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# **TECHNICAL REPORT ON THE ROÇA GRANDE AND PILAR OPERATIONS, MINAS GERAIS STATE, BRAZIL**

**NI 43-101 Report**

**Qualified Persons:  
Jason J. Cox, P.Eng.  
Reno Pressacco, P.Geo.**

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**Client Name & Address**

Jaguar Mining Inc.  
67 Yonge Street, Suite 1203  
Toronto, ON M5E 1J8  
Canada

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**Lead Author**

Jason Cox  
Reno Pressacco

(Signed)  
(Signed)

**Peer Reviewer**

William E. Roscoe

(Signed)

**Project Manager Approval**

Luke Evans

(Signed)

**Project Director Approval**

Deborah McCombe

(Signed)

**Report Distribution**

Name	No. of Copies
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RPA Filing	1 (project box)

**Roscoe Postle Associates Inc.**  
55 University Avenue, Suite 501  
Toronto, ON M5J 2H7  
Canada  
Tel: +1 416 947 0907  
Fax: +1 416 947 0395  
[mining@rpacan.com](mailto:mining@rpacan.com)

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# 1 SUMMARY

## EXECUTIVE SUMMARY

Roscoe Postle Associates Inc. (RPA) was retained by Jaguar Mining Inc. (Jaguar) to assist in preparation and audit of the Mineral Reserve and Mineral Resource estimates for the Caeté Gold Complex, including Roça Grande and Pilar mines, located in Minas Gerais, Brazil. The purpose of this report is to support disclosure of the updated Mineral Reserves and Mineral Resources. This Technical Report conforms to NI 43-101 Standards of Disclosure for Mineral Projects. RPA visited the Roça Grande Mine on November 22, 2014 and the Pilar Mine on November 21, 2014.

Jaguar is a Canadian-listed junior gold mining, development, and exploration company operating in Brazil with three gold mining complexes. Jaguar's principal operating assets are located in a greenstone belt in the state of Minas Gerais. The common shares of Jaguar are currently listed on the TSX Venture Exchange under the symbol JAG.

The Caeté Gold Complex is operated by Mineração Serras do Oeste (MSOL), a wholly-owned subsidiary of Jaguar. The Caeté Gold Complex includes a processing plant with a nominal capacity of 2,050 tonnes per day (tpd), with separate tailings disposal areas for both fine flotation tailings and carbon-in-pulp (CIP) tailings. Electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine.

The process plant treats ore produced from two mines. Roça Grande Mine recently produced approximately 500 tpd, however, it is currently on hiatus pending a review of mining plans. Ore from Pilar Mine is transported by truck 45 km to the Caeté Gold Complex for processing. Pilar Mine recently produced approximately 1,300 tpd, however, the current Life of Mine Plan (LOMP) forecasts lower production rates.

## CONCLUSIONS

Mineral Reserves at Pilar have increased by 310% year-over-year, due to positive diamond drilling results and updated resource modelling. The LOMP for the Caeté Gold Complex forecasts a mine life of four years, and production of approximately 40,000 ounces per year. The plant has capacity to process more ore, should it become available.

Conclusions by area are discussed in more detail below.

## **GEOLOGY AND MINERAL RESOURCES**

### **Roça Grande Mine**

- The mineralization at the Roça Grande Mine consists of a number of thin, moderately dipping tabular bodies. These tabular bodies are grouped into five Orebodies (RG01, RG02, RG03, RG06, and RG07).
- The main production of the mine has been from the RG01 and RG07 Orebodies, although a small amount of gold was produced by means of open pit mining from the RG03 and RG06 Orebodies. The RG01, RG02, RG03, and RG06 Orebodies are strataform to stratabound mineralized portions of a banded iron formation assemblage which dip moderately to the southeast. The RG07 Orebody is comprised mostly of a quartz vein which is hosted by a banded iron formation.
- A diamond drilling program carried out in 2015 was successful in outlining significant gold grades across mineable widths along the down-plunge continuation of the RG01 Orebody, below the current active mining area. The results from these drill holes have been incorporated into the updated block model. Additional work that will provide further detailed information of the gold distribution in this area is warranted and justified.
- The updated Mineral Resource estimate for the Roça Grande Mine was prepared based on drilling and channel sample data using a data cut-off date of June 30, 2015. The database comprises 649 drill holes and 6,517 channel samples. The estimate was generated from a block model constrained by 3D wireframe models that were constructed using a minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A minimum width criteria was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres. Raw assays were capped to 30 g/t Au for the RG01 and RG06 Orebodies while a capping value of 50 g/t Au was applied for the RG02, RG03, and RG07 Orebodies. The Mineral Resources are reported using the gold grades estimated by the inverse distance cubed ( $ID^3$ ) method. The wireframe models of the mineralization and excavated material for the Roça Grande Mine were constructed using the excavation information as of December 31, 2015.
- The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with these orebodies.
- The Mineral Resource reports were prepared by creating clipping polygons that were used to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, were located completely within the boundaries of Jaguar's mineral rights holdings at the Roça Grande Mine, possessed a grade times thickness product of at least 3 gram-metres, and were not located in mined out areas. These

resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off.

- At a cut-off grade of 1.46 g/t Au, the Mineral Resources at the Roça Grande Mine comprise 1.231 million tonnes at an average grade of 2.81 g/t Au containing 111,000 ounces of gold in the Measured and Indicated Resource category and 1.759 million tonnes at an average grade of 3.48 g/t Au containing 197,000 ounces of gold in the Inferred Mineral Resource category.

### **Pilar Mine**

- The mineralization at the Pilar Mine comprises a number of sub-parallel, quartz-rich mineralized lenses which have an average strike of 015°, and dip steeply to the east with an average dip of 65°. The available drill hole information suggests that the dip of the mineralized zones may begin to flatten to approximately 45° below the 120 m elevation. Three of the mineralized zones (BA, BF, and BF II) have been identified by drill hole and channel sample data to be isoclinally folded, with fold axes that plunge at approximately -40° to the southwest (approximately azimuth 210° to 225°). Many of the remaining mineralized zones (LFW, LPA, LHW, and the C Orebody) are interpreted to be more tabular in overall form. The LPA zone resides in the axial plane of the folded BF zone and thus provides evidence for multiple ages of gold mineralization.
- A diamond drilling program carried out in 2015 was successful in outlining significant gold grades across mineable widths along the down-plunge continuations of the BA, BF, and BF II Orebodies, below the current active mining area. The results from these drill holes have been incorporated into the updated block model. Additional work that will provide further detailed information of the gold distribution in this area is warranted and justified.
- The updated Mineral Resource estimate for the Pilar Mine was prepared based on drilling and channel sample data using a data cut-off date of July 1, 2015. The database comprises 984 drill holes and 16,445 channel samples. The estimate was generated from a block model constrained by 3D wireframe models that were constructed using a minimum width of two metres. Raw assays were capped to 10 g/t Au for the LHW lenses, 20 g/t Au for the LFW, LPA and SW Orebody lenses, 30 g/t Au for the BF II and C Orebody lenses and 60 g/t Au for the BA and BF Orebodies. Gold grades were estimated using the inverse distance cubed (ID<sup>3</sup>) method. The wireframe models of the mineralization and excavated material for the Pilar Mine were constructed using the excavation information as of December 31, 2015.
- The mineralized material for each wireframe was initially classified into the Measured, Indicated, or Inferred Mineral Resource category on the basis of the search ellipse ranges obtained from the spatial continuity study, the demonstrated continuity of the gold mineralization, the density of drill hole and chip sample information, and the presence of underground access. A clean-up script was applied in a final stage of the classification process to ensure continuity and consistency of the classified blocks in the model.
- The Mineral Resources are inclusive of Mineral Reserves. For those portions of the Mineral Resources that comprise the Mineral Reserve, the stope design wireframes were used to constrain the Mineral Resource reports.

- Additional Mineral Resources are present that reside beyond the Mineral Reserves outlines as a result of the lower cut-off grade used for reporting of Mineral Resources. These are located as remnants above Level 7 (the limit of the current development) or as additional mineralized areas peripheral to the Mineral Reserve outlines in areas located below the current development. Three-dimensional resource polygons were prepared to aid in the estimation and reporting of the Mineral Resources to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan, section or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.
- At a cut-off grade of 1.93 g/t Au, the Mineral Resources at the Pilar Mine comprise 3.479 million tonnes at an average grade of 4.59 g/t Au containing 514,000 ounces of gold in the Measured and Indicated Resource category and 1.208 million tonnes at an average grade of 5.45 g/t Au containing 212,000 ounces of gold in the Inferred Mineral Resource category.

#### **MINING AND MINERAL RESERVES**

##### **Roça Grande Mine**

- Due to the hiatus in production at Roça Grande Mine, Mineral Reserves have not been estimated.

##### **Pilar Mine**

- At a cut-off grade of 2.5 g/t Au, the Proven and Probable Mineral Reserves at the Pilar Mine comprise 1.22 million tonnes at an average grade of 4.39 g/t Au containing 172,000 ounces of gold.
- Total dilution included in reserves averages approximately 25%, which is a good match for measured results for 2014 mining. Results for 2015 were available for January to June, and show several months with improved dilution results.
- The LOMP for Pilar Mine forecasts just under four years of production, at rates ranging from 800 tpd to 1,100 tpd. Gold production is forecast to average 40,000 ounces per year.
- RPA reviewed a LOMP cash flow model that confirms the economic viability of the Mineral Reserves, at a gold price of US\$1,150/oz and an exchange rate of US\$1.00=BRL3.8.
- It is RPA's opinion that the Pilar Mineral Reserve estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

#### **PROCESSING**

- In RPA's opinion, the processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have

improved over time, resulting in higher recoveries, however, full capacity has not been tested due to lack of plant feed.

#### **ENVIRONMENT AND PERMITTING**

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

#### **LIFE OF MINE PLAN**

- The current LOMP leaves significant capacity for processing more material, should it become available, or conversely, to explore cost saving measures at the plant such as weekend shutdowns or campaign milling.
- RPA reviewed capital and operating cost estimates prepared by Jaguar, and found them to be reasonable.

### **RECOMMENDATIONS**

RPA's recommendations by area are summarized below.

