
Koolhoven	—	—	—	—	—	—	—
J Zone	—	—	—	—	—	—	—
Pay Caro	52	2,720	8,994			450	12,164
Rosebel	—	—	—	—	—	—	—
Royal Hill	8	—	2,754	—	—	—	2,754
Roma	56	—	3,552	714	5,402	513	10,181
Mayo	14	—	2,340	—	—	—	2,340
Overman	9	—	2,384	—	—	—	2,384
Total	**139**	**2,720**	**20,024**	**714**	**5,402**	**963**	**29,823**

PAY CARO

In 2016, the Pay Caro drilling campaign was carried out in three phases: first in West Pay Caro, then between Central Pay Caro and East Pay Caro, and then in Central Pay Caro.

An expansion DD drilling campaign to upgrade the resources was completed in West Pay Caro with 24 DD holes totalling 6,441 m. Most of the holes were drilled with an orientation of 160° in order to intercept the main mineralized trends. A total of 14 holes intercepted the mineralization.

In the saddle between Central Pay Caro and West Pay Caro, eight DD holes were drilled for 2,553 m. Five holes intercepted the mineralization. This saddle is the main obstacle in the expansion of the Central Pay Caro toward the West Pay Caro pits.

In addition, a development campaign was carried out between Central Pay Caro and East Pay Caro, 18 RC holes totalling 2,720 m were drilled. Most of the holes were oriented at an azimuth of 160° to intercept the main mineralized trends. Nine holes intercepted the mineralization.

ROYAL HILL

In 2016, a DD drilling campaign was carried out in a single phase in the saddle between Royal Hill North West and Royal Hill south East. In Royal Hill North West, eight DD holes were drilled for 2,319 m, of which four holes were oriented at 340° to cross cut the mineralization of the south limb of the fold, and four holes were oriented at 160° to cross cut the mineralization on the north limb of the fold. All holes intercepted the mineralization. The saddle between Royal Hill North West and Royal Hill South East is an obstacle to pit expansion. One DD hole, oriented at 270°, was drilled for 435 m to evaluate the potential of the saddle. The hole intercepted the mineralization, however, the orientation of the mineralization is not fully understood.

ROMA

In 2016, different drilling campaigns were carried out around the Roma pit; one pit expansion campaign around Roma East, one exploration campaign in Roma central, and one condemnation campaign at Roma East.

In Roma East, for the expansion campaign, 15 DD holes were drilled for 4,065 m. The holes were drilled at an orientation of 160° to intercept the main East-West mineralized trend. Seven holes intercepted the mineralization.

Regarding the exploration campaign in Roma Central, 37 RC holes were drilled for 5,402 m. A total of 29 holes, targeting the saddle between Roma West and Roma East, were drilled at an orientation of 160° along the same East-West mineralized trend. Eight of the RC holes intercepted the mineralization. The other nine RC holes, drilled at an orientation of 160°, are located in the south where there is no known mineralization.

The condemnation campaign in Roma East was carried out to ensure that the future area for the waste dump is barren. A few holes showed quartz with pyrite mineralization, however, assay results confirmed that the area can be condemned.

MAYO

In Mayo, the 2016 expansion campaign consisted of 14 RC holes totalling 2,340 m. The main target was the saddle between the main pit and the North West mini-pit. Most of the holes were oriented at 160° to intersect the main East West mineralized trend. All the holes intercepted the mineralization.

OVERMAN

In Overman, the 2016 exploration campaign was comprised of nine DD holes totalling 2,383 m. Holes were drilled with an orientation of 26° in the main mineralized area in order to crosscut the main WNW-ESE mineralized trend. Seven of the DD holes intercepted the mineralization.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

In the QP's opinion, the sample preparation, analysis, and security procedures at RGM are adequate for use in the estimation of Mineral Resources.

SAMPLE PREPARATION

RGM laboratory assays core and blast hole samples by fire assay. The RC samples are assayed by fire assay or by the Pulverize and Leach system. This new system, the Pulverize and Leach (PAL), was set up in June 2015 in order to progressively replace fire assay for RC samples and to allow for quicker turn-around, at a reduced cost.

SAMPLE PREPARATION FOR FIRE ASSAY

The whole samples (2-4 kg) are placed in large drying pans and placed in the dryer for about four hours at 105°C in order to be completely dry. Cooled samples are first crushed with a Bico-Badger (RGM) or TM jaw Rhino (Filab) crusher to approximately 75% passing -8 mesh, however, in case of coarser samples (>2"), a primary crusher is required. One in every 21 samples is screened for percentage passing - 8 mesh. After this first step of comminution, this material is called a "coarse" sample.

The samples are then riffle split to approximately 800g. The rest of the coarse sample goes back in the plastic bag (coarse reject) and is kept by the lab until the geology department decides which coarse rejects can be discarded and which has to be reprocessed.

The coarse samples are then pulverized to approximately 95% passing - 170 mesh by using Bico UA pulverizer (RGM). This material is now called "pulp". One in every 21 samples is screened for percentage passing - 170 mesh. Thirty grams of pulp are sampled and the rest of the pulp sample goes back in the plastic bag (pulp reject) and is kept by the lab until the geology department decides which pulp rejects can be discarded and which have to be reprocessed.

A sand wash is used between each sample (a cup of white sand is run through the pulverizer to scrape any smeared gold off the tool surfaces). The pulp material is then homogenized by rolling and is ready for fire assay (Figure 11-1).

SAMPLE PREPARATION FOR PULVERIZING AND LEACHING

The whole samples (5 kg) are placed in large drying pans and placed in the dryer for about four hours at 105°C in order to be completely dry. Cooled samples are first crushed with a Bico-Badger (RGM) or TM jaw Rhino (Filab) crusher to approximately 75% passing -8 mesh, however, in the case of coarser samples (> 50 mm), a primary crusher will be required. One in every 52 samples is screened for percentage passing - 8 mesh. After this first step of comminution, this material is called a “coarse” sample.

The samples are then riffle split to approximately 800g. The rest of the coarse sample goes back in the plastic bag (coarse reject) and is kept by the lab until the geology department decides which rejects can be discarded and which have to be reprocessed.

Three hundred grams of coarse material are sampled and the rest of the coarse sample stay in the sample pan and is kept by the Laboratory until the geology department decides which rejects can be discarded and which have to be reprocessed (Figure 11-2).

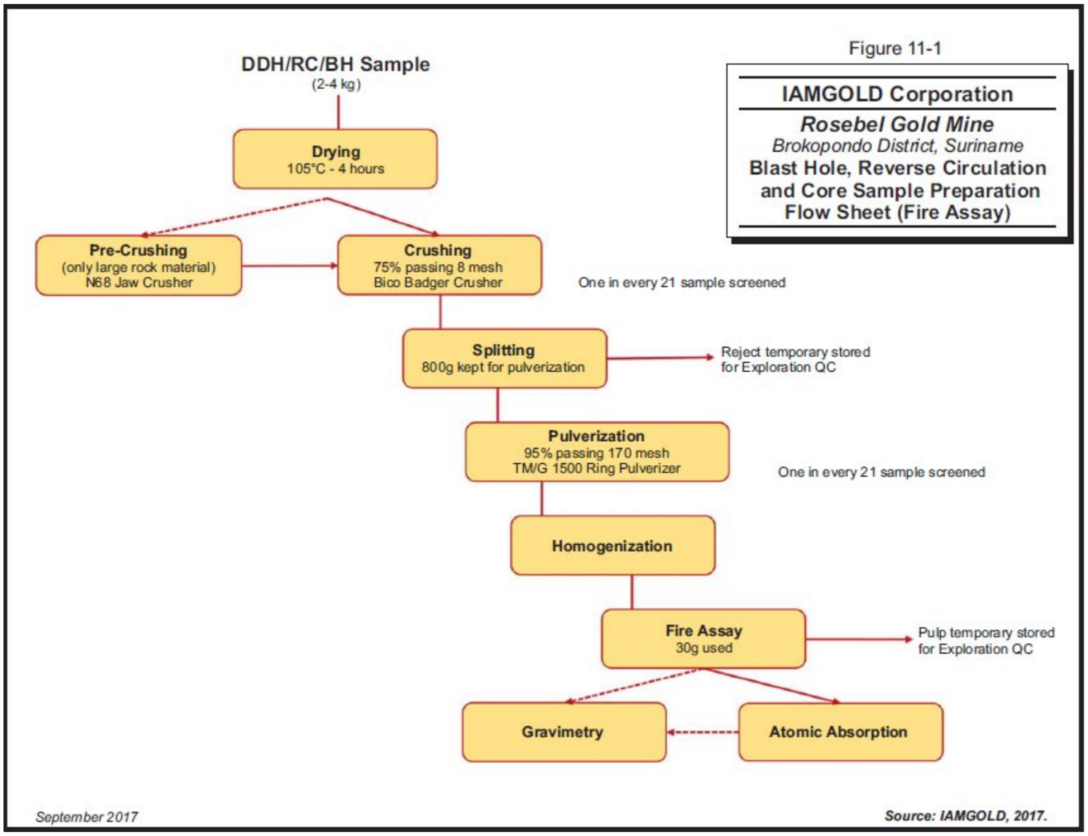

DDH/RC/BH Sample
(2-4 kg)
Drying
105°C - 4 hours
Pre-Crushing
(only large rock material)
N68 Jaw Crusher
Crushing
75% passing 8 mesh
Bico Badger Crusher
One in every 21 sample screened
Splitting
800g kept for pulverization
Reject temporary stored for Exploration QC
Pulverization
95% passing 170 mesh
TM/G 1500 Ring Pulverizer
One in every 21 sample screened
Homogenization
Fire Assay
30g used
Pulp temporary stored for Exploration QC
Gravimetry
Atomic Absorption

Figure 11-1

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Blast Hole, Reverse Circulation and Core Sample Preparation Flow Sheet (Fire Assay)

September 2017

Source: IAMGOLD, 2017.

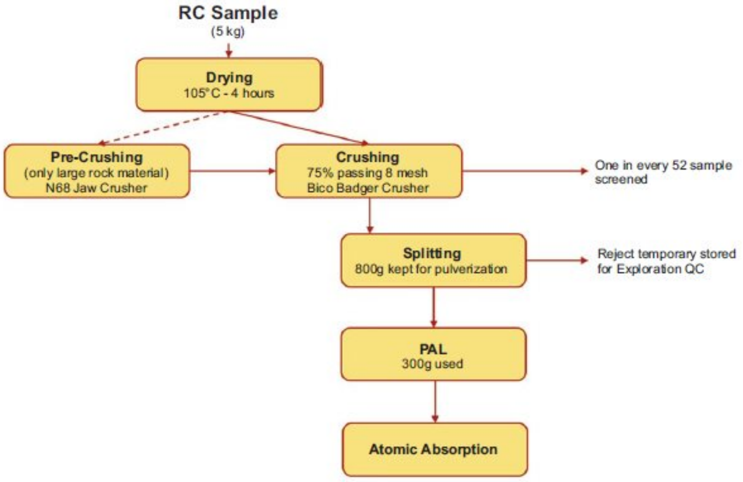

RC Sample
(5 kg)
Drying
105°C - 4 hours
Pre-Crushing
(only large rock material)
N68 Jaw Crusher
Crushing
75% passing 8 mesh
Bico Badger Crusher
One in every 52 sample screened
Splitting
800g kept for pulverization
Reject temporary stored for Exploration QC
PAL
300g used
Atomic Absorption

Figure 11-2

IAMGOLD Corporation

Rosebel Gold Mine

Brokopondo District, Suriname

Reverse Circulation Sample Preparation Flow Sheet (PAL)

September 2017

Source: IAMGOLD, 2017.

ANALYSIS

FIRE ASSAY

Around 30 g of the pulp 95% passing approximately 170 mesh is precisely measured and used for the fire assay manipulation. This pulp material is mixed with the appropriate flux and silver nitrate solution and it is placed in a crucible. Fusion of the sample occurs in a furnace for 45 minutes at 900°C. When cooled, the lead-button containing gold is separated and put in a pre-fired cupel which is positioned in the furnace for 30 minutes at around 950°C. When no more molten lead is visible, the gold-silver bead stays in the cupel. The sample is ready for the atomic absorption finishing.

PULVERIZE AND LEACH SYSTEM

Around 300 g of the coarse material > 75% passing 8 mesh is precisely measured and used for the PAL manipulation. This pulp material is put in an iron container with 1,000 ml water, two cyanide assay tabs and with few steel balls (two balls of 36 mm, four balls of 27 mm and 1 kg of 12 mm). The PAL machine grind and leach the material for 90 minutes.

An aliquot of 10 ml is collected per pot (The PAL runs 52 pots at the same time). The aliquot is sent for atomic absorption analysis after having filtered the grind media out.

ATOMIC ABSORPTION AND GRAVIMETRY

The majority of the analyses are made by atomic absorption. This technique makes use of absorption spectrometry to assess the concentration of an analyte in a sample. In short, the electrons of the atoms in the atomizer can be promoted to higher orbitals for an instant by absorbing a given quantity of energy (i.e. light of a given wavelength). This amount of energy (or wavelength) is specific to a particular electron transition in a particular element and in general, each wavelength corresponds to only one element. This gives the technique its elemental selectivity. As the quantity of energy (the power) put into the flame is known and the quantity remaining at the other end (at the detector) can be measured, it is possible to calculate how many of these transitions took place and thus get a signal that is proportional to the concentration of the element being measured (Figure 11-3).

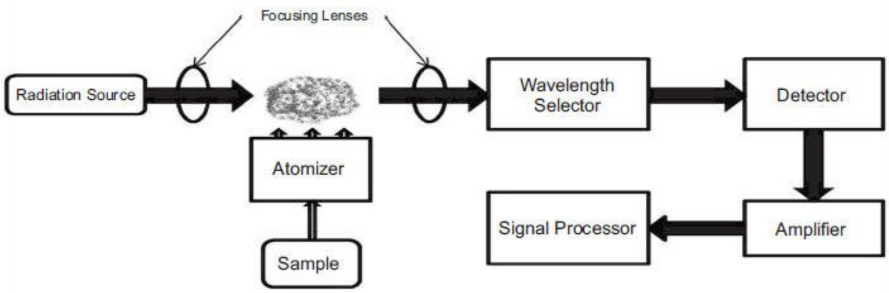

Focusing Lenses
Radiation Source
Wavelength Selector
Detector
Atomizer
Sample
Signal Processor
Amplifier

Figure 11-3

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Schematic Description of the Atomic Absorption (AA) Method

September 2017

Source: IAMGOLD, 2017.

For Fire Assay, the gold is not analyzed directly, but rather in solution. The sample is placed in test tubes and digested into HNO_3 HCL (aqua regia). Distilled water is added allowing silver chloride to form and when all silver is settled then the mix is ready for readings on the atomic absorption spectrometer.

For PAL, the solution collected out of the PAL process is read by the atomic absorption spectrometer by direct aspiration.

In case of a high concentration of gold, the sample may be subject to gravimetric finishing by weighing directly the gold. A computer is connected to the machine and records all the collected assays.

SAMPLE SECURITY

After the samples have been split and put in pre-identified plastic bags, they are delivered by the core shack personnel to the RGM Laboratory or transported by a contractor to an external Laboratory in Paramaribo (since 2009). Since 2014, Filab and ENZA are used as check laboratories by RGM Laboratory for the Fire Assay process. For the PAL samples, RGM Laboratory is using, as external laboratories, CRS-Actlab and Merian Gold Mine Laboratory (Suriname, Newmont).

The RGM Laboratory, associated with the Mill, is fenced and has security posted at the entrance. As soon as they arrive at the laboratory site, samples are registered either into the Laboratory Information Management System (LIMS, RGM), are scanned and given an internal ID (Filab) and are then stored. To ensure the integrity of each sample shipment, the Core Shack supervisor/geologist from the Mine Exploration department, using the submittal sheet, verifies that all samples are accounted for when the samples are shipped out. A submittal sheet is forwarded, as well, to the laboratories to verify, at the receiving end, that no sample is missing.

Written and detailed official procedures are available for sample preparation for both exploration samples (RC holes and DD holes) and production samples (Blast holes (BH) and RC holes (RC)). RC drilling started in 2014 in order to improve grade control and mining efficiencies.

Since 2008, a new LIMS provided by AssayNet has been used by RGM laboratory to manage the data and automatically process the data collection. The assay results are collected automatically by the LIMS (no manual data entry), exported into csv files and directed into a folder on the network with restricted access and subsequently uploaded with data loader into DataShed, which is the database of the Geology department. Ore Control RC assays are used in the 2017 resources and reserves estimation.

QUALITY ASSURANCE AND QUALITY CONTROL

BLANKS

The blanks are chronologically plotted. The safety limit is defined by two times the detection limit for pulp blank and by three times the detection limit for coarse blank. The RGM Laboratory detection limit adds up to 0.014 g/t.

If any blank is higher than any of these defined safety limits, a contamination issue is detected and the batch or the sequence of samples related to this contaminated blank has to be re-assayed.

A contamination period is considered when 10% of the coarse blanks or 5% of the pulp blanks exceed the safety limit. In that case, all the assays between problematic blanks have to be assayed again and a long term investigation has to be run.

STANDARD REFERENCE MATERIAL (SRM)

Different charts are used to analyze the SRM assays:

- A classical control chart, plotting the results in chronological order as well as the SRM reference value, the experimental mean and the experimental standard deviation (σ). This first chart is usually useful to detect quickly outliers (all values outside the interval defined by the experimental mean +/- 3* σ).
- A control chart with moving average plotting the assays in chronological order. For this peculiar graph, the confidence interval (I_C) is calculated from the acceptable standard deviation of a moving average with rank n. It takes into account the estimation error of the certified value (SDE) and the variability of the analyses in the laboratory (SD):

$$I_c = V +/- 1.96 \sqrt{SDE^2 + \frac{SD^2}{N}}$$

With:

V: certified value or reference value;

$$S = \sqrt{SDE^2 + \frac{SD^2}{N}}$$

Which is the standard deviation of the moving average acceptability.

This visual approach highlights the portions of the moving average exceeding the limits of the confidence interval and shows up the batches that need to be re-analyzed.

If any standard fails, all the samples between this standard reference material and the next one and the previous one have to be re-assayed. If a trend or bias is observed, an investigation has to be run to solve the origin of this abnormal behavior.

DUPLICATES AND CHECK ASSAYS

Two different graphs are used to plot this kind of controls:

- The first one is a scatter plot of the duplicate/check assays versus the original sample assays to visually detect outliers. All the pairs of data outside the 2 rejected curves are considered as outliers.
- The second one is a relative difference control chart. The relative difference is computed with the original sample assays and the duplicate/check assays. It is plotted in function of the original sample grades. A moving average is also calculated to help the reading of the chart.

LABORATORY INTERNAL QUALITY CONTROL PROCEDURES

For fire assaying, one blank, one standard reference material, and one duplicate sample (pulp), randomly chosen, are inserted in each tray of 24 samples, by the laboratory, in order to assure proper fluxing and to prevent accidental mix ups.

For PAL, two blanks, two standards, and two duplicate samples are randomly inserted in each tray of 52 samples. Also, some check assays for the fire assay and the PAL process are sent regularly to external laboratories.

BLANKS, STANDARDS, AND DUPLICATES

A total of 8,881 blanks with 21 contaminated blanks (0.24%) for Fire Assay and 10,603 blanks with 45 contaminated blanks (0.42%) for PAL were used by RGM Laboratory in 2016.

The laboratories are also routinely doing re-assays on pulps and coarse rejects samples to maintain proper crushing sizing, sample reduction through splitting and homogeneity between results. Those re-assays provided in each official assay certificate and/or in the QC Module are described in detail in Table 11-1.

TABLE 11-1 RGM LABORATORY INTERNAL QUALITY CONTROL SUMMARY 2016

RGM Laboratory Internal Quality Control

Clients	Type of Sample	Assaying Method	Number of Sample	Standard	Number of Pulp Duplicate	Number of Coarse Reject Duplicate
Mine Geology	BH	FA	181,543	5,813	4,610	2,175
	RC	FA	42,327	1,903	1,823	582
	RC	PAL	223,365	7,341	—	3,789
Mine Exploration	DDH	FA	23,169	1,264	2,205	1,179
	RC	PAL	7,160	293	—	476

- 1st check : Randomly selected, these checks are performed on the remaining 300 g of pulp for FA and on the remaining 800 g of coarse reject for PAL. In 2016, for Mine Exploration department, they represented about 5.1% (1,185 samples) of the total number of core samples assayed by FA (23,169 samples) and about 4.9% (345 samples) of the total number of RC samples assayed by PAL (476 samples). For the Mine Geology department they represented about 2.53% (4,610 samples) of the total number of blast hole samples assayed by FA (181,543 samples), they represented about 4.3% (1,823 samples) of the total number of RC samples assayed by FA (42,327 samples) and they represented about 1.7% (3,789 samples) of the total number of RC samples assayed by PAL (223,365 samples).

- 2nd check : These checks are also randomly selected and performed on the remaining 800 g of coarse reject for the samples assayed by FA. In 2016, for the Mine Exploration department, it corresponds to about 5% (1,179 samples) of the total number of core samples assayed by FA (23,169 samples). For the Mine Geology department those checks represent 1.1% (2,175 samples) of the total number of blast hole samples assayed by FA (181,543 samples) and about 1.3% (582 samples) of the total number of RC samples assayed by FA (42,327 samples).

The results indicate that the accuracy and the precision of RGM laboratory is within the accepted limits for diamond drill core, RC samples, and blast hole samples. No major contamination or bias have been observed in 2016.

CHECK ASSAYS

The quality of the assays of RGM Laboratory are also assessed regularly by sending check assays to external laboratories.

For the fire assay process, 145 pulp samples and 147 coarse reject samples have been sent to Filab and Enza as check assays for the blast hole samples. No bias have been detected and the proportion of outliers is, respectively, 3.4% for the pulp check assays and 4.7% for the coarse reject check assays.

Also, at the end of 2016, 150 coarse reject samples have been sent to CRS –Actlab and 200 coarse reject samples have been exchanged with Merian Gold Mine (Newmont). In both cases, no bias have been found and the proportion of outliers is respectively 4% for the check assays sent to CRS-Actlab, and 5% for the check assays sent to Merian Gold Mine (Newmont).

QUALITY CONTROL PROCEDURES

Quality control procedures are specific to the Mine Exploration and Mine Geology departments.

MINE EXPLORATION DEPARTMENT QUALITY CONTROL PROCEDURES

Sample control is maintained through documentation by means of shipment invoicing by batch, with signature approval. This documentation is always important for chain-of-custody requirements. Training requirements for analysis and sample preparation technicians have been documented through RGM Laboratory's ongoing training program, which includes equipment preventative maintenance, operation, and calibration. Assay results transmission and Quality Control (QC) reporting, since 2008, is conducted through the Laboratory Information Management System (LIMS). This system stores all computed information regarding assays in a single database from which the assaying process can be followed from reception of the sample to the result approval. All samples are identified with a barcode tag at each step of the assaying process, which eliminates potential human errors.

The RGM laboratory quality control is made internally and by the client (geology department) in order to maintain the highest possible standard controls. Samples from diamond drilling and from blast holes are never mixed up; sample preparation is completed on two different lines within the laboratory, and the fire analysis is run in distinct sequences.

Quality control is monitored by the geology department (DD holes and RC holes) by requiring regular assay checks on pulps and coarse rejects and by submitting blind standard reference material, blind blanks, re-tagged pulps, and re-tagged rejects. Those blind samples are (Table 11-2):

- Standard Reference Material (SRM) : Pulverized rock material of which gold content is certified by an independent lab (RockLab). This material is used to verify the accuracy of the lab during fire assay/PAL process. It represents **2-3%** of the assayed samples.
- Blanks : Certified core material which gold content is certified. They are used to verify the contamination of the lab mainly during sample preparation process. It represents **3-4%** of the assayed samples.
- Reject Duplicates : **1-2%** of the unused fraction of the crushed rock sample left over from the assaying process and which has been retagged. They are used to evaluate the reproducibility of results.
- Pulp Duplicates : **1-2%** of the unused fraction of the pulverized rock sample left over from the assaying process and which have been retagged. They are used to verify the reproducibility of the lab, principally linked to the homogenization of the pulverized material.
- RC Field Duplicates : **3%** of the remaining half-split of a RC-sample is afterwards mixed / split / and retagged with a different number. They are used to verify the homogeneity of a sample after splitting.
- Check Assays : **2%** of the unused fraction (coarse reject and pulp sample) of the sample left over from the assaying process after a splitting step. The selection is made by range of grades to be sure to have a representative selection. These checks are sent to CHEMEX or SGS for the core samples assayed by FA and sent to Merian Gold Mine (Newmont) and ENZA for the RC samples assayed by PAL. They are used to verify the accuracy of the main lab.

TABLE 11-2 MINE EXPLORATION DEPARTMENT QUALITY CONTROL SUMMARY 2016

Mine Exploration Department Quality Control

Type of samples	DDH	RC
Assaying Method	FA	PAL
Number of Sample	23,169	7,160
Number of Blank	723	283
% of Blank	3.1%	4.0%
Blanks Outlier	28	8

Mine Exploration Department Quality Control

Type of samples	DDH	RC
% of Blanks Outlier	3.9%	2.8%
Number of SRM	443	215
% of SRM	1.9%	3.0%
Number of SRM Outlier	35	15
% of SRM Outlier	7.9%	7.0%
Number of Pulp Duplicate	456	—
% of Pulp Duplicate	2.0%	—
Number Pulp Duplicate Outlier	—	—
% of Pulp Duplicates Outlier	—	—
Number of Coarse Reject Duplicate	321	116
% of Coarse Reject Duplicate	1.4%	1.6%
Number Coarse Reject Duplicate Outlier	—	—
% of Coarse Reject Duplicates Outlier	—	—
Number of Field Duplicate	—	216
% of Field Duplicate	—	3.0%
Number Field Duplicate Outlier	—	9
% of Field Duplicates Outlier	—	4.2%

STANDARD REFERENCE MATERIAL AND BLANKS

A total of eight different fire assay SRMs from Rocklabs ranging from 0.607 g/t Au to 2.637 g/t Au, are inserted by the Mine Exploration department at each 30 diamond drilled samples. A total of three different PAL SRMs from Gannet Holding, ranging from 0.2 g/t Au to 1.24 g/t Au, are inserted by the Mine Exploration department at each 30 RC drilled samples. Once the results are given to the Mine Exploration department, they are compiled and statistical calculations and plots are completed, as described previously.

A total of 443 fire assay SRM samples and 215 PAL SRM samples have been analyzed by RGM Laboratory in 2016 representing 1.9% of the fire assay samples processed and 3.0% of the PAL samples processed. Overall, the RGM Laboratory has shown a relative good performance on SRM accuracy with a relative standard deviation <10% for the fire assay and the PAL (Table 11-3 and Table 11-4).

TABLE 11-3 FIRE ASSAY SRM SUMMARY 2016

Year 2016	Fire Assay SRM							
SRM Name	**OxE74**	**OxF65**	**OxH66**	**Oxi67**	**SE58**	**SJ53**	**SH41**	**SG56**
Total	10	40	13	20	103	98	41	118
Total without outliers	10	33	12	15	100	87	35	109
Number of outliers	0	7	1	3	3	9	3	9
Laboratory Average (g/t)	0.59	0.792	1.223	1.833	0.6	2.61	1.34	1.01
Standard Deviation	0.044	0.06	0.085	0.109	0.051	0.223	0.12	0.082
Reference Value (g/t)	0.615	0.805	1.285	1.817	0.607	2.637	1.344	1.027
Outliers (%)	0.0%	17.5%	7.7%	15.0%	2.9%	9.2%	7.3%	7.6%
Relative Standard Deviation (%)	7.5%	7.6%	7.0%	5.9%	8.5%	8.5%	9.0%	8.1%

TABLE 11-4 PAL SRM SUMMARY 2016

Year 2016	PAL SRM		
SRM Name	**ST694**	**ST529**	**ST647**
Total	65	77	73
Total without outliers	63	71	70
Number of outliers	2	6	3
Laboratory Average (g/t)	0.213	0.621	1.218
Standard Deviation	0.021	0.036	0.063
Reference Value (g/t)	0.2	0.63	1.24
Outliers (%)	3.1%	7.8%	4.1%
Relative Standard Deviation (%)	9.9%	5.8%	5.2%

Some occasional problems of contamination occurred as 36 blanks over 1,006 failed. The results indicate that no major problem is encountered in the RGM Laboratory regarding the fire assay and PAL process.

PULP AND COARSE REJECT DUPLICATES, FIELD DUPLICATES

The Mine Exploration department sent 456 pulp samples (2.0%) and 321 coarse reject samples (1.4%) through fire assay, as duplicates, selected by a range of grades on the 23,169 samples of the 2016 DD campaign. Also, 116 coarse reject samples (1.6%) have been sent through PAL, as duplicates, selected by a range of grades on the 7,160 samples of the 2016 RC campaign (Table 11-2). The last assays of this campaign were received at the beginning of July 2016, the re-assay of the pulp and coarse rejects have been delayed.

For the 2016 RC campaign, 216 field duplicates (3.0%), randomly selected on 7,160 RC samples, were assayed (Table 11-2). The results return 4.2% of outliers and didn't show any bias.

EXTERNAL VERIFICATIONS

The quality of the assay results generated by RGM Laboratory is assessed also using external laboratories (ALS Minerals and SGS, ENZA, Merian Gold Mine (Newmont)) to which blind Standard Reference Material and blind pulp duplicates are sent.

The Mine Exploration department sent 120 coarse reject samples to Merian Gold Mine, as PAL check assay, selected by a range of grade on the 7,160 samples of the 2016 RC campaign. Also, 350 pulp samples and 345 coarse reject samples were sent to SGS and ALS, as fire assay check assays for the 2016 DD campaign. For the same reason as for the pulp and coarse reject, the check assays results have been delayed.

In regards to the general QA/QC processes concerning drilling, sampling and laboratory procedures have been externally verified by Dr. D.-François Bongarçon (ref. 2014 and 2015) and Dr. Dick Minnitt (ref. 2016).

MINE GEOLOGY DEPARTMENT QUALITY CONTROL PROCEDURES

Since the needs of the Mine Exploration department and Mine Geology department differ to some extent, the bulk of the procedure is the same as for the Mine Exploration department. The quality control process will show slight differences, however, the overall goal remains the same, to ensure that both departments can rely on the assay results.

The RGM Laboratory quality control is made internally and by the client (Mine Geology department) in order to maintain the highest possible standard controls. QC is insured by the Mine Geology department for the RC samples and the blast hole samples by requiring regular re-tagged coarse reject duplicates and by submitting Field Duplicates. Since the blast holes assays are not used in the resources & reserves estimations, the QAQC results will be developed only for the RC assays:

- Coarse Reject Duplicates : **1%** of the unused fraction of the crushed rock sample left over from the assaying process and which has been retagged. They are used to evaluate the reproducibility of results.
- RC Field Duplicates : **3-5%** of the remaining half-split of a RC-sample is afterwards mixed / split / and retagged with a different number. They are used to verify the homogeneity of a sample after splitting out in the field.

As the coarse reject duplicate program started at the end of 2016, the percentage (0.2%) for the entire year is low (Table 11-5). No major bias has been observed in 2016.

TABLE 11-5 PAL SRM SUMMARY 2016

Mine Geology Department Quality Control

Type of samples	RC	RC
Assaying Method	PAL	FA
Number of Sample	223,365	42,327
Number of Coarse Reject Duplicate	475	—
% of Coarse Reject Duplicate	0.2%	—
Number of Coarse Reject Duplicate Outliers	37	—
% of Coarse Reject Duplicate Outliers	7.8%	—
Number of Field Duplicate	12,218	1,854
% of Field Duplicate	5.5%	4.4%
Number of Field Duplicate Outliers	393	113
% of Field Duplicate Outliers	3.2%	6.1%

12 DATA VERIFICATION

DATABASE ORGANIZATION

The whole mineral inventory is monitored through GEMS 6.7 by Dassault Systèmes which is supported by centralized SQL Server 2014 databases. These SQL databases are hosted on a virtual SQL server under the responsibility of the IT department while the databases themselves are under the responsibility of the database administrator.

GEMS is mainly used by: 1) the geologists for reserve and resource calculations, geological modelling, management of the drilling campaign, and packet design; 2) by the mine planners to complete pit designs, short term planning, and whittle shells and; 3) by the surveyors to record spatial information.

Each pit in the RGM Concession forms a distinct GEMS project and so, constitutes an individual database. The GEMS projects are made of different workspaces which are a grouping of data within a project on the basis of type, such as points, drill-holes, polylines, polygons, and triangulations (solids and surfaces). Workspaces are organized into tables, with each workspace consisting of at least one header table and potentially an unlimited number of sub-tables.

The database has a high security level administered in SQL via SQL Server Management Studio, a graphical interface of SQL 2014. The mine employees requiring the use of GEMS are first added to the SQL server users list through SQL Server Management Studio with their Domain Login names. Then, for each database, the user is added to a role, which is a SQL group of users with specific permissions.

In SQL, for each project there are six main roles having distinct permissions for each workspace (BLOCK, SUR, PLN, GEO, ENG, and OC). When a user is added to a role, he/she automatically gets the permissions attributed to this role. Special restrictions are applied for critical data: 1) the block model workspaces can only be modified by the resource geologists and the database administrator; 2) the assays table from drillholes are read-only once the results have been imported. The management of those permissions is monitored by a limited amount of qualified persons.

Backups of the databases are made daily under the supervision of the database administrator. These backups are part of a back-up plan that automatically runs every night. The last six backups are kept on the server and one backup, a week, is transferred to another server and is kept for five weeks. The IT department also carries out a complete backup of the server VROSGEMS01 every day and monthly. Daily backups are incremental and the monthly backups are stored on tape.

DRILL HOLE VALIDATION

The geological data from the exploration program is imported in the database via LogChief, a logging software provided by Maxwell Geoservices, which is linked to the central database.

After the logging and assaying information have been imported into GEMS through the logger, the geologist who logged the hole and his supervisor are responsible to do a validation of his data including: 1) visual validation of the drillhole in Gems; 2) cross check for overlapping and missing intervals using the Gemcom validation tool; 3) do the quality control (QC) check on the samples when the results are received.

When the QC has been completed and all of the data has been validated, confidence in this data is considered adequate to be used in the mineral resource calculations. Beyond this, an extra validation is completed by the resource geologist to ensure the integrity of the data used.

It is the QP’s opinion that the logging, sampling procedures, and data entries were completed to industry standards. It is the QP’s opinion that the database is adequate to support a Mineral Resource estimate on the RGM property.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

This section reports on the work completed to develop the understanding of the metallurgical characteristics of the remaining ore in the RGM deposits. This understanding contributes to the design of a technically effective and economically efficient gold recovery operation.

INTRODUCTION

Since 1999, several metallurgical testwork campaigns were carried out on composite samples from each of the pits at RGM during development of the Project, and sizing the equipment for construction. The testwork included programs at Hazen Laboratory (1995), Mineral Resources Limited (1999), and Kappes Cassiday Associates (1999).

According to the LOM and historical data from 2004-2010, the existing processing plant faced new challenges in limitations to processing ore with a hard rock ratio greater than 20%. Based on this limitation, IAMGOLD made a decision to perform a whole plant survey and ore type characterization to better understand the actual bottlenecks and to predict the future mill performance. In addition to that main objective, the application of results obtained through RGM's Plant Optimization Program (POP) has shown a huge benefit to the work on the Rosebel mill performance, specifically recovery and throughput.

This section summarizes the major conclusions and outcomes from the metallurgical testing completed in June 2010. From a technical point of view the project was performed in collaboration with:

- SGS Lakefield Research Limited (SGS Lakefield): Grinding and leach/CIL surveys and ore type characterization.
- Sepro Mineral Systems Corp. (Sepro) (supplier of Falcon SB gravity concentrator technology): Gravity circuit characterization, bench scale testing, modelling, and simulation.
- Knelson Gravity Solutions (Knelson - now FLSmidth Knelson): Gravity Recoverable Gold (GRG) determination on one composite sample, gravity circuit inspection, modelling, and simulation.
- PICA SASU (now Jacobi Carbons): Diagnose carbon regeneration problems.

- Fluor Canada Ltd. (Fluor): Review of comminution circuit.

METALLURGICAL CHARACTERIZATION

A metallurgical characterization program, developed in collaboration with SGS Lakefield and site laboratory, was implemented at Rosebel in late 2009 to optimize the current mill and support its evolution towards the processing of higher proportions of hard rock. Sepro and Knelson also performed a gravity investigation. The entire program was divided into two main parts:

- Characterization of drill core samples (NQ for hard rock/transition and HQ for soft material) which represent the three ore types and different pits; and
- Mill surveys with different ratios of hard pre-crushed and non-pre-crushed ore.

The outcomes were used to estimate the maximum capacity of the existing circuit based on the LOM, and to determine the equipment additions required to process more hard rock, going forward. To date, based on the conclusions from these studies, several additions have been made to the mill. A mobile pre-crushing circuit, ball mill #3, gravity, and intensive leach (Acacia reactor) circuit were integrated.

The information from the metallurgical characterization program was also used for the calibration of a Comminution Economic Evaluation Tool (CEET) Model. This tool is used in conjunction with the grindability values and the mine block model to forecast the grinding circuit capability and to identify bottlenecks. Through this characterization program the following steps were achieved:

1. Drill core samples characterization in 2010 and comparison with 2007 grindability test work was completed to support the mill expansion in 2008 with the addition of ball mill # 2;
2. Plant audit, including detailed surveys with a focus on the effect of the hard rock ratio;
    a. First audit in December 2009, consisting of three grinding surveys;
    b. Second audit in March 2010, consisting of three grinding surveys;
    c. Third audit in February 2012, consisting of five grinding surveys with and without pre-crushed ore;
3. Modelling of the circuit based on the ore surveyed;
4. Grinding circuit evaluation using the CEET Model: maximum hard rock capacity of the current plant and evaluation of the expansion scenario using available mills from Omai Gold Project.

SAMPLING

The Rosebel plant receives fresh ore from seven different pits which makes the forecasting very challenging due to the wide range in ore grindability. A sampling strategy was developed and executed in 2009 with the geology team on site. The objective of the first step was to take composite samples from available drill cores to characterize the different deposits. The characterization program was carried out by SGS Lakefield focussing on hard rock material. Table 13-1 shows the selected samples and their chemical composition.

TABLE 13-1 SAMPLE IDENTIFICATION AND CHEMICAL COMPOSITION

Ore Type	Location	Sample ID	SiO_2 %	AL_2O_3 %	Fe_2O_3 %	MgO %	CaO %	Na_2O %	K_2O %	TiO_2 %	P_2O_5 %	MnO %	Cr_2O_3 %	V_2O_5 %	LOI %	Sum %	S %
Hard Rock	Koolhoven	#17	53.7	13.2	8.83	3.05	6.06	2.38	0.68	0.66	0.12	0.13	0.03	0.02	8.85	97.7	0.95
	Koolhoven - S	#19	66.5	11.1	8.88	1.49	2.28	1.32	0.89	0.76	0.09	0.26	0.04	0.03	4.28	97.9	0.62
	Mayo	#28	56.8	17.6	6.96	1.56	3.9	3.78	1.88	0.69	0.15	0.1	0.01	0.02	4.29	97.7	1.09
	Pay Caro - North Pushback	#38	65.3	14	7.74	1.48	1.0	2.16	1.6	0.72	0.1	0.16	0.03	0.02	3.18	98.3	0.3
	East Pay Caro	#47	50.6	12.7	10.4	3.7	6.82	2.86	0.79	0.9	0.16	0.16	0.04	0.03	8.08	97.1	0.69
	Roma	#25	55.1	16.2	7.82	2.22	4.86	4.44	1.38	0.67	0.15	0.13	0.01	0.03	5.76	98.7	0.31
	Rosebel	#21	67.2	15.4	5.46	1.32	1.4	2.53	2.28	0.55	0.11	0.08	0.02	0.01	2.63	99.1	0.68
	Royal Hill NW	#1	65.4	11.3	6.36	1.12	3.67	3.52	1.27	0.55	0.18	0.11	0.02	0.02	3.72	97.2	1.11
	Royal Hill NW	#10	59.7	15.3	6.47	1.93	4.09	4.28	1.1	0.58	0.13	0.13	0.02	0.02	4.56	98.4	0.18
	Royal Hill NW Fold one	#34	59.6	15.4	10.1	1.99	2.52	2.33	1.68	0.88	0.12	0.12	0.02	0.04	2.83	97.7	1.13
	Royal Hill SE Royal hill	#13	45	12.2	10.4	6.75	9.0	1.74	0.16	0.8	0.07	0.2	0.05	0.05	12.4	98.9	0.08
	Royal Hill	#32	53.8	16.6	9.86	2.1	4.81	2.8	1.45	0.83	0.2	0.13	0.02	0.04	4.16	96.8	0.92
Transition	J- Zone	#36	63.7	19.7	7.44	0.2	0.05	1.96	1.7	0.84	0.03	0.02	0.02	0.03	4.44	100.2	0.09
	Mayo	#27	72.1	15.9	3.79	0.3	0.18	2.26	1.41	0.27	0.07	0.04	<0.01	<0.01	3.53	99.9	0.17
	Roma	#24	59	18.2	10.1	1.05	0.17	1.06	2.9	0.86	0.13	0.12	0.04	0.04	6.12	99.8	1.03
	Rosebel	#22	65.8	16.1	6.54	1.74	0.91	1.36	2.33	0.6	0.12	0.1	0.02	0.02	4.12	99.7	0.96
Saprolite	J- Zone	#35	58.2	21.2	10.4	0.1	0.04	1.83	1.74	0.9	0.05	0.01	0.03	0.03	5.44	100	0.05
	Koolhoven	#24	54.4	22.6	11.5	0.08	0.07	1.63	1.02	1.18	0.1	0.06	0.03	0.04	7.39	100.1	0.02
	Mayo	#8	67.7	19.9	4.3	0.06	0.03	0.55	1.27	0.54	0.01	0.01	0.01	0.02	5.88	100.4	0.01
	Pay Caro - West End	#39	55.9	24.5	8.48	0.15	0.08	2.28	1.79	1.02	0.04	0.05	0.02	0.03	5.87	100.2	0.02
	East Pay Caro	#42	71.3	14.3	6.64	0.16	0.07	0.65	2.06	0.89	0.03	0.03	0.03	0.04	3.76	100	0.47
	East Pay Caro	#45	58.9	17.4	13.9	0.11	0.08	0.78	1.04	1.2	0.14	0.1	0.02	0.05	6.3	100	0.03
	Rosebel	#20	63.4	20.8	5.58	0.21	0.07	0.47	3.05	0.77	0.02	0.01	0.02	0.02	5.7	100.2	0.02
	Royal Hill SE	#11	59	17.8	13.1	0.44	0.05	0.23	0.89	0.96	0.06	0.37	0.04	0.05	6.94	99.9	0.11
	Average		60.3	16.6	8.38	1.39	2.21	2.05	1.52	0.78	0.1	0.11	0.03	0.03	5.43	99	0.46
	Standard Deviation		6.75	3.55	2.95	1.65	2.53	1.11	0.72	0.24	0.06	0.09	0.01	0.01	2.2	1.1	0.45
	Relative Standard Deviation		11.2	21.3	35.2	118.6	114.2	54.2	47.7	30.7	57.5	81.8	39.3	37.7	40.6	1.2	97.9
	Minimum		45	11.1	3.79	0.06	0.03	0.23	0.16	0.27	0.01	0.01	0.01	0.01	2.63	96.8	0.01
	10th Percentile		53.7	12.4	5.5	0.1	0.05	0.58	0.82	0.55	0.03	0.01	0.01	0.02	3.29	97.4	0.02
	25th Percentile		55.7	14.2	6.52	0.19	0.07	1.26	1.04	0.65	0.06	0.05	0.02	0.02	4.03	97.9	0.07
	Median		59.3	16.2	8.15	1.22	1.16	2.06	1.43	0.79	0.11	0.11	0.02	0.03	5	99.4	0.31
	75th Percentile		65.5	18.6	10.2	1.95	3.95	2.6	1.81	0.89	0.13	0.13	0.03	0.04	6.17	100	0.93
	90th Percentile		67.6	21.1	11.2	2.8	5.7	3.7	2.32	1	0.16	0.19	0.04	0.05	7.87	100.2	1.07
	Maximum		72.1	24.5	13.9	6.75	9	4.44	3.05	1.2	0.2	0.37	0.05	0.05	12.4	100.4	1.13

MINERAL COMPOSITION AND DISTRIBUTION

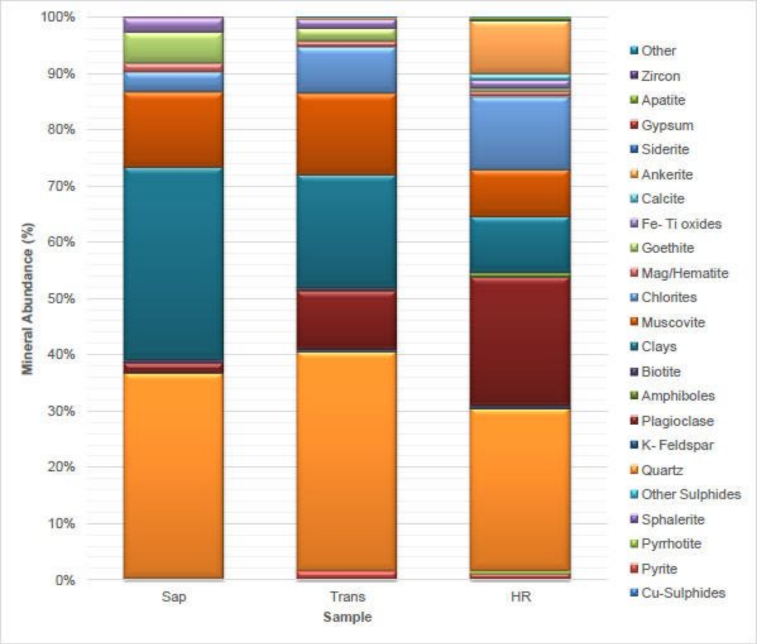
Table 13-2 and Figure 13-1 show the average mineral abundance, by rock type, measured by QEMSCAN. QEMSCAN is an abbreviation standing for Quantitative Evaluation of Minerals by SCANning electron microscopy.

TABLE 13-2 AVERAGE MINERAL ABUNDANCE BY ROCK TYPE

AVERAGE MINERAL MASS (%)

Sample	Saprolite	Transition	Hard Rock
Cu-Sulphides	0.00	0.03	0.05
Pyrite	0.13	1.41	0.96
Pyrrhotite	0.00	0.01	0.42
Sphalerite	0.00	—	—
Other Sulphides	0.00	0.01	—
Quartz	36.50	39	28.9
K- Feldspar	0.11	0.3	0.52
Plagioclase	1.72	10.4	22.9
Amphiboles	0.11	0.2	0.72
Biotite	0.42	0.5	0.18
Clays	34.30	20	9.82
Muscovite	13.40	14.5	8.28
Chlorites	3.52	8.15	13.1
Mag/Hematite	1.61	0.88	0.77
Goethite	5.54	2.41	0.54
Fe- Ti oxides	2.50	1.63	1.54
Calcite	0.01	0.01	0.95
Ankerite	0.03	0.26	9.58
Siderite	0.05	0.06	0.34
Gypsum	0.01	0.02	0.01
Apatite	0.02	0.12	0.35
Zircon	0.05	0.01	0.02
Other	0.00	0.01	0.05
Total	**100**	**100**	**100**

FIGURE 13-1 AVERAGE MINERAL ABUNDANCE BY ROCK TYPE



Mineral abundance analysis has indicated that there is low exposure to deleterious elements which would represent a significant impact to the process. However, operationally, it has been observed that pyrrhotite, in higher concentrations, has negatively impacted leach dissolved oxygen levels with consequences to the leach kinetics, and additionally, copper-bearing ores, in higher concentration, have seen CIL carbon copper loading increase to concerning levels. In order to mitigate the above mentioned scenarios, actions have been to limit the ore type reporting to the plant, which has allowed for normalized plant operation without an impact to the process performance.

GRINDABILITY TESTING

DROP-WEIGHT TESTS

A set of 26 drill core samples, comprised of two saprolite samples, eight transition samples, and 16 hard rock samples, were submitted for Bond ball mill grindability (BWI) and the Bond abrasion testing (Ai). Drop-weight testing (SMC) was performed on the hard rock samples only. The SMC test is an abbreviated version of the standard JKTech drop-weight performed on 15 samples from a single size fraction (-22.4/+19.0 mm). Test results are presented in Table 13-3, which includes the results of JK Drop-Weight Test (DWT) from the plant audit samples, as a reference.

BOND BALL MILL GRINDABILITY TEST

Bond ball mill grindability tests were performed at a grind of (150-mesh) 106 microns on the 26 samples. The test results, including the results from the plant audit samples and samples from the 2007 program (project 11700-001), are summarized in Table 13-4. The soft material samples were soaked in water and wet-screened on a 150-mesh screen. The tests were performed on the screen oversize and the Bond ball mill work indices (BWI) were obtained on the oversize fractions are referred as ‘’direct’’ BWI. The calculated overall work indices take into account the amount of fines material that was removed.

The whole grindability results are summarized in Table 13-5, including samples from the plant audit and the previous grindability test program conducted in 2007 (project 11700-001).

Table 13-6 presents the overall grindability statistics. Table 13-7 presents the average grindability results by rock type. Table 13-8 presents the Axb and Bond Work Index per pit as a function of rock type.

TABLE 13-3 JKTECH DROP-WEIGHT AND SMC TEST RESULTS

Sample Name	Deposit	Rock Type	Lithology	A	b	A x b	Hardness Percentile	t_a	Hardness Percentile	DWI (kWh/m^3)	M_{ia} (kWh/t)	M_{ih} (kWh/t)	M_{ic} (kWh/t)	Relative Density
S - 1 Conveyor #3	RH/ mayo	86% saprolite/ 14% HR	—	96	8.87	852	0	12.5	—	0.2	1.8	0.7	0.4	1.77
S - 1 Conveyor #2	RH/ mayo	36% saprolite/ 64% HR	—	82	0.46	37.7	69	0.33	74	—	—	—	—	2.76
S - 1 Conveyor #2 - SMC	RH	100% Hard Rock	—	78.6	0.46	36.2	73	0.34	—	7.5	21	15.9	8.2	2.75
S -1 SAG Screen O/S	RH	Pebbles	—	85.4	0.38	32.5	81	0.31	—	8.5	23.1	17.9	9.3	2.76
S - 4 Conveyor #2	RH+ ?	100% Hard Rock	—	65.4	0.85	55.6	39	0.54	40			—	—	2.73
S - 5 Conveyor #3	RH/ mayo	52% Saprolite	—	70.9	1.68	119	11	1.27	—	2.0	8.3	4.9	2.5	2.44
S - 5 Coveyor #3 - Grey	RH	100% hard rock	—	72.5	0.67	48.6	48	0.45	—	5.7	16.8	12.0	6.2	2.76
RHNW Fold	RH	HR	—	58.6	0.97	56.8	37	0.58	36	—	—	—	—	2.80
Sample #17	Kool	HR	Volc.	69.4	0.47	32.6	81	0.3	—	8.7	22.9	17.8	9.2	2.82
Sample #18	Kool-N	HR	Sed	67.3	0.58	39	66	0.36	—	7.1	19.7	14.8	7.6	2.8
Sample #19	Kool-S	HR	Sed	71.6	0.54	38.7	66	0.36	—	7.2	19.9	14.9	7.7	2.79
Sample #21	Ros	HR	—	87.3	0.31	27	92	0.25	—	10.2	26.8	21.5	11.1	2.75
Sample #25	Roma	HR	Volc./Sed.	80.3	0.33	26.5	93	0.25	—	10.5	27.2	22.0	11.4	2.76
Sample #28	Mayo	HR	Sed	82.3	0.31	25.5	95	0.24	—	10.9	27.9	22.7	11.7	2.78
Sample #29	Mayo	HR	Volc.	94.7	0.27	25.6	94	0.24	—	10.7	28.4	23.1	11.9	2.69
Sample #32	RH	HR	Sed	62.1	0.49	30.4	86	0.28	—	9.1	24.2	19.0	9.8	2.78
Sample #33	RH	HR	Volc.	74.4	0.33	24.6	96	0.22	—	11.7	28.9	23.9	12.3	2.84
Sample #34	RH-NW -Fold	HR	Volc./Sed.	67.6	0.45	30.4	86	0.28	—	9.4	24.4	19.3	10.0	2.82
Sample #37	J-Zone	HR	Volc./Sed.	53.9	1.13	60.9	34	0.61	—	4.3	14	9.5	4.9	2.61
Sample #38	PC-N-Push	HR	Volc./Sed.	97.5	0.23	22.4	98	0.21	—	12.6	30.7	25.8	13.3	2.84
Sample #41	PC-WE	HR	Volc./Sed.	56.6	0.6	34	78	0.31	—	8.4	22.3	17.2	8.9	2.81
Sample #44	EPC	HR	Sed	69.2	0.43	29.8	87	0.27	—	9.5	24.8	19.6	10.2	2.81
Sample #47	EPC	HR	Volc.	78.2	0.36	28.2	90	0.26	—	9.9	25.6	20.5	10.6	2.79

TABLE 13-4 BOND BALL MILL GRINDABILITY TEST RESULTS

Sample Name	Deposit	Rock type	Lithology	Mesh of grind	F_{80} (mm)	P_{80} (mm)	Gram per Revolution	BWI feed Weight(%)	Work index (kWh/t)	Hardness Percentile
S-1 Conveyor #3- Direct	RH/Mayo	86% Saprolite/ 14% HR	—	150	2.088	87	1.51	28.2	14.1	46
S-1 Conveyor #3 -Overall	RH/Mayo	86% Saprolite/ 14% HR	—	150	—	—	—	100	4	0
S-2 Conveyor #3 - Direct	RH/Mayo	36% saprolite/ 64% HR	—	150	2.24	84	1.53	71	13.5	40
S-2 Conveyor #3 -Overall	RH/Mayo	36% saprolite/ 64% HR	—	150	—	—	—	100	9.6	7
S -1 Conveyor #2	RH	100% Hard Rock	—	150	2.464	83	1.75	100	11.8	23
S-1 SAG Screen O/S	RH	Pebbles	—	150	2.425	86	1.83	100	11.6	21
S-1 SAG Screen U/S - Direct	RH/Mayo	86% Saprolite/ 14% HR	—	150	975	85	1.41	25.6	16.6	70
S-1 SAG Screen U/S Overall	RH/Mayo	86% Saprolite/ 14% HR	—	150	—	—	—	100	4.3	0
S-4 Convoyer #2	RH + ?	100% Hard Rock	—	150	2.397	81	1.93	100	10.8	16
S-5 Conveyer #3 - Direct	RH/Mayo	52% Saprolite/ 48% HR	—	150	2.132	81	1.82	54.3	11.5	21
S-5 Conveyor #3- Overall	RH	100% Hard Rock	—	150	—	—	—	100	6.2	1
RHNW Fold	RH	HR	—	150	2.127	82	1.86	100	11.3	19
Sample #4 -Direct	Kool-S	Trans.	Sed.	150	2.202	55	4.02	50.1	4.7	0
Sample #4 Overall	Kool-S	Trans.	Sed.	150	—	—	—	100	2.4	0
Sample #5 -Direct	Kool-S	Trans.	Sed.	150	2.16	49	4.22	35.2	4.3	0
Sample #5 Overall	Kool-S	Trans.	Sed.	150	—	—	—	100	1.5	0
Sample #8 -Direct	Mayo	Sap.	Volc.	150	802	88	1.26	14.9	19.4	89
Sample #8 Overall	Mayo	Sap.	Volc.	150	—	—	—	100	2.9	0
Sample #11 -Direct	RH-SE	Sap.	Volc.	150	1.504	87	1.48	15.5	14.9	54
Sample #11 Overall	RH-SE	Sap.	Volc.	150	—	—	—	100	2.3	0
Sample #12 -Direct	RH-SE	Trans.	Volc.	150	2.19	69	2.84	52	7.2	1
Sample #12 Overall	RH-SE	Trans.	Volc.	150	—	—	—	100	3.8	0
Sample #15 -Direct	RH-SE	Trans.	Sed.	150	590	91	1.89	36	15.7	62
Sample #15 Overall	RH-SE	Trans.	Sed.	150	—	—	—	100	5.6	1
Sample # 17	Kool	HR	Volc.	150	2.603	77	1.55	100	12.5	29
Sample # 18	Kool-N	HR	Sed.	150	2.218	82	1.55	100	13.1	36
Sample # 19	Kool-S	HR	Sed.	150	2.286	84	1.49	100	13.8	43
Sample # 21	Ros	HR	—	150	2.419	76	1.93	100	10.3	12
Sample # 25	Roma	HR	Volc./Sed.	150	2.51	80	1.32	100	14.6	50
Sample #26 -Direct	Mayo	Trans.	Sed.	150	1.867	85	1.76	41.6	12.4	29
Sample #26 Overall	Mayo	Trans.	Sed.	150	—	—	—	100	5.1	0
Sample #27 -Direct	Mayo	Trans.	Volc.	150	2.137	82	2.87	36.8	7.9	2
Sample #27 Overall	Mayo	Trans.	Volc.	150	—	—	—	100	2.9	0
Sample # 28	Mayo	HR	Sed.	150	2.375	82	1.34	100	14.7	52
Sample # 29	Mayo	HR	Volc.	150	2.439	80	1.09	100	17.1	74
Sample # 32	RH	HR	Sed.	150	2.441	79	1.31	100	14.6	51
Sample # 33	RH	HR	Volc.	150	2.22	78	1.55	100	12.7	32
Sample # 34	RH-NW Fold	HR	Volc./Sed.	150	2.429	80	1.3	100	14.8	53
Sample # 37	J-Zone	HR	Volc./Sed.	150	2.159	74	2.15	100	9.5	7
Sample # 38	PC-N Push	HR	Volc./Sed.	150	2.445	78	1.36	100	14.1	46
Sample # 41	PC-WE	HR	Volc./Sed.	150	2.389	81	1.35	100	14.5	50
Sample #43 - Direct	EPC	Trans.	Sed.	150	1.953	84	2.07	62.1	10.6	14
Sample #43 - Overall	EPC	Trans.	Sed.	150	—	—		100	6.6	1
Sample #44	EPC	HR	Sed.	150	2.268	82	1.31	100	15	55
Sample #46 - Direct	EPC	Trans.	Volc.	150	2.125	79	2.12	56.6	10	9
Sample #46 - Overall	EPC	Trans.	Volc.	150	—	—		100	5.7	1
Sample #47	EPC	HR	Volc.	150	2.54	81	1.39	100	14	45
P001	PC	HR	—	150	2.217	82	1.61	100	12.8	33
P001RK2	PC	HR	—	150	2.294	84	1.76	100	11.9	24
P002	PC	HR	Sed.	150	2.119	84	1.68	100	12.6	30
P003	PC	HR	Volc.	150	2.129	82	1.52	100	13.4	39
E001	EPC	HR	—	150	2.14	80	1.7	100	12.1	26
E002	EPC	HR	Sed.	150	2.178	86	1.53	100	13.7	42
E003	EPC	HR	Volc.	150	2.172	74	1.65	100	11.7	22
E004- Direct	EPC	Trans.	—	150	1.891	84	1.94	75.6	11.3	19
E004- Overall	EPC	Trans.	—	150	—	—		100	8.5	4
RH001	RH	HR	—	150	2.112	80	1.51	100	13.3	38
RH002	RH	HR	Pyrrhotite	150	2.149	78	1.53	100	12.9	34
RH003	RH	HR	Sed.	150	2.147	84	1.65	100	12.7	32
RH004	RH	HR	Volc.	150	2.284	77	1.51	100	12.8	34
K001	Kool	HR	—	150	1.962	81	1.89	100	11.3	19
K002 - Direct	Kool	Trans.	—	150	2.013	75	3.32	75.7	6.7	1
K002 - Overall	Kool	Trans.	—	150	—	—		100	5.1	0
M001	Mayo	HR	—	150	2.141	82	1.41	100	14.3	48
R001	ROS	HR	ed./High Qua	150	2.319	89	1.41	100	14.8	53
R002	ROS	HR	ed./Low Quar	150	2.288	76	1.85	100	10.8	16
S001	SAG Pebbles	—	Sed.	150	2.103	92	1.16	100	17.9	80
S002	SAG Pebbles	—	Volc.	150	2.08	73	1.83	100	10.8	15
S003	SAG Pebbles	—	Ferrocrete	150	1.781	82	2.38	100	9.5	7

TABLE 13-5 GRINDABILITY TEST SUMMARY

				Relative		JK parmeters		BWI		AI
Sample Name	Deposit	Rock type	Lithology	Density	A x b [1]	A x b [2]	t_s	(kWh/t) [3]	(kWh/t) [4]	(g)
S- 1 Conveyor #3	RH/Mayo	56% saprolite/ 14% HR	—	1.77	—	852	—	14.1	4	- 0.024
S-2 Conveyor #3	RH/Mayo	36% Saprolite 64% HR	—		—	—	—	13.5	9.5	—
S- 1 Conveyor #2	RH	100% HR	—	2.76	37.7	36.2	0.33	11.8	11.8	0.413
S- 1 SAG Screen O/S	RH	Pebbles		2.76	—	32.5	0.31	11.6	11.6	0.574
S- 4 Conveyor #2	RH +?	100% Hard Rock	—	2.73	55.6	—	0.54	10.8	10.8	0.184
S- 5 Conveyor #3	RH/Mayo	52% Saprolite	—	2.44	—	119	—	11.5	6.2	0.109
S- 5 Conveyor #3 - Grey Rocks	RH	100% Hard Rock	—	2.76	—	48.6	—	—	—	—
RHNW Fold	RH	HR	—	2.8	56.8	—	0.58	11.3	11.3	0.129
Sample #4	Kool-S	Trans.	Sed.	—	—	—	—	4.7	2.4	0.019
Sample #5	Kool-S	Trans.	Sed.	—	—	—	—	4.3	1.5	0.007
Sample #8	Mayo	Sap.	Volc	—	—	—	—	19.4	2.9	N/A
Sample #11	RH -SE	Sap.	Volc	—	—	—	—	14.9	2.3	0.148
Sample #12	RH -SE	Trans.	Volc	—	—	—	—	7.2	3.8	- 0.005
Sample #15	RH -SE	Trans.	Sed.	—	—	—	—	15.7	5.6	0.014
Sample #17	Kool	HR.	Volc	2.82	—	32.6	0.3	12.5	12.5	0.239
Sample #18	Kool-N	HR.	Sed.	2.8	—	39.0	0.36	13.1	13.1	0.203
Sample #19	Kool-S	HR	Sed.	2.79	—	38.7	0.36	13.8	13.8	0.455
Sample #21	ROS	HR	—	2.75	—	27.1	0.25	10.3	10.3	0.27
Sample #25	Roma	HR	Volc/Sed.	2.76	—	26.5	0.25	14.6	14.6	0.3
Sample #26	Mayo	Trans.	Sed.	—	—	—	—	12.4	5.1	0.04
Sample #27	Mayo	Trans.	Volc	—	—	—	—	7.9	2.9	0.116
Sample #28	Mayo	HR	Sed.	2.78	—	25.5	0.24	14.7	14.7	0.282
Sample #29	Mayo	HR	Volc	2.69	—	25.6	0.24	17.1	17.1	0.6
Sample #32	RH	HR	Sed.	2.78	—	30.4	0.28	14.5	14.6	0.199
Sample #33	RH	HR	Volc	2.84	—	24.6	0.22	12.7	12.7	0.219
sample #34	RH-NW Fold	HR	Volc/Sed.	2.82	—	30.4	0.28	14.8	14.8	0.288
Sample# 37	J-Zone	HR	Volc/Sed.	2.61	—	60.9	0.61	9.5	9.5	0.047
sample #38	PC-N-Push	HR	Volc/Sed.	2.84	—	22.4	0.21	14.1	14.1	0.299
Sample #41	PC-WE	HR	Volc/Sed.	2.81	—	34.0	0.31	14.5	14.5	0.166
Sample #43	EPC	Trans.	Sed.	—	—	—	—	10.6	6.6	0.059
Sample #44	EPC	HR	Sed.	2.81	—	29.8	0.27	15	15	0.294
sample #46	EPC	Trans.	Volc	—	—	—	—	10	5.7	0.108
Sample #47	EPC	HR	Volc	2.79	—	28.2	0.26	14	14	0.291
P001	PC	HR	—	—	—	—	—	12.8	12.8	0.307
P001 RK2	PC	HR	—	—	—	—	—	11.9	11.9	0.339
P002	PC	HR	Sed.	—	—	—	—	12.6	12.6	0.279
P003	PC	HR	Volc	—	—	—	—	13.4	13.4	0.328
E001	EPC	HR	—	—	—	—	—	12.1	12.1	0.276
E002	EPC	HR	Sed.	—	—	—	—	13.7	13.7	0.361
E003	EPC	HR	Volc	—	—	—	—	11.7	11.7	0.148
E004	EPC	Trans.	—	—	—	—	—	11.3	8.5	0.166
RH001	RH	HR	—	—	—	—	—	13.3	13.3	0.212
RH002	RH	HR	Pyrrotite	—	—	—	—	12.9	12.9	0.254
RH003	RH	HR	Sed	—	—	—	—	12.7	12.7	0.265
RH004	RH	HR	Volc	—	—	—	—	12.8	12.8	0.196
K001	Kool	HR	—	—	—	—	—	11.3	11.3	0.1
K002	Kool	Trans.	—	—	—	—	—	6.7	5.1	0.081
M001	Mayo	HR		—	—	—	—	14.3	14.3	0.422
R001	ROS	HR	Sed/High Quartz	—	—	—	—	14.8	14.8	0.316
R002	ROS	HR	Sed/High Quartz	—	—	—	—	10.8	10.8	0.193
S001	SAG Pebbles		Sed	—	—	—	—	17.9	17.9	0.618
S002	SAG Pebbles		Volc	—	—	—	—	10.8	10.8	0.119
S003	SAG Pebbles		Ferrocrete	—	—	—	—	9.5	9.5	0.229

TABLE 13-6 OVERALL GRINDABILITY STATISTICS

	S.G. [3]	A x b [3]	t a [3]	BWI [1]	BWI [2]	AI
Average	2.77	35.3	0.33	12.4	10.6	0.225
Std. Dev.	0.05	11.5	0.12	2.9	4.2	0.15
Rel. Std. Dev.	2	32	37	23	40	67
Minimum	2.61	60.9	0.61	4.3	1.5	-0.024
10th Percentile	2.73	55.7	0.55	9.5	3.8	0.038
25th Percentile	2.76	38.8	0.35	11.2	8.1	0.117
Median	2.79	31.4	0.28	12.7	11.9	0.215
75th Percentile	2.81	26.9	0.25	14.1	13.7	0.298
90th Percentile	2.82	25.4	0.24	14.9	14.7	0.414
Maximum	2.84	22.4	0.21	19.4	17.9	0.618

Notes:

1 “Direct” or Measured Bond Ball Mill Work Index
2 “Overall” or Recalculated Work Index
3 The statistics excludes the Saprolite samples from plant audits

TABLE 13-7 AVERAGE GRINDABILITY RESULTS PER ROCK TYPE

Rock Type	Number of Samples	BWI (kWh/t) [1]	BWI (kWh/t) [2]	AI
Saprolite	2	17.2	2.6	0.086*
Transition	10	9.1	4.7	0.061
Hard Rock	34	13.1	13.1	0.280

Notes:

1 “Direct” or Measured Bond Ball Mill Work Index
2 “Overall” or Recalculated Work Index
* From three samples, including Saprolite samples from plant audits

TABLE 13-8 AXB AND BOND WORK INDEX PER PIT IN FUNCTION OF THE TYPE OF ORE

		BWI, kWh/t		
Pit	A x b	HR	Sap	Trans
Pay Caro	28.2	13.2	2.6	4.7
East Pay Caro	29.0	13.3	2.6	6.9
Koolhoven	36.8	12.7	2.6	5.1
J Zone	60.9	9.5	2.6	4.7
Royal Hill	28.5	13.4	2.3	4.7
Mayo	25.5	15.9	2.9	4.0
Roma	26.5	14.6	2.6	4.7
Rosebel	27.1	12.0	2.6	4.7
Stockpile	31.7	13.2	2.6	4.7

The Bond low-energy impact test determines the Bond Crusher Work Index (CWI), which can be used with Bond's third theory of comminution to calculate the power requirement for crusher sizing. Table 13-9 summarizes the crushability index performed by SGS Lakefield.

TABLE 13-9 BOND CRUSHER WORK INDEX (CWI)

Sample Name	Number of Specimens	Work Index (kWh/t)	Min (kWh/t)	Max (kWh/t)	SD (kWh/t)	Relative Density	Hardness Percentile
RH2	19	18.8	11.8	28.1	4.9	2.76	93
RH - PC	19	19.1	9.5	25.3	4.8	2.70	94
Mayo	18	21.8	8.4	35.1	7.7	2.69	96
S-1 Conveyor #2	20	18.4	8.8	29.4	4.3	2.69	93

From the whole grindability test results the following conclusions were made:

- The average relative density ranged from 2.61 to 2.84;
- Rock hardness, Axb, varied from 22.4 to 39 (hard to moderate soft) with one drill core sample at 60.9. According to these grindability results;
  - The bulk samples collected during the mill surveys were generally in the softer range of the distribution, with Axb varying from 37.7 (S1- Conveyor #2) to 56.8 (RHNW Fold);
  - The BWI of hard rock varied from 9.5 to 17.1 kWh/t i.e. moderate soft to medium
  - Direct BWI (fines removed) of transition ranged from 4.3 to 15.7 kWh/t but from 1.5 to 6.6 kWh/t for the equivalent calculated work index (very soft);
  - Direct BWI of saprolite (fines removed) were the hardest at 14.9 to 19.4 kWh/t but very low for the equivalent calculated work index between 2.3 and 2.9 kWh/t;
  - Abrasion Index Ai varies between 0.2 and 0.45 for hard rock. This was used to evaluate the steel consumption;
  - The crusher work index used in the process design criteria is 21.8 kWh/t.

GRINDING CIRCUIT SURVEYS

The first audit clearly showed the limitation of the existing mill to process more than 10% hard rock. Based on positive results from simulations, by using pre-crushing and benchmarking, it was decided in March 2012 to pre-crush the ore at the aggregate plant on site from run-of-mine down to -101 mm and send it to the mill for a trial. Based on the results, pre-crushing can increase hard rock grinding capacity by about 30%. This was confirmed by using a mobile crushing unit with different particle sizes (-101 mm, -75 mm and -50 mm). The mobile crushing unit, with a capacity of 500 tph, was installed at the crushing plant from 2012 to 2016. The processing plant was able to maintain hard rock ratio as per predicted.

Based on the surveys completed, the pebble crusher and the magnet were retrofitted on CV-4 and a new pebble crusher (CH 660 to treatment) is designed for CV-6. The impact of the pebble crusher can be visualized in the CEET simulation graph in the following section (Figure 13-2). The recirculating load from mill surveys with 100% hard rock is about 25%. A larger pebble crusher is considered which will run almost completely with hard rock. A Sandvik CH660 cone crusher was installed in 2012 to maintain the increase in the hard rock ratio.

EVALUATION OF THE CURRENT AND FUTURE GRINDING CIRCUIT OPERATION

Preliminary simulations were performed using JKSimMet, initially, and resulted in some challenges to forecast and predict the impact of pre-crushing on the grinding circuit. Therefore, a decision was made to use a CEET Model. Once well calibrated, the CEET Model is useful to forecast production. In order to calibrate the CEET Model, one of the metallurgical parameters required is the semi autogenous grinding (SAG) Power Index (SPI) which is determined in the laboratory. Given that SPI values were not available from direct characterization on drill core, a correlation was developed to convert available Axb values to SPI values in order to perform simulations. Table 13-10 shows the calculated SPI index for each pit based on available Axb values.