#### **GEOLOGICAL DATA**

- Continue updating the written procedures for the collection of geological and sampling information. The written procedures for entry of this data into the central database and its management should also be updated/prepared.
- Continue with database validation exercises focusing specifically on reducing the error rates for the collar and survey tables in the drill hole database.
- Make a slight modification to the logging procedures whereby detailed information regarding the mineralized intervals will be brought forward from the remarks column and inserted as a major level entry in the drill logs to assist in preparation of future updates to the Mineral Resources.

#### **ASSAY LABORATORY**

- The data collected from programs implemented by the site geologists is entered into the BDI database, which is set up to automatically validate the results, however, the database does not have the functionality to easily extract the data and prepare control charts. The database should be amended as a minimum to improve the data extraction functionality so that standard control charts can be prepared.
- The certificate number for each assay batch should be included into the central BDI database.
- The central BDI database should be updated to store drill core recovery, channel sample recovery, and sample tracking (lost sample) information. This will assist in deciding how to address null values in future resource estimates.

- The Quality Assurance/Quality Control (QA/QC) program should be amended to include the channel samples.
- Analysis of the QA/QC results should be carried out on a regular and timely basis to permit correction of any out-of-bounds results.
- Disseminate the QA/QC results to all relevant parties.
- At present, the pulverizers are cleaned with compressed air and a polyester fibre brush after each sample. As a minimum, the pulverizers should be cleaned with a wire brush. No special protocols are in place to clean the pulverizers after passing a sample of known high gold grade (e.g., RG7). The pulverizers should be cleaned with silica sand after processing each known high grade sample (e.g., Turmalina quartz veins).
- All gold grades are determined by fire assay (FA)–atomic absorption (AA). The AA unit is currently calibrated to direct-read gold values up to 3.3 g/t. Any samples containing gold values in excess of this are analyzed by diluting the solute. High grade samples should be determined using a gravimetric method.
- The assay laboratory automatically re-assays all samples containing gold grades greater than 30 g/t Au, and the average of the re-assays are reported to the sites. All sample results should be reported to the site, without averaging.
- The threshold of 30 g/t Au is high. Re-assay thresholds of 10 g/t Au to 15 g/t Au are commonly used in other gold operations.

#### **MINERAL RESOURCES**

- Structural mapping information should be integrated with isopach maps of the carbonate iron formation at the Roça Grande Mine and trend analyses of the gold distribution to identify any primary controls on the distribution of the BIF-hosted gold mineralization.
- Preparation of a detailed geological model for the Roça Grande Mine will aid in understanding the controls on the distribution of the gold mineralization.
- Preparation of a detailed geological and fault model for the Pilar Mine is warranted. These models will assist in understanding the detailed relationships between the host rocks and timing of the various episodes of mineralization and faulting. The detailed fault model will assist in estimating the amount of dilution that may be experienced during the excavation phase of the operation.
- Continued collection of detailed density measurements of the mineralization at the Roça Grande and Pilar mines is warranted.
- In-fill drilling on the RG01 Orebody along the down-plunge projection of the encouraging drilling results is warranted.
- In-fill drilling of the mineralization found below Level 7 at the Pilar Mine is warranted. The goal of this drilling program is to increase the confidence in the distribution of the mineralization and to assist in preparation of mine schedules.

- A detailed geological review of the controls on the mineralization contained within the SW Orebody at the Pilar Mine should be carried out to aid in selecting high priority areas for future exploration programs.
- Collection of the excavated volumes for the Pilar Mine should be implemented using a digital cavity monitoring unit.
- Amendment of the cut-off grade strategy used for preparation of the mineralization wireframes is warranted to better reflect the potentially economic in-situ gold grades. As a minimum, mineralization wireframes should be created using the incremental cut-off grade for the Pilar and Roça Grande mines, respectively.
- Amendment of the current reconciliation procedures is warranted. As a minimum, the goal of the reconciliation program should be to develop tools and procedures to measure and monitor the accuracy of the block model as well as the amount of planned and unplanned dilution.
- Use of a partial percentage attribute in the block models for the mined out volumes will aid in improving the reconciliation results.
- A detailed evaluation of those Mineral Resources contained within the area of the current mine workings as possible additional feed sources at both the Pilar and Roça Grande mines is warranted.

#### **MINERAL RESERVES**

- Efforts to reduce dilution should continue, and measurements using cavity monitoring systems (CMS) should be used to analyse dilution by mining type. Measured results should be used to choose inputs to the reserve estimation process.

#### **LIFE OF MINE PLAN**

- Review alternative feed sources to utilize unused capacity at the process plant.
- Review alternatives for the plant operating schedule.

## **TECHNICAL SUMMARY**

### **PROPERTY DESCRIPTION AND LOCATION**

The Caeté Mining Complex is located to the east of Belo Horizonte, the capital city of the state of Minas Gerais. The Roça Grande and Pilar mines are located in the municipalities of Caeté and Santa Bárbara, respectively, in the state of Minas Gerais, Brazil. Caeté (35,000 inhabitants) and Santa Bárbara (30,000 inhabitants) are comparably sized towns, located 55 km and 110 km, respectively, from Belo Horizonte. The two towns have good urban infrastructure, including banks, hospitals, schools, and commercial businesses.

The Pilar ore is transported to the plant by trucks using paved and dirt public roads totalling 45 km.

Belo Horizonte is the capital and also the largest city of the state, with a population in excess of four million. It is the major centre for the Brazilian mining industry. A large commercial airport with domestic and international flights services Belo Horizonte, which hosts several state and federal government agencies and private businesses that provide services to the mining industry.

Jaguar maintains a corporate office in Belo Horizonte.

## **LAND TENURE**

The land tenure package for the Caeté Mining Complex comprises 21 mining leases and exploration concessions granted by the National Department of Mineral Production (DNPM), and four surface rights holdings. The mining leases and exploration concessions cover an area totalling 12,971.52 ha. The surface rights holdings comprise ten separate agreements that cover a total area of 741.06 ha.

Mining leases are renewable annually, and have no set expiry date. Each year Jaguar is required to provide information to DNPM summarizing mine production statistics.

Jaguar is obligated to pay a royalty equivalent to 1% of net sales to DNPM. In addition, one royalty payment (0.5% of gross profits) and three lump sum annual rental payments (totalling BRL479,000) are associated with the Caeté Mining Complex.

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

## **EXISTING INFRASTRUCTURE**

The Caeté Mining Complex includes a nominal 2,050 tpd processing plant with separate tailings disposal areas for both fine flotation tailings and CIP tailings. Electrical power supply

is provided through the national power grid. The process plant is located at the Roça Grande Mine at an elevation of approximately 1,250 MASL.

An administration complex is located at the entrance to the plant site, with such ancillary buildings as offices, conference rooms, cafeteria, maintenance shops, compressors (mine and mill), a dry, a first aid station, warehouse, backfill preparation, and a water treatment plant, which is located near the process plant. The assay laboratory and process testing laboratory are also located near the process plant. The Roça Grande Mine is accessed by an adit that is located approximately 800 m to the southwest of the plant at an elevation of approximately 1,100 MASL. Trailers located at the mine adit provide local storage and office space. The explosives and blasting accessories warehouses are located 3.5 km away from the mine area, in compliance with the regulations set forth by the Brazilian Army.

The surface infrastructure at the Pilar Mine is limited to shops, offices, cafeteria, first aid, and warehouse facilities. The mine is accessed by an adit that is located at an elevation of approximately 750 MASL.

## **HISTORY**

Initial exploration activities carried out by Vale between 1973 and 1993 in the Roça Grande Mine area consisted of regional geological, geochemical and geophysical surveys, along with excavation of a number of exploration trenches and diamond drilling to evaluate the gold mineralization found in the area. Vale also carried out geological mapping, geological interpretation, and exploration and in-fill drilling at the Pilar deposit.

In December 2003, Jaguar acquired the Santa Bárbara property, which includes the Pilar mineral concessions, from Vale. In November 2005, Jaguar entered into a mutual exploration and option agreement with Vale that resulted in final transfer of the Roça Grande concessions to Jaguar in December 2010 and August 2011 (Jaguar 2015b).

Jaguar initiated exploration activities at Pilar in 2006 and initially contemplated building a sulphide plant on site, however, the acquisition of the Roça Grande concessions created an opportunity to develop an expanded project, with greater plant capacity to receive ore from several mineral properties.

In December 2008, Jaguar began transporting ore by truck from the Pilar Mine to the Paciência Plant to supplement the ore being supplied from Paciência's Santa Isabel Mine.

In 2007, Jaguar completed a scoping study of the Caeté Project, received the Implementation Licence, and secured the power contract for the start-up. A feasibility study was completed in 2008, and by the end of the third quarter, Jaguar initiated construction for the milling and treatment circuits. After a hiatus due to the 2008/2009 disturbance in global markets, construction resumed and the Caeté plant was commissioned in June 2010. The first gold pour was conducted in August 2010 and commercial production was declared in October 2010.

Production for the Caeté Mining Complex is summarized in Table 1-1.

**TABLE 1-1 CAETÉ MINING COMPLEX PRODUCTION**  
**Jaguar Mining Inc. – Caeté Operations**

Year	Pilar Production		Roça Grande Production		Caeté Plant Production			Ounces Produced
	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Recovery	
2008	6,000	5.95						
2009	121,000	4.20						
2010	311,000	3.39	80,000	2.30	258,000	2.87	93%	17,595
2011	473,000	3.35	166,000	2.30	634,000	3.08	87%	53,175
2012	422,000	3.11	172,000	2.72	594,000	3.00	89%	50,331
2013	454,000	3.04	158,000	2.72	612,000	2.96	88%	51,429
2014	421,000	2.66	175,000	2.32	596,000	2.56	88%	43,228
2015	309,000	3.27	159,000	2.26	468,000	2.93	90%	39,763
<b>Total</b>	<b>2,517,000</b>	<b>3.18</b>	<b>910,000</b>	<b>2.45</b>	<b>3,162,000</b>	<b>2.90</b>	<b>89%</b>	<b>255,521</b>

Note: From 2008 to 2011, some or all of Pilar ore was processed at Paciência.