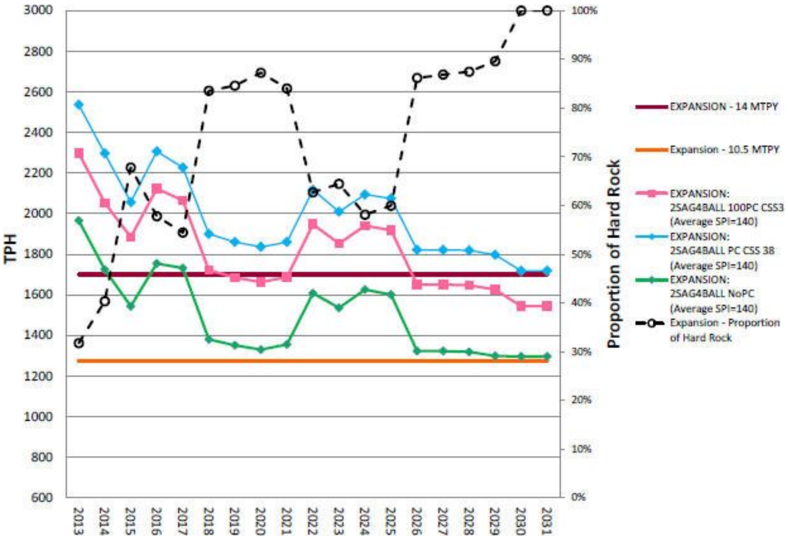
TABLE 13-10 CALCULATED SPI INDEX PER PIT

Pit	Hard Rock	BWI Saprolite	Transition	Axb	SPI	CEET Ci
Pay Caro	13.2	2.6	4.7	28.2	126.7	9.3
Pay Caro East	13.3	2.6	6.9	29.0	122.9	9.5
Koolhoven	1.2.7	2.6	5.1	36.8	95.0	11.8
J Zone	9.5	2.6	4.7	60.9	55.1	18.5
Royal Hill	13.4	2.3	4.7	28.5	125.2	9.3
Mayo	15.9	2.9	4.0	25.5	141.2	8.5
Roma	14.6	2.6	4.7	26.5	135.5	8.8
Rosebel	12.0	2.6	4.7	27.1	132.2	8.9
Stockpile	13.2	2.6	4.7	31.7	111.6	10.3

Figure 13-2 illustrates, in function of the revised LOM, the equipment addition to be completed in order to achieve 12.5 Mtpa with 100% hard rock, according to the CEET Model. The 10.5 Mtpa scenario is also illustrated on the same graph. The Status Quo scenario is illustrated in the second CEET graph as the life of mine of this scenario is slightly different. Simulations with the calibrated CEET Model using data from the three audits concluded that:

- The previous circuit will not be capable of handling 12 Mt/year (1,441 t/h) when processing 60% hard rock with low Axb values. Pre-crushing will be required to achieve this target on the hardest ores. Only approximately 25% hard ore can be pushed through with the hardest material;
- The previous circuit (1 SAG, 3 Ball Mills) with the mobile crushing unit (no permanent secondary crushing) used in parallel with the gyratory crusher could achieve 5 Mtpa at 100% hard rock, which is a conservative throughput.

FIGURE 13-2 CEET SIMULATION – IMPACT OF EQUIPMENT ADDITION



Based on the comminution testwork result, IAMGOLD requested to Fluor to review the performance of the Rosebel grinding circuit. The aims of the review were:

- To identify opportunities that can be implemented in the short term that allows the SAG mill to process a feed blend consisting of approximately 35% hard ore, 40% transition ores, and 25% soft ores at a rate of 12 Mtpa during the period 2012 through to the end of 2013;
- To identify options for improving the power efficiency of the overall grinding circuit; and
- To identify long term opportunities for maximizing throughput rates when the operation switches to the processing of 100% hard ore.

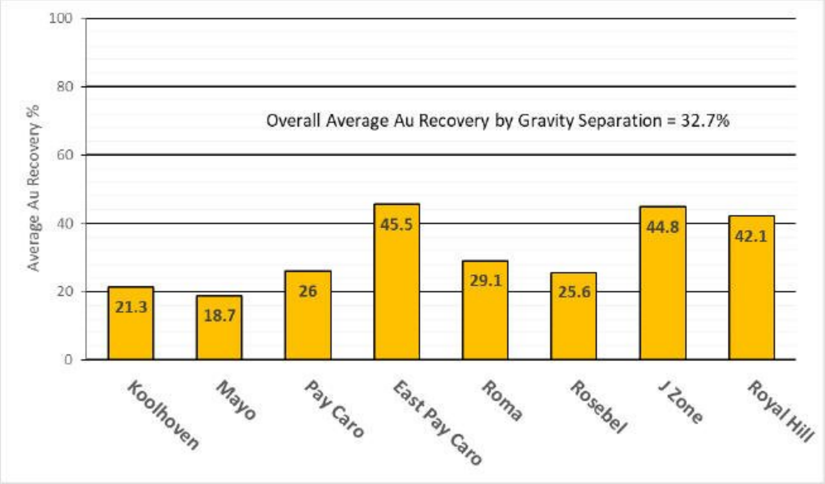
The report presents the findings and conclusions generated by the review of the information and documents provided by the IAMGOLD-Rosebel operating team.

GRAVITY AND LEACHING TEST WORK

Twenty-four samples, comprised of eight saprolite, four transition, and 12 hard rock, were submitted to metallurgical variability tests. A simplified gravity test was completed on samples using a Knelson concentrator and a Mozley table to remove out the coarse gold particles. This mimics the existing process flow sheet using milling in cyanide and gravity separation before the leach/CIL circuit.

Based on historical data, different surveys and laboratory test work performed in collaboration with Sepro and Knelson, an encouraging potential was shown for gravity concentration. This will minimize the variations in the leach feed grade and allow for better cyanide/carbon management and more predictable leach times and leach recoveries. Figure 13-3 shows the gravity recoveries obtained at SGS.

FIGURE 13-3 AVERAGE GRAVITY GOLD RECOVERY BY DEPOSIT USING MOSLEY TABLE



Based on surveys and E-GRG (Extended-Gravity Recoverable Gold), Knelson performed a simulation with Rosebel data to evaluate recoveries for different scenarios and the maximum recovery achievable for different gravity throughputs. From these tests, three Falcon gravity concentrator units and an intensive leach system (Acacia) were installed. The expected recovery from the gravity circuit is set to 40.0% in the process design criteria. There is no change to this new circuit in the expansion project.

Regarding the overall mill recovery assumed by rock type and per pit, two batches of results were used:

- Direct cyanidation tests on fresh ore completed in 2007 by SGS Lakefield (project 11700-001) on 20 samples, mainly hard rock, were submitted to 48 hours of cyanidation at 45% solid (w/w) and with 0.5 g/L NaCN;
- Gravity and cyanidation tests completed in 2010 on 24 samples, listed above, were submitted to 48 hours of cyanidation after gravity separation at 50% solid (w/w) and 0.23 g/L NaCN.

Table 13-11 and Table 13-12 summarize the whole direct leaching test results for 2007.

TABLE 13-11 CYANIDATION TEST RESULTS (DIRECT LEACH)*

Statistics	Feed Size P80 μm	NaCN Consumption g/t of CN Feed	48h Gold Extraction (%)	Residue Grade (g/t Au)	Head Gade (g/t Au)	
					Calc.	Direct
Minimum	41	0.06	91.0	0.02	0.62	0.60
Maximum	107	0.56	98.6	0.16	5.53	5.60
Average	76	0.26	95.7	0.07	1.84	1.75

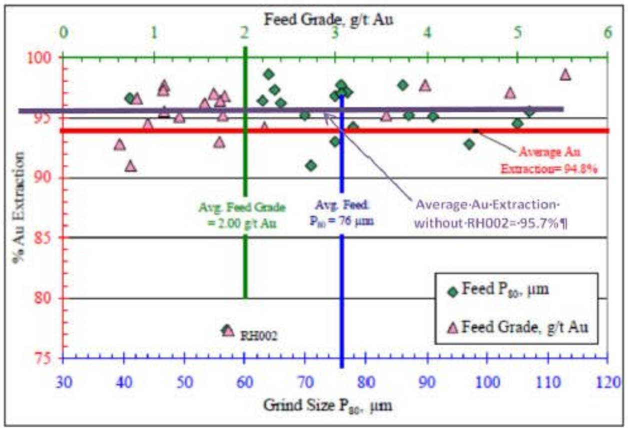
* Excluding results from RH002

TABLE 13-12 DIRECT CYANIDATION RESULTS

Comp.	Test No	Feed size P 80 μm	Reag. Cons'nKg/t of CN feed		Au Extraction/ Recovery, %					Residue grade g/t Au	Head Grade g/t	
			NaCN	CaO	4h	12h	24h	36h	48h		Calc.	Direct
E001	CN-1	66	0.39	0.81	23	57	79	91	97.1	0.05	1.56	0.6
E002	CN-2	107	0.45	0.52	30	67	83	88	96.8	0.04	1.11	0.77
E003	CN-3	65	0.41	0.88	25	50	76	91	97.7	0.03	1.1	0.62
E004	CN-9	91	0.15	1.94	34	62	77	88	94.5	0.07	1.28	1.38
K001	CN-8	105	0.33	0.86	35	64	79	83	93	0.07	0.93	0.76
K002	CN-14	41	0.11	0.87	36	73	86	94	95.1	0.04	0.81	0.73
M001	CN-15	78	0.19	0.73	40	70	88	97	96.6	0.08	2.22	1.51
P001	CN-4	87	0.29	0.62	35	61	78	90	95.2	0.09	1.76	1.77
P001RK2	CN-7	76	0.22	0.91	41	56	73	86	92.8	0.08	1.11	1.06
P002	CN-5	57	0.32	0.62	24	60	84	92	97	0.06	1.82	1.7
P003	CN-6	86	0.06	0.89	41	76	91	94	96.4	0.15	3.98	3.25
R001	CN-16	64	0.049	0.53	43	87	95	98	97.7	0.13	5.53	5.6
R002	CN-17	75	0.6	0.7	44	76	86	93	94.2	0.1	1.72	1.75
RH001	CN-10	76	0.14	0.66	40	59	78	89	95.5	0.08	1.66	1.63
RH002	CN-11	77	0.26	0.79	20	40	55	69	77.3	1.12	4.92	2.93
RH003	CN-12	63	0.21	0.62	27	49	71	84	96.2	0.07	1.73	1.19
RH004	CN-13	75	0.3	1.09	25	48	66	79	91	0.16	1.78	4.18
S001	CN-18	71	0.56	0.53	10	27	66	87	97.3	0.02	0.74	1.09
S002	CN-19	70	0.17	2.25	40	65	85	94	98.6	0.05	3.55	2.9
S003	CN-20	97	0.17	0.66	30	55	76	85	95.2	0.03	0.62	0.72

Figure 13-4 illustrates the gold extraction achieved (recovery) as a function of head grade and grind size.

FIGURE 13-4 GOLD RECOVERY IN FUNCTION OF HEAD GRADE AND GRIND SIZE
(Project 11700-001)



Average gold extraction was approximately 95% and ranged from 77.3% (Sample RH002) to a high of 98.6% (Sample S002). Nineteen of the 20 gold extraction values were 91% or higher. There was no clear correlation between either head grade or grind size and recovery.

In the 2010 batch tests, the recombined Knelson + Mozley tailings from each of the 24 variability samples were cyanide leached as per the conditions shown in Table 13-13.

TABLE 13-13 CYANIDE LEACH CONDITIONS

Pulp Density	50% Solid (w/w)
pH	10.5 – 11 (maintained with lime addition)
Pre-aeration	1-2 hours with sparged air
Cyanide concentration	0.23 g/L Na CN
Retention time	48 hours, subsample for Au assay at 4, 12, 24, and 36 hours

Results from test work are presented for each rock type in Tables 13-14, 13-15, 13-16, and 13-17.

TABLE 13-14 CYANIDE LEACH RESULTS, HARDROCK SAMPLES - GRAVITY TAILINGS

Location	Feed=Tail		Grinds size P80	Reagents Kg/t of CN Feed			48 h NaCN	% Au Recovery/Extraction								Head Grade Au/g/t	
				Adition	Consumption		in Sol'n	CN Unit Operation						Grav+Tails	Residue	Calculated	
Composite	from test	Test No	µm	NaCN	NaCN	CaO	g/L	4 h	12 h	24 h	36 h	48 h	Grav.	CN	Au/gt	CN	Grav + CN
J Zone Sample 35	G-25	CN-28	54	0.33	<0.02	1.16	0.29	32	66	—	97	95.1	51.9	97.6	0.07	1.3	2.75
Koolhoven Sample 2	G-21	CN-24	39	0.27	0.03	2.43	0.24	23	34	52	63	79.3	18	83	0.04	0.2	0.22
Mayo Sample 8	G-17	CN -20	69	0.26	0.01	0.8	0.25	45	76	79	84	91.6	15.3	92.9	0.02	0.2	0.28
Pay Caro West End Sample 39	G-23	CN-26	63	0.32	<0.03	1.33	0.28	51	65	74	83	92.7	13.9	93.7	0.06	0.8	0.94
East-Pay Caro Sample 42	G-26	CN-29	76	0.25	0.05	1.04	0.21	41	61	65	80	87.6	63	95.4	0.19	1.5	4.02
East-Pay Caro Sample 45	G-24	CN-27	72	0.27	<0.04	1.98	0.22	52	73	83	89	95.5	22.8	96.6	0.02	0.5	0.67
Rosebel Sample 20	G-19	CN-22	55	0.26	<0.03	1.03	0.23	41	62	76	87	96.1	17.4	96.8	0.03	0.8	1.00
Royal Hill -SE Sample 11	G-18	CN-21	62	0.25	0.07	2.75	0.19	50	63	89	84	93.8	64.8	97.8	0.02	0.3	0.91

TABLE 13-15 CYANIDE LEACH RESULTS, TRANSITION SAMPLES - GRAVITY TAILINGS

Location	Feed=Tail	Test	Grinds size P80	Reagents Kg/t of CN Feed			48 h NaCN in	% Au Recovery/Extraction								Head grade Au/g/t	
				Adition	Consumption		Sol'n	CN Unit operation							Residue	Calculated	
Composite	from test	No	µm	NaCN	NaCN	CaO	g/L	4 h	12 h	24 h	36 h	48 h	Grav.	CN	Au/gt	CN	Grav + CN
J-Zone Sample 36	G-22	CN-25	83	0.25	<0.03	0.91	22	41	57	67	81	87.1	37.7	92	0.08	0.6	1.01
Mayo Sample 27	G-20	CN-23	65	0.24	0.04	1.2	0.19	40	63	74	85	91	23.9	93.2	0.03	0.3	0.42
Roma Sample 24	G-16	CN-19	77	0.36	0.11	2.64	0.24	40	56	67	74	81.9	31	87.5	0.08	0.4	0.6
Rosebel Sample 22	G-15	CN-18	84	0.24	<0.01	0.72	0.24	34	60	82	89	92.7	35.7	95.3	0.1	1.3	2.03

TABLE 13-16 CYANIDE LEACH RESULTS, SAPROLITE SAMPLES GRAVITY TAILINGS

Location	Feed=Tail		Grinds size P80	Reagents Kg/t of CN Feed			48 h NaCN in	% Au Recovery/ Extraction								Head grade Au/g/t	
				Addition	Consumption		Sol'n	CN Unit operation						Grav + Tails	Residue	Calculated	
Composite	from test	Test no	µm	NaCN	NaCN	CaO	g/L	4 h	12 h	24 h	36 h	48 h	Grav.	CN	Au/gt	CN	Grav + CN
Koolholven Sample 17	G-10	CN-13	74	0.27	0.05	0.7	0.22	46	70	84	85	86.1	20.1	88.9	0.09	0.6	0.77
Koolhoven S Sample 19	G-4	CN-7	99	0.28	0.03	0.64	0.25	43	65	76	82	84.7	25.8	88.6	0.11	0.7	0.97
Mayo Sample 28	G-5	CN-8	90	0.27	<0.01	0.65	0.28	47	73	83	86	87.8	16.8	89.8	0.15	1.2	1.47
Pay Caro-North pushback Sample 38	G-7	CN-10	90	0.23	0.02	0.44	0.21	36	54	73	85	94.1	38.2	96.4	0.07	1.2	1.92
East-Pay Caro Sample 47	G-13	CN-16	73	0.27	0.02	0.75	0.25	52	72	86	90	89.4	50.6	94.8	0.09	0.9	1.72
Roma Sample 25	G-11	CN-14	80	0.25	<0.01	0.66	0.25	38	66	81	87	92.1	27.2	94.2	0.02	0.3	0.35
Rosebel Sample 21	G-8	CN-11	69	0.27	0.03	0.59	0.24	37	64	85	91	95.7	23.7	96.7	0.03	0.6	0.75
Royal Hill-NW Sample 1	G-14	CN-17	72	0.27	<0.01	0.78	0.3	44	66	76	83	89.1	64.8	96.2	0.13	1.2	3.26
Royal Hill-NW Sample 10	G-3	CN-6	97	0.26	<0.01	0.56	0.26	46	73	84	94	95.7	29	96.9	0.02	0.5	0.65
Royal Hill-NW Fold Ore Sample 34	G-12	CN-15	74	0.33	0.1	0.76	0.23	36	57	73	77	84.4	9.3	85.9	0.11	0.7	0.74
Royal Hill-SE Sample 13	G-9	CN-12	66	0.27	0.04	0.74	0.23	53	75	—	84	85.5	56	93.6	<0.02	0.1	0.31
Royal Hill Sample 32	G-6	CN-9	93	0.26	<0.01	0.62	0.27	35	55	68	76	83	28.6	87.8	0.44	2.6	3.58

Overall, average gold recoveries ranged from a low of 86.8%, in the case of the Koolhoven deposit, to a high of 96.3% from the Rosebel deposit. Cyanide addition and consumption values were quite low and similar, regardless of the rock type or deposit. The minimum, maximum, and average cyanide addition and consumption values for the 24 variability composite tests are shown in Table 13-17.

TABLE 13-17 CYANIDE CONSUMPTION DATA

	kg of NaCN per tonne of Leach Feed							
	Overall		Hard Rock		Transition		Saprolite	
	Added	Cons	Added	Cons	Added	Cons	Added	Cons
Minimum	0.23	0.01	0.23	0.01	0.24	0.01	0.25	0.01
Maximum	0.36	0.11	0.33	0.1	0.36	0.11	0.33	0.07
Average	0.27	0.03	0.27	0.03	0.27	0.05	0.28	0.03

In conclusion, a conservative leaching time of 36 hours, including CIL, was chosen for the design criteria. Based on the results obtained from the 2007 and 2010 programs, Table 13-18 shows the assumed recoveries for the study, per rock type and pit.

TABLE 13-18 ASSUMED RECOVERIES PER PIT AND ROCK TYPE

	Mill Overall Recovery (%) per rock types		
Pit name	Hard	Transition	Saprolite
East Pay Caro (EPC)	94.8	95.4	96.0
Pay Caro (PC)	96.4	95.1	93.7
Koolhoven (KH)	88.7	85.9	83.0
J Zone (JZ)	94.0	94.5	95.0
ETR	94.8	95.1	95.4
Royal Hill (RH)	96.0	96.9	97.8
Mayo (MA)	90.0	93.0	96.0
Rosebel (RB)	96.7	96.8	96.8
Roma (RM)	94.2	95.1	96.0

GOLD DEPORTMENT AND TAILINGS DIAGNOSTIC LEACH

During the CIL survey, samples were taken from the feed and tails to characterize gold deportment and evaluate the potential recovery from lost gold in the solid. Diagnostic leach shows that 73% (Table 13-19) of lost gold in the solid is free or accessible and could be recovered by cyanide leaching under operating conditions to be determined. The difference is refractory in association with Carbonates, Fe Oxides, and Pyrrhotite. From mineralogy and liberation analysis (Figure 13-5) principal remarks are:

- Most gold in leach feed is liberated and accessible;
- In leach feed, gold grain composition is 94% gold and 6% silver;
- Carbon pores contain principally CaO-CO $_3$ and minor presence of chlorite, micas, Fe-Ti oxides, plagioclase, sulfides, etc.

FIGURE 13-5 GOLD DISTRIBUTION IN LEACH FEED

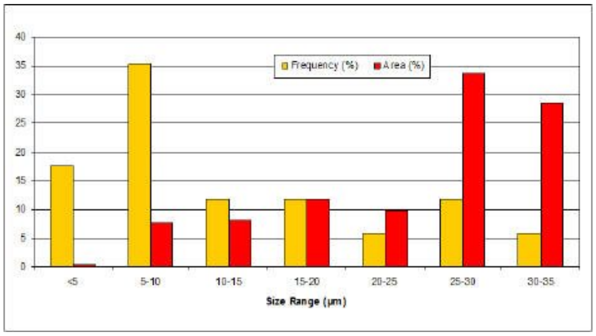


TABLE 13-19 RESULTS FROM DIAGNOSTIC LEACHING OF THE PLANT LEACH TAIL SAMPLE

		Test DL - 1 % of contained Au Extracted Per stage	
		Maximum	Minimum
Stage 1	Free Milling Au Extractable by direct cyanidation of Rosebel Mill Tailing	39.10%	73.50%
Stage 2 and 3	Au Refractory Association with Carbonates FE Oxides and Pyrrhotitte(liberated by Hydrochloric Acid and recovered in the subsequent CN Leach	19.00%	26.50%
Stage 4 and 5	Au in Refractory Associated with Sulphides Liberated by Aqua-Regia	28.50%	0.00%
	Overall Au Extraction	86.60%	100%
	Overall Calc. Head g/t Au	0.24	0.13
	Direct reported by IAMGold g/t Au	0.12	

ONGOING TEST WORK

The IAMGOLD-Rosebel mine requested SGS Lakefield to update the old CEET2® Model. Surveys were completed in February 2017, using different blends of hard rock, saprolite, and/or transition ores. The survey results will then be used to update the model. After the survey modelling, the model will be further fine-tuned through plant data reconciliation using four to six months of plant data. Finally, LOM throughput forecasting simulations will be carried out using the updated CEET2® model, from 2018 to 2023.

The program has been broken-down into the following steps:

- Plant data review and survey preparation;
- Plant audit and circuit survey;
- Comminution testing;
- Mass balances, grinding circuit modelling, and plant data reconciliation;
- LOM throughput forecasting simulations.

It has been assumed that all the survey samples will be sized and the % solids determined at the mine site by Rosebel personnel. The following grindability tests will be performed on the selected SAG feed survey samples so that the CEET2® model can be calibrated:

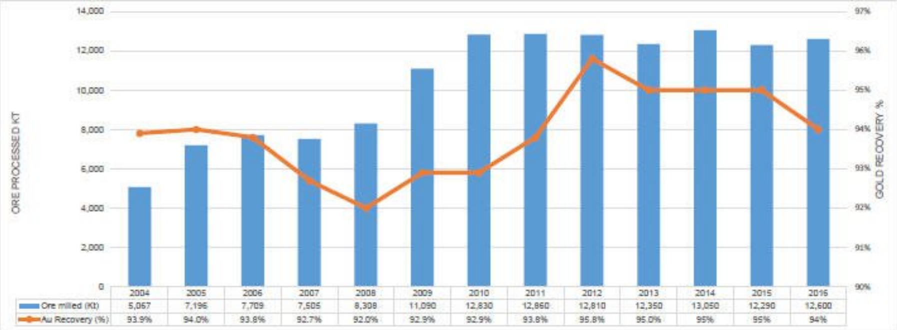
- SPI® test;
- Bond ball mill grindability test.

A single SAG mill feed sample will also be submitted for the DWT, in order to model the circuit using JKSimMet in parallel. The JKSimMet model will be required to estimate the performance of the grinding circuit for the two alternative circuit configurations.

CONCLUSIONS

The ore characteristic test work completed at the SGS Lakefield laboratory and onsite metallurgical testwork facility was in line with the overall gold production (Figure 13-6). The overall gold recovery has been maintained in the range 94 – 95% with several expansion projects and optimization completed between 2009 and 2016.

FIGURE 13-6 ORE MILLED AND OVERALL RECOVERY



14 MINERAL RESOURCE ESTIMATE

SUMMARY

The Mineral Resource estimate at June 30, 2017 for RGM is summarized in Table 14-1 and is reported on a 100% basis. The Mineral Resource estimate was prepared by, or under immediate supervision of, Vincent Cardin-Tremblay, P.Geo., an IAMGOLD employee, who is a Qualified Person (QP) as defined by National Instrument 43-101. The QP is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the Mineral Resource estimate.

TABLE 14-1 MINERAL RESOURCES – JUNE 30, 2017

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	31,402	0.7	676
Indicated	275,710	1.0	8,649
Total M&I	**307,112**	**0.9**	**9,325**
Inferred	84,866	1.0	2,667

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are inclusive of Mineral Reserves.
3. Mineral Resources are estimated at average cut-off grades which vary between0.19 g/t Au and 0.50 g/t Au depending on material type and pit.
4. Mineral Resources are estimated using an average long-term gold price of US$1,500 per ounce.
5. Bulk density is variable by rock type.
6. Numbers may not add due to rounding.
7. Mineral Resources that are not Mineral Reserves don't have demonstrated economic viability.

The Mineral Resource estimate, as reported in Table 14-1, is constrained by a preliminary pit optimization shell. The Mineral Resources are classified as Measured, Indicated, and Inferred and follow Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves adopted on May 10, 2014 (CIM Definitions).

For the present Mineral Resource estimate, Koolhoven (KH), Roma West (RMW), Mama Kreek (MK), East Tailing Road (ETR), and Overman (OV) block models were not updated and, as such, remain the same as the December 31, 2016 Mineral Resources. However, new whittle optimization parameters have been applied and the first six months of mining depletion at

RMW have been removed from the Mineral Resources. The KH, RMW, MK, ETR, and OV block models will subsequently be referred to as the *not-updated* models. The following block models have been updated and will be referred to as the *newly updated* models: J Zone (JZ), Pay Caro (PC), Mayo (MA), Roma East (RME), Royal Hill (RH), and Rosebel (RB).

The Mineral Resource estimate has been completed using Geovia GEMS 6.7 (GEMS) software and GSLib software using a conventional approach, including 3D geological modelling and block modelling. Two different interpolation approaches are used, depending on the area:

- for KH, RMW, MK, ETR, OV (not-updated models) : an Inverse Distance Cube interpolator is used (ID3);
- for JZ, PC, RB, RH, RME, and MA (newly updated models): a panel's co-ordinary kriging and Localized Uniform Conditioning (LUC) grade estimation is performed.

DATABASE

The Mineral Resources at RGM are estimated using DD hole and RC hole data. All holes have been established on a local grid and the final collar locations have been surveyed and reported in UTM Zone 17 NAD83 coordinates. The current Mineral Resource database is composed of 6,392 DD holes, totalling 920,207 m for 680,802 assayed samples and 22,287 RC holes, totalling 816,717 m for 408,244 assayed samples. The resource database includes DD holes and RC holes within and close to the pit area.

Table 14-2 shows the drill hole data that was collected and is available in the databases for each project. From these databases, the necessary information is prepared for resource calculation (modelling, compositing, etc.).

TABLE 14-2 DRILL HOLE DATA COLLECTION USED FOR RESOURCES ESTIMATION

	Diamond Drill			Reverse Circulation		
Pit	**Holes**	**m**	**Intervals***	**Holes**	**m**	**Samples**
Koolhoven	833	117,282	77,893	—	—	—
J Zone	450	58,040	41,825	5,049	196,010	98,005
Pay Caro	1,267	217,645	152,629	5,333	205,652	102,830
Mayo	1,004	145,344	109,307	3,594	123,764	61,514
Roma	570	81,207	68,951	2,481	76,648	38,326

		Diamond Drill			Reverse Circulation	
Pit	Holes	m	Intervals*	Holes	m	Samples
Royal Hill	1,070	148,915	114,018	1,800	85,954	42,977
Rosebel	806	98,508	71,766	4,005	127,012	63,506
ETR	90	12,078	8,424	—	—	—
Overman	184	29,727	20,210	—	—	—
Mama Kreek	118	11,461	15,779	25	1,677	1,086
Total	**6,392**	**920,207**	**680,802**	**22,287**	**816,717**	**408,244**

* Note: some intervals don't have assays results due to core loss or equivalent.

The drill hole database contains information including: collar information, downhole deviation surveys, gold assays, multi-elements-ICP assays, lithological descriptions, alteration, structural data, mineralization, major textures, specific gravity measurements, and vein descriptions.

The GEMS database validation routines were applied to the resource database. No errors were detected in the data tables. Based on this assessment, and the checks described in Section 12, it is the QP's opinion that the drill hole database is appropriate to form the basis of the Mineral Resource estimate for the Rosebel Gold Mine.

DRILL HOLE SPACING

The drill hole spacing is variable depending on which area of the project the drilling is carried out. Generally, the DD hole spacing is about 50 m by 50 m and locally 25 m. Most DD holes are drilled more or less north to south (with the exception of the Royal Hill folded area) perpendicular to the main trend. Regularly, control DD holes were drilled south to north, and very rarely in the east-west direction.

RC holes are generally drilled at an azimuth of 160°, however, the orientation may vary locally to follow local geology. RC hole spacing varies between 10 m by 5 m to 12 m by 6 m, as a function of local continuity.

The current drill hole spacing for the RGM deposits is judged adequate to develop a reasonable model of the mineralization distribution and to quantify its volume and quality with a good level of confidence in all of the deposits.

MODELLING

Geologic modelling work is completed using the GEMS software package.

The main lithologies, structural elements, weathering profiles, and ore zone models of each deposit are constructed using 3D outlines created on 25 m evenly spaced cross sections. The weathering profiles, which include saprolite, transition, and rock are determined using geotechnical measurements taken on the core by the geotechnicians and geologists. The laterite profile is determined using geological observations of the core samples by the geologists and from the topography; it is generally modelled as a layer thinner than 5 m.

Ore zone modelling is strongly guided by a project's geological model and refers to lithological units, structural, and deformation constraints. Generally, ore zone envelopes are drawn from drill data assays which carry a gold content higher than 0.3 g/t Au. Ore zones must be at least 4 m thick in saprolite and at least 5 m thick in transition and rock; except for the Mayo deposit where a 3 m minimum thickness might occur in some areas. From the 3D rings drawn on the sections, surfaces and solids are built and validated. For deposits with production data available (Koolhoven, Pay Caro, J Zone, Mayo, Roma, Rosebel, and Royal Hill), the ore zone modelling might also consider blast hole results for geometrical purposes. The ore zone model for the Northern deposits (KH, JZ, PC, and ETR) is presented in Figure 14-1.

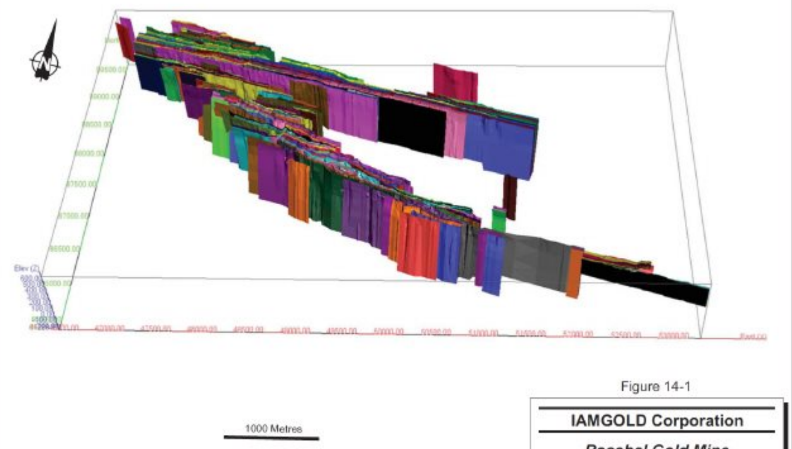

Elev (Z)
East (X)
1000 Metres

Figure 14-1

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Isometric View
Northern Deposits Ore Zones

September 2017

Source: IAMGOLD, 2017.

STATISTICAL ANALYSIS

COMPOSITING

NOT-UPDATED BLOCK MODELS

Three metre and five metre composites are generated from DD hole uncapped assays for ETR, RMW, KH, and OV, respectively.

The choice of composite length is mainly based on the following criteria: height of mining bench, ore zone thickness, length of assays, and reconciliation with production numbers. All composites are constrained within the ore zone and laterite solids first, and secondly, within the lithology and weathering solid limits. Poorly representative composites are not taken into consideration for resource calculation. These can include composites which are missing more than 50% of assays and/or where the composites that are less than 1 m (for 5 m composites) or 0.6 m (for 3 m composites). The smaller composites have possibly been created at the end of a solid interval or at the bottom of a hole. They are discarded from the composite data set.

The Mamakreek and Roma West deposits differ from that last rule on the minimum length of a composite. In order to ensure representative composites, if the last interval is less than the composite length, the composite length is adjusted to make all intervals equal. For these two deposits, all composites, constrained in the ore zones, are used unless they are missing more than 50% of the assays.

NEWLY UPDATED BLOCKS MODELS

For DD holes, 3 m composites are created based on capped assays. Composites are created from collars to toes respecting the Ore zone contacts. For RC holes, 2 m assays are not composited.

The composite length of a DD hole is selected to approximately align with the volume of 2 m RC hole samples. The DD hole composite interval is assigned a null value if non-null samples account for less than 20% of its length (i.e. 0.6 m).

STATISTICS COMPOSITES

Gold grade statistics, from the set of composites, are calculated using GEMS Geostatistical module or GSlib-type software. Statistics for raw assays and composites, used during estimation, are presented in Table 14-3 for DD holes and Table 14-4 for RC hole data used.

The two limits *(High Grade Limit and High Grade Transition Limit)* that are used in the treatment of high grade results (see Section 13 - Ongoing Test Work for details) during resource estimation are determined from these statistics. The first one, the *High Grade Limit* , corresponds to outliers observed in histogram plots. This first limit is also used to cap the assays of the Mamakreek and Rosebel deposits. The second one, the *High Grade Transition Limit,* corresponds to inflection points representing different grade domains on the curve of cumulative probability plots.

TABLE 14-3 DDH GRADES STATISTICS

Pit	Type	Capping applied to	Comps Length (m)	Capped at	Number	Capped n (%)	Mean	CV	Min	Max
Koolhoven	Raw Assays			—	34,676	—	0.56	9.64	—	99.00
	Composites	Comps	5	10	10,855	0.43	0.54	2.16	—	10.00
J Zone	Raw Assays			—	41,825	—	0.22	5.77	—	82.29
	Composites	Assays	3	12	19,588	0.12	0.18	2.74	—	10.26
Pay Caro	Raw Assays			—	146,276	—	0.33	6.00	—	329.28
	Composites	Assays	3	22	65,799	0.09	0.27	3.29	0.01	22.00
Mayo	Raw Assays			—	109,306	—	0.26	20.19	—	1,600.30
	Composites	Assays	3	15	49,007	0.17	0.18	3.22	—	15.00
Roma - East	Raw Assays			—	31,838	—	0.14	11.71	—	126.70
	Composites	Assays	3	15	14,436	0.10	0.11	3.94	—	10.20
Roma - West	Raw Assays			—	4,799		0.58	31.03	—	169.11
	Composites	Comps	3	10*	2,130	0.47	0.35	2.97	—	10.00
Royal Hill	Raw Assays			—	113,685	—	0.32	11.94	—	852.85
	Composites	Assays	3	29	50,209	0.11	0.23	3.79	—	24.17
Rosebel	Raw Assays			—	70,780	—	0.26	6.85	—	130.38
	Composites	Assays	3	17	32,912	0.11	0.21	3.09	—	14.73
ETR	Raw Assays			—	1,685		0.61	11.11	—	75.50
	Composites	Comps	3	9**	1,081	0.55	0.45	2.04	0.01	9.00
Overman	Raw Assays			—	3,927	—	0.73	6.36	0.01	108.75
	Composites	Comps	5	6**	1,136	0.44	0.63	1.27	0.01	6.00
Mama Kreek	Raw Assays			—	2,130		0.35	5.35	—	32.05
	Composites	Assays	3	Varying (1 to 6)	1,037		0.26	0.64	—	4.01

* Laterite composites were capped at 3g/t

** Laterite composites were capped at 4g/t

CV – Coefficient of Variation

TABLE 14-4 RC GRADES STATISTICS

Pit	Type	Capping applied to	Capped at	Number	Capped n (%)	Mean	CV	Min	Max
J Zone	Raw Assays			97,983		0.46	6.59	0.01	460.98
	Composites	Assays	15	97,983	0.19	0.42	2.70	0.01	15.00
Pay Caro	Raw Assays			102,807		0.29	5.27	0.01	253.13
	Composites	Assays	15	102,807	0.05	0.28	2.67	0.01	15.00
Mayo	Raw Assays			60,342		0.34	3.99	0.01	111.70
	Composites	Assays	20	60,342	0.06	0.33	3.22	0.01	20.00
Roma - East	Raw Assays			38,325		0.21	8.45	0.01	292.76
	Composites	Assays	16	38,325	0.07	0.20	3.74	0.01	16.00
Royal Hill	Raw Assays			42,976		0.50	5.23	0.01	163.31
	Composites	Assays	26	42,976	0.13	0.46	3.71	0.01	26.00
Rosebel	Raw Assays			63,506		0.57	15.49	0.01	2,054.24
	Composites	Assays	25	63,506	0.07	0.50	2.96	0.01	25.00

CV – Coefficient of Variation

BULK DENSITY DATA

In-situ bulk density samples are taken from DD holes for each weathering type (laterite, saprolite, transition, and rock) and for specific lithology units in each project. The density is calculated by the RGM laboratory by using the wax method for soft and transitional material. In this method, the samples are dried in an oven for about 12 hours at 150°C. The sample is then cleaned and weighed on a balance to get the dry weight. To calculate the specific gravity, the sample is waxed and weighed again with the wax. Finally, the waxed sample is weighed in water. Considering that the paraffin wax density is 0.9, the calculation for bulk specific gravity is:

$$Bulk\ Specific\ Gravity = \frac{A}{D - E - \frac{(D-A)}{F}}$$

Where A is Dry weight (g)

D is Waxed Weight (g)

E is Weight in Water

F is Paraffin Wax Density

Over 18,000 specific gravity measurements were used to assign densities for the various rock types and alteration profiles. Table 14-5 presents the in-pit average densities, by material type, for the actual resources.

TABLE 14-5 RGM RESOURCES – BULK DENSITY DATA

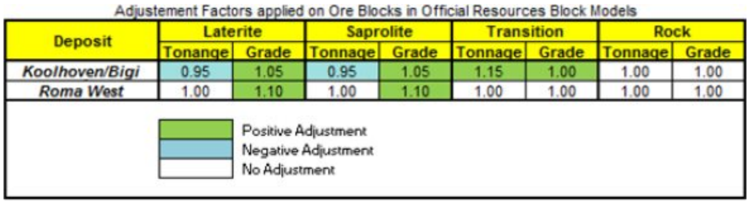
Average Resources density by material type

Pit	Laterite	Saprolite	Transition	Hard Rock
Koolhoven/Bigi	1.73	1.74	2.29	2.70
J Zone	1.73	1.73	2.32	2.71
Pay Caro	1.68	1.79	2.35	2.78
Mayo	1.73	1.73	2.23	2.74
Roma East	1.72	1.76	2.34	2.69
Roma West	1.73	1.74	2.29	2.70
Royal Hill	1.71	1.70	2.35	2.78
Rosebel	1.67	1.76	2.36	2.70
Overman	1.87	1.72	2.30	2.66
East Tailings Road	1.73	1.79	2.31	2.79
Mama Kreek	1.66	1.71	2.30	2.80

ADJUSTMENT FACTORS

Adjustment factors are applied to the different block models for reconciliation purposes. These adjustment factors are applied on the grade of the ore blocks and on the tonnage of the ore and waste blocks for some of the *not updated* models (KH and RMW). Factors used are presented in Table 14-6.

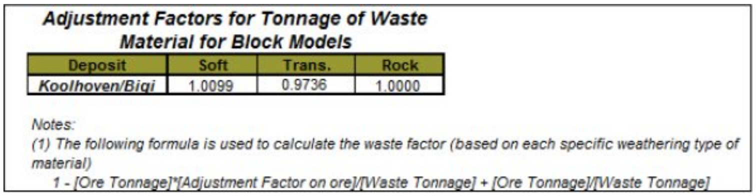
TABLE 14-6 RGM RESOURCES – ADJUSTMENT FACTORS BETWEEN PRODUCTION AND RESERVES BY PIT AND BY MATERIAL TYPE



Adjustement Factors applied on Ore Blocks in Official Resources Block Models

Deposit	Laterite		Saprolite		Transition		Rock	
	Tonange	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
Koolhoven/Bigi	0.95	1.05	0.95	1.05	1.15	1.00	1.00	1.00
Roma West	1.00	1.10	1.00	1.10	1.00	1.00	1.00	1.00

🟩 Positive Adjustment
🟦 Negative Adjustment
⬜ No Adjustment



Adjustment Factors for Tonnage of Waste Material for Block Models

Deposit	Soft	Trans.	Rock
Koolhoven/Bigi	1.0099	0.9736	1.0000

Notes:

(1) The following formula is used to calculate the waste factor (based on each specific weathering type of material)

1 - [Ore Tonnage][Adjustment Factor on ore]/[Waste Tonnage] + [Ore Tonnage]/[Waste Tonnage]*

BLOCK MODELLING INTERPOLATION

For each pit, block models are created and interpolated using the GEMS software package for the *not updated* block models while interpolation was run using GSLib-style scripts for the *newly updated* models. Block size properties and extensions are selected to cover all the interpreted Ore zones and in accordance with RGM mining equipment and practices. Block model properties are presented in Table 14-5.

All block models are coded for Lithologies, Alterations (Weathering), and Ore zones (mineralized area) using a unique rock code assigned when at least 50% of the blocks are located inside a solid.

TABLE 14-7 BLOCK MODELS PROPERTIES

	Origin				Size			Number of block		
Pit	X	Y	Z	Orient.*	Column	Row	Level	Column	Row	Level
KH-JZ	46,181	88,486	670	-18	10	4	4	500	413	144
Pay Caro	47,335	86,843	700	-18	10	4	4	400	492	175
Mayo	42,600	80,400	580	0	10	4	5	370	393	116
Roma-East	47,300	81,050	602	0	10	4	4	150	313	138
Roma-West	46,575	80,643	602	30	10	5	6	140	220	91
Royal Hill	48,650	80,400	580	0	10	4	4	310	550	150
Rosebel	56,800	80,700	598	0	10	4	6	425	369	100
ETR	51,766	85,533	700	-18	10	4	4	140	175	150
Overman	47,367	102,657	620	-26	10	5	5	400	165	60
Mama Kreek	57,000	86,250	650	-15	10	5	6	313	240	100

* Using Gems ZXZ rotation system

NOT-UPDATED BLOCK MODELS

Block models for Koolhoven (KH), Roma West (RMW), East Tailing Road (ETR), Overman, (OV), and Mama Kreek (MK) were not updated recently. The last block model updates for these deposits vary from 2014 to 2016. It was considered appropriate to not update these block models as no major new drilling was completed nor was mining information added to these deposits.

Interpolations are performed in GEMS software using a conventional anisotropic inverse distance cube (ID3) interpolation. The Au grade estimates are generally generated from 5 m composites (KH and OV) or 3 m composites (RMW, ETR, and MK). To avoid smearing gold grades from one mineralized zone to another or into the host rock, geologic and mineralized contacts were considered as hard boundaries.

A three pass interpolation strategy is performed with relaxing search parameters. The first pass ellipse size was generally about 50 m in the two main directions and 25 m in the minor direction. The second pass is selected as 75 m in the major and the intermediate direction and as 37.5 m in the minor direction. The third pass is set as the double of the second pass. Ellipsoid directions were orientated according to the interpreted mineralized ore zones or the main grade orientation (ore shoot). A spherical search method is preferred to interpolate for:

- Lateritic part of each deposit to follow the original topography of the deposit.
- ETR deposit due to the folding shapes of the ore zones.

Interpolation is performed using Inverse Distance cube (ID3), with a maximum number of composites varying by pit from 12 to 20 in order to control smoothing. For each pass, the minimum number of composite is decreased to increase the number of blocks estimated. A maximum of two or three composites, from the same hole, is set to limit grade smearing. Finally, to limit the impact of the highest results, a *High Grade Transition Limit* is used at KH and RMW; grades above the limit were restricted to half of the search radius. The parameters used to estimate gold grade in the block models are shown in Table 14-8. The three pass grade evaluations from composites is used to support the resources classification (*Measured, Indicated,* and *Inferred Mineral* R *esources*).

TABLE 14-8 DETAILED BLOCK MODEL PARAMETERS.

Interpolation parameters - ID ^{3}

	Composites				Ellipse average ranges		
Pit	Min (Pass1-P2-P3)	Max	Max per hole	Restricting search grade	Pass1	Pass2	Pass3
Koolhoven	1 - 3 - 5	12	2	4 - 6	50/25/50	75/37.5/75	150/75/150
Roma - West	2 - 4 - 8	20	3	2 - 4	50/25/50	75/50/75	150/100/150
ETR	1 - 5 - 8	20	3	None	50/50/50	75/75/75	150/150/150
Overman	1 - 3 - 5	12	3	None	50/20/50	75/25/75	150/50/150
Mama Kreek	1 - 4 - 7	20	3	None	50/25/50	75/37.5/75	150/75/150

NEWLY UPDATED BLOCK MODELS

J Zone (JZ), Pay Caro (PC), Rosebel (RB), Royal Hill (RH), Roma East (RME), and Mayo were updated with the latest drilling and mining information; databases were closed as of December 31, 2016. For these deposits, a new interpolation approach was developed with support from Clayton V. Deutsch Consultants Ltd (CVDC), an independent consulting firm based in Edmonton, Alberta (Canada).

A more geostatistical approach was developed with a kriging or co-kriging of panel followed by a Localized Uniform Conditioning (LUC) support correction. These well-known geostatistical methods were used in an effort to better reflect the production reconciliation history of RGM and to incorporate new RC exploration and definition holes drilled since 2015.

In addition to the lithological and alteration (weathering) interpretation, a new sub-model was created to reflect the two different data types (DD and RC) and data spacing : grade control tight spacing (generally at 10 m by 5 m or 12 m by 6m) and exploration-definition relatively sparse spacing (generally around 50 m by 50 m). In the new approach all blocks were interpolated (inside and outside Ore zones). A total of five different geostatistical domains were defined and used for interpolation.

- Model 1 blocks represents area within around 12 m from RC grade control data. These holes are generally shallow (40 m to 70 m deep) and as such represent only the upper portion of the new resources.
- Model 2 are blocks situated within the Ore zones and at a maximum distance of 20 m from RC holes.
- Model 3 are blocks located outside of the Ore zones and at a maximum distance of 5 m from RC holes.

- Model 4 are blocks situated within the Ore zones not within the 20 m buffer from RC holes (model 2).
- Model 5 are all others blocks at a distance of maximum distance of 200 m to Ore zones or hole.

Although the vast majority of the blocks were classified as model 5, model 5 represents only a negligible percentage (<1%) of the resources (metal) above cut-off. Most of the metal is within model 1 (grade control area) and model 4 (within interpreted Ore zones wireframes).

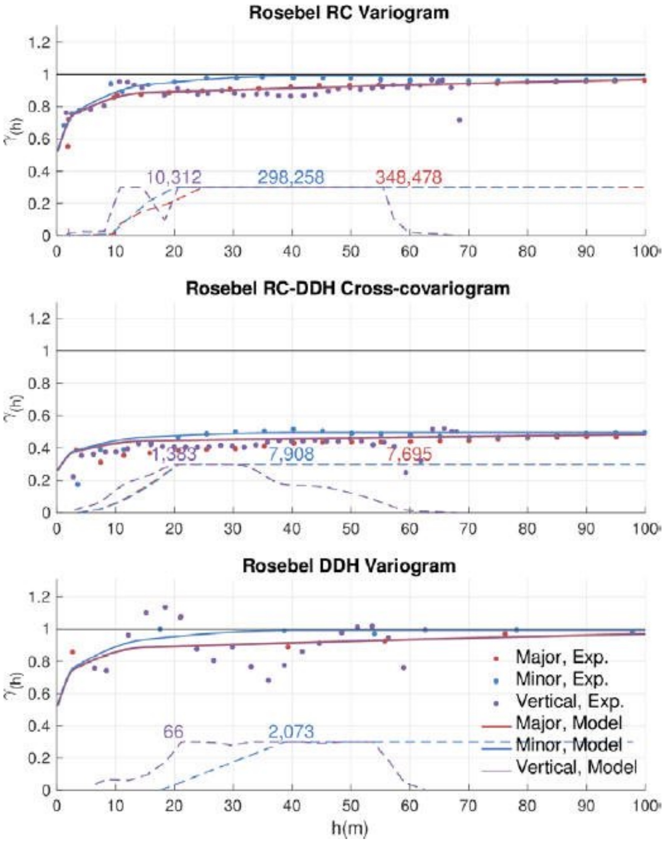
In order to take into consideration the two different types of data at different positions (heterotopic), an Ordinary Co-Kriged (OCK) interpolation was performed using RC hole assays (2 m) and DD hole composites (3 m). As RC holes returned possibly more consistent grade than DD holes, a trend model was first built using a moving windows average method for model 1, 2, and 3; this trend model emphasised the RC holes compared to the DD holes.

The OCK was performed using a minimum of one and a maximum of 12 data points, although ellipse size is selected in order to insure that virtually all blocks were estimated with 12 composites. The exception to the use of a maximum of 12 data is Royal Hill, where a maximum of 36 data is used to yield smoother estimates. This mimics the nature of previous models, where ID3 is used for all pits, except Royal Hill, where ID1 was used previously. The Royal Hill wireframes are particularly restrictive, meaning that smoother estimates are necessary to create smoother grades and additional tonnes in order to reconcile with production history.

Kriging is applied to panels of 40 m by 40 m by level height (4 m to 6 m as reported in the block property table). Localized Uniform Conditioning (LUC) is then performed on a panel to estimate the grade at the 10 m by 10 m by 8 m SMU size (with the exception of RME where a 10 m by 10 m by 4 m SMU size is used).

In order to perform Ordinary Co-Kriging, a set of three different variograms needs to be produced: one for RC holes only, one for DD holes only and one cross-variogram for RC-DD data together. In order to ease the variography exercise, modelling is performed on back-transformed Normal Score experimental variograms. 3D variogram models are fitted in three directions (major, semi-major, and minor) following the geological understanding. For each pit, a set of variogram is created for model 1, 2, and 3 such that a total of 162 variogram models are fitted. Examples of variogram models used at Rosebel for model 1 are presented in Figure 14-2.

FIGURE 14-2 VARIOGRAM MODELS USED AT ROSEBEL FOR MODEL 1



MINERAL RESOURCES CLASSIFICATION

The Mineral Resources estimations for all projects are classified according to the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves adopted on May 10, 2014 (CIM Definitions).

Detailed parameters used in the calculation of each resource category are presented in Table 14-7.

MEASURED

Blocks estimated using grade control data (model 1) were classified as Measured; blocks inside a 5 m x 10 m or 6 m x 12 m drill hole spacing pattern.

INDICATED

The search ellipse's primary and secondary radius for laterite and ore zones in the indicated resource classification are respectively extended to 75 m, and 30 m to 50 m depending on the project area. In projects using the spherical ellipsoids, the radius is lengthened to 75 m. For 5 m composites, a minimum of three up to a maximum of 12 data points, from which no more than two composites, originating from the same source of information (DD), are used to evaluate the grade in a block. For 3 m composites, a minimum of four up to a maximum of 20 data points, from which no more than three composites, originating from the same source of information (DD), are used to evaluate a grade in a block. Composites are thus taken from at least two different locations.

It is the QP's opinion that the parameters described above ensure that blocks classified as indicated resources are estimated only where mineralization grade and continuity are reasonably reliable.

INFERRED

The search ellipses in the inferred resource classification are extended to 150 m in the primary azimuth and dip directions, and to 50 m to100 m for the secondary radius. The radius of a spherical ellipsoid is lengthened to 150 m. For 5 m composites, a minimum of one up to a maximum of 12 data points are used to evaluate the grade in a block. For 3 m composites, a minimum of one up to a maximum of 20 data points are used to evaluate the grade. The number of composites originating from an individual source of information is not limited in this resource category.

Inferred Mineral Resources are not used for mine optimization, nor mining reserves.

BLOCK MODEL VALIDATIONS

As part of the validation process, a number of different interpolation runs were completed using various search strategy, number of composites, and alternative capping values. Alternative interpolation methods (Inverse Distance Squared, Ordinary Kriging, and Uniform Conditioning) were also used, as well as different block sizes, and composite lengths. The results of these runs were visually, statistically, and graphically compared (grade tonnage curves).

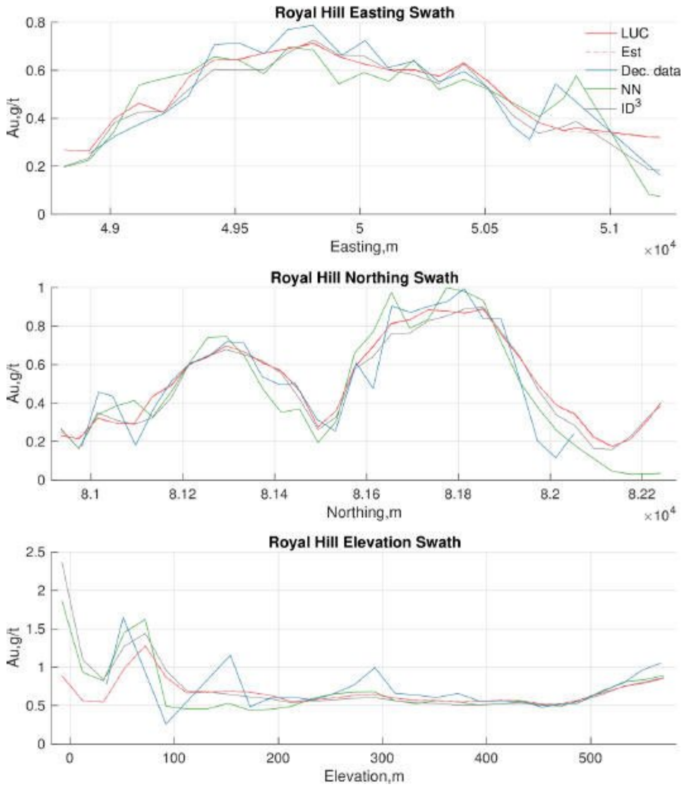
Other validation steps included:

- Comparison of the 3D volumes and block model volumes;
- Comparison of the basic statistics for assays, composites, and block model for each domain;
- Verification of rock code flagging in block model attributes for consistency with 3D wireframes;
- Visual check of variogram orientation along known geological features;
- Naïve Cross-validation (block grade compared to input conditioning data);
- Comparison with previous grade control production data;
- Visual check of the block and composite grades in plans and sections view.

Swath plots were compiled on vertical sections and plan views to check the consistency of the interpolation. For the newly updated block models, values were compared with cell-declustered data, Nearest Neighbour model (NN), and an Inverse Distance cube (ID3) model. No pits were used to constrain the data as swath plots are designed to check the overall quality of an estimate.

Figure 14-3 presents the swath plots for the Royal Hill block model. In general, the LUC model is shown to reproduce the overall trend of the declustered data. The declustered data is more variable due to the relatively few amount of data that occurs in some bins (particularly near the edges of each plot), however, its overall trend is reproduced. Elevation swath plots show a fair correlation in the first hundreds of metres, which is not a concern as this part of the deposit is already mined-out. At depth, the correlation is much better.

FIGURE 14-3 SWATH PLOTS FOR ROYAL HILL BLOCK MODEL



WHITTLE OPTIMIZATION

Conceptual mining parameters used to calculate block values in Whittle for the various RGM deposits are presented in Section 15.

DETAILED MINERAL RESOURCE STATEMENTS

The Mineral Resource estimate at June 30, 2017 is 307.1 Mt at an average grade of 0.9 g/t Au, containing 9.3 Moz in the Measured and Indicated category. There is an additional 84.9 Mt at an average grade of 1.0 g/t Au, containing 2.7 Moz in the Inferred category.

Table 14-9 presents the Mineral Resource estimation at RGM at June 30, 2017. This Mineral Resource is estimated within pit shells optimized at a $1,500/oz Au price and corresponding cut-off grades and includes the Measured, Indicated, and Inferred Mineral Resource categories. A volumetric analysis using GEMS is performed to determine the tonnage and grade of the Measured, Indicated, and Inferred Mineral Resources (MI+I) inside each of these shells. The Stockpile inventory is classified as measured and is included in the total.

TABLE 14-9 MEASURED, INDICATED, AND INFERRED MINERAL RESOURCE ESTIMATION AS OF JUNE 30, 2017

Measured Resources - June 30, 2017 (Inside pit shell)
$1,500 / ounce

	Cutoffs			Laterite			Saprolite			Transition			Rock			Total		
Deposit	Laterite & Saprolite	Transition	Hard Rock	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)
Koolhoven/Bigi	0.19	0.23	0.37	—	—	—	—	—	—	—	—	—	—	—	—	**—**	**—**	**—**
J Zone	0.19	0.24	0.37	9	0.4	0	22	0.5	0	2,680	0.6	54	3,417	0.9	94	**6,128**	**0.8**	**148**
Pay Caro	0.19	0.23	0.37	13	0.3	0	314	0.4	4	2,631	0.5	42	2,680	0.7	64	**5,638**	**0.6**	**110**
Mayo	0.19	0.24	0.37	—	—	—	4	0.5	0	52	0.6	1	2,395	0.8	63	**2,450**	**0.8**	**64**
Roma East	0.20	0.24	0.38	30	0.5	0	290	0.5	4	404	0.7	9	406	1.1	14	**1,130**	**0.8**	**28**
Roma West	0.20	0.24	0.38	—	—	—	—	—	—	—	—	—	—	—	—	**—**	**—**	**—**
Royal Hill	0.19	0.24	0.37	—	—	—	3	0.4	0	17	0.8	0	2,097	0.9	58	**2,116**	**0.9**	**58**
Rosebel	0.21	0.25	0.39	—	—	—	68	0.6	1	227	0.6	5	1,067	0.9	30	**1,362**	**0.8**	**36**
TOTAL				52	0.4	1	700	0.4	10	6,010	0.6	111	12,062	0.8	322	**18,825**	**0.7**	**443**
Stockpiles																**12,577**	**0.6**	**233**
GRAND TOTAL	**Measured Resources**			**52**	**0.4**	**1**	**700**	**0.4**	**10**	**6,010**	**0.6**	**111**	**12,062**	**0.8**	**322**	**31,402**	**0.7**	**676**

Indicated Resources - June 30, 2017 (Inside pit shell)
$1,500 / ounce

	Cutoffs			Laterite			Saprolite			Transition			Rock			Total		
Deposit	Laterite & Saprolite	Transition	Hard Rock	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)
Koolhoven/Bigi	0.19	0.23	0.37	371	0.5	6	318	0.6	6	11,383	0.6	233	13,556	1.1	484	**25,627**	**0.9**	**729**
J Zone	0.19	0.24	0.37	198	0.6	4	568	0.6	12	2,816	0.7	61	11,194	1.0	346	**14,776**	**0.9**	**422**
Pay Caro	0.19	0.23	0.37	65	0.5	1	587	0.5	10	5,050	0.7	106	69,567	1.1	2,435	**75,269**	**1.1**	**2,552**
Mayo	0.19	0.24	0.37	17	0.4	0	948	0.5	15	1,058	0.5	17	44,247	0.9	1,335	**46,270**	**0.9**	**1,368**
Roma East	0.20	0.24	0.38	8	0.8	0	304	0.7	7	603	0.8	16	367	1.0	12	**1,282**	**0.8**	**34**
Roma West	0.20	0.24	0.38	1	0.2	0	153	0.6	3	422	1.0	13	2,209	—	80	**2,785**	**1.1**	**96**
Royal Hill	0.19	0.24	0.37	76	0.6	1	1,862	0.6	38	2,290	0.6	45	73,771	1.0	2,412	**77,998**	**1.0**	**2,497**
Rosebel	0.21	0.25	0.39	172	0.5	3	3,327	0.5	57	3,421	0.6	68	24,783	1.0	822	**31,703**	**0.9**	**950**
TOTAL				907	0.5	16	8,067	0.6	148	27,043	0.6	559	239,694	1.0	7,925	**275,710**	**1.0**	**8,649**

Measured and Indicated Resources - June 30, 2017 (Inside pit shell)
$1,500 / ounce

	Cutoffs			Laterite			Saprolite			Transition			Rock			Total		
Deposit	Laterite & Saprolite	Transition	Hard Rock	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)
Koolhoven/Bigi	0.19	0.23	0.37	371	0.5	6	318	0.6	6	11,383	0.6	233	13,556	1.1	484	**25,627**	**0.9**	**729**
J Zone	0.19	0.24	0.37	208	0.6	4	590	0.6	12	5,495	0.6	114	14,610	0.9	440	**20,903**	**0.8**	**570**
Pay Caro	0.19	0.23	0.37	77	0.5	1	901	0.5	14	7,681	0.6	148	72,248	1.1	2,498	**80,908**	**1.0**	**2,662**
Mayo	0.19	0.24	0.37	17	0.4	0	952	0.5	15	1,109	0.5	18	46,642	0.9	1,398	**48,721**	**0.9**	**1,432**
Roma East	0.20	0.24	0.38	38	0.6	1	594	0.6	11	1,007	0.8	25	773	1.0	25	**2,412**	**0.8**	**62**
Roma West	0.20	0.24	0.38	1	0.2	0	153	0.6	3	422	1.0	13	2,209	1.1	80	**2,785**	**1.1**	**96**
Royal Hill	0.19	0.24	0.37	76	0.6	1	1,864	0.6	38	2,306	0.6	45	75,868	1.0	2,470	**80,114**	**1.0**	**2,555**
Rosebel	0.21	0.25	0.39	172	0.5	3	3,394	0.5	59	3,649	0.6	73	25,850	1.0	851	**33,065**	**0.9**	**985**
TOTAL				959	0.5	17	8,767	0.6	158	33,053	0.6	670	251,756	1.0	8,247	**294,535**	**1.0**	**9,092**
Stockpiles																**12,577**	**0.6**	**233**
GRAND TOTAL	**M+I Resources**			**959**	**0.5**	**17**	**8,767**	**0.6**	**158**	**33,053**	**0.6**	**670**	**251,756**	**1.0**	**8,247**	**307,112**	**0.9**	**9,324**

Inferred Resources - June 30, 2017 (Inside pit shell)
$1,500 / ounce

	Cutoffs			Laterite			Saprolite			Transition			Rock			Total		
Deposit	Laterite & Saprolite	Transition	Hard Rock	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)
Koolhoven/Bigi	0.19	0.23	0.37	381	1.2	14	73	0.6	1	320	0.6	6	1,155	1.1	42	**1,929**	**1.0**	**65**
J Zone	0.19	0.24	0.37	113	0.4	1	233	0.4	3	472	0.4	7	1,038	1.0	32	**1,857**	**0.7**	**43**
Pay Caro	0.19	0.23	0.37	164	0.4	2	1,018	0.4	14	1,303	0.5	23	11,664	1.1	419	**14,150**	**1.0**	**458**
Mayo	0.19	0.24	0.37	202	0.4	3	797	0.4	11	161	0.5	3	2,652	1.1	91	**3,812**	**0.9**	**108**
Roma East	0.20	0.24	0.38	34	0.4	0	120	0.4	2	11	0.4	0	5	1.6	0	**171**	**0.4**	**2**
Roma West	0.20	0.24	0.38	9	0.2	0	—	—	—	—	—	—	62	2.8	6	**72**	**2.5**	**6**
Royal Hill	0.19	0.24	0.37	180	0.4	3	1,805	0.4	23	1,156	0.5	18	35,478	1.1	1,201	**38,619**	**1.0**	**1,244**
Rosebel	0.21	0.25	0.39	200	0.5	4	2,124	0.5	35	1,122	0.6	21	11,319	1.0	360	**14,765**	**0.9**	**420**
Overman*	0.25	0.30	0.50	450	0.5	8	163	0.7	4	220	0.7	5	5,760	1.3	232	**6,594**	**1.2**	**248**
East Tailings Road*	0.21	0.26	0.41	41	0.4	1	682	0.5	12	1,060	0.9	30	241	1.9	15	**2,023**	**0.9**	**57**
Mama Kreek*	0.21	0.25	0.39	266	0.5	4	494	0.7	11	111	0.8	3	2	0.9	0	**873**	**0.6**	**17**
TOTAL				2,042	0.6	40	7,509	0.5	115	5,937	0.6	115	69,378	1.1	2,398	**84,866**	**1.0**	**2,667**

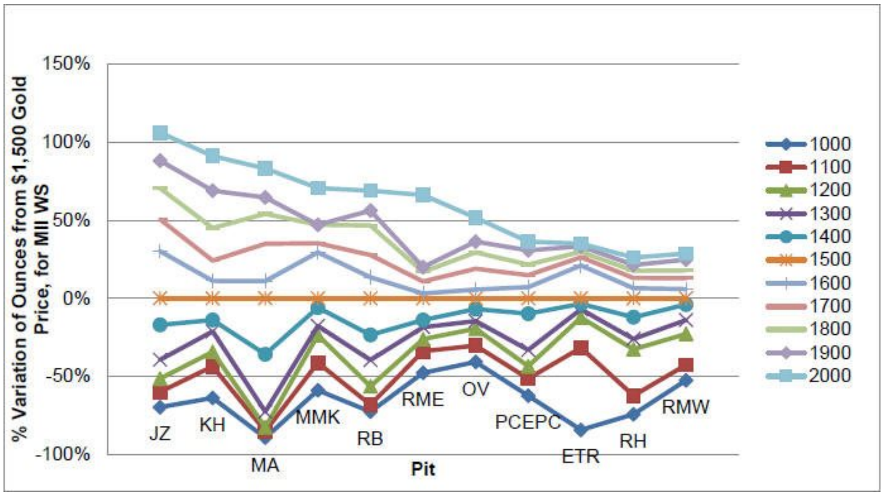
RESOURCE SENSITIVITY TO METAL PRICES

In order to examine the sensitivity of the Rosebel deposit to different gold prices, several nested pit shells at different prices were generated. The resources (Measured + Indicated + Inferred) were estimated inside the optimized Whittle pit shells. Shells were created at $100 intervals estimated between $1,000/oz Au and $2,000/oz Au using the appropriate cut-off grades.

Whittle shells are used in sensitivity analysis as they indicate a pit size relative to gold price and can be generated quickly. They do not, however, take into account additional mining constraints such as minimum mining widths and practical mining access ramps that need to be accounted for in reality. Therefore the waste tonnage and strip ratios are higher in the final pit designs than in these sensitivity shells. The results of the sensitivity to gold price between $1,000/oz Au and $2,000/oz Au, for each deposit, are presented in Figure 14-4.

Globally, a $100/oz increase in the gold price from the $1,500/oz Whittle Shell increases the resource ounces by 9%, while a $100/oz decrease in the gold price decreases the resource ounces by 16%. The results of the sensitivity analyses are compiled in Figure 14-4, which shows the sensitivity of all pits to varying metal prices in percent ounces gained or lost (as compared to the $1,500 Whittle Shell).

FIGURE 14-4 PERCENTAGE CHANGE IN OUNCES FOR THE RANGE OF GOLD PRICES BETWEEN $1,000 AND $2,000 USD/OZ COMPARED TO THE $1,500 AU PRICE
(Based on MI+I Grade Inside Optimized Shells)



From Figure 14-4, it can be noted that a large negative or positive shift in the gold price will equally impact the deposit size in its respective direction. As a general trend, the pits are less sensitive above $1,700/oz Au because infill drilling is still required to obtain information for higher gold prices.

COMPARISON WITH PREVIOUS ESTIMATES

The present Mineral Resource estimate is presenting a new interpolation approach for the most significant RGM deposits. It is roughly estimated that about 30% of the Mineral Resource increase is due to block model changes (i.e. new parameters and new drilling), and about 70% of the increase is due to new whittle shells (optimization parameters, costs, and blending optimization).

Table 14-10 presents the evolution of the Mineral Resources over the last five years. As a general trend, from 2012 to 2016, the decrease in Mineral Resources is mostly due to the decrease in the gold price and an increase in costs. The important increase in the Inferred

Mineral Resources is partially due to new drilling, new whittle shells, however, it is mostly due to the interpolation of blocks outside of the main interpreted Ore zones in the deeper parts of the deposits. This represent potential new targets for definition drilling in order to convert the Inferred Mineral Resources to Indicated Mineral Resources in the future.

TABLE 14-10 RGM PREVIOUS MINERAL RESOURCE ESTIMATES

	Measured + Indicated			Inferred		
	Mt	Grade	M Oz	Mt	Grade	M Oz
Dec-12	252.3	1.0	7.8	13.0	0.7	0.3
Dec-13	232.3	1.0	7.5	14.4	0.7	0.3
Dec-14	177.7	1.0	5.8	19.0	0.9	0.5
Dec-15	199.6	1.0	6.3	22.5	0.9	0.6
Dec-16	190.0	1.0	6.0	22.3	0.9	0.6
Jun-17	307.1	0.9	9.3	84.9	1.0	2.7

15 MINERAL RESERVE ESTIMATE

SUMMARY

The Mineral Reserve estimate at June 30, 2017 for RGM is summarized in Table 15-1 and is reported on a 100% basis. The Mineral Reserve estimate was prepared by RGM.

TABLE 15-1 MINERAL RESERVES – JUNE 30, 2017

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Proven	24,356	0.7	516
Probable	90,544	1.1	3,215
Total	**114,900**	**1.0**	**3,730**

Notes:

1. CIM definitions were followed for Mineral Reserves.
2. Mineral Reserves are estimated at average cut-off grades which vary between 0.16 g/t Au and 0.44 g/t Au depending on material type, pit, and time.
3. Mineral Reserves are estimated using an average long-term gold price of US$1,200 per ounce.
4. Bulk density is variable by rock type.
5. Numbers may not add due to rounding.

RGM is not aware of any known mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

The mine design and Mineral Reserve estimate have been completed to a level appropriate for feasibility studies. The Mineral Reserve estimate, stated herein, is consistent with the CIM Definitions and is suitable for public reporting. As such, the Mineral Reserves are based on Measured and Indicated Mineral Resources, and do not include any Inferred Mineral Resources.

RESOURCE MODELS

The June 30, 2017 Mineral Reserve estimate is based on updated resource models at year-end 2016 for all pits. The resource models were updated by RGM in GEMS format.

Mining activity is ongoing in most pits. As such, December 31, 2016 status maps were used to deplete the in-pit Mineral Reserves.

DILUTION

The Mineral Reserve estimate and cut-off grades include a mining dilution provision of 8% for saprolite and 10% for transition and fresh rock (hard) ore. The lower dilution for saprolite is due to the fact that limited blasting does not displace the ore zones compared to that required for transition and fresh rock. The dilution tonnage is estimated at zero grade.

The dilution is applied in the model directly in the Whittle shell selection. In addition to this dilution, a 10% adjustment factor, consistent with historical reconciliation data since 2004, is applied to the final tonnage, thus increasing the tonnage by 10%, and reducing the grade by an equivalent percentage, with no change to final in-situ gold reserves.

MINING LOSSES

Historical ore tonnage production has shown a consistent positive reconciliation at RGM. As such, no mining losses are applied to the reserves resulting in the mining recovery being 100%.

MINE OPTIMIZATION METHODOLOGY

The June 30, 2017 Mineral Reserves were determined based on the latest Life-of-Mine plan, which was developed using the Whittle Enterprise Optimization methodology, combining activity-based cost accounting, theory of constraints, pit phasing, and multi-pit scheduling in order to maximize value and bring forward cash production. Whittle Consulting and BBA Inc. were mandated, respectively, to provide support to RGM in the development of this process.

Prior to developing the pit shells and mine schedule, an assessment was made to determine the production limits in the RGM production system to be used as constraints in the final mining schedule. These bottlenecks are not necessarily fixed in time, and the constraint that proves to be the primary bottleneck may vary based on changes or optimizations that are brought to the production system. The current bottleneck in the production cycle from the mine to the mill is the SAG mill throughput, which is primarily being constrained by ore hardness, mainly controlled by SAG mill power availability.

An activity-based cost model was developed to take into account time and production related cost variables, which can change or limit production. All costs were thus categorized as either period costs (time related, with no production drivers), attributable costs (directly related to a production driver in the system), capital costs, or sustaining costs. Understanding and allocating the correct cost structure to the business is critical to the optimization and scheduling process, as each block in the model is attributed a value which is then weighted and compared to other block values when determining the most optimal ore blend composition to be delivered to the mill. Maximizing value is achieved within the given production constraints by applying the period costs to the identified main constraint element of the production cycle, thus the hardness of ore going through the mill. The outcome of this is that the difference in value of soft and hard ore is increased, favouring soft ore over and above the simple arithmetic costs of mining either type of ore (drilling, blasting, loading, and hauling).

Design of the ultimate pit was carried out using Whittle Lerchs-Grossmann pit optimization algorithm, which effectively estimates the final pit shell based on input parameters such as block grades, pit slopes, costs, recoveries, and metal prices. The outer shell determined by the algorithm defines the resource that would generate the maximum quantity of net undiscounted cash. A series of phases are then incorporated into the optimization to simulate practical mining using field mining constraints, and discounted cash flow to take into account the time value of each block in the pit shell. Typical input parameters in this part of the pit optimization process include annual discount rate, processing throughput, mine production limits, minimum mining width, as well as other criteria.