## **GEOLOGY AND MINERALIZATION**

### **REGIONAL GEOLOGY**

The Roça Grande and Pilar deposits are located in the eastern part of the Iron Quadrangle. Gold has been produced from numerous deposits, primarily in the northern and southeastern parts of the Iron Quadrangle, most hosted by Archean or Early Proterozoic banded iron formations (BIF) contained within greenstone belt supracrustal sequences.

In the Brumal region, outcrops belonging to the granitic gneiss basement of the Nova Lima and Quebra subgroups of the Rio das Velhas Supergroup occur. The granitic gneiss basement

is comprised of leucocratic and homogeneous gneisses and migmatites, making up a complex of an initial tonalitic composition intruded by Archean-aged rocks of granitic composition. The Rio das Velhas Supergroup is regionally represented by schists of the Nova Lima Group and meta-ultramafic rocks of the Quebra Group including serpentinites, talc schists, and metabasalts. The rocks of the Nova Lima Group have been folded and sheared along a northeast-southwest regional trend.

Iron formations occur as the only metasediments in layers with thicknesses up to 10 m. The Nova Lima Group can be subdivided into two units: a unit consisting of talc chlorites and intercalations of iron formation, fuchsite schist, quartz sericite schist, and carbonaceous phyllite; and a unit hosting sulphidized gold bearing iron formation and quartz sericite schists.

#### **ROÇA GRANDE DEPOSIT**

The Roça Grande Mine is located in the upper unit of the Nova Lima Group. The dominant rock types found in the mine are a mixed assemblage of meta-volcanoclastics and meta-tuffs. These are represented by quartz sericite and chlorite schists with variable amounts of carbonate facies BIF, oxide-facies BIF, metacherts, and graphitic schists. The iron formations, chert units, and graphitic schist units are intimately inter-bedded with each other, such that they form an assemblage of chemical and clastic sedimentary units.

Two important BIF horizons are present at the Roça Grande Mine, the North Structure (Structure 1) which hosts the RG01 mineralized body and the South Structure (Structure 2) hosts the RG02, RG03, and RG06 mineralized bodies. The RG07 mineralized body is located immediately in the hanging wall of Structure 1 and is hosted mostly by a quartz vein. The bedding is well defined by the carbonate-facies iron formation and chert found in the BIF horizons, with an overall strike of azimuth 70° to 80°, and dipping approximately 30° to 35° south.

At Roça Grande, gold mineralization is most commonly associated with BIF horizons. In RG01, RG02, RG03, and RG06 mineralized bodies, the gold mineralization is developed roughly parallel to the primary bedding and is related to centimetre-scale bands of massive to disseminated pyrrhotite and arsenopyrite. In many cases, better gold values are located along the hangingwall contact of the iron formation sequence and is hosted by carbonate-facies iron formation. The grades generally decrease towards the footwall where the iron formation becomes more silica-rich.

In the RG07 mineralized body, gold is found to be hosted in quartz veins that are contained within a sericite (chlorite) schist associated with an east-west oriented shear zone (Machado 2010).

#### ***PILAR DEPOSIT***

The Pilar deposit is hosted by the basal units of the Nova Lima Group. The rocks in the region of the mine are comprised of tholeiitic basalts and komatiite flows of the Ouro Fino and Morro Vermelho Units, along with their intrusive equivalents. To the west, these basal units are in fault contact with mica-quartz schists, chlorite-quartz schists, chlorite-sericite schists, and chemical and clastic sedimentary rocks of the Santa Quitéria Unit. The chemical sedimentary rocks include chert and BIF. To the east, the units are in fault contact with migmatites and granitic gneisses of the Bação Complex that form the basement sequence.

On the mine property, all rock units strike in a northeasterly direction. The regional strike of the units changes to a southeasterly direction to the south of the mine property. Regional mapping has found that the foliations mostly dip steeply to the southeast. The regional-scale thrust faults also strike in a northeasterly direction and dip steeply to the southeast on the mine property.

On the property scale, at least three different orientations of faults are recognized. The earliest fault is the northeasterly-striking regional-scale thrust fault that forms the contact between the Santa Quitéria Unit and the Ouro Fino and Morro Vermelho Units. This thrust fault cross-cuts and terminates a more northerly set of faults that have a strike of approximately 020° and dip steeply to the east. The third set of faults are oriented in an east-west orientation and have subvertical dips. The displacement along these faults has been observed in underground exposures to be in the order of one to two metres.

The host rocks of the mine have been affected by at least one period of folding. Structural mapping on the property has shown that the orientation of the fold axes dip approximately 45° to the southeast (azimuth 135°).

The mineralization at the Pilar Mine is hosted by a number of the host rock units including the BIFs along with mafic schists and talc-chlorite schists. Gold mineralization is associated with sulphide mineralization consisting of arsenopyrite and pyrrhotite. Quartz veins and veinlets can also be present, however, the presence of quartz is not a prerequisite for higher gold

values. The sulphide minerals occur mostly as disseminations in the host rock, however, semi-massive to massive concentrations are seen locally over a few tens of centimetres. Quartz veins are typically less than one metre in width.

## MINERAL RESOURCES

RPA has audited and accepted the Mineral Resource estimates prepared by Jaguar for the Roça Grande and Pilar mines. Table 1-2 summarizes the Mineral Resources as of December 31, 2015 based on a US\$1,400/oz gold price. A cut-off grade of 1.46 g/t Au was used to report the Mineral Resources for the Roça Grande Mine, and a cut-off grade of 1.93 g/t Au was used to report the Mineral Resources for the Pilar Mine.

**TABLE 1-2 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2015**  
**Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
<b>Roça Grande Mine:</b>			
Measured	217	2.17	15
Indicated	1,014	2.95	96
<b>Sub-total M&amp;I</b>	<b>1,231</b>	<b>2.81</b>	<b>111</b>
Inferred	1,759	3.48	197
<b>Pilar Mine:</b>			
Measured	709	4.25	97
Indicated	2,770	4.68	417
<b>Sub-total M&amp;I</b>	<b>3,479</b>	<b>4.59</b>	<b>514</b>
Inferred	1,208	5.45	212
<b>Total, Caeté Operations:</b>			
Measured	926	3.76	112
Indicated	3,784	4.22	513
<b>Sub-total M&amp;I</b>	<b>4,710</b>	<b>4.13</b>	<b>625</b>
Inferred	2,967	4.29	409

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au for the Roça Grande Mine and 1.93 g/t Au for the Pilar Mine.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reals: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.
6. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
7. No Mineral Reserves are currently present at the Roça Grande Mine. Mineral Resources are inclusive of Mineral Reserves for the Pilar Mine
8. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
9. Numbers may not add due to rounding.

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

It is RPA's opinion that the Roça Grande and Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

### **ROÇA GRANDE**

The updated block model for the Roça Grande Mine is based on drilling and channel sample data using a data cut-off date of June 30, 2015. The database comprises 649 drill holes and 6,517 channel samples. The estimate was generated from a block model constrained by three-dimensional (3D) wireframe models that were constructed using a minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A minimum width criteria was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres. The gold grades are estimated using the inverse distance cubed interpolation (ID<sup>3</sup>) algorithm using capped composited assays. A capping value of 30 g/t Au was applied for the RG01 and RG06 Orebodies while a capping value of 50 g/t Au was applied for the RG02, RG03 and RG07 Orebodies. The Mineral Resources are reported using the gold grades estimated by the inverse distance cubed (ID<sup>3</sup>) method. The wireframe models of the mineralization and excavated material for the Roça Grande Mine were constructed using the excavation information as of December 31, 2015.

The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with these orebodies.

### **PILAR**

The updated block model for the Pilar Mine is based on drilling and channel sample data using a data cut-off date of July 1, 2015. The database comprises 984 drill holes and 16,445 channel samples. The estimate was generated from a block model constrained by three-dimensional (3D) wireframe models that were constructed using a minimum width of two metres. The gold

grades are estimated using the inverse distance cubed interpolation (ID<sup>3</sup>) algorithm using capped composited assays. Various capping values were applied to each of the different Orebodies, ranging from 60 g/t Au for the BA Orebody to 10 g/t Au for the LHW Orebody. The Mineral Resources are reported using the gold grades estimated by the inverse distance cubed (ID<sup>3</sup>) method. The wireframe models of the mineralization and excavated material for the Pilar Mine were constructed using the excavation information as of December 31, 2015.

The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with this deposit.

## MINERAL RESERVES

Table 1-3 summarizes the Mineral Reserves for Pilar Mine as of December 31, 2015 based on a gold price of US\$1,150/oz. A break-even cut-off grade of 2.5 g/t Au was used to report the Mineral Reserves for the Pilar Mine. Due to the hiatus in production at Roça Grade Mine, Mineral Reserves have not been estimated.

**TABLE 1-3 PILAR MINERAL RESERVES – DECEMBER 31, 2015**  
**Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Proven	164	3.15	17
Probable	1,056	4.58	156
<b>Total</b>	<b>1,220</b>	<b>4.39</b>	<b>172</b>

Notes:

1. CIM definitions were followed for Mineral Reserves.
2. Mineral Reserves are estimated at a break-even cut-off grade of 2.5 g/t Au.
3. Mineral Reserves are estimated using an average long-term gold price of US\$1,150 per ounce and a US\$/BRL\$ exchange rate of 3.8.
4. A minimum mining width of approximately 2 m was used.
5. Bulk densities used are either 2.89 t/m<sup>3</sup> for iron-formation poor domains or 3.05 t/m<sup>3</sup> for iron-formation rich domains.
6. Numbers may not add due to rounding.

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

It is RPA's opinion that the Pilar Mineral Reserve estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

## **MINING METHODS**

At Pilar Mine, gold mineralization is contained within a shear zone with an average 50° to 60° dip. The mineralization is structurally complex due to intense folding and displacements (up to one metre) due to local faulting. This results in direction changes and pinching and swelling of the vein over relatively short distances.

There are two mining methods in use. The cut and fill method is utilized in the narrower sections of the deposit whereas the longhole method is used in the thicker areas. The current LOMP forecasts longhole mining for a majority of the Mineral Reserves. Recent production rates have been approximately 1,300 tpd, accounting for 70% to 75% of the total Caeté Mining Complex mill feed.

The mine is accessed from a five metre by five metre primary decline located in the footwall of the deposit. The portal is located at elevation 760 MASL. The mine is divided into levels with Level 01 established at elevation 690 m. Starting at this point, the vertical clearance is 75 m, i.e., Level 02 is at elevation 615 m, Level 03 at elevation 540 m, etc. A three-metre thick sill pillar is left between levels. Sublevels have also been excavated from the main ramp at 15 m vertical intervals to provide for intermediate access to the mining panels. The decline has reached Level 07, a vertical depth of approximately 500 m.

Longhole mining is carried out on a longitudinal retreat sequence, towards a central access. Stopes are 50 m in length and separated by three metre to five metre wide pillars, depending on the thickness of the zone. When the mining of each longhole stope has been completed, the excavation is filled using a combination of development waste and hydraulically placed cemented classified flotation tailings. Once the cement is allowed to set, the next stope in the sequence is drained of excess water and can be mined. The sequence continues until the entire sublevel is mined. Mining then proceeds upward to the next sublevel and the sequence is repeated until the sill pillar is reached. Stopes are mined from several individual levels simultaneously in order to provide the required number of active workplaces needed to meet production targets.

The mine is highly mechanized. Development and mining activities are accomplished with a fleet of five two-boom electric-hydraulic jumbos. Longhole drilling is completed with two Atlas Copco Simba drills. Three six cubic yard Load-Haul-Dump (LHD) units are used for mucking. A fleet of eight Iveco 25 t trucks and four 10 t trucks are used to haul broken rock to surface.

## LIFE OF MINE PLAN

Stope and development designs, and production scheduling were carried out using Deswik mine design software, and depleted for stopes mined out as of December 31, 2015.

The production schedule covers a mine life of four years based on Mineral Reserves, and is summarized in Table 1-4.

**TABLE 1-4 LOMP PRODUCTION SCHEDULE**  
**Jaguar Mining Inc. – Caeté Operations**

Item	Units	2016	2017	2018	2019	Total
Ore Tonnes	Tonnes	287,000	336,000	281,000	241,000	1,144,000
	g/t Au	3.68	4.71	5.25	4.88	4.62
Total Mill Feed	Tonnes	331,000	372,000	291,000	243,000	1,238,000
	g/t Au	3.39	4.40	5.11	4.84	4.39
	Ounces	36,031	52,705	47,900	37,906	174,542
Recovery	%	90	90	90	90	90
Gold Produced	Ounces	32,428	47,434	43,109	34,115	157,085

RPA notes that the LOMP production schedule includes a small amount of inferred material (18k tonnes at 4.2 g/t Au). This material is not included in Mineral Reserves.

The current LOMP leaves significant capacity for processing more material, should it become available, or conversely, to explore cost saving measures at the plant such as weekend shutdowns or campaign milling.

## MINERAL PROCESSING

The Caeté processing plant has a design capacity of 720,000 tpa of run-of-mine (ROM) ore. In 2015, the plant processed feed from the Pilar and Roça Grande mines. Over the past five

years of operation, the Caeté processing plant operated at approximately 84% of its design capacity. In 2015, this decreased to 65% due to lower ore production from the mines.

Following the completion of a number of modifications to improve the performance of the plant, the overall recovery achieved in 2015 was 89.5%, which is 0.5% higher than planned (89.0%) and an increase of 1.7% compared to 2014 (87.8 %). Gold recovery by flotation improved from 79.8% in 2014 to 85.5% in 2015.

The process flowsheet primarily consists of the following unit steps.

- Crushing
- Grinding
- Gravity Gold Recovery
- Flotation
- Leaching & Carbon-in-Pulp
- Gold Recovery
- Detoxification
- Tailings

In RPA's opinion, the processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been tested due to lack of plant feed.

## **MARKET STUDIES**

Gold is freely traded, at prices that are widely known, so that prospects for sale of any production are virtually assured. A gold price of US\$1,150 per ounce was used for estimating Mineral Reserves. RPA notes that this price is consistent with consensus long-term forecasts, and prices used by other gold producers.

## **ENVIRONMENTAL, PERMITTING AND SOCIAL CONSIDERATIONS**

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

As of December 31, 2015, Jaguar has maintained progressive rehabilitation and reclamation provisions of BRL\$18.2 million for the Roça Grande Mine and the process plant and BRL\$9.6 million for the Pilar Mine which represent the undiscounted, uninflated future payments for the expected rehabilitation costs.

## CAPITAL AND OPERATING COST ESTIMATES

Sustaining capital cost estimates for the Caeté Mining Complex were prepared by Jaguar and include primary access development, mine equipment replacement, plant equipment replacement, tailings dam expansion, and mine closure.

**TABLE 1-5 CAPITAL COSTS (US\$000s)**  
Jaguar Mining Inc. – Caeté Operations

Description	2016	2017	2018	2019	2020	2021	2022	2023-2028	Total
Closure	26	196	194	321	2,103	1,824	297	2,828	7,788
Sustaining	9,527	7,232	1,186	961					18,906
<b>Total</b>	<b>9,554</b>	<b>7,428</b>	<b>4,250</b>	<b>1,282</b>	<b>2,103</b>	<b>1,824</b>	<b>297</b>	<b>2,828</b>	<b>26,694</b>

Operating cost estimates for the Caeté Mining Complex were prepared by Jaguar and include mining, processing, and general and administration (G&A) expenses. Table 1-6 summarizes the operating costs.

**TABLE 1-6 OPERATING COSTS**  
Jaguar Mining Inc. – Caeté Operations

Description	Cost per tonne milled (US\$)				
	2016	2017	2018	2019	Average
Mining	65	58	58	58	60
Processing	18	17	19	21	19
G&A	8	7	9	11	8
<b>Total</b>	<b>91</b>	<b>82</b>	<b>86</b>	<b>90</b>	<b>87</b>

RPA reviewed the cost estimates in comparison to recent operating results, and found them to be reasonable.

## 2 INTRODUCTION

Roscoe Postle Associates Inc. (RPA) was retained by Jaguar Mining Inc. (Jaguar) to assist in preparation and audit of the Mineral Reserve and Mineral Resource estimates for the Caeté Gold Complex, including Roça Grande and Pilar mines, located in Minas Gerais, Brazil. The purpose of this report is to support disclosure of the updated Mineral Reserves and Mineral Resources. This Technical Report conforms to NI 43-101 Standards of Disclosure for Mineral Projects.

Jaguar Mining Inc. is a Canadian-listed junior gold mining, development, and exploration company operating in Brazil with three gold mining complexes. The Company's principle operating assets are located in a greenstone belt in the state of Minas Gerais. The common shares of Jaguar are currently listed on the TSX Venture Exchange under the symbol JAG.

The Caeté Gold Complex is operated by Mineração Serras do Oeste (MSOL), a wholly-owned subsidiary of Jaguar. The Caeté Gold Complex includes a processing plant with a nominal capacity of 2,050 tpd, with separate tailings disposal areas for both fine flotation tailings and carbon-in-pulp (CIP) tailings. Electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine.

The process plant treats ore produced from two mines. Roca Grande Mine recently produced approximately 500 tpd, however, it is currently on hiatus pending a review of mining plans. Pilar Mine recently produced approximately 1,300 tpd, however, current Life of Mine Plans forecast lower production rates.

### SOURCES OF INFORMATION

Site visits to the Roça Grande Mine and to the Pilar Mine were carried out by Mr. Jason Cox, P. Eng., RPA Principal Mining Engineer, and Mr. Reno Pressacco, P. Geo., RPA Principal Geologist, on November 22, 2014 and November 21, 2014, respectively. Messrs. Cox and Pressacco were accompanied by Mr. Jean-Marc Lopez, Director – Mine Geology.

A summary of the Jaguar staff and its consultants who contributed to the preparation of the Mineral Resource and Mineral Reserve estimates for the Pilar and Roça Grande mines is presented below.

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<b>Name</b>	<b>Position</b>	<b>Company</b>	<b>Mine/Project</b>
Helbert Taylor	Senior Geologist	Jaguar	Corporate
Jean-Marc Lopez	Director - Mine Geology	Jaguar	Corporate
Jim Healy	VP of Development Projects	Jaguar	Corporate
Marcos Dias Alvim	Project Development Manager	Jaguar	Corporate
Elias de Oliveira Andrade	Geology Manager	Jaguar	Pilar
Rômulo Prado	Operation Manager	Jaguar	Pilar
Marcus Eduardo Nilton Viera Neri	Structural Geologist	Jaguar	Pilar
Igor Savaiva	Mining Engineer	Jaguar	Pilar
Edson Cassemiro	Plant Manager	Jaguar	Roça Grande
José Carlos Chaves	Operation Manager	Jaguar	Roça Grande
Jussara de Fátima Toffoli	Mine Geologist	Jaguar	Roça Grande
Luiz Henrique Lisboa	Geology Manager	Jaguar	Roça Grande
Marco Túlio Naves	Laboratory Manager	Jaguar	Roça Grande
Bruno Gadelha	Senior Mining Engineer	MCB	
Fernando Madeira	Senior Mining Engineer	MCB	

Mr. Cox and Mr. Pressacco are the Qualified Persons taking responsibility for this Technical Report. A summary of the individual contributions of each of the authors to this report is provided in Section 29 Certificates of Qualified Persons.