Once the pit shells have been determined, a schedule is obtained using Prober optimizer software, which functions by analyzing permutations of various sequences and blends to produce the most optimal schedule based on (amongst other parameters), time, distance, grade, hardness, and costs. By varying the parameters in such a way, the resulting blend is not constrained by a fixed Cut-off Grade (CoG) determined by static costs, but rather by a CoG that varies periodically to account for the variability of the above mentioned parameters in the ore feed. This last point is an important consideration in this process.

Finally, the last step in the mine plan process is the detailed mine plan, in which the schedule is broken down into specific periods. The final mine plan is then used to calculate operational requirements, such as equipment and man-power. General and administrative (G&A) costs are adjusted accordingly, and capital (CAPEX) costs are determined separately based on established strategic performance objectives.

CUT-OFF GRADE

Metal prices used for Mineral Reserves are based on consensus, long term forecasts from banks, financial institutions, and other sources. For Mineral Resources, metal prices used are slightly higher than those for Mineral Reserves.

IAMGOLD uses a consistent reserve and resource gold price assumption for all of its sites. The reserve gold price assumption for estimating Mineral Reserves at June 30, 2017 is $1,200/oz, unchanged from the year-end 2016 Mineral Reserve estimate gold price assumption. Other economic parameter assumptions utilized to estimate costs and revenues such as fuel price, exchange rates, and royalty rates are summarized in Table 15-2.

TABLE 15-2 PIT OPTIMIZATION ECONOMIC ASSUMPTIONS

Economic Parameters	Unit	Value
Gold price (P)	US$/oz	1,200
Long term oil price	US$/bbl	55
SRD exchange rate	SRD/USD	7.25
Transport & refining cost	US$/oz	3.00
Site diesel price	US$/L	0.59
Site Heavy Fuel Oil (HFO) price	US$/L	0.78
Power cost	US$/kWh	0.114
Production Royalty (2.25%)	US$/oz	27.00
Cash Royalty (6.5%)	US$/oz	50
Discount rate	%	6.00

Table 15-3 summarizes the 2017 CoGs by pit.

TABLE 15-3 SUMMARY OF 2017 COGS AT US$1,200/OZ

COG by Pit		Saprolite	Transition	Rock
J Zone	(g/t Au)	0.24	0.30	0.47
Pay Caro	(g/t Au)	0.24	0.29	0.46
Mayo	(g/t Au)	0.24	0.30	0.47
Roma East	(g/t Au)	0.24	0.30	0.47
Roma West	(g/t Au)	0.25	0.30	0.47
Royal Hill	(g/t Au)	0.24	0.30	0.47
Rosebel	(g/t Au)	0.26	0.31	0.48

Table 15-4 summarizes the pit optimization parameters by pit.

TABLE 15-4 SUMMARY OF PIT OPTIMIZATION PARAMETERS

Ore Based Cost & COG by Deposit			**All Pits**	
Rock type		**Saprolite**	**Transition**	**Rock**
Metallurgical recovery (rFGO)	%	96%	94%	93%
Processing Cost	US$/t treated	4.17	5.01	6.06
Power Cost	US$/t treated	0.72	1.25	3.98
Total processing cost (Cp)	**US$/t treated**	**4.89**	**6.26**	**10.04**
Mining dilution (d)	%	8.0%	10.0%	10.0%
PC Ore premium mining cost (Com)	US$/t treated	-0.17	-0.16	-0.15
JZ Ore premium mining cost (Com)	US$/t treated	0.02	0.02	0.02
RB Ore premium mining cost (Com)	US$/t treated	0.45	0.43	0.39
RH Ore premium mining cost (Com)	US$/t treated	0.01	0.01	0.01
RM Ore premium mining cost (Com)	US$/t treated	0.18	0.17	0.16
MA Ore premium mining cost (Com)	US$/t treated	0.04	0.04	0.04
Ore Feed	US$/t treated	0.22	0.22	0.22
Tailings Storage	US$/t treated	0.32	0.32	0.32
G&A cost (Ca)	US$/t treated	1.90	1.90	3.20
Stay-in-business capital (Csibc)	US$/t treated	0.30	0.30	0.30
PC Total Ore Based Cost	**US$/t treated**	**7.46**	**8.85**	**13.93**
JZ Total Ore Based Cost	**US$/t treated**	**7.65**	**9.03**	**14.10**
RB Total Ore Based Cost	**US$/t treated**	**8.08**	**9.44**	**14.47**
RH Total Ore Based Cost	**US$/t treated**	**7.64**	**9.02**	**14.09**
RM Total Ore Based Cost	**US$/t treated**	**7.81**	**9.18**	**14.24**
MA Total Ore Based Cost	**US$/t treated**	**7.67**	**9.05**	**14.11**
Reference Mining Cost by Deposit				

Ore Based Cost & COG by Deposit				All Pits			
Rock type		Saprolite		Transition		Rock	
Material		Ore	Waste	Ore	Waste	Ore	Waste
PC Total Reference Mining Cost	US$/t mined	1.86	2.03	2.21	2.37	2.46	2.61
JZ Total Reference Mining Cost	US$/t mined	2.12	2.10	2.31	2.29	2.52	2.50
RB Total Reference Mining Cost	US$/t mined	2.41	1.96	2.68	2.25	2.94	2.55
RH Total Reference Mining Cost	US$/t mined	2.00	1.99	2.34	2.33	2.62	2.61
RM Total Reference Mining Cost	US$/t mined	2.15	1.97	2.49	2.32	2.70	2.54
MA Total Reference Mining Cost	US$/t mined	2.32	2.28	2.54	2.50	2.75	2.71

Actual CoGs per pit, material type, and time are provided in Figure 15-1 through Figure 15-7. In these figures, it should be noted that the CoGs are zero during the time that the material is not actively mined.

FIGURE 15-1 PAY CARO WASTE-ORE CUT-OFF GRADE

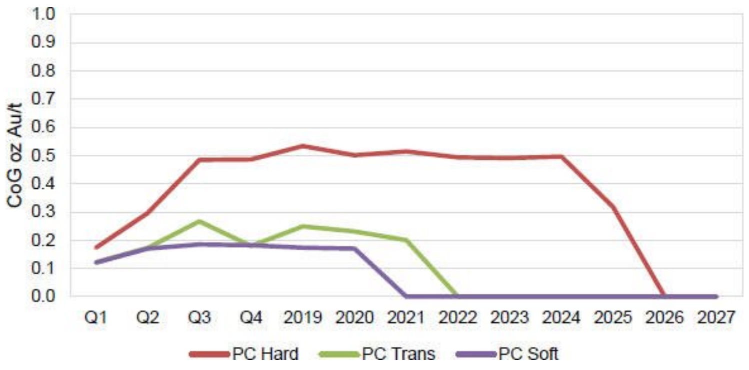


FIGURE 15-2 J ZONE WASTE-ORE CUT-OFF GRADE

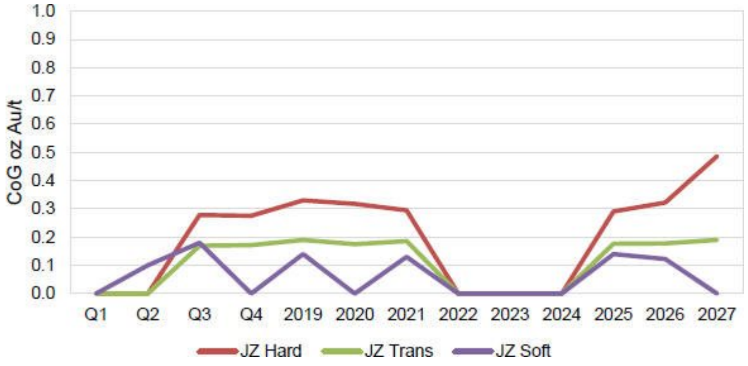


FIGURE 15-3 ROSEBEL WASTE-ORE CUT-OFF GRADE

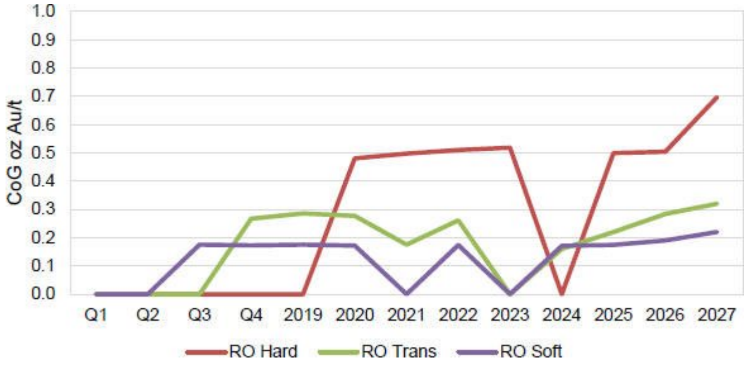


FIGURE 15-4 ROYAL HILL WASTE-ORE CUT-OFF GRADE

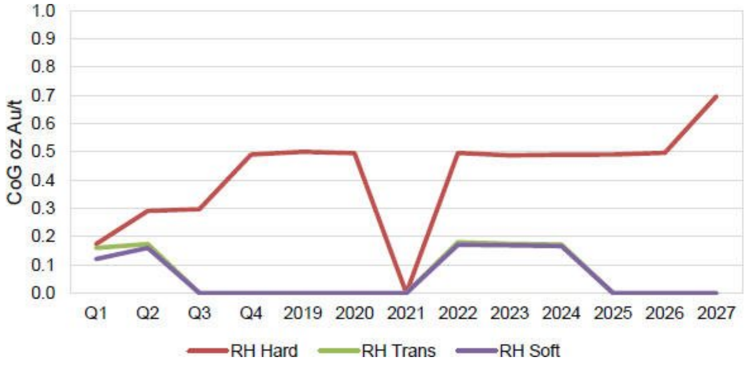


FIGURE 15-5 ROMA EAST WASTE-ORE CUT-OFF GRADE

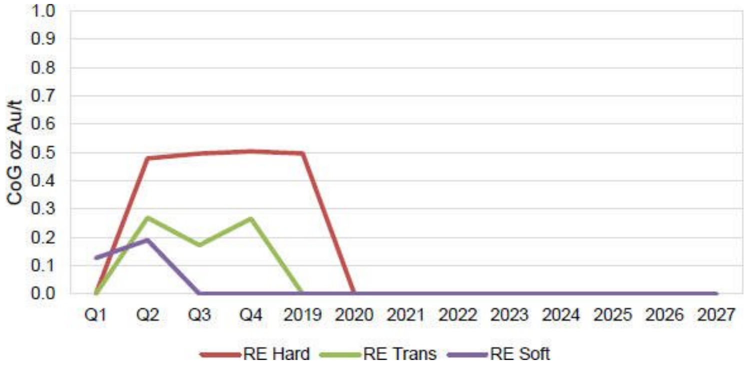


FIGURE 15-6 ROMA WEST WASTE-ORE CUT-OFF GRADE

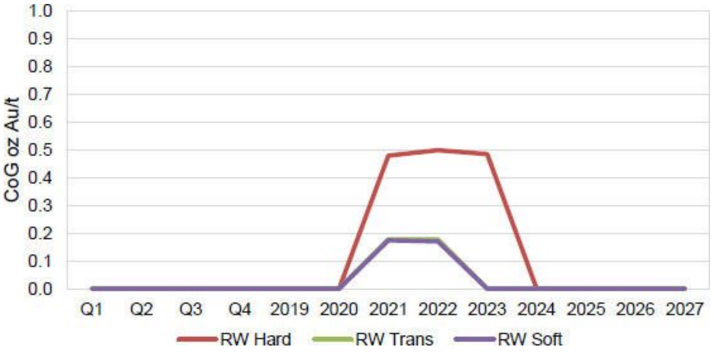
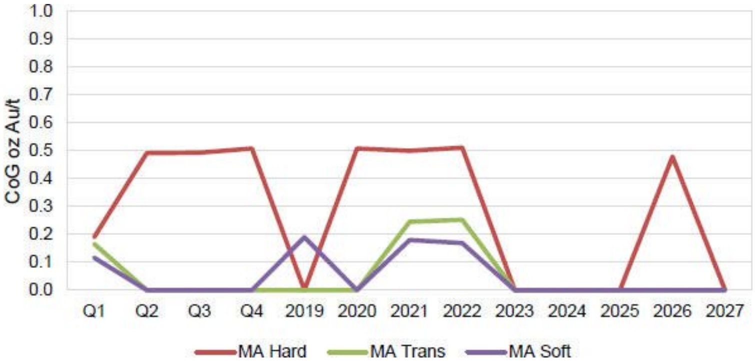


FIGURE 15-7 MAYO WASTE-ORE CUT-OFF GRADE



The metallurgical recovery assumptions for all pits are 96% for saprolite, 94% for transition, and 93% for fresh rock.

PIT SLOPE DESIGNS

RGM has recently increased the bench heights in all pits, with the exception of Mayo, to 8 m in order to optimize both productivity and costs. Five metre bench heights were maintained at Mayo to minimize ore mining dilution due to the shallow dipping mineralization.

The pits are sub-categorized into weathering domains based on the weathering profiles in the geological model. There are three main weathering profiles in the pit design criteria; saprolite, transition, and rock. Exceptionally, for J Zone, because of the presence of a more competent transition domain, the domain sub-categorization includes weathered rock, which is located stratigraphically between transition and fresh rock.

An extensive geotechnical drilling program was carried out in 2013 and 2014 to define the domains used in the slope designs. In addition to the weathering domains, sectors were developed for each pit based on structural rock mass characteristics. Five pits were targeted by the field investigation (Pay Caro, Royal Hill, Mayo, Rosebel, and J Zone). No field investigation was carried out for the small Roma pits (East and West). Pit slope parameters in those two pits were determined based on in-pit mapping, and adjacent pit parameters (Royal Hill and Mayo). The design parameters were provided by SRK (Canada) Inc. (SRK), Vancouver B.C (with the exception of Roma pits). The pit slope designs have undergone slight modifications to the original parameters to accommodate modifications to the design Bench Face Angle for certain sections. All pit slope designs are included in the current mine designs, and are reviewed yearly by SRK.

Tables 15-5 through Table 15-11 provide all pit slope design parameters.

TABLE 15-5 PAY CARO PIT DESIGN SLOPE RECOMMENDATIONS

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
Pay Caro	PC-1	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	34	15	40
		Fresh Rock	75	16	11.5	45	20	96
	PC-2	Saprolite	60	8	8	32	15	32
		Transition	65	7.3	8	34	15	40
		Fresh Rock	80	10.5	16	50	15	96
	PC-3	Saprolite	60	8	8	32	15	32
		Transition	65	7.3	8	36	15	40
		Fresh Rock	75	7.6	16	53	20	96
	PC-4	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	36	15	40
		Fresh Rock	75	11.5	16	50	20	96
	PC-5	Saprolite	60	8	8	32	15	32
		Transition	65	8.5	8	34	15	40
		Fresh Rock	80	9	16	50	20	96
	PC-6	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	34	15	40
		Fresh Rock	75	11.5	16	45	20	96
	PC-7	Saprolite	60	8	8	32	15	32
		Transition	65	9	8	29	15	40
		Fresh Rock	75	11.5	16	45	20	96
EPC	EPC-1A	Saprolite	50	5	5	29	20	30
		Transition	90	16	10	32	20	32
		Fresh Rock	90	12	10	40	20	96
	EPC-1B	Fresh Rock	90	10	10	45	20	96
	EPC-2	Saprolite	50	5	5	29	20	30
		Transition	90	15	10	34	20	32
		Fresh Rock	90	10	10	45	20	96
	EPC-3	Saprolite	50	5	5	29	20	30
		Transition	90	15	10	34	20	32
		Fresh Rock	90	12	10	40	20	96
	EPC-4	Saprolite	50	5	5	29	20	30
		Transition	90	5	5	37	20	32
		Fresh Rock	90	14	20	55	20	96
WPC	PC-7	Saprolite	60	8	8	32	15	32
		Transition	65	9	8	29	15	40
		Fresh Rock	75	11.5	16	45	20	96

TABLE 15-6 J ZONE PIT DESIGN SLOPE RECOMMENDATIONS

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
J-Zone	JZ-1	Saprolite/Transition	60	7	8	35	15	40
		Weathered Rock	90	7.8	8	39	15	56
		Fresh Rock	75	9	16	46	20	96
	JZ-2	Saprolite/Transition	60	7	8	35	15	40
		Weathered Rock	90	7.8	8	39	15	40
		Fresh Rock	75	9	16	50	20	96
	JZ-3	Saprolite/Transition	60	7	8	35	15	40
		Weathered Rock	90	7.8	8	39	15	40
		Fresh Rock	75	9	16	50	20	96
	JZ-4	Saprolite/Transition	60	7	8	35	15	40
		Weathered Rock	90	8.3	8	44	15	96
		Fresh Rock	75	7	16	55	20	96

TABLE 15-7 ROYAL HILL PIT DESIGN SLOPE RECOMMENDATIONS

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
Royal Hill	RH-1	Saprolite	60	11	8	32	15	30
		Transition	65	8	8	34	15	40
		Fresh Rock	75	7.5	16	50	20	96
	RH-2	Saprolite	60	10	8	29	15	30
		Transition	65	7	8	37	15	40
		Fresh Rock	75	9	16	50	20	96
	RH-3	Saprolite	60	11	8	27	15	30
		Transition	65	7	8	37	15	40
		Fresh Rock	75	6	8	44	20	96
	RH-4	Saprolite	60	10	8	29	15	30
		Transition	65	7	8	37	15	40
		Fresh Rock	75	7.5	8	54	20	96
	RH-5	Saprolite	60	10	8	29	15	30
		Transition	65	7	8	37	15	40
		Fresh Rock	75	6	8	44	20	96
	RH-6	Saprolite	60	11	8	27	15	30
		Transition	65	7	8	37	15	40
		Fresh Rock	75	7.5	16	55	20	96

TABLE 15-8 MAYO PIT DESIGN SLOPE RECOMMENDATIONS

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
Mayo	Mayo-1	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	34	15	40
		Fresh Rock	75	8.5	16	51	20	96
	Mayo-2	Saprolite	60	8	8	32	15	32
		Transition	65	8.5	8	33	15	40
		Fresh Rock	75	9.5	16	49	20	96
	Mayo-3	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	34	15	40
		Fresh Rock	75/90	6/8	8	45	20	96
	Mayo-4	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	34	15	40
		Fresh Rock	75/90	7.8/10	8	39	20	96

TABLE 15-9 ROSEBEL PIT DESIGN SLOPE RECOMMENDATIONS

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
Rosebel	RSB-1	Saprolite	60	8	8	32	15	32
		Transition	65	8	8	34	15	32
		Fresh Rock	75	10.5	16	47	20	96
	RSB-1A	Fresh Rock	75	11	16	45	20	96
	RSB-2	Saprolite	60	8	8	32	15	32
		Transition	65	6	8	40	15	40
		Fresh Rock	75	10	16	51	20	96
	RSB-3	Saprolite	60	8	8	34	15	40
		Transition	65	6	8	40	15	40
		Fresh Rock	75	7	16	55	20	96
	RSB-3A	Fresh Rock	75	11	16	46	20	96
	RSB-4	Saprolite	60	8	8	32	15	32
		Transition	65	10	8	34	15	40

TABLE 15-10 ROMA WEST PIT DESIGN SLOPE RECOMMENDATIONS (FROM RGM)

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
Roma West	NORTH	Saprolite	60	8	6	32	15	32
		Transition	65	8	12	34	15	40
		Fresh Rock	90	14.5	6	48	20	96
	SOUTH	Saprolite	60	6	6	29	20	30
		Transition	75	10	12	33	20	40
		Fresh Rock	90	8.5	5	45	20	96

TABLE 15-11 ROMA EAST PIT DESIGN SLOPE RECOMMENDATIONS (FROM RGM)

Pit	Sector	Material Type	BFA(°)	Berm Width(m)	Design Bench Height(m)	IRA(°)	Geotech Berm Width(m)	Max. Stack Height
Roma East	NORTH	Saprolite	60	8	6	32	15	32
		Transition	65	8	12	34	15	40
		Fresh Rock	90	14.5	6	48	20	96
	SOUTH	Saprolite	60	6	6	29	20	30
		Transition	75	10	12	33	20	40
		Fresh Rock	90	8.5	5	45	20	96

MINE PLAN

PAY CARO

The Pay Caro pits are located northeast of the Mill site on the northern side of the RGM concession. Mining at the Pay Caro pit began in 2003 and has been mined continuously since. To date (since 2003), 167.6 Mt have been mined from the Pay Caro pit.

In the vicinity of the Pay Caro pits is Koolhoven, located to the north-west, J Zone to the north, and the tailings area is in the north-east. Natural drainage occurs west of the Pay Caro pit and this will be managed as the mining phases progress. Access to the mill is via a haul road on the south side of the pits; this road is also a link with the Rosebel haul road.

The Pay Caro deposit (including East and West PC) contains a total of five phases, namely, PC_Z1, PC_A3, PC_B2, PC_C5, and PC_D1 (Figure 15-8 to Figure 15-12). The stripping ratios for the phases are 5.1:1, 5.2:1, 6.0:1, 4.0:1, and 7.4:1, respectively. The ultimate pit floor elevation is 200 m resulting in a total pit depth of 325 m.

The new ultimate pit design is significantly larger than previous years due to the pit optimization techniques that were used to develop the pit shells as discussed in Section 14. Phases PC_Z1 and PC_B2 are confined to the Central Pay Caro pit. These phases focus primarily on the west side of the central pit with the ramping system exiting on the north side to minimize the waste haul distance and a ramp exiting on the south side of the pit to minimize the ore haul distance. Phase PC_A3 is confined to the East Pay Caro pit where a push back to the south is planned. The ramping system for PC_A3 is exiting the pit on the north side, as well, in order to minimize the waste haul distance. Phase PC_C5 is confined to the West Pay Caro pit and is comprised of four small pits. Phase PC_D1 is the ultimate pit which includes mining in the Central and East Pay Caro pits. The ultimate pit design includes a ramping system exiting on the north side of the pit to minimize waste haul distance, as well as exiting on the south side of the pit for ore haul efficiencies.

Future dumping in the Pay Caro pits will be on the Pay Caro north dump. In order to minimize truck haul distances and reduce the environmental footprint, in-pit waste dumping will be carried out in the later phases of mining in West Pay Caro pit (Figure 15-13).

There are an estimated 37.0 Mt of ore at 1.2 g/t Au available, at a stripping ratio of 6.56.

FIGURE 15-8 PAY CARO PHASE PC_Z1

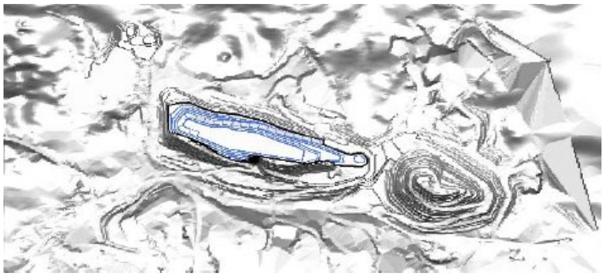


FIGURE 15-9 PAY CARO PHASE PC_A3

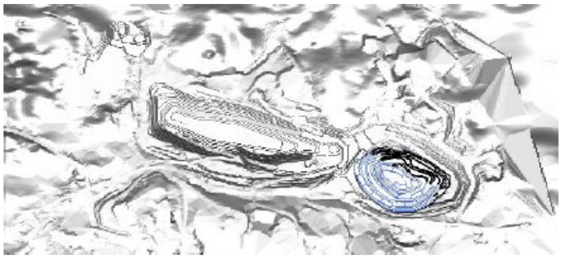


FIGURE 15-10 PAY CARO PHASE PC_B2

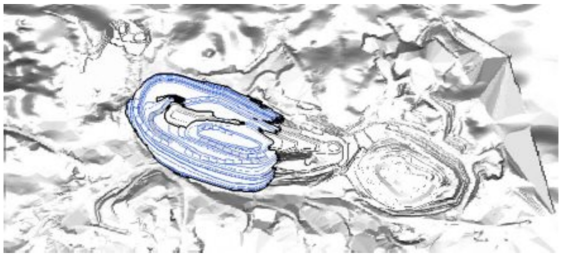


FIGURE 15-11 PAY CARO PHASE PC_C5

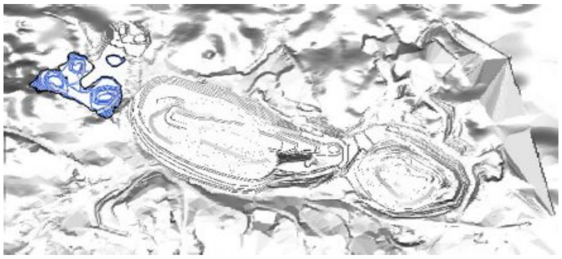


FIGURE 15-12 PAY CARO PHASE PC_D1

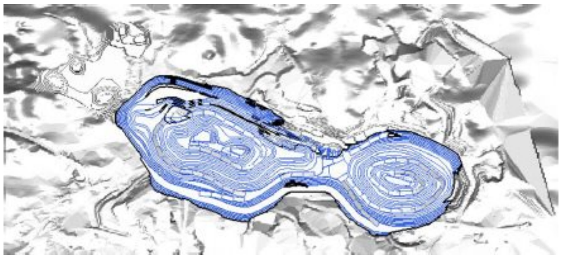
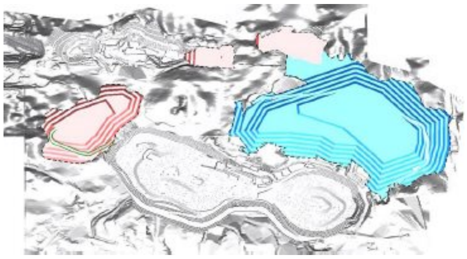


FIGURE 15-13 PAY CARO WASTE DUMPS
(In-Pit Waste Shown In Red)



J ZONE

The J Zone pits are located on the northern boundary of the RGM concession, north of Pay Caro and east of Koolhoven. Mining at the J Zone pits began in 2014 has been mined every year since. To date 32.9 Mt have been mined from the J Zone pits.

Due to the proximity of J Zone to the other pits, dumps, and tailings storage facility, there is only limited space in the surrounding area to further develop the infrastructure. The primary ore haul route will be located on the south-west side of the west pit with another access off of the Pay Caro North Dump from the east pit. The central drainage zone between the two main pits will be maintained.

The J Zone deposit contains a total of five phases, namely, JZ_A3, JZ_D1, JZ_E2, JZ_F2, and JZ_G3 (Figure 15-14 to Figure 15-18). The stripping ratios for the phases are 3.8:1, 0.9:1, 2.9:1, 2.8:1, and 4.2:1, respectively. The ultimate pit floor elevation is 432 m resulting in a total a pit depth of 112 m.

The J Zone deposit is separated into two main pits, the east pit, and the west pit. Phase JZ_A3 is the only phase for the east pit. The ore and waste routes are to the southwest of the phase where the waste will be dumped on the North Pay Caro dump and the ore will travel along the north Pay Caro haul road. Phases JZ_D1, JZ_E2, JZ_F2, and JZ_G3 are in the J Zone west pit. Phase JZ_D1 is a relatively small phase which extends the existing ramping system on the south side of the pit. Phase JZ_E2 is a pushback of the north wall which has the ramping system exiting on the northwest corner of the pit. Phase JZ_F2 is a pushback of the south wall which has the ramp exit on the south side of the pit and connects to the current ramping system at the pit rim. Phase JZ_G3 is located on the west side of the mini pit and has the ramp exiting on the south side of the pit.

The phases in the J Zone west pit will utilize the J Zone north waste dump while the J Zone east pit will send the waste to the Pay Caro north dump as seen in Figure 15-16. The east portion of the pit will be used for in-pit dumping with waste from the Pay Caro pit (refer to Figure 15-19).

There are an estimated 8.2 Mt of ore at 0.7 g/t Au available, at a stripping ratio of 3.17.

FIGURE 15-14 J ZONE PHASE JZ_A3

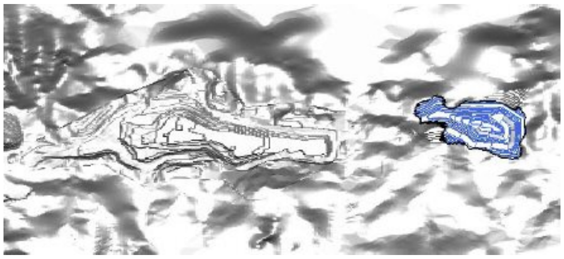


FIGURE 15-15 J ZONE PHASE JZ_D1

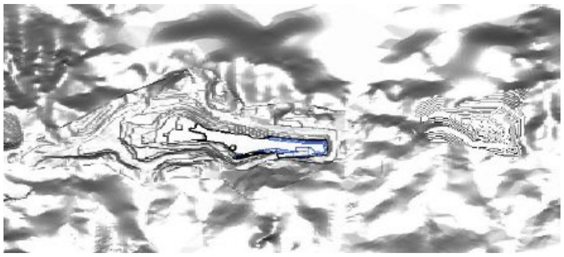


FIGURE 15-16 J ZONE PHASE JZ_E2

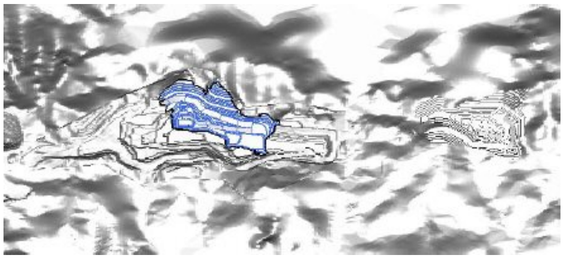


FIGURE 15-17 J ZONE PHASE JZ_F2

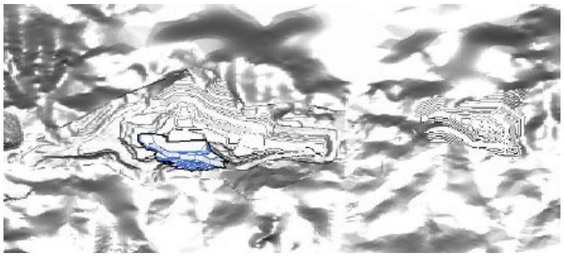


FIGURE 15-18 J ZONE PHASE JZ_G3

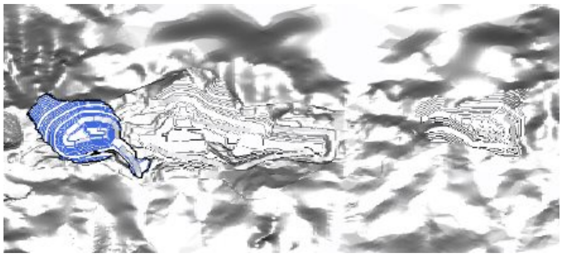
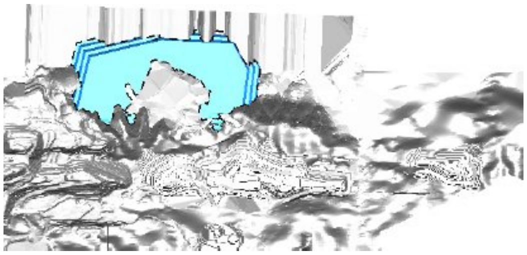


FIGURE 15-19 J ZONE DUMP



ROYAL HILL

The Royal Hill pit is located at the southern boundary of the RGM concession. Mining of the pit commenced in 2004 and has been mined continuously since. To date (since 2004), 124.o Mt have been mine from the Royal Hill pit.

Roma East is located west of Royal Hill. To the north of the pit there is also an Archeological site (burial ground), a power line, and old camp infrastructure. To the east of the pit lies Nieuw Koffiekamp village and, as such, RGM has made a commitment to not advance any further in that direction. Concession boundary limits prevent expansions to the south. A drainage ditch already exists to the east of the Royal Hill SE pit and this ditch is planned to be maintained through the mine life. A second drainage system also exists on the east side of the pit, funneling surface water to a settling pond in the south of the pit. Access to the mill will be via the haul road located to the north of the pit.

The Royal Hill deposit (comprised of Royal Hill NW Pit and Royal Hill SE Pit) contains a total of three phases, namely, RH_A3, RH_A6, and RH_B3 (Figure 15-20 to Figure 15-22). The stripping ratios for the phases are 3.8:1, 7.9:1, and 6.7:1, respectively. The ultimate pit floor elevation is 208 m resulting in a total pit depth of 337 m.

The new ultimate pit design is significantly larger than previous years due to the pit optimization techniques that were used to develop the pit shells as discussed in section 14. Phases RH_A3 and RH_A6 are confined to the Royal Hill NW pit. These phases are designed with the ramping section on the northwest side of the pit to minimize the ore and waste haul distances. Phase RH_B3 has a ramping system that exits on the west side of the pit to minimize ore and waste haul distance.

Future dumping in the Royal Hill pits will be on the Royal Hill west dump. Due to the phasing sequence, in-pit dumping is possible, and has been planned in the south portion of the pit to minimize truck haul distances and reduce the environmental footprint (Figure 15-23).

There are an estimated 34.3 Mt of ore at 1.1 g/t Au available, at a stripping ratio of 6.54.

FIGURE 15-20 ROYAL HILL PIT PHASE RH_A3

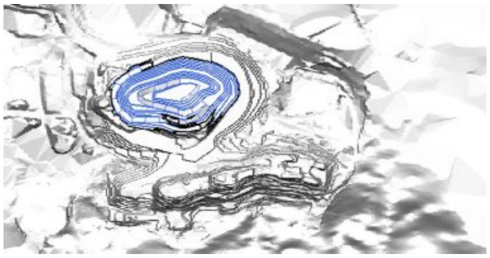


FIGURE 15-21 ROYAL HILL PIT PHASE RH_A6

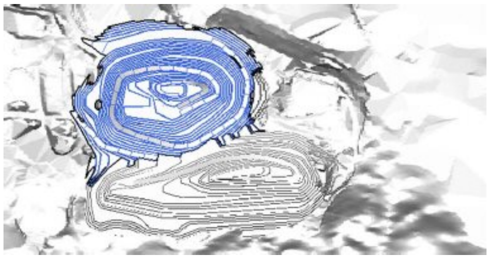


FIGURE 15-22 ROYAL HILL PIT PHASE RH_B3

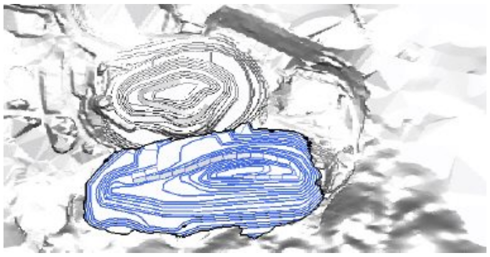
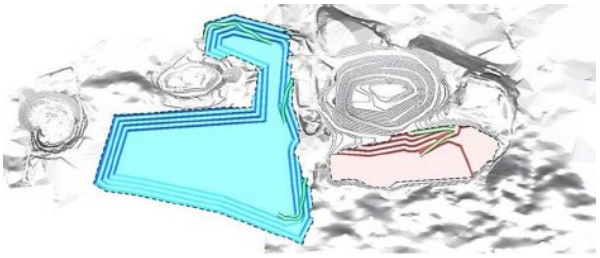


FIGURE 15-23 ROYAL HILL WASTE DUMPS
(In-Pit Waste Shown In Red)



MAYO

The Mayo deposit is located at the southern boundary of the RGM concession. Mining in Mayo pit commenced in 2009 and has been mined continuously since. To date (since 2009) 154.4 Mt have been mined from the Mayo pit.

In the vicinity of Mayo is Roma West which is to the east of Mayo. Natural drainage is located to the north of the north Mayo dump. On the southern side of the pit, a diversion ditch has been constructed to divert water way from the pit. There has also been some ditching on the east side of the pit to control the water flow. Access to the mill is via a haul road on the northeast side of the pit, this road links with the Royal Hill haul road.

The Mayo deposit contains a total of five phases, namely MA_A2, MA_B2, MA_B3, MA_C1, and MA_C2 (Figure 15-24 to Figure 15-28). The stripping ratios for the phases are 4.2:1, 2.4:1, 1.3:1, 3.6:1, and 1.3:1, respectively. The ultimate pit floor elevation is 350 m resulting in a total pit depth of 165 m.