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. All currency in this report is US dollars (US\$) unless otherwise noted.

a	annum	kWh	kilowatt-hour
A	ampere	L	litre
bbl	barrels	lb	pound
btu	British thermal units	L/s	litres per second
°C	degree Celsius	m	metre
C\$	Canadian dollars	M	mega (million); molar
cal	calorie	m <sup>2</sup>	square metre
cfm	cubic feet per minute	m <sup>3</sup>	cubic metre
cm	centimetre	μ	micron
cm <sup>2</sup>	square centimetre	MASL	metres above sea level
d	day	μg	microgram
dia	diameter	m <sup>3</sup> /h	cubic metres per hour
dmt	dry metric tonne	mi	mile
dwt	dead-weight ton	min	minute
°F	degree Fahrenheit	μm	micrometre
ft	foot	mm	millimetre
ft <sup>2</sup>	square foot	mph	miles per hour
ft <sup>3</sup>	cubic foot	MVA	megavolt-amperes
ft/s	foot per second	MW	megawatt
g	gram	MWh	megawatt-hour
G	giga (billion)	oz	Troy ounce (31.1035g)
Gal	Imperial gallon	oz/st, opt	ounce per short ton
g/L	gram per litre	ppb	part per billion
Gpm	Imperial gallons per minute	ppm	part per million
g/t	gram per tonne	psia	pound per square inch absolute
gr/ft <sup>3</sup>	grain per cubic foot	Psig	pound per square inch gauge
		R\$ or BRL	Brazilian Real
gr/m <sup>3</sup>	grain per cubic metre	RL	relative elevation
ha	hectare	s	second
hp	horsepower	st	short ton
hr	hour	stpa	short ton per year
Hz	hertz	stpd	short ton per day
in.	inch	t	metric tonne
in <sup>2</sup>	square inch	tpa	metric tonne per year
J	joule	tpd	metric tonne per day
k	kilo (thousand)	US\$	United States dollar
kcal	kilocalorie	USg	United States gallon
kg	kilogram	USgpm	US gallon per minute
km	kilometre	V	volt
km <sup>2</sup>	square kilometre	W	watt
km/h	kilometre per hour	wmt	wet metric tonne
kPa	kilopascal	wt%	weight percent
kVA	kilovolt-amperes	yd <sup>3</sup>	cubic yard
kW	kilowatt	yr	year

### 3 RELIANCE ON OTHER EXPERTS

This report has been prepared by Roscoe Postle Associates Inc. (RPA) for Jaguar Mining Inc. (Jaguar). The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to RPA at the time of preparation of this report,
- Assumptions, conditions, and qualifications as set forth in this report, and
- Data, reports, and other information supplied by Jaguar and other third party sources.

For the purpose of this report, RPA has relied on ownership information provided by Jaguar. RPA has not researched property title or mineral rights for the Roça Grande and Pilar mining operations and expresses no opinion as to the ownership status of the property.

RPA has relied on Jaguar for guidance on applicable taxes, royalties, and other government levies or interests, applicable to revenue or income from the Roça Grande and Pilar mining operations.

Except for the purposes legislated under provincial securities laws, any use of this report by any third party is at that party's sole risk.

## 4 PROPERTY DESCRIPTION AND LOCATION

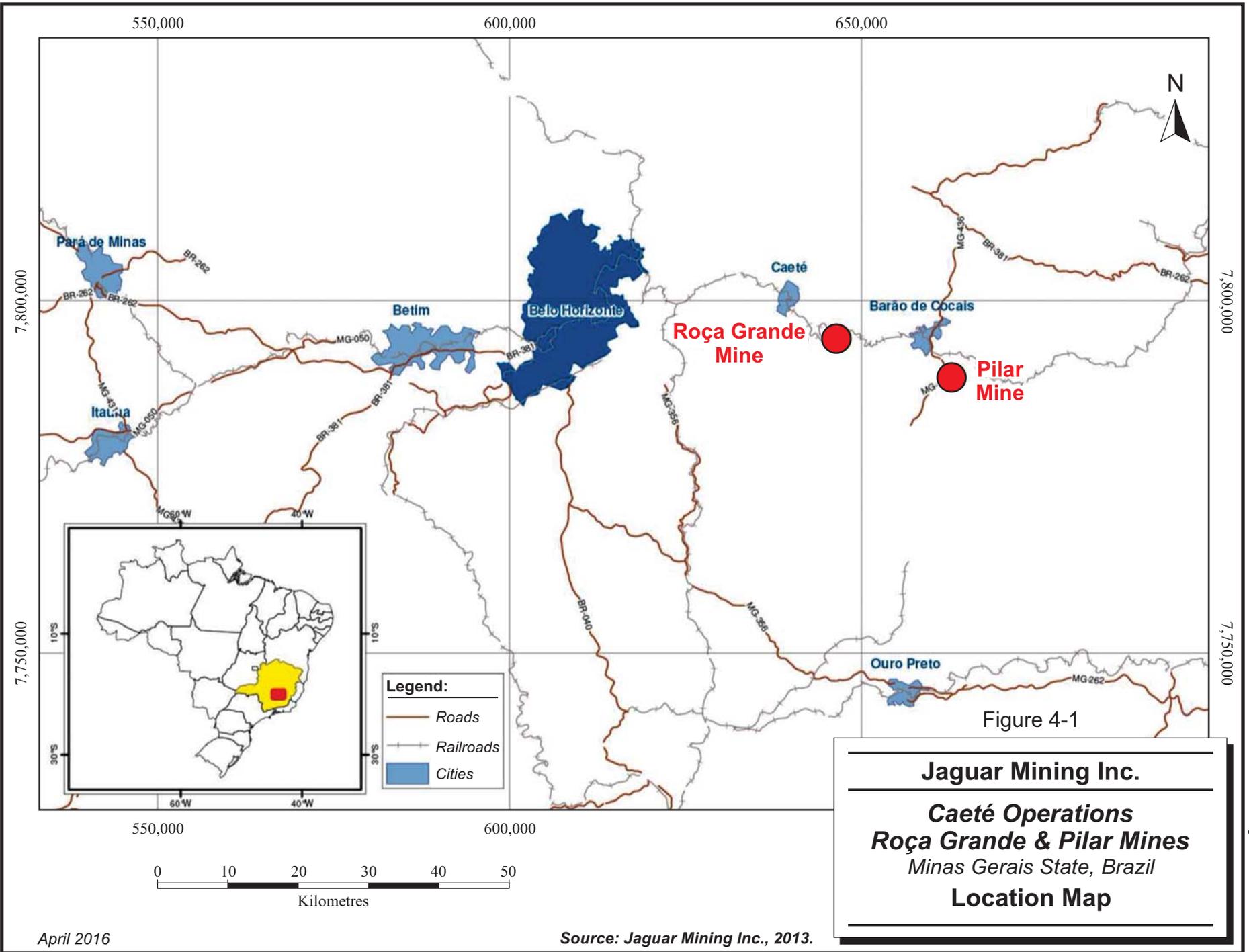
The Roça Grande and Pilar mines form the Caeté Mining Complex, located to the east of Belo Horizonte, the capital city of the state of Minas Gerais (Figures 4-1 and 4-2). Both mines share the same milling complex and are reported together in this Technical Report. The processing plant is located at the Roça Grande Mine. The Roça Grande and Pilar mines are located in the municipalities of Caeté and Santa Bárbara, respectively, in the state of Minas Gerais, Brazil. Caeté (35,000 inhabitants) and Santa Bárbara (30,000 inhabitants) are comparably sized towns, located 55 km and 110 km, respectively, from Belo Horizonte. The two towns have good urban infrastructure, including banks, hospitals, schools, and commercial businesses.

From Caeté, the main access to the plant site and to the Roça Grande Mine is by a seven kilometre public dirt road that links Caeté to the town of Barão de Cocais. The Roça Grande Mine has geographic coordinates of 19°57' S latitude and 43°38' W longitude.

The Pilar ore is transported to the plant by trucks using paved and dirt public roads totalling 45 km. The Pilar Mine has geographic coordinates of 19°58'4.43" S latitude and 43°28' 25.70" W longitude.

Belo Horizonte is the capital and also the largest city of the state, with a population in excess of four million. It is the major centre for the Brazilian mining industry. A large commercial airport with domestic and international flights services Belo Horizonte, which hosts several state and federal government agencies and private businesses that provide services to the mining industry.

Jaguar maintains a corporate office in Belo Horizonte.



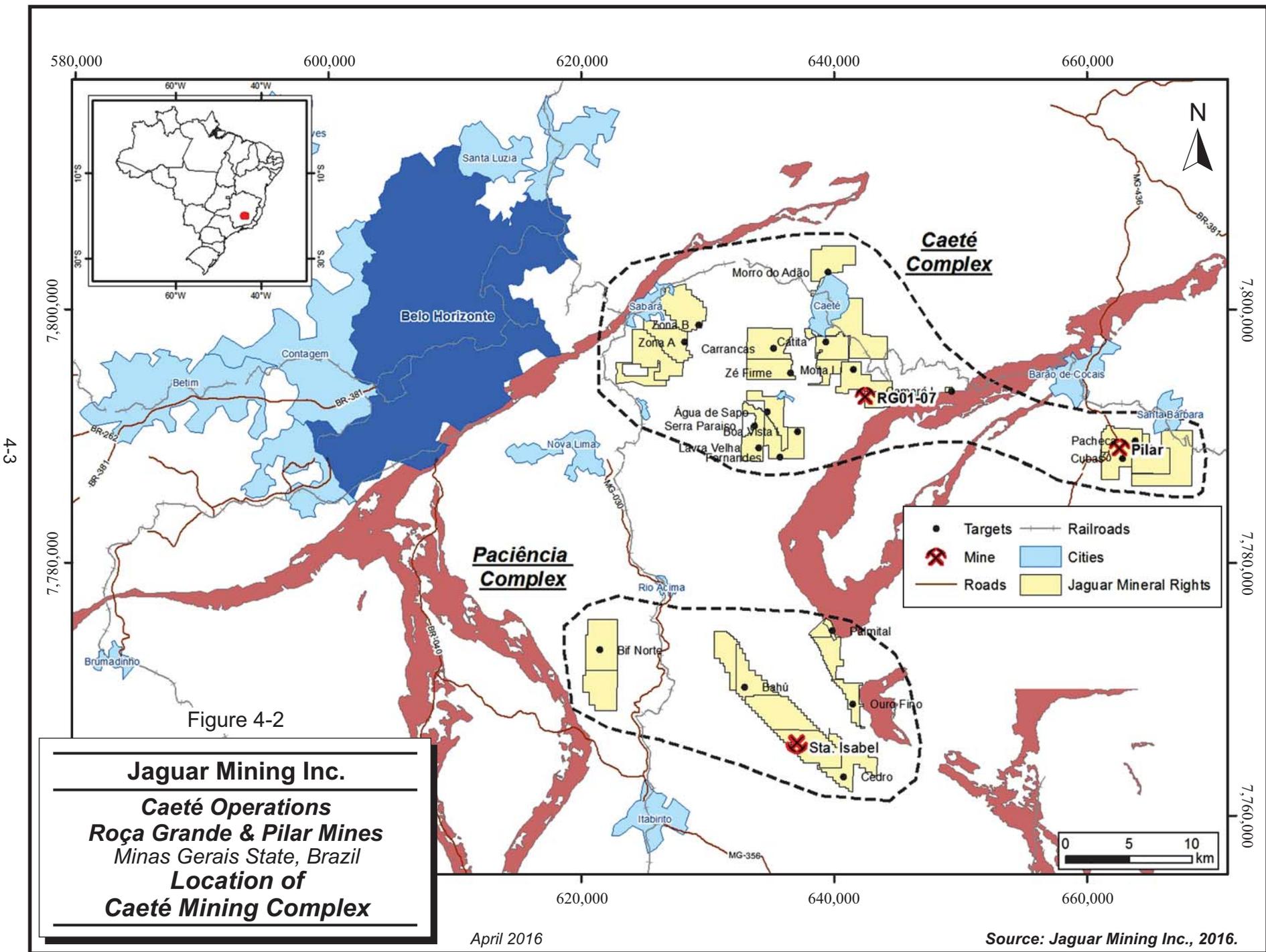


Figure 4-2

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande & Pilar Mines**  
 Minas Gerais State, Brazil  
**Location of**  
**Caeté Mining Complex**

## MINERAL TENURE AND SURFACE RIGHTS

The land tenure package for the Caeté Operations comprises 21 mining leases and exploration concessions granted by the National Department of Mineral Production (DNPM), and four surface rights holdings (Figures 4-3 and 4-4). The mining leases and exploration concessions cover an area totalling 12,971.52 ha (Table 4-1). The surface rights holdings comprise ten separate agreements that cover a total area of 741.06 ha (Table 4-2).