Phase MA_A2 is the continuation of a mini pit on the north side of the Mayo deposit with the ramp exiting on the south side of the phase adjacent to the north in pit haul road and the dump access. Phase MA_B2 is confined to the east side of the main pit. The ramping system exits on the north side of the pit with the ore exiting the pit via the haul road on the east side of the pit while the waste will be sent to the south Mayo dump. Phases MA_B3, MA_C1, and MA_C2 are all smaller individual pits on the north side of the Mayo deposit. These phases all access the north in-pit haul road.

Future dumping in Mayo will be on the Mayo north waste dump and the Mayo south waste dump (Figure 15-29).

There are an estimated 7.5 Mt of ore at 0.9 g/t Au available, at a stripping ratio of 2.53.

FIGURE 15-24 MAYO PIT PHASE MA_A2

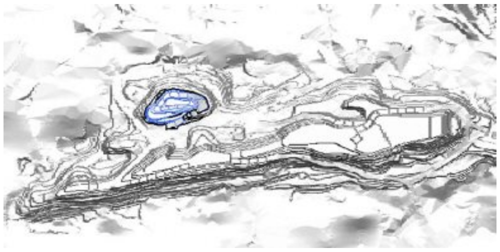


FIGURE 15-25 MAYO PIT PHASE MA_B2

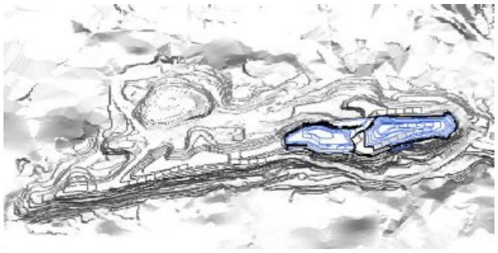


FIGURE 15-26 MAYO PIT PHASE MA_B3

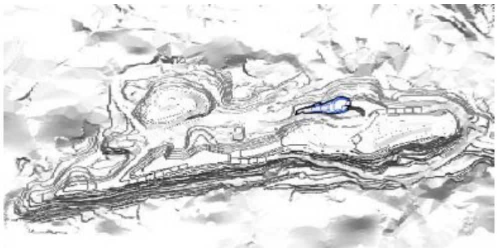


FIGURE 15-27 MAYO PIT PHASE MA_C1

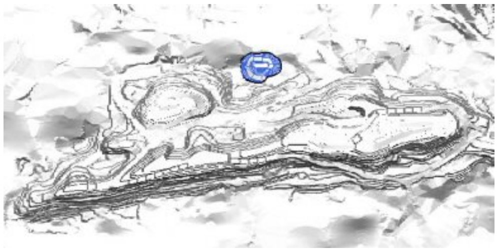


FIGURE 15-28 MAYO PIT PHASE MA_C2

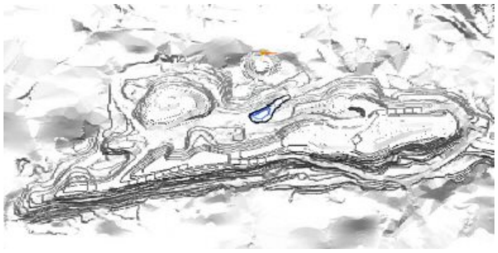
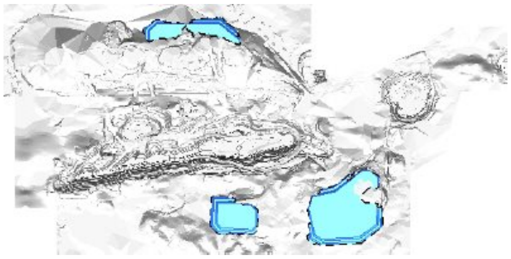


FIGURE 15-29 MAYO PIT WASTE DUMPS



ROSEBEL

The Rosebel pit is located roughly 12 km south-east of the RGM Mill and is accessed via an 11.5 km haul road that links the east side of East Pay Caro to the Rosebel pit. Mining at the Rosebel pit began in 2012 and has been mined continuously since. To date (since 2012) 72.9 Mt have been mined from the Rosebel pit.

Rosebel pit is isolated from other pits and infrastructure at RGM and is located in the southeast section of the concession. Drainage ditches have been established to the north and south of the pit to control surface water. Access to the mill is via a haul road located on the north side of the pit which connects with the Pay Caro haul road near the mill.

The Rosebel deposit contains a total of seven phases, namely RB_Z1, RB_A3, RB_C2, RB_C3, RB_D4, RB_E4, and RB_G2 (Figure 15-30 to Figure 15-36). The stripping ratios for the phases are 2.7:1, 10.3:1, 3.2:1, 5.2:1, 6.6:1, 7.7:1, and 6.6:1, respectively. The ultimate pit floor elevation is 310 m resulting in a pit depth of 222 m.

Phase RB_Z1 is a continuation of the current mining phase with the spiral ramp exiting on the north side of the pit tying into the haul road. Phases RB_A3, RB_C2, and RB_C3 are small independent phases to the east of the main pit. These phases will be accessed through an extension of the haul road on the north side of the pit. Phase RB_D4 is a pushback on the west side of the pit with the ramp exiting on the east side of the pit. Phase RB_E4 is a pushback on the west side of the pit with the ramping system exiting on the north side of the pit. Phase RB_G2 is an independent pit located to the west of the main pit with the ramp exiting on the north side of the pit adjacent to the haul road.

Future dumping in Rosebel will be on the Rosebel north waste dump (Figure 15-37).

There are an estimated 11.5 Mt of ore at 1.1 g/t Au available, at a stripping ratio of 5.38.

FIGURE 15-30 ROSEBEL PIT PHASE RB_Z1

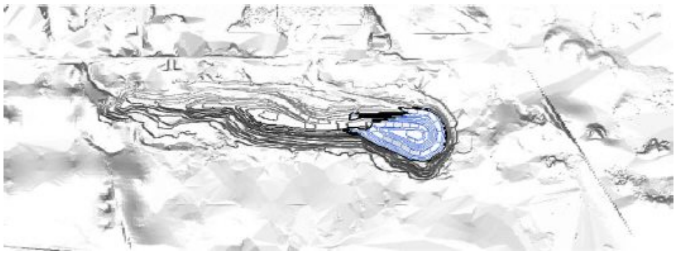


FIGURE 15-31 ROSEBEL PIT PHASE RB_A3

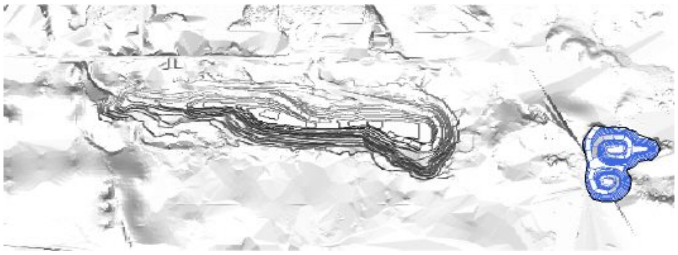


FIGURE 15-32 ROSEBEL PIT PHASE RB_C2

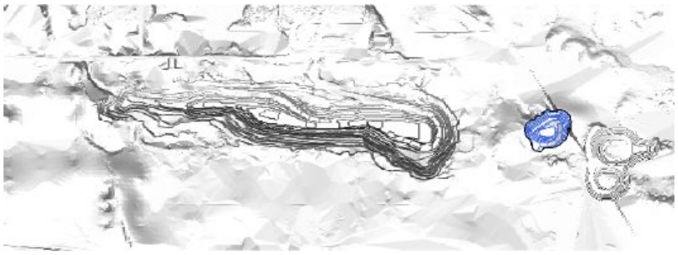


FIGURE 15-33 ROSEBEL PIT PHASE RB_C3

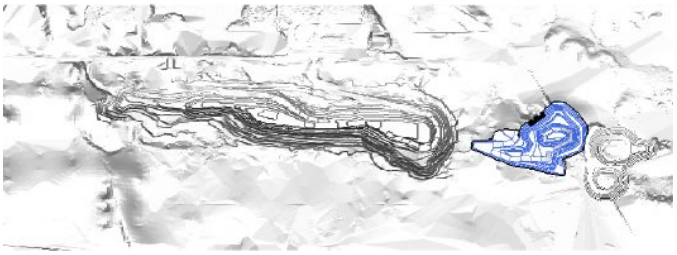


FIGURE 15-34 ROSEBEL PIT PHASE RB_D4

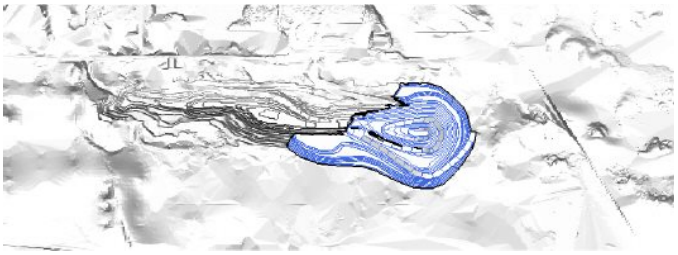


FIGURE 15-35 ROSEBEL PIT PHASE RB_E4

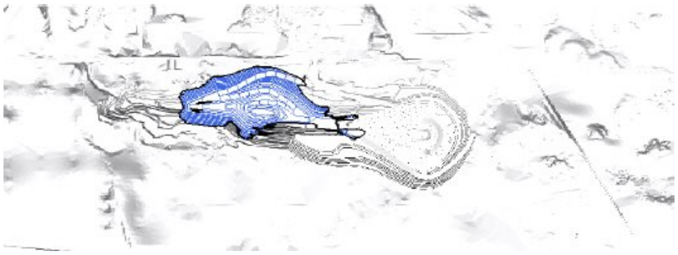


FIGURE 15-36 ROSEBEL PIT PHASE RB_G2

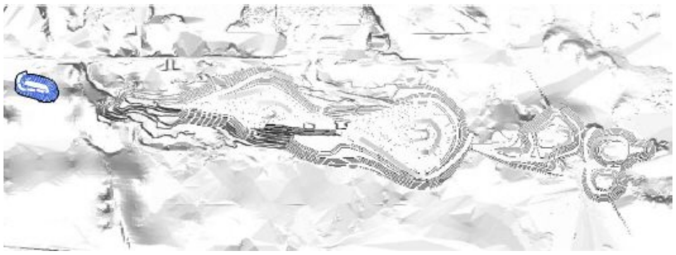
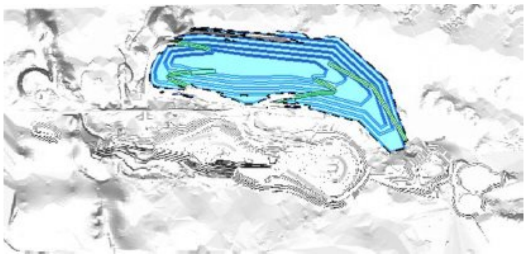


FIGURE 15-37 ROSEBEL PIT WASTE DUMP



ROMA

The two Roma pits, East and West, are found in the southern half of the RGM concession. Mining of the Roma pits began in 2011 and has had mining activity every year since with the exception of 2015. To date 13.9 Mt have been mined from the Roma pits.

In the vicinity the Roma pits is Royal Hill, on the east, and Mayo on the west. Natural drainage occurs to the south of the pits. Access to the mill is via the Mayo haul road with is north of the pits.

The Roma deposit contains a total of two phases, namely RME_A3 and RMW_A1 (Figure 15-38 and Figure 15-39). Each pit has only a single phase. The stripping ratios for the phases are 2.5:1 and 10.6:1, respectively. The ultimate pit floor elevation for Roma East is 470 m resulting in a total pit depth of 60 m and the ultimate pit floor elevation for the Roma West pit is 404 m resulting in a total pit depth of 126 m.

Phase RME_A3 is confined to the Roma East pit. This phase has a ramping system which exits on the northwest side of the pit. The waste will be dumped on the Royal Hill waste dump which is west of the pit while ore can be sent to the mill via the Mayo haul road. Phase RMW_A1 has a ramping system which exits on the west side of the pit where waste haulage can continue to the south to the waste dump while ore can be sent to the mill via the Mayo haul road.

Waste from the Roma East pit will be sent to the Royal Hill west waste dump as seen in Figure 15-6 and the waste from the Roma West pit will be sent to the Mayo south waste dump, as seen in Figure 15-22.

There are an estimated 3.8 Mt of ore at 1.0 g/t Au available, at a stripping ratio of 5.1:1

FIGURE 15-38 ROMA PIT PHASE RME_A3

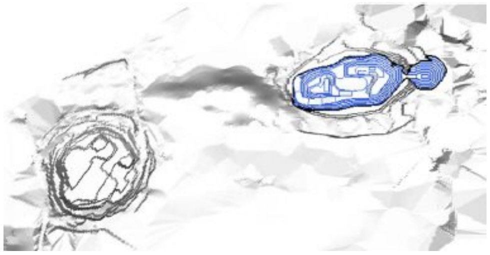
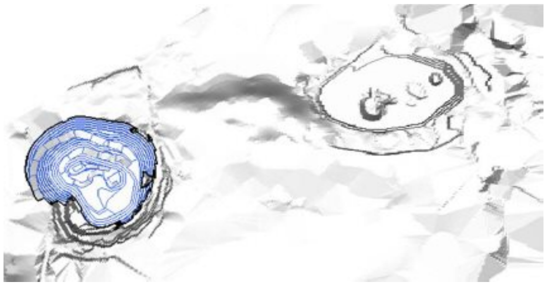


FIGURE 15-39 ROMA PIT PHASE RME_A1



DESIGN SUMMARY

Mineral Reserves are defined within pit designs based on optimized pit shells using Whittle optimizer software and then applying practical mining and geotechnical constraints to design realistic pits using GEMS software. In order to determine the Mineral Reserves within the RGM concession, it was necessary to create pit designs based on the optimized pit shells produced by Whittle optimizer. The pit designs where then entered into the Prober scheduling software to produce a final production schedule. The tonnes and grade of the ore are determined based on the results of the production schedule and not on the traditional method of using a static cut-off grade.

The Measured Mineral Resources within the pit design are considered to be Proven Mineral Reserves and the Indicated Mineral Resources considered as Probable Mineral Reserves for all RGM deposits and the pit designs are considered to be practical mining and economical ore reserves envelopes. Stockpile inventory is classified as Proven Mineral Reserves and is included in Table 15-12. The inferred category of Mineral Resource is not reported inside of the pit designs, nor is it used in the pit optimization process.

Reconciliation of predicted tonnes versus actual tonnes is performed each month to check that the estimates are accurate. The Proven and Probable Mineral Reserves, for a $1,200/oz gold price and new open pit designs, are listed in Table 15-13 and Table 15-14.

STOCKPILES

At the end of June 2017, approximately 154.4 Mt of ore had been mined at RGM and, of this, 141.9 Mt had been milled. The difference of 12.6 Mt has been stockpiled.

The stockpile status as of June 30, 2017 is presented in Table 15-12. Stockpiles are balanced using surveyed volumes and truck factors. Tonnes milled are calculated using a calibrated balance and tonnes mined are estimated using a combination of truck factors and surveyed volumes.

TABLE 15-12 STOCKPILE STATUS AS OF JUNE 30, 2017

Stockpiles	Tonnes (millions)	Grade (g/t Au)	Ounces Au ('000)
Permanent Stockpiles	12.3	0.57	229
Temporary Stockpile	0.3	0.78	4
Total	**12.6**	**0.57**	**233**

MINERAL RESERVES

A Mineral Reserve is the economically mineable part of a Measured or Indicated Mineral Resource. RGM Mineral Reserves as of June 30, 2017 are presented in Table 15-13 and Table 15-14. The Mineral Reserve is estimated using only Measured and Indicated Mineral Resources within pits designed at $1,200/oz Au with ore/waste classification provided by the production schedule. The Mineral Reserves are based on the June 30, 2017 status. Overman, Mamakreek, Koolhoven, and East Tailings Road are not included as reserve deposits.

Figure 15-40 is a waterfall graph showing the variations in Mineral Reserves from December 31, 2016 to June 30, 2017. As shown in Figure 15-40, the major impact to the Mineral Reserves is due to the updated mine planning methodology (1,400 koz), as described previously. This methodology is a departure from previous methodologies applying fixed break-even CoGs, no pit shell phasing, and less sophisticated mine scheduling.

TABLE 15-13 PROVEN AND PROBABLE MINERAL RESERVES

Rosebel Gold Mines N.V. - 100%
Diluted Mineral Reserve Estimates - June 30, 2017
$1,200/oz Pit Designs and $1,200/oz Cut-off Grades

Proven Mineral Reserves

Ore:

	Laterite			Saprolite			Transition			Rock			Total			Gold
Deposit	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Ounces Contained
J Zone	8	0.4	0	10	0.3	0	2,174	0.6	41	1,730	0.9	51	**3,922**	**0.7**	**93**	**93,000**
Pay Caro & East Pay Caro	10	0.3	0	181	0.4	2	1,747	0.5	26	1,237	0.8	31	**3,176**	**0.6**	**59**	**59,000**
Mayo	—	—	—	—	—	—	27	0.7	1	1,787	0.8	48	**1,814**	**0.8**	**49**	**49,000**
Roma East	20	0.5	0	188	0.5	3	405	0.6	8	150	1.4	7	**763**	**0.7**	**18**	**18,000**
Roma West	—	—	—	—	—	—	—	—	—	—	—	—	**—**	**—**	**—**	**—**
Royal Hill	—	—	—	0	0.2	0	7	0.8	0	1,292	1.0	42	**1,299**	**1.0**	**43**	**43,000**
Rosebel	—	—	—	50	0.6	1	196	0.5	3	558	1.0	17	**804**	**0.8**	**22**	**22,000**
TOTAL	38	0.4	1	430	0.4	6	4,556	0.5	79	6,755	0.9	197	**11,779**	**0.7**	**283**	**283,000**
Stockpiles													**12,577**	**0.6**	**233**	**233,000**
GRAND TOTAL	**38**	**0.4**	**1**	**430**	**0.4**	**6**	**4,556**	**0.5**	**79**	**6,755**	**0.9**	**197**	**24,356**	**0.7**	**516**	**516,000**

Probable Mineral Reserves

Ore:

	Laterite			Saprolite			Transition			Rock			Total			Gold
Deposit	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Tonnes (000)	Au (g/t)	Au (K oz)	Ounces Contained
J Zone	144	0.5	3	347	0.6	7	2,130	0.6	41	1,629	1.0	50	**4,250**	**0.7**	**101**	**101,000**
Pay Caro & East Pay Caro	41	0.5	1	452	0.4	6	2,937	0.6	60	30,391	1.3	1,261	**33,821**	**1.2**	**1,328**	**1,328,000**
Mayo	3	0.3	0	193	0.6	4	177	0.5	3	5,267	1.0	162	**5,640**	**0.9**	**169**	**169,000**
Roma East	12	0.7	0	334	0.7	7	720	0.7	17	97	1.2	4	**1,163**	**0.8**	**28**	**28,000**
Roma West	—	—	—	167	0.7	3	466	0.9	13	1,277	1.4	55	**1,909**	**1.2**	**72**	**72,000**
Royal Hill	30	0.5	0	950	0.5	15	2,126	0.5	35	29,922	1.1	1,097	**33,028**	**1.1**	**1,148**	**1,148,000**
Rosebel	143	0.5	2	2,095	0.5	34	1,489	0.6	28	7,006	1.4	305	**10,733**	**1.1**	**369**	**369,000**
TOTAL	372	0.5	6	4,539	0.5	77	10,045	0.6	196	75,589	1.2	2,936	**90,544**	**1.1**	**3,215**	**3,215,000**
GRAND TOTAL	**372**	**0.5**	**6**	**4,539**	**0.5**	**77**	**10,045**	**0.6**	**196**	**75,589**	**1.2**	**2,936**	**90,544**	**1.1**	**3,215**	**3,215,000**

Rosebel Gold Mines N.V. - 100% Basis
Diluted Mineral Reserve Estimates - June 30, 2017
$1,200/oz Pit Designs and $1,200/oz Cut-off Grades

Proven and Probable Mineral Reserves

Ore:

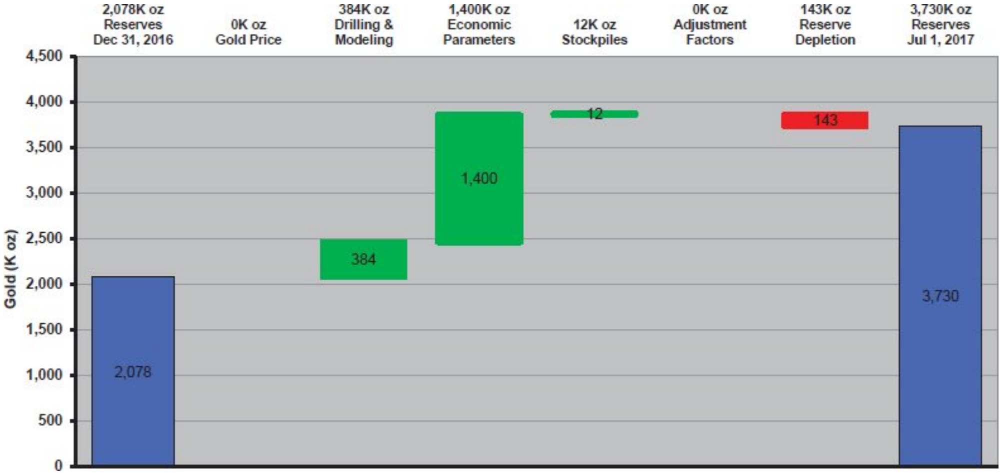
	Laterite			Saprolite			Transition			Rock			Total			Gold
Deposit	**Tonnes (000)**	**Au (g/t)**	**Au (K oz)**	**Tonnes (000)**	**Au (g/t)**	**Au (K oz)**	**Tonnes (000)**	**Au (g/t)**	**Au (K oz)**	**Tonnes (000)**	**Au (g/t)**	**Au (K oz)**	**Tonnes (000)**	**Au (g/t)**	**Au (K oz)**	**Ounces Contained**
J Zone	152	0.5	3	357	0.6	7	4,305	0.6	82	3,359	0.9	102	**8,173**	**0.7**	**194**	**194,000**
Pay Caro & East Pay Caro	51	0.4	1	633	0.4	9	4,684	0.6	85	31,628	1.3	1,292	**36,996**	**1.2**	**1,387**	**1,387,000**
Mayo	3	0.3	0	193	0.6	4	204	0.5	3	7,054	0.9	211	**7,454**	**0.9**	**218**	**218,000**
Roma East	32	0.6	1	522	0.6	10	1,125	0.7	25	247	1.3	10	**1,926**	**0.7**	**46**	**46,000**
Roma West	—	—	—	167	0.7	3	466	0.9	13	1,277	1.4	55	**1,909**	**1.2**	**72**	**72,000**
Royal Hill	30	0.5	0	951	0.5	15	2,133	0.5	35	31,214	1.1	1,140	**34,328**	**1.1**	**1,191**	**1,191,000**
Rosebel	143	0.5	2	2,146	0.5	35	1,684	0.6	31	7,564	1.3	323	**11,537**	**1.1**	**391**	**391,000**
TOTAL	410	0.5	7	4,969	0.5	83	14,601	0.6	275	82,343	1.2	3,133	**102,323**	**1.1**	**3,498**	**3,498,000**
Stockpiles													**12,577**	**0.6**	**233**	**233,000**
GRAND TOTAL	**410**	**0.5**	**7**	**4,969**	**0.5**	**83**	**14,601**	**0.6**	**275**	**82,343**	**1.2**	**3,133**	**114,900**	**1.0**	**3,730**	**3,730,000**

Ore & Waste:

Deposit	**Saprolite Waste Tonnes (000)**	**Trans. Ore Tonnes (000)**	**Trans. Waste Tonnes (000)**	**Rock Ore Tonnes (000)**	**Rock Waste Tonnes (000)**	**Infill Waste Tonnes (000)**	**Total Ore Tonnes (000)**	**Total Waste Tonnes (000)**	**Total Ore+Waste Tonnes (000)**	**Strip Ratio**
J Zone	2,821	4,305	11,373	3,359	10,187	—	**8,173**	**25,926**	**34,099**	**3.17**
Pay Caro & East Pay Caro	13,205	4,684	33,196	31,628	189,303	4,774	**36,996**	**242,715**	**279,712**	**6.56**
Mayo	661	204	658	7,054	17,415	—	**7,454**	**18,834**	**26,288**	**2.53**
Roma East	1,885	1,125	1,593	247	720	265	**1,926**	**5,041**	**6,967**	**2.62**
Roma West	2,737	466	2,433	1,277	9,169	5	**1,909**	**14,645**	**16,555**	**7.67**
Royal Hill	17,762	2,133	22,485	31,214	181,424	1,659	**34,328**	**224,552**	**258,879**	**6.54**
Rosebel	14,450	1,684	9,657	7,564	34,054	1,210	**11,537**	**62,096**	**73,633**	**5.38**
TOTAL	53,521	14,601	81,395	82,343	442,272	7,912	**102,323**	**593,809**	**696,132**	**5.80**

FIGURE 15-40 ALL PITS - IN PRODUCTION AND EXPLORATION

Estimation of Relative Impact of Gold Price, Economic Parameters and Exploration Drilling on Proven and Probable Mineral Reserves December 31, 2016 versus June 30, 2017



16 MINING METHODS

The mining operation at RGM is a conventional truck and shovel, drill and blast, open pit operation, with an owner fleet. In 2017, the annual mining rate is projected to be 62.8 Mt, with a stripping ratio of 4.15, including 12.1 Mt of ore at an average grade of 0.97 g/t Au for a total of 317 koz of recovered gold.

The loading fleet consists of five CAT 6030 shovels, four CAT 5130 shovels using both the excavator and front shovel configuration, and one CAT 993 loader which is used for run of mine (ROM) stockpile reclaim. The hauling fleet consists of 36 CAT 777 and 18 CAT 785 haul trucks. The drilling fleet consists of a mixed fleet of 11 drills. Dust control is accomplished with four CAT 777 converted haulage trucks and one CAT 769 water truck. A list of RGM's primary mine production equipment fleet is shown in Table 16-1.

TABLE 16-1 CURRENT PRIMARY MINE EQUIPMENT FLEET

Type	Model	Number
Shovel	CAT 6030	5
	CAT 5130	4
Loader	CAT 993K	1
Truck	Caterpillar 785	18
	Caterpillar 777	36
Drilling	Sandvik DK45	1
	Sandvik D245S	3
	MD6290	8
Dozer	CAT D9T	24
	CAT 824 Wheeldozer	2
Excavator	CAT 345/349	10
Grader	CAT 16H	1
	CAT 16G	1
	CAT 16M	5
Auxiliary	CAT 980/990 Loader	3

RGM's ancillary equipment includes, amongst others, fuel trucks, mobile light plants, and service trucks.

Drill and blast parameters vary for each pit due to different material type and pit designs. All drill holes are 165 mm diameter. All blasting activities on site are executed by an explosives supplier. Holes are loaded with bulk explosive matrix and initiated with non-electric detonators.

Grade movement during blasting is a critical issue at the mine. For this reason, blast movement monitors (BMMs) are systematically used when blasting mineralized areas in order to measure vertical and horizontal displacement which allows for the adjustment of the post blast ore packets. Blast movement is typically in the order of 3 - 4 m horizontally and about 0.75 m vertically, according to recent measurements in 2017.

MINE OPERATIONS

REVERSE CIRCULATION GRADE CONTROL DRILLING

RC grade control drilling is planned on a 10 m by 10 m or 12 m by 6 m pattern using inclined holes according to the parameters as presented in Table 16-2. Due to the inconsistence in ore appearances, 100% of the benches are drilled with RC (ore & waste) for 2017. Blast hole sampling is used for grade control in areas where RC grade control drilling isn't completed. A fleet of four to five Foremost Prospector W750 Buggy rigs are used for RC drilling.

TABLE 16-2 REVERSE CIRCULATION GRADE CONTROL PARAMETERS

RC Parameters		Saprolite	Transition	Rock
Drill pattern				
Hole inclination		50.00	50.00	50.00
Hole diameter	in	6.00	6.00	6.00
Diameter (D)	m	0.152	0.152	0.152
Burden (B)	m	12.00	12.00	12.00
Spacing (S)	m	6.00	6.00	6.00
Subdrill (J)	m	—	—	—
Bench height (H)	m	8.00	8.00	8.00
Hole length (L)	m	40.00	40.00	40.00

PRODUCTION DRILLING AND BLASTING

RGM presently has a total fleet capacity of 13 drills including four Sandvik D45KS/D45S and eight CAT MD6290 drills, in which 10 drills are kept operational from Q3-FY 2016. All blast hole drills have been designed to drill 165 mm diameter holes.

Drill and blast parameters varies significantly at each pit due to different material type and pit designs. Blasts are designed based on post blast requirements from the geology, geo-tech, and operations departments.

A number of trials were conducted with both pyrotechnic and electronic detonators to identify potential opportunities for improvement in fragmentation, dilution management, and wall control. The trials included seed wave analysis using signatures shots, ground wave velocities using cross hole tests, pattern expansions, combined trim and production shots in narrow areas, Interactive shielding, etc.

Pre-splitting of selective areas of pit walls are carried out based on the recommendation from the geo-tech department as a wall control measure. Pre-split parameters are designed to achieve borehole pressure within 130-140 mega Pascals using 165 mm holes.

Blast design flexibility is limited due to pit constraints including operating width, bench height, ore movement direction, etc. Most of these constraints make it necessary to identify post blast priorities of each shot and to design the shot accordingly. The achievement of optimal slope angles and stable inter-ramps, within the hard rock, requires a well implemented program of wall control blasting. The program requires a substantial reduction in the size of blasting blocks along the perimeter wall and the use of well-engineered blast designs that include free faces and suitable timing.

Drilling and blasting parameters are provided in Table 16-3

TABLE 16-3 DRILL AND BLAST PARAMETERS

Pit	Rock Type		Bench Height (m)	Burden (m)	Spacing (m)	Subdrill (m)	Charge Length (m)	Stem Length (m)	Yield/ Hole (t/hole)	Yield/ Metre (t/m)	Power Factor (kg/t)
PC	Soft	Ore	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Soft	Waste	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Trans	Ore	8.0	5.0	5.6	—	4.8	3.7	515	64	0.24
	Trans	Waste	8.0	5.2	6.0	—	4.8	3.7	574	72	0.21
	Hard	Ore	8.0	5.2	6.0	—	5.7	3.1	699	87	0.21
	Hard	Waste	8.0	5.2	6.0	—	5.7	3.1	699	87	0.21
JZ	Soft	Ore	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Soft	Waste	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16

Pit	Rock Type		Bench Height (m)	Burden (m)	Spacing (m)	Subdrill (m)	Charge Length (m)	Stem Length (m)	Yield/ Hole (t/hole)	Yield/ Metre (t/m)	Power Factor (kg/t)
	Trans	Ore	8.0	5.0	5.6	0.5	4.8	3.7	515	61	0.24
	Trans	Waste	8.0	5.2	6.0	0.5	4.8	3.7	574	68	0.21
	Hard	Ore	8.0	4.4	5.0	0.5	5.7	3.1	493	58	0.3
	Hard	Waste	8.0	4.4	5.0	0.5	5.7	3.1	493	58	0.3
RH	Soft	Ore	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Soft	Waste	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Trans	Ore	8.0	5.0	5.6	0.5	4.8	3.7	515	61	0.24
	Trans	Waste	8.0	5.0	5.6	0.5	4.8	3.7	515	61	0.24
	Hard	Ore	8.0	4.4	5.0	0.5	5.7	3.1	493	58	0.3
	Hard	Waste	8.0	4.4	5.0	0.5	5.7	3.1	493	58	0.3
MA	Soft	Ore	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Soft	Waste	8.0	6.0	7.0	—	3.6	4.4	571	71	0.16
	Tran	Ore	8.0	4.4	5.0	0.5	4.8	3.7	405	48	0.3
	Tran	Waste	8.0	4.4	5.0	0.5	4.8	3.7	405	48	0.3
	Hard	Ore	8.0	4.4	5.0	0.5	5.7	3.1	493	58	0.3
	Hard	Waste	8.0	4.4	5.0	0.5	5.7	3.1	493	58	0.3
RM	Soft	Ore	6.0	4.9	5.5	—	2.8	3.2	275	46	0.26
	Soft	Waste	6.0	4.9	5.5	—	2.8	3.2	275	46	0.26
	Trans	Ore	6.0	4.4	5.0	0.5	3.0	3.0	304	47	0.25
	Trans	Waste	6.0	3.9	4.5	0.5	3.0	3.0	242	37	0.32
	Hard		6.0	3.9	4.5	0.5	3.4	3.1	295	45	0.3
MA	Soft	Ore	5.0	3.9	4.5	—	2.8	3.2	149	30	0.48
	Soft	Waste	5.0	3.9	4.5	—	2.8	3.2	149	30	0.48
	Trans	Ore	5.0	3.5	4.0	0.5	3.0	3.0	161	29	0.48
	Trans	Waste	5.0	3.5	4.0	0.5	3.0	3.0	161	29	0.48
	Hard		5.0	3.5	4.0	0.5	3.4	3.1	196	36	0.44
RB	Soft	Ore	6.0	4.9	5.5	—	2.8	3.2	275	46	0.26
	Soft	Waste	6.0	4.9	5.5	—	2.8	3.2	275	46	0.26
	Trans	Ore	6.0	4.4	5.0	0.5	3.0	3.0	304	47	0.25
	Trans	Waste	6.0	4.4	5.0	0.5	3.0	3.0	304	47	0.25
	Hard		6.0	4.4	5.0	0.5	3.4	3.1	370	57	0.24

LIFE OF MINE PRODUCTION SCHEDULE

The mining schedule and production rate for the LOM have been established to feed the mill to its power capacity while respecting annual mining rate constraints, phase drop down rates, and minimizing truck peak requirements.

The mine production plan for the LOM was developed on a monthly basis for 2018, quarterly for 2019, and annually from 2020 to 2028. The results presented in this report have been summarized on an annual basis for all years.

The maximum processing rate at RGM has been established to be 12.8 Mtpa assuming the percentage of hard rock does not exceed 55%. In the event that the percentage of hard rock exceeds this amount, the processing rate is reduced as a function of the amount of hard rock according to the following formula where X is the hard rock tonnage:

$$\textbf{Maximum Annual Processing Rate} = (-4.8456x^2 - 3.198x + 16.039)*1\,000\,000$$

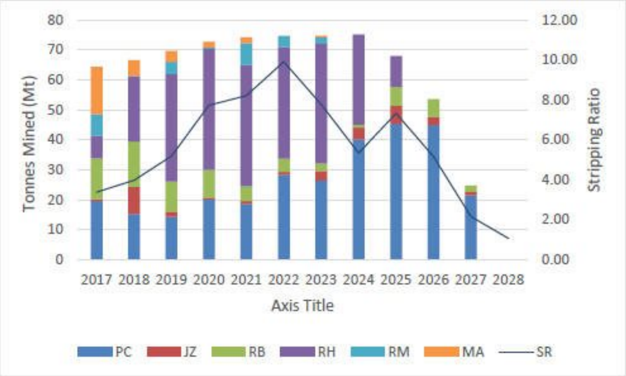
The processing rate in the LOM is at maximum capacity during 2018 and 2019 and subsequently declines for the remainder of the mine life as more hard rock is introduced, averaging approximately 9.4 Mtpa from 2020 to 2027, with approximately two months of stockpile milling in 2028.

The production starts at a rate of 64.3 Mtpa in 2017 and steadily increases to a rate of 74.0 Mtpa until 2021. The production rate stays relatively constant until 2024, then it starts to decline until the end of production in 2028. In the later years, production rates are reduced, constrained by the longer hauls and the available working area at the pit bottoms, which are not as productive as on the upper benches.

While the schedule targets softer ore in the earlier years, the proportion of hard rock in the mill feed varies between 43% in 2017 and 100% in 2026 and 2027.

Figure 16-2 shows the annual production, broken down by pit, as well as the overall stripping ratio.

FIGURE 16-1 MINING BY PIT - RGM 2017 LIFE OF MINE PLAN



The LOM mine plan assumes a maximum vertical rate of mining advance of 60 m. Further details on data are identified in Table 16-4.