**TABLE 4-1 SUMMARY OF MINERAL RIGHTS HOLDINGS**  
**Jaguar Mining Inc. – Caeté Operations**

DNPM No.	Ownership	Concession	Area (ha)	Status
831.878/2013	MCT		35.33	Exploration Licence
807.482/1976	MSOL	Boa Vista	675.18	Mining Concession
830.938/1979	MSOL	Catita	521.70	Mining Concession
830.940/1979	MSOL	Juca Vieira	285.32	Mining Concession
830.463/1983	MSOL	Pilar	961.66	Mining Concession
830.402/2016	MTL	Pilar	1,237.95	Exploration Licence
831.057/2010	MSOL	RG01,02,05,06 and 07	193.08	Application for Mining Concession
831.056/2010	MSOL	RG03	706.03	Application for Mining Concession
830.038/2015	MSOL	Camará 1	12.72	Application for Mining Concession
830.037/2015	MSOL	Camará 1	8.15	Application for Mining Concession
830.935/1979	MSOL	Morro do Adão	728.38	Application for Mining Concession
832.152/2002	MSOL	Serra Paraíso	600.24	Application for Mining Concession
831.371/2003	MSOL	Zé Firme	583.42	Final Exploration Report submitted to DNPM
834.409/2007	MSOL	Água de Sapo	550.61	Final Exploration Licence
834.126/2007	MSOL	Carrancas	808.95	Final Exploration Licence
831.817/2003	MSOL	Moita W	1,583.69	Application for final Exploration Licence
830.187/2004	MSOL	Cubas	600.00	Application for final Exploration Licence
430.001/1935	MSOL	Sabará – ZB	1,000.01	Mining Concession
430.002/1935	MSOL	Sabará – ZA	654.41	Mining Concession
831.282/2002	MSOL		884.70	Application for Mining Concession
832.230/2003	MSOL		339.99	Final Exploration Licence
<b>TOTAL</b>			<b>12,971.52</b>	

**TABLE 4-2 SUMMARY OF SURFACE RIGHTS HOLDINGS  
Jaguar Mining Inc. – Caeté Operations**

<b>Fazenda</b>	<b>Area (ha)</b>	<b>Registry No.</b>	<b>Orebody or Utility</b>	<b>20% Area Forest Legal Reserve</b>
Velha/Navantinho Peixoto	140.00	Pending		Inactive The legal reserve area of 28.00 ha
Trindade	184.78	2920	Camará II	Inactive Not Available
Roça Grande	41.65	13171		Inactive The legal reserve area of 8.95 ha
Roça Grande	177.71	13172	RG01, RG07 and RG05	Active The legal reserve area of 64,07 ha
Gongo Soco	64.00	8854	RG02, RG03 and RG06	Inactive Not Available
Serra Luis Soares	9.38	13170		The legal reserve area of 8,17 ha
Serra Luis Soares	99.47	12734	Processing Plant	Active Not Available
Santa Rita	23.55	11379	Catita I	Inactive The legal reserve area of 4,29 ha
<b>Total</b>	<b>740.54</b>			

Mining leases are renewable annually, and have no set expiry date. Each year Jaguar is required to provide information to DNPM summarizing mine production statistics. Exploration concessions are granted for a period of three years. Once a company has applied for an exploration concession, the applicant holds a priority right to the concession area as long as there is no previous ownership. The owner of the concession can apply to have the exploration concession renewed for one-time extension for a period of two or three years. Renewal is at the sole discretion of DNPM. Granted exploration concessions are published in the Official Gazette of the Republic (OGR), which lists individual concessions and their change in status. The exploration concession grants the owner the sub-surface mineral rights. Surface rights can be applied for if the land is not owned by a third party.

The owner of an exploration concession is guaranteed, by law, access to perform exploration field work, provided adequate compensation is paid to third party landowners and the owner accepts all environmental liabilities resulting from the exploration work. The exploration permits are subject to annual fees based on its size.

The location of the mineralized wireframes in relation to the property boundaries for the Roça Grande Mine and the Pilar Mine are shown in Figures 4-5 and 4-6, respectively.

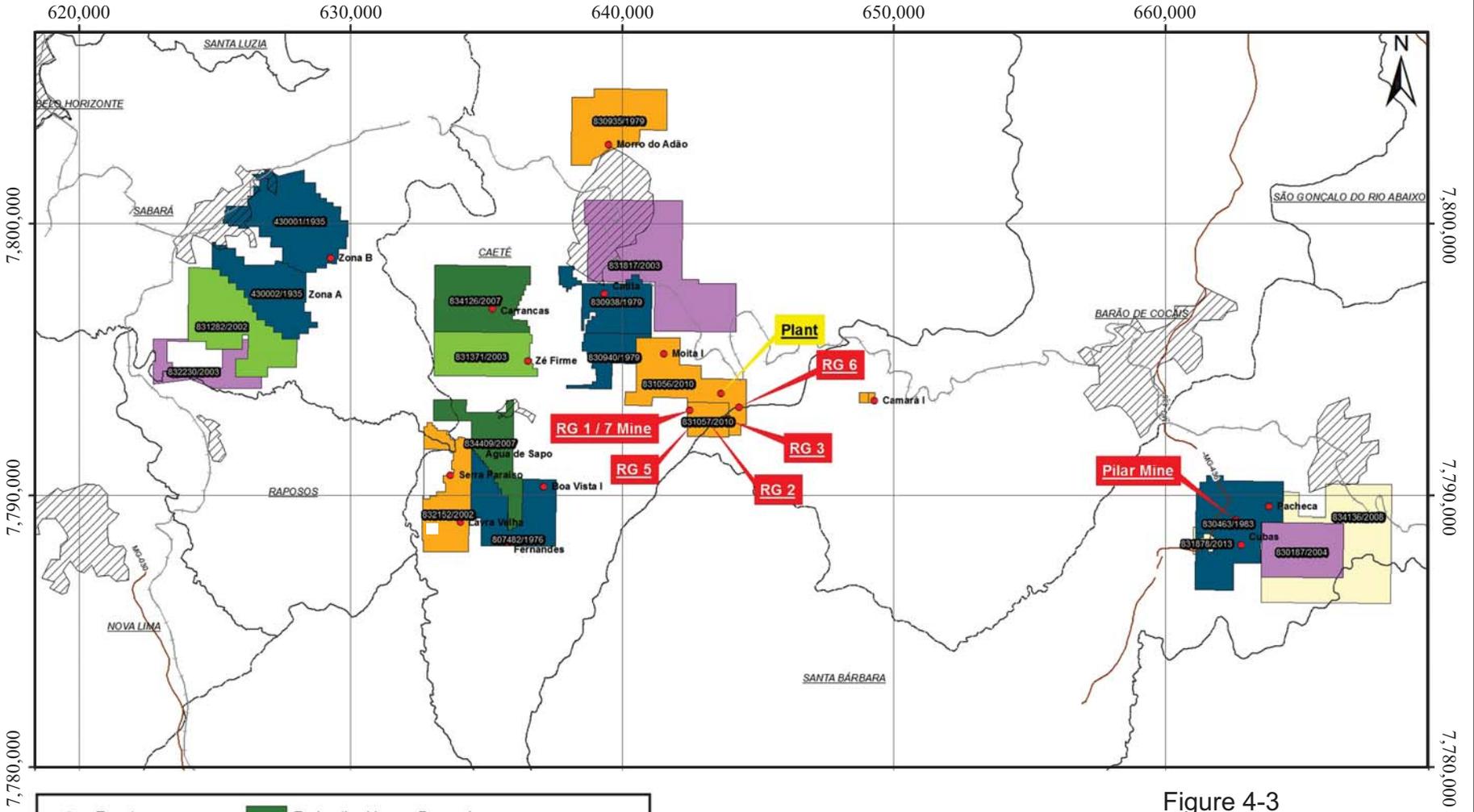


Figure 4-3

<span style="color: red;">●</span> Targets	<span style="background-color: #388e3c; color: white;"> </span> Exploration License Renewal
Roads	<span style="background-color: #8bc34a; color: white;"> </span> Exploration License Renewal (Positive Final report filed)
Railroads	<span style="background-color: #ffcdd2; color: white;"> </span> Exploration License Renewal (Appeal accepted)
Municipality	<span style="background-color: #9c27b0; color: white;"> </span> Exploration License Renewal Application
Urban Area	<span style="background-color: #ffc107; color: white;"> </span> Mining Concession Application
<b>Mineral Rights - Status</b>	<span style="background-color: #d32f2f; color: white;"> </span> Mining Concession (Partial Cession from Vale)
<span style="background-color: #fff9c4; color: black;"> </span> Exploration Application	<span style="background-color: #007060; color: white;"> </span> Mining Concession

UNIVERSAL TRANSVERSE MERCATOR PROJECTION - UTM  
 CENTRAL MERIDIAN: 45° WGR  
 ZONE: 23S  
 VERTICAL DATUM: LOCAL  
 HORIZONTAL DATUM: SIRGAS2000

**Jaguar Mining Inc.**

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**Caeté Operations**  
**Roça Grande & Pilar Mines**  
 Minas Gerais State, Brazil

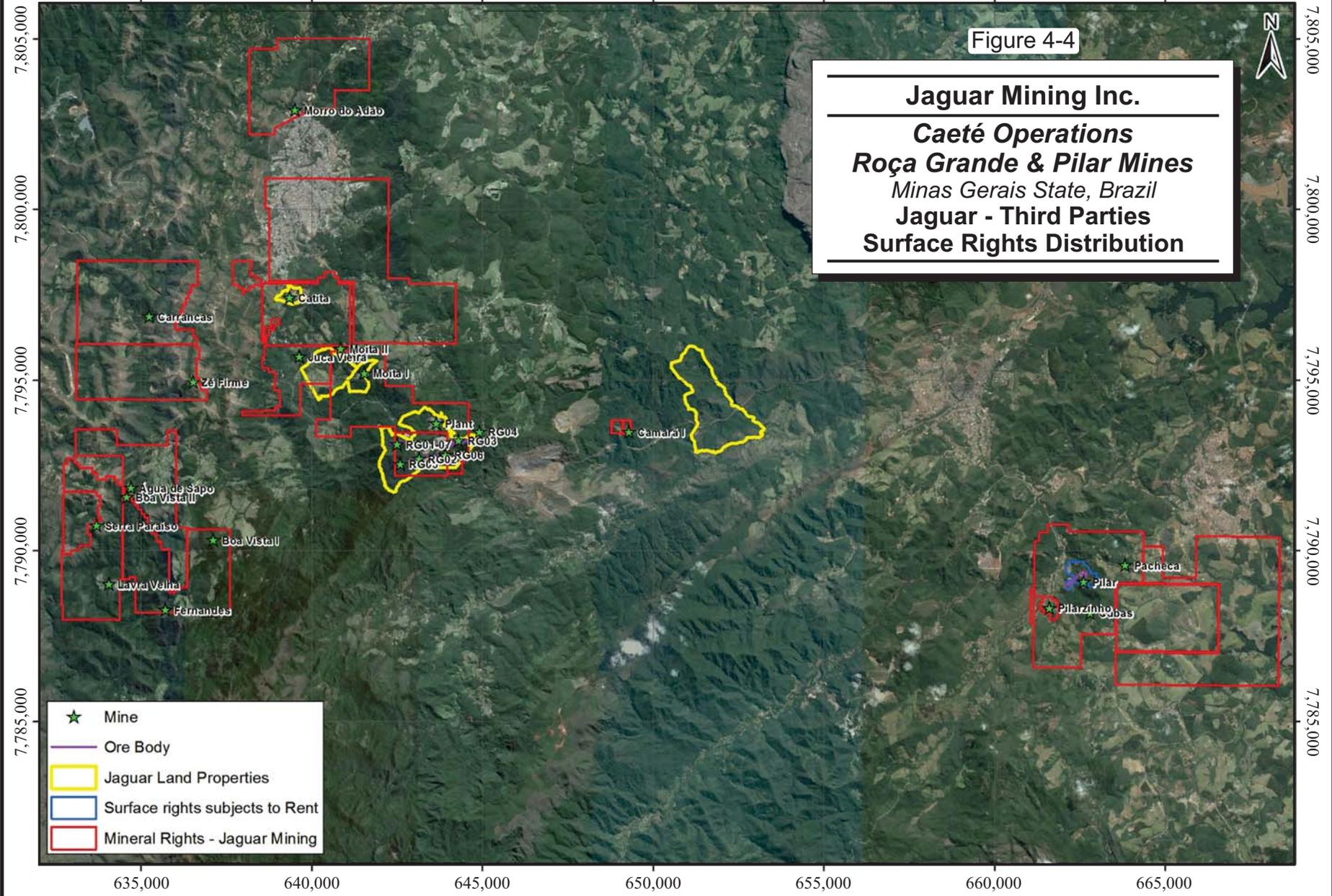
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**Mineral Rights Distribution**

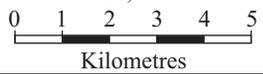
Figure 4-4

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande & Pilar Mines**  
 Minas Gerais State, Brazil  
**Jaguar - Third Parties**  
**Surface Rights Distribution**

4-7

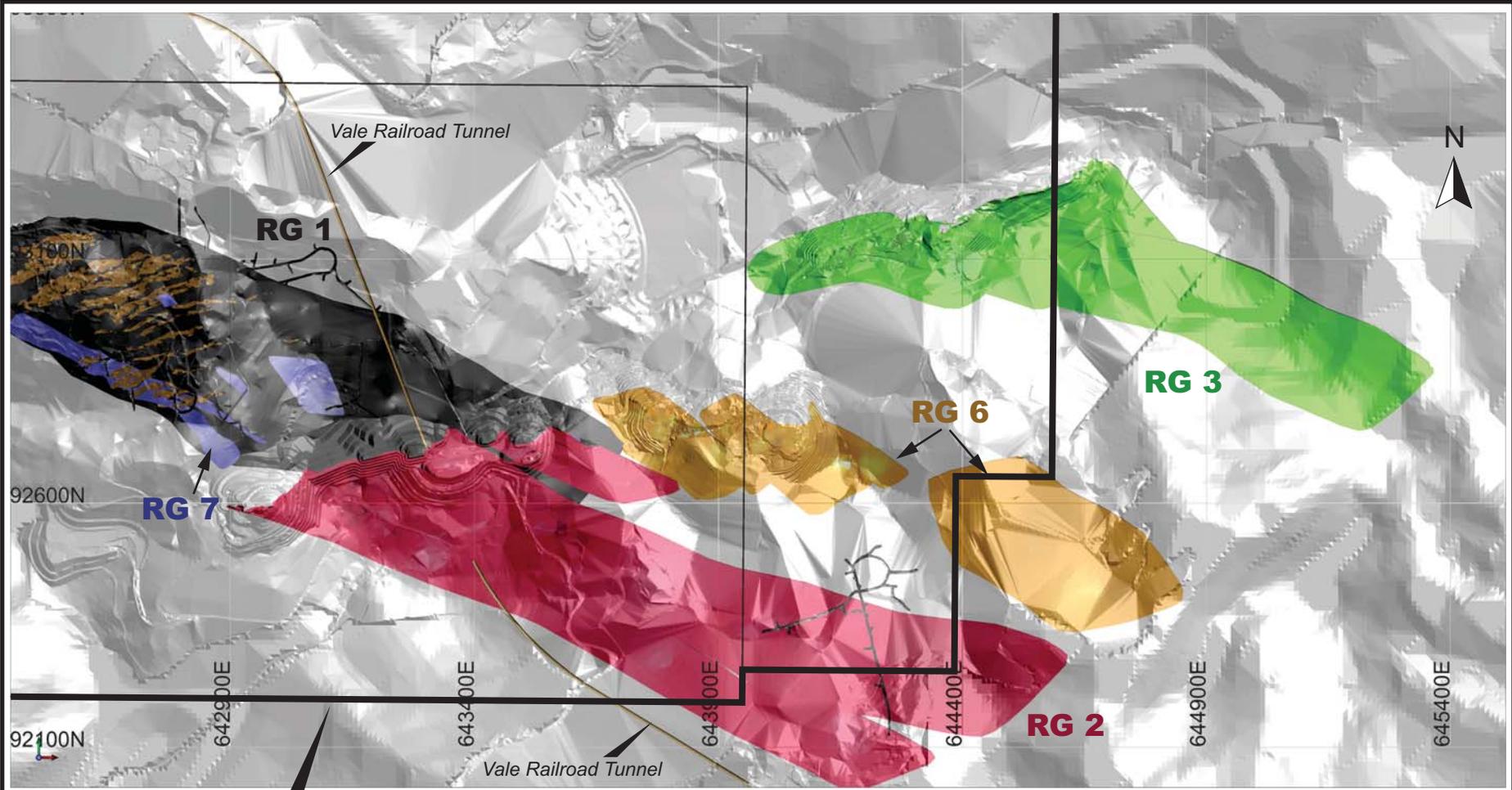


- ★ Mine
- Ore Body
- ▭ Jaguar Land Properties
- ▭ Surface rights subjects to Rent
- ▭ Mineral Rights - Jaguar Mining

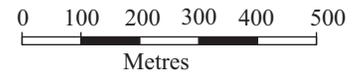


April 2016

Source: Jaguar Mining Inc., 2016.