TABLE 16-4 LIFE OF MINE PLAN

			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
PC	**Ore**	**Tonnes**	1,817,389	2,662,138	2,124,683	2,417,295	1,373,417	1,880,646	2,622,397	5,893,482	3,685,732	7,194,716	6,788,361	—	36,642,867
		g/t	0.57	0.65	1.04	0.79	0.98	1.17	1.19	1.26	1.18	1.23	1.39	—	1.16
	Waste	**Tonnes**	8,867,208	12,521,327	12,160,113	17,685,823	17,233,618	26,413,729	23,742,678	34,238,052	41,605,198	37,727,868	14,701,943	—	238,030,349
	All	**Tonnes**	10,684,597	15,183,465	14,284,796	20,103,118	18,607,034	28,294,375	26,365,075	40,131,534	45,290,930	44,922,584	21,490,304	—	274,673,216
	S/R	**(-)**	4.9	4.7	5.7	7.3	12.5	14.0	9.1	5.8	11.3	5.2	2.2	—	6.5
JZ	**Ore**	**Tonnes**	304,670	2,144,543	451,072	178,736	382	42,155	229,147	571,000	2,042,877	778,677	364,319	—	6,802,909
		g/t	0.63	0.66	0.85	0.81	0.27	0.39	0.38	0.51	0.63	1.18	1.14	—	0.73
	Waste	**Tonnes**	371,192	7,007,175	1,330,807	456,110	897,008	955,666	3,034,070	3,323,590	4,049,319	1,957,575	710,391	—	23,721,710
	All	**Tonnes**	675,862	9,151,718	1,781,879	634,846	897,390	997,821	3,263,218	3,894,590	6,092,196	2,736,252	1,074,710	—	30,524,620
	S/R	**(-)**	1.2	3.3	3.0	2.6	2,350.1	22.7	13.2	5.8	2.0	2.5	1.9	—	3.5
RB	**Ore**	**Tonnes**	5,322,571	3,343,284	1,059,984	1,222,715	306,942	596,811	766,517	20,695	438,768	722,391	689,253	34,778	9,202,137
		g/t	0.99	1.15	0.63	0.59	0.90	1.06	1.42	0.39	1.05	1.18	1.37	1.76	1.04
	Waste	**Tonnes**	8,298,102	11,757,360	9,008,688	8,088,287	4,754,523	3,875,769	1,756,801	1,013,956	5,831,333	5,131,549	1,509,811	37,123	52,765,200
	All	**Tonnes**	13,620,673	15,100,644	10,068,671	9,311,003	5,061,465	4,472,580	2,523,318	1,034,651	6,270,101	5,853,939	2,199,065	71,901	61,967,337
	S/R	**(-)**	1.6	3.5	8.5	6.6	15.5	6.5	2.3	49.0	13.3	7.1	2.2	1.1	5.7
RH	**Ore**	**Tonnes**	119,971	3,936,150	5,235,121	3,705,658	5,648,765	3,924,135	4,326,176	5,363,481	1,992,075	—	—	—	34,131,560
		g/t	0.46	0.89	1.07	0.97	0.98	1.12	1.00	1.24	1.53	—	—	—	1.07
	Waste	**Tonnes**	7,358,882	17,626,949	30,540,978	36,628,420	34,766,894	33,225,992	35,586,401	24,629,466	8,277,288	—	—	—	221,282,388
	All	**Tonnes**	7,478,853	21,563,099	35,776,099	40,334,078	40,415,659	37,150,127	39,912,577	29,992,947	10,269,363	—	—	—	255,413,948
	S/R	**(-)**	61.3	4.5	5.8	9.9	6.2	8.5	8.2	4.6	4.2	—	—	—	6.5
RM	**Ore**	**Tonnes**	1,291,322	3,117	1,197,344	174,938	398,006	375,455	348,090	—	—	—	—	—	2,496,951
		g/t	0.79	0.37	0.71	1.20	0.92	1.37	1.52	—	—	—	—	—	0.99
	Waste	**Tonnes**	5,939,642	328,840	2,914,454	195,465	6,919,857	3,257,175	1,695,692	—	—	—	—	—	15,311,483
	All	**Tonnes**	7,230,963	331,956	4,111,798	370,403	7,317,863	3,632,631	2,043,782	—	—	—	—	—	17,808,434
	S/R	**(-)**	4.6	105.5	2.4	1.1	17.4	8.7	4.9	—	—	—	—	—	13.1
MA	**Ore**	**Tonnes**	3,880,926	1,303,664	1,193,329	633,941	327,857	22,891	221,395	—	—	—	—	—	3,703,077
		g/t	0.77	0.89	1.05	1.04	0.71	0.97	0.89	—	—	—	—	—	0.95
	Waste	**Tonnes**	11,903,977	3,913,810	2,406,284	1,310,122	1,520,641	39,374	312,805	—	—	—	—	—	9,503,036
	All	**Tonnes**	15,784,903	5,217,473	3,599,613	1,944,063	1,848,498	62,266	534,200	—	—	—	—	—	13,206,113
	S/R	**(-)**	3.1	3.0	2.0	2.1	4.6	1.7	1.4	—	—	—	—	—	2.6
TOTAL	**Ore**	**Tonnes**	14,581,171	13,392,896	11,261,533	8,333,283	8,055,369	6,842,094	8,513,722	11,848,658	8,159,451	8,695,784	7,841,933	34,778	92,979,501
		g/t	0.79	0.87	0.97	0.87	0.96	1.14	1.09	1.21	1.12	1.22	1.38	1.76	1.07
	Waste	**Tonnes**	49,282,958	53,155,460	58,361,323	64,364,227	66,092,541	67,767,705	66,128,447	63,205,064	59,763,138	44,816,991	16,922,146	37,123	560,614,166
	All	**Tonnes**	63,864,129	66,548,356	69,622,856	72,697,510	74,147,910	74,609,799	74,642,169	75,053,722	67,922,590	53,512,776	24,764,079	71,901	653,593,667

17 RECOVERY METHODS

The original RGM processing plant was nominally designed to process 5.0 Mtpa, or approximately 14,000 tpd of ore. The gold processing plant has been expanded since the last technical report, *"Rosebel Mine, Suriname NI 43-101 Technical Report released on March 29, 2010.*

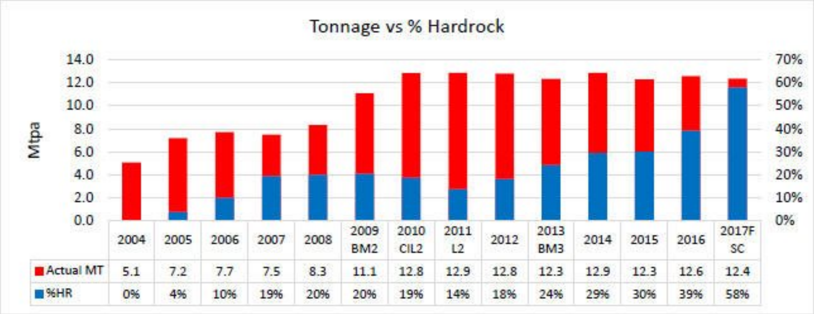
Based on the metallurgical testwork result, the processing plant at RGM has seen a number of expansion initiatives, since commissioning in 2004, to allow for sustained throughput rates at increased hard rock ratios including:

- Installation of ball mill #2 in 2009;
- Completion of CIL train #2 in 2010;
- Completion of additional Leach tank to increase retention time in 2010;
- Installation of ball mill #3 in 2011;
- Completion upgrade gravity circuit including installation 3 (three) Falcon SB 5200 and Acacia intensive leach reactor in 2012;
- Installation of secondary crusher plant, commissioning of Powerflex SAG drive, SAG shell liner design change from 40 to 30 row and increased media size 125mm to 140 mm to increase hard rock capacity in 2016.

The nameplate capacity is 12.5 Mtpa. The plant has been operating near this capacity on a sustained long term basis. A sustained rate, at or near the nameplate design capacity, is expected for 2017 and beyond.

Figure 17-1 shows the historical ore processed and the hard rock ratio from 2004 through to 2017.

FIGURE 17-1 ORE PROCESSED AND HARD ROCK RATIO



	2004	2005	2006	2007	2008	2009 BM2	2010 CIL2	2011 L2	2012	2013 BM3	2014	2015	2016	2017F SC
🟥 Actual MT	5.1	7.2	7.7	7.5	8.3	11.1	12.8	12.9	12.8	12.3	12.9	12.3	12.6	12.4
🟦 %HR	0%	4%	10%	19%	20%	20%	19%	14%	18%	24%	29%	30%	39%	58%

OVERVIEW OF THE EXISTING PROCESSING PLANT

The metallurgical process is conventional grinding followed by leach, carbon in leach (CIL) with a gravity circuit installation in the grinding circuit for the recovery of gravity recoverable gold. Gold recovery facilities include acid washing, carbon stripping, and electro winning, followed by bullion smelting and carbon regeneration. The process was developed to accommodate varying ratios of soft rock, transition, and hard rock ores. The process used at RGM was developed through various pilot plant programs and through additional initiatives by mill personnel to improve the process further since commissioning. Further process optimization continues to target constraints and opportunities to further increase plant capacity and performance. Figure 17-2 shows the present RGM processing plant flowsheet.

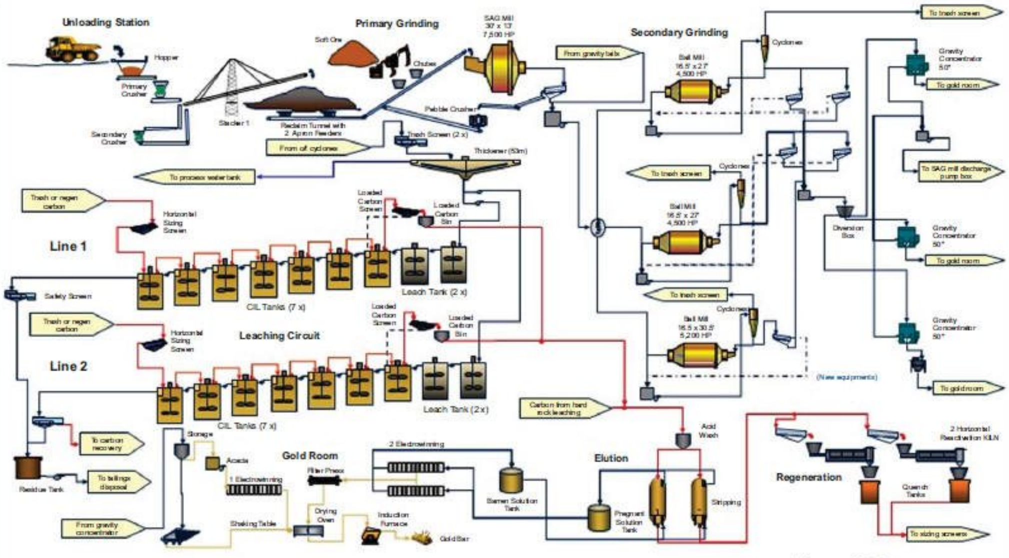

Unloading Station
Hopper
Primary Crusher
Secondary Crusher
Stacker 1
Reclaim Tunnel with 2 Apron Feeders
Primary Grinding
Soft Ore
Chutes
SAG Mill 37' x 17' 7,500 HP
Pebble Crusher
Trash Screen (2 x)
From all cyclones
Thickener (53m)
To process water tank
Trash or regen carbon
Horizontal Sizing Screen
Line 1
Loaded Carbon Screen
Loaded Carbon Bin
Leach Tank (2 x)
CIL Tanks (7 x)
Safety Screen
Trash or regen carbon
Horizontal Sizing Screen
Leaching Circuit
Loaded Carbon Screen
Loaded Carbon Bin
Line 2
Leach Tank (2 x)
CIL Tanks (7 x)
To carbon recovery
Residue Tank
To tailings disposal
From gravity concentrator
Storage
Acacia
Gold Room
1 Electrowinning
2 Electrowinning
Filter Press
Drying Oven
Shaking Table
Induction Furnace
Gold Bar
Barren Solution Tank
Secondary Grinding
From gravity table
Ball Mill 16.5' x 27' 4,500 HP
Cyclones
To trash screen
Gravity Concentrator 50"
To gold room
To SAG mill discharge pump box
To trash screen
Cyclones
Ball Mill 16.5' x 27' 4,500 HP
Diversion Box
Gravity Concentrator 50"
To gold room
To trash screen
Cyclones
Ball Mill 16.5 x 30.5' 5,200 HP
Gravity Concentrator 50"
(New equipments)
To goldroom
Carbon from hard rock leaching
Acid Wash
Elution
Pregnant Solution Tank
Stripping
Regeneration
2 Horizontal Reactivation KILN
Quench Tanks
To sizing screens

Figure 17-2

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Simplified RGM
Process Flowsheet

September 2017

Source: IAMGOLD, 2017.

CRUSHING, STOCKPILING AND RECLAIM

Run-of-mine from the hard rock stockpile is delivered to the primary crushing facility by haul trucks and front-end loaders. Ore delivery from the mine is on a 24 hour per day schedule. The primary crusher incorporates a 1.37 m x 1.88 m Allis/Superior gyratory crusher, followed by a vibrating grizzly and a 2.1 m Nordberg Symons secondary crushing system that produces the required feed for SAG mill. The crushing product sizing is set at minus 63 mm (2.5”). An active hard rock stockpile is maintained at approximately 50,000 tonnes.

Soft rock feed is maintained through two grizzlies using one CAT D9 dozer and two CAT 345 backhoes, with an active stockpile maintained at approximately 200,000 tonnes. Hard rock/soft rock blending to the SAG feed conveyor is maintained by two Svedala 1.8 m x 6.9 m apron feeders respectively.

GRINDING AND CLASSIFICATION

The two stage grinding circuit produces 80% passing 74 microns to the cyclone overflow. The first stage includes a 9.1 m x 4.0 m Allis SAG mill driven by a 7,500 hp variable speed motor controlled by an Allen Bradly Power Flex drive. The SAG mill is operating in an open circuit feeding two Simplicity 2.4 m x 4.8 m vibratory screens. Screen oversize is processed through a Sandvik CH 660 cone crusher with 1⁄2“ product returning to the SAG mill. Undersize from the SAG mill discharge screen is pumped to the pressure distributor where it is combined with the ball mill discharge and process water. The second grinding stage consists of two 5.0 m x 8.2 m Allis ball mills driven by 4,500 hp motor and one 5.0 m x 9.3 m ball mill driven by 5,200 hp fixed speed motor that operate in parallel closed circuit and receive the SAG discharge screen undersize. The ball mills operate in closed circuit with each cyclone cluster consisting of eight 660 mm diameter cyclones. The cyclone cluster is fed by a combination of the SAG mill discharge, the ball mill discharge, and process water. The cyclone underflow reports back to the ball mill for further grinding, while the cyclone overflow, at 35 wt% solids and 80% passing 75 microns (200 mesh) gravitates to the four 25 m^2 Delkor linear screens to remove trash from the slurry.

GRAVITY CIRCUIT

Approximately 20% of the cyclone underflow from each cyclone cluster reports to the Sizetec 2.1 m x 4.9 m vibratory screens fitted with 10 mesh panels. Oversize reports to the ball mill discharge pump boxes, and undersize reports to the gravity circuit via a magnetic drum separator at a rate 400 tph. The plant has an active gravity concentration circuit consisting of three SB 5200 model falcon concentrators, a Consep Acacia CS6000 intensive leach reactor, and a Deister table. The concentrate is leached with high concentration cyanide (2% NaCN) and the pregnant solution is transferred to the Electrowinning cell. The Diester table is used to upgrade the purity of the concentrate up to 75%, prior to smelting whenever the Acacia reactor is offline. Gravity recovery represents up to 30% of gold production.

THICKENING, LEACHING, AND ADSORPTION CIRCUIT

Trash screen undersize reports directly to a Westech 53 m x 2.9 m high rate thickener. The slurry is thickened from 35% (w/w) solid to 50% (w/w) solid prior pumped to the leach tank. The thickener overflow is flowed to the process water tank.

The current leaching and adsorption circuit consist of two parallel lines consisting of two agitated leach tanks followed by seven leach-adsorption stages. Each stage of the adsorption circuit consists of a mechanically agitated tank equipped with a mechanically swept vertical 13.5 m^2 Westech carbon retaining screen. Slurry flows from tank to tank, and carbon is advanced counter current by pumping slurry upstream from tank to tank.

There is a Multotec online automatic sampler that samples the leach feed. Plant air is injected into the tanks to aid the leach kinetic. The circuit residence time varies from approximately 28 hours to 33 hours, dependent on mill throughput and tanks availabilities. Additional leach tanks, installed with the plant expansion in 2010, provide a total tank volume of 65,000 m^3 that maintains the residence time to 33 hours at 35,000 tpd and 50 % (w/w) solids.

Lime is added to the grinding circuit to increase the slurry pH to 10.5 which is the alkalinity required for subsequent cyanidation. Sodium cyanide is added to the SAG feed chute and the first leach tank to effect gold leaching. All tanks are sparged with low pressure air to ensure sufficient oxygen is available for the gold dissolution reaction.

Granular 6 x 12 mesh activated carbon is present in the slurry to absorb the gold-cyanide complex ion, and is maintained at a concentration of 10 to 12 kg/m^3 per tank.

The tailing slurry is pumped to the tailings storage facility and the water is reclaimed for the process. Pumping of tailings slurry is maintained by three sets of three pumps in series, of which two sets are active and one set maintained as redundancy. Slurry is pumped (46% solids) for 6 km to three operating booster pumps which push material up to 5 km to various spigot points.

CARBON STRIPPING (ELUTION) AND ELECTROWINNING

The metal-loaded carbon is recovered from the adsorption circuit using the loaded carbon transfer pump. The carbon is screened and washed with process water on the loaded carbon screen and reports to the acid wash column. Loaded carbon is then acid washed with 4% (w/v) nitric acid pumped from the acid mixing tank. The carbon is allowed to soak, with acid-soluble metals being dissolved from the loaded carbon. After soaking, the carbon is rinsed with two bed fresh water. Spent acid solution is neutralized with caustic, prior to being pumped to the tailings pump box.

The Rosebel elution circuit utilizes a batch pressure Zadra to treat carbon in 10 t batches. To recover gold from the carbon, batches of carbon are subject to a high pressure and temperature process termed elution. A hot, 0.1% cyanide and 2% caustic solution is used to remove the gold from the carbon and into solution. There are two stripping vessel tank installed to maintain two strips per day, as required.

Barren strip solution is pumped through a heat recovery heat exchanger and a solution heater. The solution then flows up through the bed of carbon and overflows near the top of the stripping vessel. The solution is cooled by exchanging heat with barren solution and flows through a back pressure control valve to the pregnant solution holding tank.

Pregnant solution is pumped from the pregnant solution tank through the electrowinning cells where gold is recovered by electrolysis. Barren solution is then returned to the barren solution tank for recycle. Gold is recovered from this pregnant solution by electrowinning onto stainless steel wire wool cathodes in two electrowinning cells running in parallel with 85% efficiency. The loaded cathodes are removed and pressure washed, with the gold in the form of sludge being recovered and dried. The dried gold sludge which could be combined with gravity concentrate, is mixed with fluxing chemicals and smelted on site to produce bullion bars of 88%-92% gold purity, with silver forming the balance.

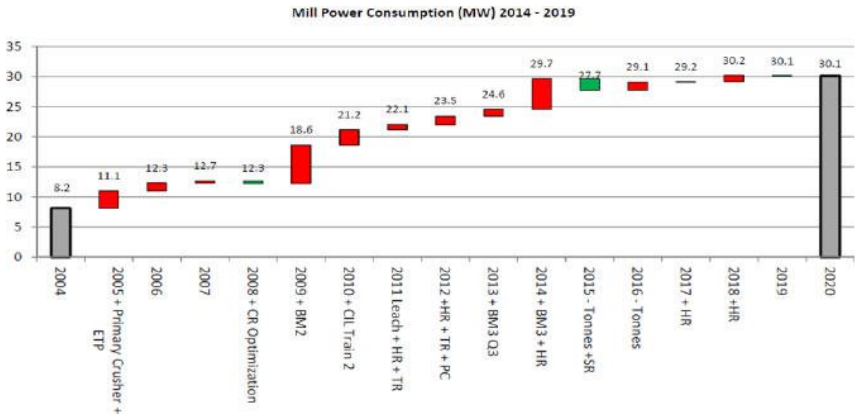
The gold bullion is shipped to the contracted refinery for further processing and subsequent sale. All shipment process is under high security control.

The fines carbon generated in the stripping circuit is collected at the educator tank and shipped out on a monthly basis to the smelter.

POWER

RGM has seen continued rise in power consumption with various equipment additions to accommodate the increased throughput and hard rock feed ratio. Power consumption, on-site, is divided into three categories, mill grinding (52%), mill other (38%), and site infrastructure and mining (10%). Figure 17-3 is a waterfall chart which shows the actual mill power consumption from 2004 to 2016, and the estimated power consumption to 2020. The X axis indicates when equipment additions were made and shows the subsequent power consumption increase.

FIGURE 17-3 MILL POWER CONSUMPTION – ESTIMATES



CONSUMABLES

Mill consumables consumption has seen significant increases with plant expansion initiatives and consequent increases in throughput. Moving forward with increasing hard rock ratios will see maintained throughput rates with reduced soft rock. The consequence of the feed ratio changes will be increased grinding media consumption with additional mills and stable chemical consumption. Table 17-1 shows the projected five year reagent consumption.

TABLE 17-1 MILL CONSUMABLES

Consumables - tonnes	2016	2017	2018	2019	2020
5” Balls	1,434	1,387	1,332	1,339	1,354
2” Balls	5,915	5,748	5,531	5,543	5,623
Lime	10,875	10,052	8,902	8,918	9,315
Cyanide	4,321	3,892	3,296	3,307	3,504
Flocculant	134	117	92	92	100
Caustic Soda	611	562	493	494	517
Nitric Acid	2,293	2,106	1,848	1,854	1,939
Carbon	306	281	246	247	259
Anti Scalant	122	112	99	99	103

CONCLUSION

Control strategies have been implemented to better control plant operational parameters with net benefits in process stabilization/automation. Ore characterization, on newly defined deposits, is currently in process which will establish mill work indexes, leach characteristics, and grinding capacity. As well, leach kinetic definition will be further defined resulting in increased plant capacity and recovery rates.

Comminution circuit process optimization has also been extended to re-design liners in order to improve SAG mill capacity with the higher rock ratio. The gravity circuit optimization and CIL optimization is a continuous process which will target improved recoveries. The Rosebel site has preparing future ore characteristics changed.

18 PROJECT INFRASTRUCTURE

ROAD AND TRANSPORTATION

MAIN ACCESS ROAD

The RGM property lies approximately 85 km south of the capital city of Paramaribo. The best mode of travel to the site is by road, which takes about two hours from Paramaribo. The road is a paved asphalt road and is in good condition and capable of carrying heavy equipment.

AIR STRIP

An existing airstrip with an approximate length of 1.2 km is used for emergency evacuation and gold shipment. The airstrip is located 5 km from the campsite.

SITE ROADS

The site roads include access from the main gatehouse to the airstrip, the camp, the process plant area, the truck shop, and administration building area. It also includes road access to the Mindrineti River for water supply.

The site roads are mostly built with laterite compacted with aggregate produced by the aggregate plant and are 10 m wide. Culverts are installed and ditching is completed to provide adequate drainage.

BUILDINGS

MINE BUILDINGS FACILITY

Mine facilities, such as the truck shop, warehouse, and administration services are integrated to facilitate communication between departments. The mine building complex is approximately 300 m from the process plant.

ADMINISTRATION BUILDING

The administration building is a single story air-conditioned building approximately 22 m wide by 95 m long. The administration building provides accommodation for the following departments:

- Security, Health, and Safety;
- Engineering and Geology;
- Accounting, Information Technology, Human Resources, Procurement, and Logistics;
- Mine offices
- Mine Dry/Lunchroom

The security department is located at the furthest end of the building. This area provides office space, a centralized control center, and changing rooms for security personnel. Health and Safety services include space and equipment for medical assistance on site. An ambulance and fire truck are also provided. All administration services are centralized in the building with mine offices, lunchroom, and mine dry facilities closer to the truck shop.

CAMP COMPLEX

The camp complex is located approximately 0.5 km to the south of the process plant and truck shop/administration building.

The camp complex includes a kitchen, gymnasium, recreation area, camp offices, and different types of dormitories. The accommodations are built to house 1,500 employees, on a single or double occupancy basis. The overall building is constructed with concrete slabs for the floors and concrete blocks for the walls.

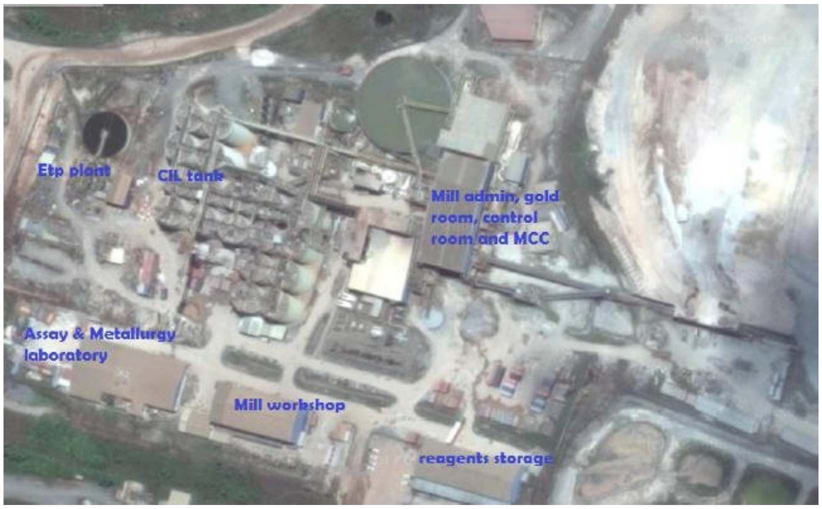
Insulation is added in complement to the acoustic tile ceilings where air-conditioning is required. The floors are tile-finished. Air-conditioned buildings have double-glazed windows, and buildings with natural ventilation are provided with louvers, which include mosquito net screens. Open ceilings are used in naturally ventilated areas. The roofs are pitched and clad with pre-finished metal roofing. Municipal works, such as potable water, sewage, fire protection, and electric utilities complete the general arrangements.

PROCESSING PLANT BUILDINGS

The processing plant main buildings consist of mill administration building, refinery, process control, mill workshop, reagent storage, and laboratory facility.

Figure 18-1 shows the processing plant area.

FIGURE 18-1 PROCESSING PLANT AREA


Etp plant
CIL tank
Mill admin, gold room, control room and MCC
Assay & Metallurgy laboratory
Mill workshop
reagents storage

TRUCK SHOP

The truck shop is a structural steel building of 44 m by 36 m, covered with pre-painted metal siding and roofing. The truck shop accommodates the following services:

- Heavy truck maintenance
- Heavy welding shop
- Haul truck tire change
- Dozer/shovel bay for tracked equipment
- Mine auxiliary equipment maintenance and repair
- Maintenance

Based on the building's configuration, the truck shop is equipped with two 20 tonne electrical overhead cranes and one 5 tonne auxiliary hoist capable of handling dump boxes. Clearance under the overhead crane is 12 m to allow maintenance of the 90-tonne haul trucks. All bays are serviced by the overhead cranes.

The building is open on both sides for equipment access. The shop floor is sloped for drainage purposes towards a trench that carries oil and water the length of the shop to a water-oil separator. This provides protection against accidental oil spills. Lubricant dispensers, compressed air, electrical and water outlets are provided. A concrete apron, adjacent to the truck shop is provided for tire repairs.

A concrete wash pad, 15 m wide by 15 m long is built to wash equipment prior to maintenance. It is built with steam and pressure washing units and can accommodate all types of mine equipment. Waste water is diverted through a trench connected to a settling basin and water-oil separator. Steel platforms provide elevated access.

A separate section is available for light vehicle maintenance and repairs. The area is serviced by a 5 tonne capacity overhead crane. Machine shop equipment is installed for minor equipment fabrication. Between the truck shop and the light vehicle maintenance area a tool room and maintenance offices are provided.

WAREHOUSE

The warehouse is a structural steel building. The building is 22 m in width, 90 m in length and 10 m in height and is completely clad with pre-painted siding. The building is equipped with shelving space for inventory material on one side and pallet racking on the other side. The warehouse personnel offices are within the building. A fenced yard is adjacent to the warehouse building and is used for storage of sizeable parts and bulk material.

ASSAY AND METALLURGICAL LABORATORY

The site has an assay laboratory with the capacity for up to 700,000 sample determinations per annum. This laboratory facility is to provide services for the RGM gold plant operation including grade control, plant assay requirements, and environmental and exploration samples. The main building contains a laboratory office, wet laboratory room, AAS room, balance room, store room, metallurgical office, receiving area, sample preparation, sample storage, fire assay, metallurgical preparation room, PAL system area, and toilets.

ANCILLARY BUILDINGS AND SERVICES

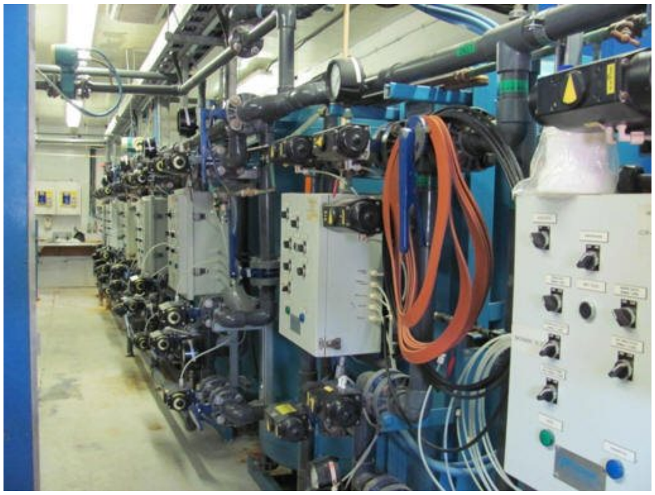
FUEL STORAGE

A fuel storage area is provided close to the truck shop. The fuel storage capacity is 60,000 US gallons and will provide for approximately one week of production. The entire tank farm is situated in a bermed enclosure, which is sized to hold 110 percent of the volume of the largest tank. Also included is a 3,000 US gallon storage capacity for gasoline as well as a dispensing system for both products.

POTABLE WATER

Potable water is supplied from 250 mm water wells located along the Mamanari Creek near the camp complex. Submersible pumps are used to pump water to a 10,000 l tank. Potable water treatment is limited to pH adjustment and chlorination before water distribution to project facilities. Figure 18-2 shows the potable water plant facility.

FIGURE 18-2 POTABLE WATER PLANT FACILITY

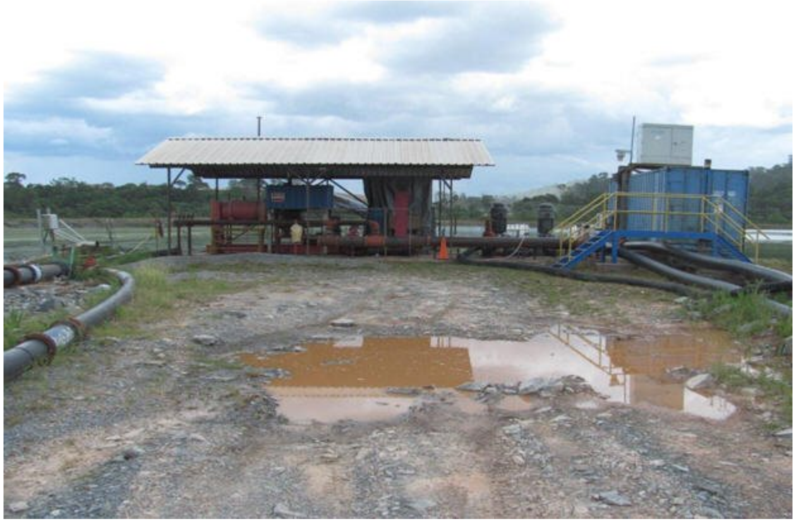


FIRE PROTECTION

The fire protection system includes fire water pumps, a fire water distribution network, fire water hose stations, and water sprinkler systems. The fire water pumps are built for a demand of 227 cubic metres per hour (m^3/hr) at a minimum terminal pressure of 345 kPa at any point in the fire water network. Hose cabinets are provided in every building and are spaced at a maximum of 15 m in any one direction. Fire hydrants are spaced at a maximum of 90 m around buildings and process facilities.

A water sprinkler system is installed over covered conveyor belts and over the lubrication or hydraulic systems in the process areas.

FIGURE 18-3 FIRE PROTECTION PUMP FACILITY



The pumps are located adjacent to the fresh water pumps at the pumping station on the edge of the fresh water pond (Figure 18-3). There are three pumps, two main pumps of a capacity of 227 m^3/hr each and one jockey pump to maintain the fire water pipe network at 345 kPa pressure at all times. The jockey pump has a capacity of 17 m^3/hr. One of the main pumps is driven by an electric motor and the other is driven by a diesel engine with a control panel for automatic start. All pumps are automatically controlled to start on system pressure drop set points.

SEWAGE AND WASTE DISPOSAL

The sewage disposal system, including septic tanks and seepage fields, is built for the process plant, the truck shop, the administration complex, and the camp site area.

Domestic waste is buried in trenches 3 m wide by 3 m deep. The deposited waste is covered with 150 mm of saprolite daily. The trenches are approximately 100 m long and spaced 5 m, centre to centre.

AGGREGATES PLANT

Different sizes of aggregates are produced at the RGM site which are used for road maintenance. The Mill department operates the quarry and Mine department supplies the waste rock. The aggregate plant was purchased on the used market and includes a primary crushing circuit and a complete second stage, including a closed loop conveyor system, a secondary crushing, and screening.

ELECTRICAL AND COMMUNICATION

POWER SUPPLY

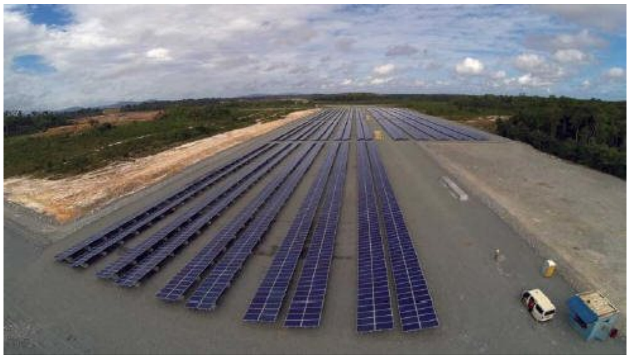
Electrical energy is purchased directly from the Surinamese government. Power is delivered from the Afobaka hydroelectric generating station. This plant is owned and operated by Suralco, a subsidiary of Alcoa. The installed capacity of the plant is 189 megawatts (MW). Power is generated by six groups (3-30 MW and 3-33 MW).

The normal annual precipitation allows four groups to operate and generate an average of 120 MW. Suralco has priority on the first 35 MW generated for their operations, however, with the closure of the Suralco Bauxite Company, the power is available for RGM for the duration of the life of mine.

Presently, the balance of the generated energy is delivered to Energy Bedrijen Suriname N.V. (EBS), the local utility company. Delivery to EBS is carried out at Paranam through a 161/33 kilovolts (kV) step down substation. Power is delivered to Paramaribo with two double-circuit transmission lines. Power demand for RGM, at the initial production was 12 – 15 MW. Afterwards, the demand was increased with the addition of generating equipment during the second year of operation. The power demand for a mining operation is relatively constant on a 24 hours per day basis.

In 2014, IAMGOLD built a 5 MW solar power plant at Rosebel. It is the country's first renewable source of energy. The solar power plant was commissioned in June 2016. Figure 18-4 is a photograph of the solar power plant.

FIGURE 18-4 ROSEBEL 5 MW SOLAR POWER PLANT



IAMGOLD has reached an agreement with the Government of Suriname whereby RGM will purchase power at $0.14/kWh given a contribution of $50M to fund an additional 42 MW of power generation capacity in the country.

The available supply of power from the National grid and the solar power plant is sufficient to supply the power required for the Rosebel mine until the end of mine life. Table 18-1 shows the projected power demand over the life of the mine. The plant throughput is to a maximum until 2024 due to processing harder material.

TABLE 18-1 PROJECTED LIFE OF MINE POWER DEMAND

Year	MW
2017	31.9
2018	32.0
2019	34.5
2020	34.8
2021	33.9
2022	32.3
2023	31.5
2024	30.9
2025	20.3

TRANSMISSION LINE

The tie-in to the 161 kV grid is carried out at the Afobaka generating plant. A new switchyard has been erected to the west of the existing Suralco substation. Connection to the grid is performed outside the generating plant by a fly tap off the first span of the existing 161 kV circuits.

The 161 kV breaker protections are interconnected in order that the Suralco breaker is not affected by a fault on the RGM circuit. The station is equipped with the following major equipment:

- 161 kV disconnect switches;
- 161 kV breaker;
- Metering and protective devices;
- Auxiliary services; and
- Steel structures to connect with aerial transmission lines.

The 161 kV transmission line covers a distance of 32 km. It originates at the Afobaka switchyard, continues its route towards the intersection of the Brownsweg and Nieuw-Koffiekamp road, and turns towards the plant's main substation.

PLANT MAIN SUBSTATION AND DISTRIBUTION LINES

The plant main substation is located next to the electrical room. It transforms the incoming voltage from 161 kV to 4.16 kV. The substation size is sufficient for the present requirements and for an eventual hard rock expansion.

Distribution lines, on site, are at 12,470 / 7,200 volts, the standard distribution voltage in Suriname. Two main circuits are provided. One circuit feeds the kitchen, the camps, and all loads east of the plant. The other circuit feeds loads west of the plant. Two 4.16 kV circuits feed the step-up transformers. The transformers are operated in parallel to improve the fault capacity.

EMERGENCY GENERATORS

RGM has three emergency generators, each with a capacity of 800 kilowatts at 480 volts. They are located at the following strategic loads:

- One unit at the plant for loads such as kiln drive, agitators (in a sequential mode), etc. It also feeds loads that are required to execute plant maintenance during the scheduled power outages. This unit starts automatically;
- One for the kitchen and services area. This unit starts manually. The load transfer is also carried out manually; and
- One at the administration complex, which is also started manually. This group also feeds the communication equipment and the truck shop. Each generator is equipped with a dyke diesel tank.

COMMUNICATION, AND IT SYSTEMS

The RGM site has the following communication and radio facilities:

- Satellite internet;
- VOIP satellite phone;
- Cell phone coverage (Digicel and Telesure operators);
- Vehicle and hand-held radios.

Additional communications networks will be expanded and installed, as required, for the various satellite mines as development commences.

TAILINGS STORAGE FACILITY

The Rosebel tailings storage facility (TSF) consists of a series of earth fill dam structures, joining topographical highs, to form two distinct basins (Figure 18-5, Main basin, and expansion basin). The original tailings facility, TSF1, consists of a series of 12 dams in operation, at a minimum elevation of 555 m (mine elevation datum). In 2014, the tailings facility was expanded to the east to form the expansion facility, namely TSF2. To date, there are a total of five additional dams in operation, with two more dam structures planned once higher elevations are achieved. The current minimum elevation of the dams at TSF2 is 549 m. It is anticipated that the TSF2 dams will be at the same elevation as TSF1 (555 m) in 2019.

The total combined area of both TSF1 and TSF2, is 315 hectares and when completed to the required final elevation of 563 m, represents a total storage capacity of approximately 294 Mt (210 Mm^3) of tailings.

Tailings are discharged into the basin by a combination of spigotting from the dam crests and end of pipe discharge. Spigotting consists of discharging tailings from a series of small diameter holes or pipes tapped into the main tailings line. This method of discharge produces a quasiplanar beach parallel to the discharge line.

Direct discharge is also utilized both on smaller dam structures and always at the end of line. This consists of discharging the entire tailings stream from the end of the main tailings line. This type of discharge creates a conical shaped beach around the discharge point, which is appropriate for smaller valleys.

The existing effluent treatment plant (ETP) is used for both tailings basins. Discharge from the facility is at a treatment rate which allows the pond to be maintained at a constant volume year over year.

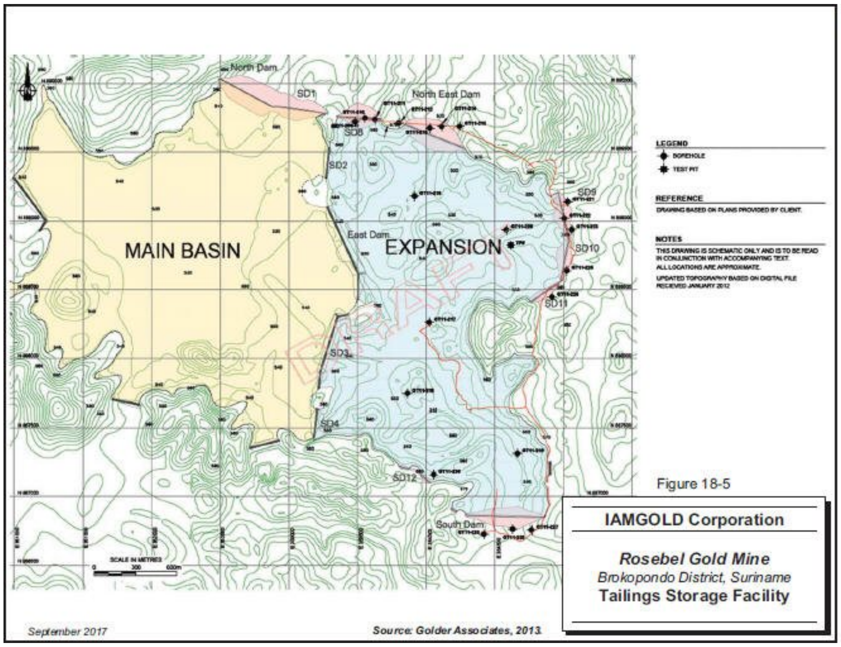

North Dam
SD1
North East Dam
SD8
SD2
SD9
MAIN BASIN
East Dam
EXPANSION
SD10
SD11
SD3
SD4
SD12
South Dam
SCALE IN METRES
0
300
600m
LEGEND
BOREHOLE
TEST PIT
REFERENCE
DRAWING BASED ON PLANS PROVIDED BY CLIENT.
NOTES
THIS DRAWING IS SCHEMATIC ONLY AND IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING TEXT.
ALL LOCATIONS ARE APPROXIMATE.
UPDATED TOPOGRAPHY BASED ON DIGITAL FILE RECIEVED JANUARY 2012

Figure 18-5

IAMGOLD Corporation

Rosebel Gold Mine
Brokopondo District, Suriname
Tailings Storage Facility

September 2017

Source: Golder Associates, 2013.

19 MARKET STUDIES AND CONTRACTS

MARKETS

Gold is the principal commodity produced at RGM and is freely traded at prices that are widely known, so that prospects for sale of any production are virtually assured. All gold produced by IAMGOLD is in the form of doré bars, which is then shipped to a refiner who refined the doré into bullion. The bullion is then sold directly on the open market to gold trading institutions at prevailing market prices.

CONTRACTS

RGM has signed contracts which are directly linked to the operations. Contracts are negotiated by going out for tenders on an annual or bi-annual basis. Contracts with values higher than $5M per year include fuel and lubricants, major equipment parts, process plant reagents and grinding media, and reverse circulation drilling.

20 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

ENVIRONMENTAL AND SOCIAL STUDIES

The project-specific Mineral Agreement dated April 7, 1994, between Suriname, Grassalco, and Golden Star stipulated that prior to the construction of the Gross Rosebel project, an Environmental Impact Assessment (EIA), or an Environmental and Social Impact Assessment (ESIA) be conducted, including public enquiry and a mitigation and/or an enhancement plan of negative or positive impacts.

An ESIA was conducted by Rescan and submitted to the Government of Suriname in September 2002. This study included an Environmental and Social Management Plan (ESMP) for the project. The ESIA was completed following a public consultations in 2002 with key stakeholders.

Following this process, on December 16, 2002, the Rosebel Gold Mine was approved by the Suriname authorities and the Right of Exploitation of Gold, Diamond, and other Minerals over a 170 km² area (G.M.D. No.: 468/02) was granted to IAMGOLD Rosebel Gold Mines.

RGM TAILINGS STORAGE FACILITY EXPANSION PERMITTING

In order to maintain the 2012 gold production levels, a tailings expansion Feasibility Study (the 2011 FS) was initiated in 2012 by RGM personnel and Golder Associates.

The proposed expansion Project included the expansion of the existing tailings facility to the east by the construction of seven additional dams, raising the total vertical containment by 45 m at completion, for an additional storage capacity of 100 Mm^3. As required by this expansion work, a limited ESIA was completed in May 2013 to assess the environmental and social impacts of the tailings expansion project. The final ESIA and supporting documents were submitted on August 22, 2013, a subsequent permit was delivered by the Minister of Natural Resources on September 10, 2013 (No: NH 13/791).

SOCIAL AND COMMUNITY ASSESSMENT

A Community Relations Plan with supporting guideline and procedures was developed to minimize the mine's impact on communities and the environment.

There is one active community, Nieuw-Koffiekamp, within the boundaries of the mine concession. In the immediate surroundings of the RGM concession, six more villages were identified as communities of interest that may be directly impacted by or have influence on the mine. These villages are Marshallkreek, Klaaskreek, Nieuw-Lombe, Balingsoela, Brownsweg, Kwakugron, and along with Nieuw-Koffiekamp are considered the direct area of influence of the company's operations.

Although mining activities may not directly impact these communities, their inhabitants have high expectations towards RGM in terms of employment, social, and financial support. Communication Committees and key stakeholders are identified and a community development program is implemented for these villages.

Accordingly, community information and consultation programs, community visits from mine representatives and management, and participation in concerted action frameworks at a regional and national level are carried out regularly.

In addition, inter communication committee meetings are held on a quarterly basis to review community concerns and advancement of community investment projects and other engagements.

As part of the community investment plan, socio-educational infrastructures were being built and upgraded (medical centres, schools, etc.). Programs to boost the overall health are implemented, with focus on healthy lifestyle, HIV/AIDS, non-communicable diseases, and increased environmental awareness, were developed for the benefit of neighbouring populations.

Rural development activities (agriculture, poultry projects, etc.) are primarily undertaken as part of income generating program. Since 2004, a community investment program has been financing community projects through communal development plans.

The community engagement program encompasses all engagement actions and community development projects of the Community Relation Department. On a biannual basis performance of the Community Relations team is reviewed through village meetings.

WASTE AND TAILING DISPOSAL, SITE MONITORING, AND WATER MANAGEMENT

WASTE ROCK DISPOSAL

Storage areas for waste rock have been planned and designed to reduce haulage distances between pit ramp exits and storage areas, and were selected to minimize the impact on water management. In-pit mine rock waste disposal is planned where the mine phasing allows, in Pay-Caro and Royal Hill.

The estimated tonnes of waste for each pit for the LOM is shown in Table 20-1.

TABLE 20-1 WASTE ROCK BY PIT

Pit	Dump	Waste Rock (Mt)	Footprint (ha)	Height[1] (m)	Max Elevation (m)
Rosebel	External	52.7	100	65	615
Pay Caro	External	196.6	175	95	630
	In-Pit[2]	48.5	72	65	580
J Zone	External	16.7	62	45	570
Royal Hill / Roma East	External	152.4	200	65	585
	In-Pit	72.2	57	0	524
Mayo / Roma West	North	3.4	16	45	555
	South	18.0	62	35	555

1 - For the in-pit dumps the height represents the height above the original ground surface.
2 - Part of the Pay Caro External Dump includes waste rock from J Zone.

TAILINGS DISPOSAL

The mine tailings site was designed by Golder Associates. As noted in Section 18, the site footprint is 315 ha, with a storage capacity of 294 Mt. To ensure the infrastructure's stability, daily, monthly, and yearly inspections are carried out. Geochemical studies have shown that tailings are non-acid generating.

A program for environmental monitoring (ground water quality, fauna, and dam stability inspection) and progressive rehabilitation of the tailings site is in place, at and around, the tailings site.

An annual tailings management external audit is carried out to review the operational monitoring of the tailings site and to provide guidance to improve environmental performance.

SITE MONITORING

A monitoring program is in place (at all stages of the life-of-mine) at the site. This program encompasses water quality monitoring (potable water, ground water, surface water, and pit lakes, tailings pond, air quality (dust and greenhouse gas emission), biodiversity (terrestrial and aquatic fauna), weather, ARD and follow-up and assessment of the community investment program (health, education, potable water access, agriculture, animal husbandry, etc.) through post mortem evaluations.

WATER MANAGEMENT

Accumulated water in the pits is collected in a sump located in the bottom of the pit, close to the ramp system, or near the pit rim. Water is pumped out of the pit from the sump, and discharged into sedimentation ponds. Water from the pit sumps may be pumped directly in water trucks and used for dust suppression on active haul roads and secondary roads.

Tailings are thickened to a density of 40% solids before they are discharged into the tailings site. Water recovered from the tailings site, is reused in the process plant (reclaim water).

For potable water, to supply the mining camp, nine wells were drilled at new camp. Potable water treatment consists of chlorination, sediment filtration, carbon filtration, and UV treatment.

For industrial water needs, reclaim water is recycled from the tailings facility. Hydrologic design is based on 100-year floods. A water quality monitoring program (surface water, ground water, potable water, pit lake water) is in place. Additionally, the quantity of water resources is monitored (river flow, water table level, water meters, etc.). The dykes of the dams and the ponds are inspected regularly (on a daily, monthly, and annual basis).

MINE CLOSURE REQUIREMENTS AND COSTS

RGM is committed to undertaking the closure of the mine components (i.e. open pits, waste rock storage areas, etc.) in a manner which is consistent with the RGM environmental policy, applicable legislation, operating criteria, and the principles of sustainability. Accordingly, RGM has integrated reclamation and mine closure activities into the RGM life of mine (LOM) plan in order to ensure that potential closure liabilities and uncertainties are identified and that appropriate mitigation strategies are developed and implemented in a timely manner.

The closure cost for RGM is estimated to be $49.1 million considering disturbance to date as per January 1, 2017. Closure costs were developed taking the assumption “Most Likely” as reference. The closure cost estimate developed for the RGM site addresses the costs associated with the following activities:

- Dismantling and removal of mill site and ancillary infrastructure;
- Re-contouring, topsoil preparation, and re-vegetation of disturbed areas;
- Design and implementation of a reclamation research program and closure monitoring program;
- Post closure site drainage control.
- Post closure site management and Land Transfer to Regulating Entities.

OPEN PITS

Unless identified for the future storage of tailings, reclamation of each open pit will be undertaken as soon as mining has been completed. Upon completion of mining the pits will be allowed to flood via a combination of direct precipitation, surface runoff, and groundwater infiltration. The pits will eventually overflow and discharge to the environment, the ultimate water level within the pits and the direction of discharge will be controlled using a combination of spillways and ditches.

WASTE ROCK MANAGEMENT

Reclamation of waste rock storage areas will be undertaken concurrent with open pit mining wherever possible.

Waste rock types that have been identified as having the potential to generate ARD and/or leach metals will either be placed underwater in one of the mined-out pits or encapsulated with saprolite waste.

Waste rock storage areas will be re-contoured, as required, in a manner that will blend in with local topography, provide for the long-term physical stability of the facility, and re-establish suitable drainage patterns. Following re-contouring, stockpiled topsoil will be placed over the rock, when available, to promote the re-vegetation of waste rock storage facilities.

BUILDINGS AND INFRASTRUCTURE

The mill complex and all support infrastructures (i.e. truck shop, warehouse, reagents storage, lab facilities, etc.) will be dismantled and removed from their current location. Once the mill complex and support infrastructure has been removed, re-contouring, topsoil preparation, and re-vegetation of the mill site will be undertaken in manner similar to the reclamation strategy described for the waste rock storage area.

It is currently envisioned that ownership of the Camp David complex, the air strip, the Afobaka switchyard, and the 161 kV transmission line and would likely be transferred to the Government of Suriname following the completion of mining.

TAILINGS MANAGEMENT AREAS

The rehabilitation of the tailings pond will include erosion protection of the dams, pumping and final treatment, re-contouring, re-vegetation, and installation of two spillways and a spillway for the Treated Water Storage Pond (TWSP).

The spillway will be constructed at an elevation which will result in the majority of the impoundment area being completely drained.

Once the majority of the water has been drained from the impoundment area, re-vegetation of the area will be undertaken in manner similar to the reclamation strategy described for the waste rock storage area.

WATER MANAGEMENT

Storm water drainage and contingency features consist of the site ponds and diversion ditches.

Containment berms of sedimentation ponds will be breached following the completion of open pit mining and contoured to blend in with the surrounding landscape. Re-vegetation of pond areas will be undertaken to minimize the erosion of sediment into area creeks.

ENVIRONMENTAL STUDIES AND MONITORING

Post-closure monitoring is envisioned to occur over a period of approximately 5 years. Monitoring of reclaimed areas will be undertaken to ensure that they are physically stable and that vegetation is self-sustaining.

Sampling of surface water and groundwater wells will be undertaken on a quarterly basis to verify that post-closure receiving water quality criteria is being met.

Surface and groundwater quality monitoring data will be reviewed on an annual basis. Supplemental reclamation will be undertaken, as required, to address areas where the quality of surface water or groundwater does not meet the closure objectives. Surface water and groundwater monitoring programs will be terminated when it is clearly demonstrated that all required closure objectives have been met.

In the case of the tailings facility, in the event that the quality of the water is not suitable for direct discharge to the environment, the water will be routed to the effluent treatment plant (ETP) for treatment. Treatment will continue until the water meets applicable receiving water quality criteria.

21 CAPITAL AND OPERATING COSTS

CAPITAL COSTS

Note: All costs provided in this section are reported for 2018 and forward.

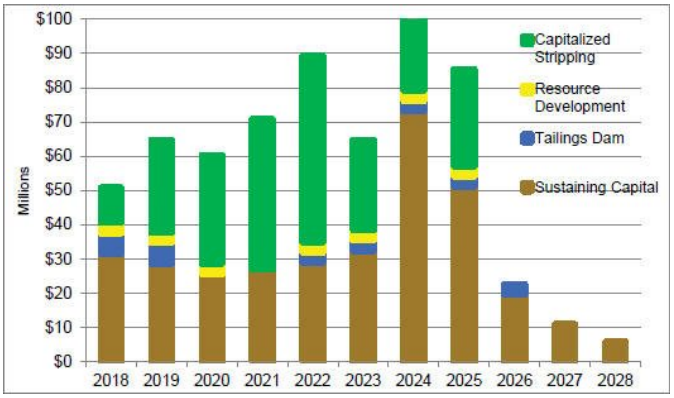
The capital cost requirement over the LOM includes the following:

- Resource development costs;
- Tailings dam construction;
- Capitalized waste stripping;
- Sustaining capital expenditures (including mine equipment additions and replacements, mill and site in general).

A total of $629 million of capital is planned to be spent over the remaining LOM, which equates to $5.89/t milled or $197/oz of Au.

Capitalized waste stripping (cash portion) is the largest capital cost estimated at $246 million, representing 39% of the LOM remaining capital expenditure. Figure 21-1 shows the distribution of capital over the LOM.

FIGURE 21-1 LOM CAPITAL EXPENDITURE



Capital cost estimate breakdowns and explanations are provided below.

RESOURCE DEVELOPMENT

An annual resource development budget of $3 million has been allocated to continue drilling prospective Inferred Mineral Resources, with no additional funds allocated beyond 2025. The manpower levels are also forecasted accordingly. Exploration or resource development is treated as a discretionary expense which is renewable every six months. The intent of this measure is to ensure that capital is allocated with caution by progressively advancing strategic development zones.

TAILINGS DAM CONSTRUCTION

An annual budget of $6 million has been allocated for the annual raise of the tailings dams, with no additional funds allocated beyond 2025. The manpower levels are also forecasted accordingly.

CAPITAL WASTE STRIPPING

Capitalized waste stripping (CWS), or deferred stripping, is an accounting practice used to capitalize the cost of stripping waste to access future ore for future economic benefits. The definition of deferred stripping and the method of calculating these costs are outlined in International Financial Reporting Interpretations Committee (IFRIC) 20 by the International Accounting Standards Board (IASB).

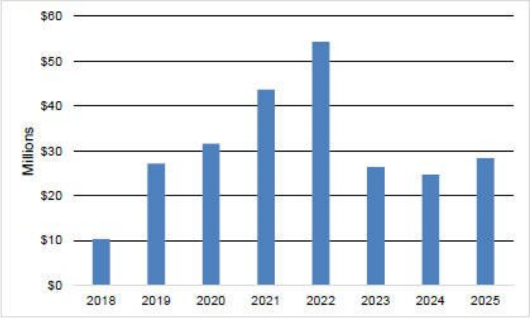
Each of these components (i.e., pit or phase) is treated separately when calculating the CWS. The strip ratio over the life of the phase (LOPSR) is determined by dividing the quantity of waste by the quantity of ore for the entirety of the phase, including past mining.

The mining of waste can be considered as a deferred cost if:

- The strip ratio for the period exceeds the LOPSR; whereby the waste that exceeds that of the LOPSR is capitalized;
- The stripping does not occur within one year of the end of the life of the phase.

The CWS associated tonnages are illustrated in Figure 21-2. Most of the mined waste will be capitalized between 2019 and 2025, specifically during 2021 and 2022. The waste will be completely stripped by 2026, where the CWS will be nil.

FIGURE 21-2 CAPITALIZED WASTE STRIPPING



SUSTAINING CAPITAL - MINE EQUIPMENT CAPITAL EXPENDITURES

As part of the mine sustaining capital, a life-of-fleet model has been prepared to track equipment hours and schedule equipment replacements based on useful life assumptions. The major equipment purchase schedule including replacements and additions is presented in Table 21-1.

As of 2018, major equipment purchases require $103 million of capital and support equipment purchases require $48 million, for a total of $152 million excluding capital spares. The mine equipment capital expenditure profile as of 2016 is presented in Figure 21-3.

TABLE 21-1 MAJOR EQUIPMENT PURCHASE REPLACEMENT SCHEDULE

Mine Equipment Fleet (Units)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Loading Fleet											
6030 Shovels					1	1	2	1			
5330B Shovels	1	1	1								
CAT 993 Wheel Loaders		1									
Nb. Loading Units	**1**	**2**	**1**	**0**	**1**	**1**	**2**	**1**	**0**	**0**	**0**
Hauling Fleet											
CAT 785 Trucks		1	1	1	1	8	8	6			
CAT 777 Trucks											
Nb. Haul Trucks	**0**	**1**	**1**	**1**	**1**	**8**	**8**	**6**	**0**	**0**	**0**
Drill Fleet											
Sandvik D245S		2									
MD6290						2	3	3			
Nb. Drill Rigs	**0**	**2**	**0**	**0**	**0**	**2**	**3**	**3**	**0**	**0**	**0**
Anciliary Fleet											
CAT 345/349 Excavator	3	2	1	1	1	2					
CAT D9T Bulldozer	2	4			2	4	4	3			
CAT 16H Grader	1										
CAT 16G Grader		1									
CAT 16M Grader					2	1	1	1			
CAT 777 Water Truck	1	1				1					
CAT 740 A/B Truck			1	1	1	3	3				
CAT 990H Loader								1			
CAT 980G Loader				1		1		1			
CAT 824 Wheeldozer							2				
Nb. Support Units	**7**	**8**	**2**	**3**	**6**	**12**	**10**	**6**	**0**	**0**	**0**
Total Equipment Replacem	**8**	**13**	**4**	**4**	**8**	**23**	**23**	**16**	**0**	**0**	**0**

CLOSURE AND RECLAMATION COSTS

A provision of $61 million is planned for the closure of the Rosebel Gold Mine.

OPERATING COSTS

The mine operating costs are estimated on the basis of the physical quantities of the mine plan, realistic equipment productivity assumptions, overall equipment efficiencies, and updated consumable prices.

Average mine operating costs over the LOM are estimated at $1.67/t mined and average $1.90/t mined over the next two years. Subsequent to that, the strip ratios will increase, resulting in lower ore hauling costs and a significant reduction in RC drilling costs. Furthermore, as the annual mine production will ramp up to over 70 Mtpa, this will result in economies of scale. Over the later years of the LOM, costs will further decrease as no RC drilling will be required.

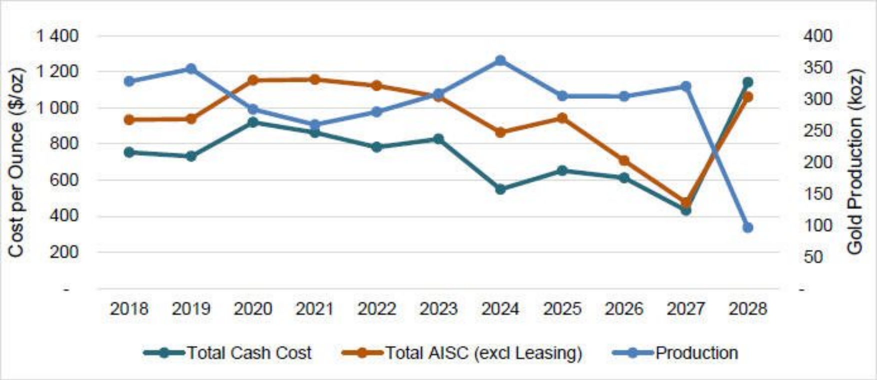
The average LOM milling cost is estimated to be $8.47/t milled and an average of $7.21/t milled over the next two years. The increase in milling cost is mainly related to the increasing hard rock. Electricity is the primary cost and represents 39% of the mill operating cost at $3.29/t milled, followed by maintenance, grinding media, and cyanide.

The average LOM G&A cost is $2.03/t milled and assumes an annual spend of $ 25 million until 2023, after which G&A costs will gradually decrease as the operation will approach the end of life. A high proportion of the G&A costs are fixed costs and are difficult to compress once the milling rate decreases because of the increase in hard rock. The top G&A costs relate to camp management, transport, security, and supply chain management.

The operating cost metrics per ounce of gold produced are presented in Figure 21-3. The average total cash cost per ounce is $707/oz Au while the all-in sustaining cost (AISC) averages $923/oz Au over the LOM.

Note that AISC measures do not have any standardized meaning prescribed by International Financial Reporting Standards (IFRS) and differ from measures determined in accordance with IFRS. AISC is intended to provide additional information and should not be considered in isolation or as a substitute for measures of performance prepared in accordance with IFRS. This measure is not necessarily indicative of net earnings or cash flow from operating activities as determined under IFRS.

FIGURE 21-3 OPERATING COST METRICS



22 ECONOMIC ANALYSIS

This section is not required as the Rosebel Gold Mine is currently in production and there is no material expansion of current production.

23 ADJACENT PROPERTIES

There are no significant properties to report in this section.

24 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report understandable and not misleading.

25 INTERPRETATION AND CONCLUSIONS

IAMGOLD has the following conclusions and observations:

- Mineral Resources and Mineral Reserves have been prepared in accordance with the CIM definitions.
- Work completed to date by the geological staff is appropriate.
- The geological model employed by RGM geologists is reasonably well understood and is well supported by field observations in both outcrop, pit mapping, and drill intersections.
- The resource model has been prepared using appropriate methodology and assumptions. These parameters include:
    - Treatment of high assays;
    - Compositing length;
    - Search parameters;
    - Bulk density;
    - Cut-off grade;
    - Classification.
- The block model has been validated using a reasonable level of rigour consistent with common industry practice.
- The resource evaluation reported herein is a reasonable representation of the Mineral Resources delineated at the Rosebel Gold Mine as of June 30, 2017.
- The current drill spacing in all deposits is judged adequate to develop a reasonable model of the mineralization distribution and to quantify its volume and quality with a good level of confidence in all areas of the project.
- Based on visual verification, the models (Rock Type, Density, and Au Grade) were found to be globally representative of the known geological and structural controls of mineralization of the RGM deposit.
- Statistical analysis demonstrates that the block model provides a reasonable estimate of the Mineral Resources of the RGM deposit.
- Validation of the block model, using different interpolation methods, indicated that tonnages, grades, and gold contents are similar.
- Block models were also compared and reconciled with production data and are considered as being appropriate.
- Swath plots for Indicated and Inferred Mineral Resources, by vertical sections for the RGM pits, indicate that peaks and lows in gold content generally match peaks and lows in composite frequency; no bias was found in the resource estimate in this regard.

- A review of the information stored in the RGM database found it to be in good standing.
- Sampling and assaying have been carried out following standard industry QA/QC practices. These practices include, but are not limited to, sampling, assaying, chain of custody of the samples, sample storage, use of third-party laboratories, standards, blanks, and duplicates.
- The mine design and Mineral Reserve estimate have been completed to a level appropriate for an operating mine.
- The economic assumptions and methodology used for estimation of the Mineral Reserves are appropriate.
- The Mineral Reserve estimate is consistent with the CIM definitions and is suitable for public reporting. As such, the Mineral Reserves are based on Measured and Indicated Mineral Resources and do not include any Inferred Mineral Resources.
- Current production statistics indicate that the process flow sheet is adequate and suitable for processing the Rosebel Gold Mine ore types.

26 RECOMMENDATIONS

IAMGOLD has the following recommendations:

- Continue the process of updating the resource models to incorporate the remaining deposits and update of the geological models of the current orebodies.
- Continue upgrading the Inferred Mineral Resources to Indicated Mineral Resources.
- Implement a stringent planning and operations process for following the variable cut-off grades in production, and closely monitor the reconciliation between planning and production.
- Further refine the mine cost model for future input to the long term planning and scheduling designs.

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28 DATE AND SIGNATURE PAGE

This report titled "Technical Report on the Rosebel Gold Mine, Suriname" with an effective date of June 30, 2017 was prepared and signed by the following authors:

(Signed & Sealed) "Michel Payeur"

Dated at Toronto, ON September 5, 2017	Michel Payeur, Eng.

(Signed & Sealed) "Vincent Cardin-Tremblay"

Dated at Toronto, ON September 5, 2017	Vincent Cardin-Tremblay, P.Geo.

(Signed & Sealed) "Adam Doucette "

Dated at Toronto, ON September 5, 2017	Adam Doucette, P.Eng.

(Signed & Sealed) "Triadi Sugiarto "

Dated at Toronto, ON September 5, 2017	Triadi Sugiarto, MAusIMM CP (Met).

29 CERTIFICATE OF QUALIFIED PERSON

MICHEL PAYEUR

I, Michel Payeur, Eng., M.A.Sc., as an author of this report entitled “Technical Report on the Rosebel Gold Mine, Suriname with an effective date of June 30, 2017, do hereby certify that:

1. I am the Manager Technical Services at Rosebel Gold Mines, based in IAMGOLD Corporation offices, 1111, St. Charles Street West, Longueuil, QC, Canada, J4K 5G4.
2. I am a graduate of École Polytechnique de Montréal, Quebec (B. Eng. in Geological Engineering) in 2001.
3. I am registered as an Engineer in the Province of Quebec (OIQ #127646). I have been practicing as a geological engineer since 2002. My relevant experience for the purpose of the Technical Report is as Manager of Technical Services at Rosebel Gold Mines.
4. I have read the definition of “qualified person” set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
5. I have visited the Rosebel Gold Mine multiple times since 2014, most recently in July 2017.
6. I am responsible for Sections 1 to 6, 19 to 22, and 24 to 27 of the Technical Report.
7. I have been working for IAMGOLD since 2014. I am a full–time employee of IAMGOLD Corporation, Canada and I own shares of IAMGOLD Corporation.
8. I am not independent of IAMGOLD Corporation as set out in Section 1.5 of NI 43-101, as per NI 43-101 s.8.1(2)(f), as I am a full-time employee.
9. I have read NI 43-101, and the part of the Technical Report for which I am responsible has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 1 to 6, 19 to 22, and 24 to 27 of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 5 th day of September, 2017

(Signed & Sealed) “ *Michel Payeur* ”
Michel Payeur, Eng., M.A.Sc., (OIQ #127646)
Manager of Technical Services, Rosebel Gold Mines IAMGOLD Corporation

VINCENT CARDIN-TREMBLAY

I, Vincent Cardin-Trembaly, P.Geo., as an author of this report entitled “Technical Report on the Rosebel Gold Mine, Suriname with an effective date of June 30, 2017, do hereby certify that:

1. I am the Chief Geologist at Rosebel Gold Mines, in the Brokopondo District, Suriname (Heerenstraat 8, P.O.Box 2973, Paramaribo, Suriname).
2. I am a graduate of Université du Québec à Montréal, Quebec (B. Sc. Geology) in 2008.
3. I am registered as a Professional Geologist in the Province of Quebec (OGQ #1386).
4. I have practised my profession of geologist continuously for the last 9 years. My relevant experience for the purpose of the Technical Report is my position of Chief Geologist since November 2016.
5. I have read the definition of “qualified person” set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
6. I am responsible for Sections 7 to 12, and 14 of the Technical Report.
7. I have been working for IAMGOLD Corporation since 2011 as a Mine Exploration Geologist, Senior Resource Geologist and Chief Geologist. I am a full-time employee IAMGOLD, Rosebel Gold Mines, in Suriname, and I own shares of IAMGOLD Corporation.
8. I am not independent of IAMGOLD Corporation as set out in Section 1.5 of NI 43-101, as per NI 43-101 s.8.1(2)(f), as I am a full-time employee.
9. I have read NI 43-101, and the part of the Technical Report for which I am responsible has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 7 to 12, and 14 of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 5 th day of September, 2017

(Signed & Sealed) “ ***Vincent Cardin-Tremblay*** ”
Vincent Cardin-Tremblay, P. Geo., (OGQ # 1386)
Chief Geologist
IAMGOLD, Rosebel Gold Mines

ADAM DOUCETTE

I, Adam Doucette, P. Eng., as an author of this report entitled "Technical Report on the Rosebel Gold Mine, Suriname with an effective date of June 30, 2017, do hereby certify that:

1. I am the Chief Engineer at Rosebel Gold Mines, in the Brokopondo District, Suriname (Heerenstraat 8, P.O.Box 2973, Paramaribo, Suriname).
2. I am a graduate of Dalhousie University, Halifax, Nova Scotia, with a Bachelor of Mine Engineering in 2005.
3. I am registered as a Professional Engineer in the Province of Ontario (PEO# 100200823).
4. I have practised my profession of mining engineer continuously for the last 12 years, mostly in gold mining. My relevant experience for the purpose of the Technical Report is my position as Chief Engineer since November 2016.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
6. I am responsible for Sections 15, 16, and 18 of the Technical Report.
7. I have been working for IAMGOLD Corporation since 2015, and previously from 2009 to 2012 as short term planner, medium term planner and chief engineer. I am a full-time employee IAMGOLD, Rosebel Gold Mines, in Suriname.
8. I am not independent of IAMGOLD Corporation as set out in Section 1.5 of NI 43-101, as per NI 43-101 s.8.1(2)(f), as I am a full-time employee.
9. I have read NI 43-101, and the part of the Technical Report for which I am responsible has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 15, 16, and 18 of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 5 th day of September, 2017

(Signed & Sealed) " ***Adam Doucette*** **"**
Adam Doucette, P. Eng., (PEO# 100200823)
Chief Engineer IAMGOLD, Rosebel Gold Mines

TRIADI SUGIARTO

I, Triadi Sugiarto, MAusIMM CP (Met), as an author of this report entitled “Technical Report on the Rosebel Gold Mine, Suriname with an effective date of June 30, 2017, 2017, do hereby certify that:

1. I am the Senior Metallurgist at Rosebel Gold Mines, in the Brokopondo District, Suriname (Heerenstraat 8, P.O.Box 2973, Paramaribo, Suriname).
2. I am a graduate of the University of Indonesia (Bachelor of Engineering, Metallurgical Engineering) in 2002.
3. I am registered as a Charted Professional Metallurgist with the Australasian Institute of Mining and Metallurgy (MAusIMM #226903).
4. I have practised my profession of metallurgist continuously for the last 15 years, mostly in gold metallurgy. My relevant experience for the purpose of the Technical Report is my position of Senior Metallurgist since April 2012.
5. I have read the definition of “qualified person” set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a “qualified person” for the purposes of NI 43-101.
6. I am responsible for Sections 13 and 17 of the Technical Report.
7. I have been working for IAMGOLD Corporation since 2012. I am a full-time employee IAMGOLD Rosebel Gold Mines, in Suriname, and I own shares of IAMGOLD Corporation.
8. I am not independent of IAMGOLD Corporation as set out in Section 1.5 of NI 43-101, as per NI 43-101 s.8.1(2)(f), as I am a full-time employee.
9. I have read NI 43-101, and the part of the Technical Report for which I am responsible has been prepared in compliance with NI 43-101 and Form 43-101F1.
10. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 13 and 17 of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 5 th day of September, 2017

(Signed & Sealed) “ *Triadi Sugiarto* ”
Triadi Sugiarto, MAusIMM CP (Met), (MAusIMM #226903)
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