Roça Grande Property Boundary



**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
Minas Gerais State, Brazil  
**Location of Mineralized Wireframes**

Figure 4-5

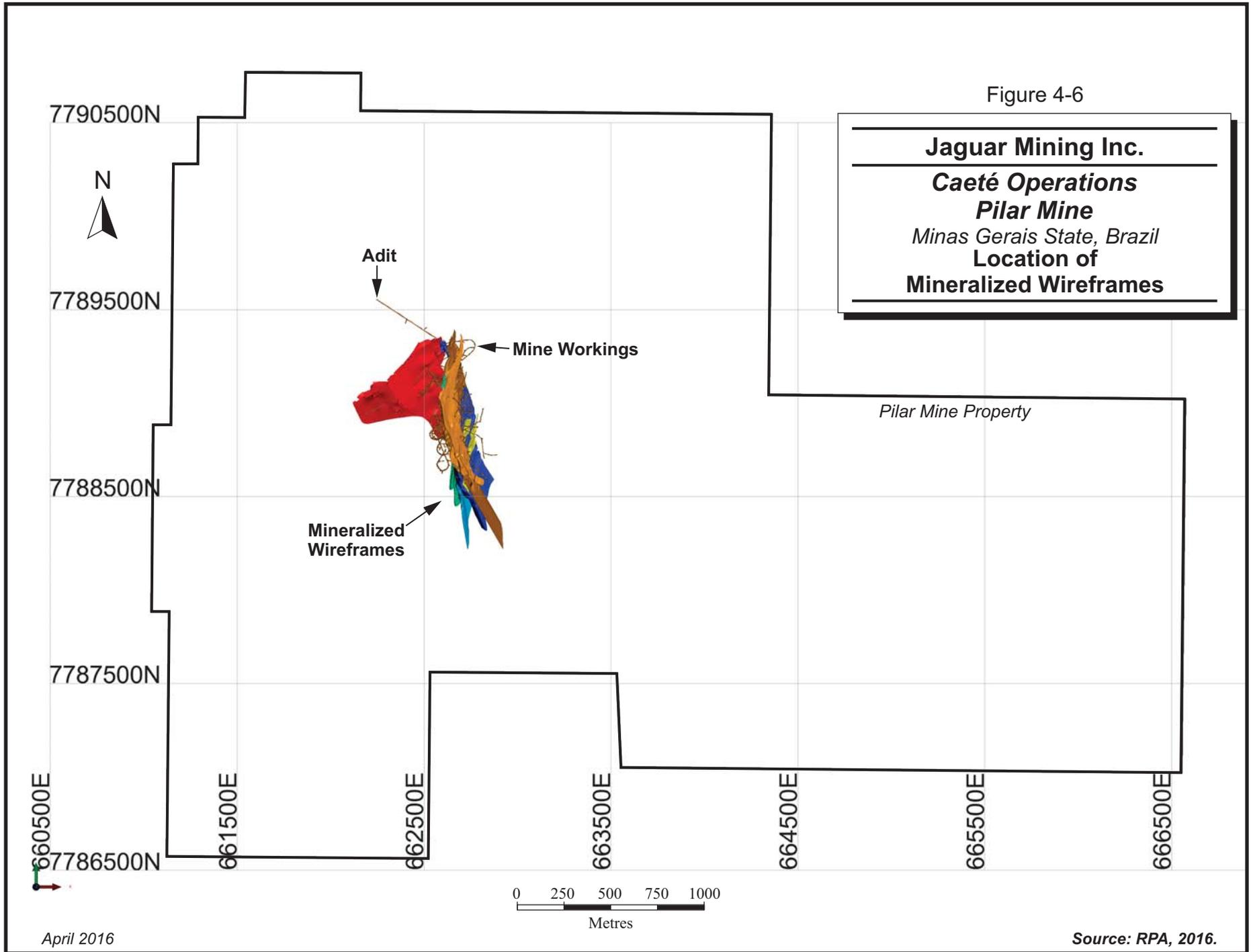
Figure 4-6

**Jaguar Mining Inc.**

**Caeté Operations  
Pilar Mine**

*Minas Gerais State, Brazil*  
**Location of  
Mineralized Wireframes**

4-9



*Pilar Mine Property*

7790500N  
7789500N  
7788500N  
7787500N  
7786500N  
660500E  
661500E  
662500E  
663500E  
664500E  
665500E  
666500E

0 250 500 750 1000  
Metres

April 2016

Source: RPA, 2016.

## ROYALTIES AND OTHER ENCUMBRANCES

Jaguar must pay a royalty equivalent to 1% of net sales to DNPM. In addition, one royalty payment and three lump sum annual rental payments are associated with the Caeté Operations (Table 4-3).

**TABLE 4-3 SUMMARY OF ROYALTIES AND RENTS**  
**Jaguar Mining Inc. – Caeté Operations**

Owner	Royalty	Orebody or Utility	Payments (BRL)
<b>Royalties:</b>			
Carlos Marcelani	0.5% of Production Gross Profits (Concession 830.463/1983)	Pilar office, Mechanic Shop, BA, BF, BFII and SW orebodies	478,541

RPA is not aware of any environmental liabilities on the property. Jaguar has all required permits to conduct the proposed work on the property. RPA 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**

### **ACCESSIBILITY**

The Roça Grande and Pilar properties can be accessed via the federal highway BR 381 and state paved roads. The distance from Belo Horizonte to the town of Caeté is 110 km along paved roads and eight kilometres from Caeté to the Roça Grande Mine site by dirt road. Access to the Pilar Mine is provided by a paved highway from both Belo Horizonte (93 km) and Santa Bárbara (7 km). A partially paved, 45 km secondary road is used to transport Pilar run-of-mine (ROM) ore to the processing plant that is located at the Roça Grande Mine.

### **CLIMATE**

The Caeté Mining Complex lies approximately 1,000 MASL. The terrain in the area is rugged in many places, with numerous rolling hills incised by deep gullies along drainage channels. The relief in the area is approximately 400 m. Farming and ranching activities are carried out in approximately 50% of the region.

Annual rainfall in area of the Roça Grande and Pilar mines averages between 1,300 mm and 2,300 mm, 84% of which falls during the rainy season between October and March. Most of the precipitation falls in the months of December and January. The surface winds have a generally low average speed (<1 m/s), and are predominantly from the south and southeast.

The annual average temperature is slightly above 20°C. Air humidity does not exceed 90%, even during the summer months. The annual average evaporation is approximately 934 mm. The climate is suitable for year-round operations.

### **LOCAL RESOURCES**

Belo Horizonte is one of the world's mining capitals with a regional population in the range of four million people. Automobile manufacturing and mining services dominate the economy. General Electric has a major locomotive plant which produces engines for all of South America

and Africa. Mining activities in Belo Horizonte and the surrounding area have been carried out in a relatively consistent manner for over 300 years.

This mining region has historically produced significant quantities of gold and iron from open pit and large-scale underground mining operations operated by AngloGold Ashanti, VALE, Companhia Siderúrgica Nacional (CSN), and Eldorado Gold Corp. Belo Horizonte is a well-developed urban metropolis and has substantial infrastructure including two airports, an extensive network of paved highways, a fully developed and reliable power grid, and ready access to process and potable water.

Caeté is a town of approximately 35,000 people. The town has good urban infrastructure, including banks, hospitals, schools, and commercial businesses. The local economy is based on agriculture and iron mining. Manpower, energy, and water are readily available. The mine is supplied by electric power from the Brazilian national grid, but back-up generator power is also available at the mine site.

## **INFRASTRUCTURE**

The Caeté Mining Complex includes a nominal 2,050 tpd processing plant with separate tailings disposal areas for both fine flotation tailings and CIP tailings. Electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine at an elevation of approximately 1,250 MASL.

An administration complex is located at the entrance to the plant site, with such ancillary buildings as offices, conference rooms, cafeteria, maintenance shops, compressors (mine and mill), a dry, a first aid station, warehouse, backfill preparation, and a water treatment plant, which is located near the process plant. The assay laboratory and process testing laboratory are also located near the process plant. The Roça Grande Mine is accessed by an adit that is located approximately 800 m to the southwest of the plant at an elevation of approximately 1,100 MASL. Trailers located at the mine adit provide local storage and office space. The explosives and blasting accessories warehouses are located 3.5 km away from the mine area, in compliance with the regulations set forth by the Brazilian Army.

The surface infrastructure at the Pilar Mine is limited to shops, offices, cafeteria, first aid, and warehouse facilities. The mine is accessed by an adit that is located at an elevation of approximately 750 MASL.

A railroad tunnel measuring approximately seven metres wide by six metres high traverses the Roça Grande Mine area at approximately 1,050 MASL. The tunnel is owned and operated by Vale and intersects the mineralized wireframe of the RG02 lens at an elevation of approximately 1,055 MASL.

RPA noted that the Pilar Mine and the Caeté Mining Complex were well run and organized, provided a safe environment for the mine workforce, and had well maintained maintenance and equipment facilities. The facilities are of a size and quality capable of supporting the forecasted production rates.

## 6 HISTORY

### PRIOR OWNERSHIP

In December 2003, Jaguar acquired the Santa Bárbara property, which includes the Pilar mineral concessions, from Vale. In November 2005, Jaguar entered into a mutual exploration and option agreement with Vale with respect to six concessions, known as the Roça Grande concessions, located on 9,500 acres of highly prospective gold properties along 25 km of a key geological trend in the Iron Quadrangle. The contract between Jaguar and Vale provided Jaguar with the exclusive right over a 28 month period beginning November 28, 2005 to explore and conduct feasibility studies and to acquire gold mining rights in the Vale properties if the studies supported economical mining operations. The contract granted corresponding rights for Vale to explore the Jaguar property for iron and acquire mineral rights in the property during a three-year period. In November 2007, Jaguar notified Vale of its intent to exercise the option to acquire all six Roça Grande concessions. The final transfers of the Roça Grande concessions to Jaguar were concluded in December 2010 and August 2011 (Jaguar 2015b). In November 2014, four of the six Roça Grande concessions acquired from Vale were returned to Vale by amending the original contract.

### EXPLORATION AND DEVELOPMENT HISTORY

Initial exploration activities carried out by Vale in the Roça Grande Mine area consisted of regional geological, geochemical and geophysical surveys, along with excavation of a number of exploration trenches and diamond drilling to evaluate the gold mineralization found in the area. In total, 4,746 stream sediment samples were collected and 4,350 m of trenches were excavated during the 1973 to 1993 period.

Vale carried out geological mapping, geological interpretation, and exploration and in-fill drilling at the Pilar deposit. Eldorado Gold Corp. executed a small drilling campaign to evaluate the deposit from 2002 to 2003 (Machado, 2010).

Soil sampling programs have been carried out throughout the various claim blocks that comprise the CCA project. A summary of the soil samples collected by the various mining companies is presented in Table 6-1.

**TABLE 6-1 CCA SOIL SAMPLES BY MINING COMPANY**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Company</b>	<b>Total</b>
MMV (Anglo)	1,270
DOCEGEO (Vale)	7,899
WMC (Western Mining Co.)	2,674
Jaguar Mining	10,472
<b>Grand Total</b>	<b>22,315</b>

Jaguar initiated exploration activities at Pilar in 2006 and initially contemplated building a sulphide plant on site, however, the acquisition of the Roça Grande concessions created an opportunity to develop an expanded project, with greater plant capacity to receive ore from several mineral properties.

In 2007, Jaguar completed a scoping study of the Caeté Project, received the Implementation Licence, secured the power contract for the start-up, and commissioned TechnoMine to prepare a NI 43-101 technical report on the Caeté Project mineral resources, which was completed during the year.

In 2008, expansion plans at the Caeté Project continued as TechnoMine completed a feasibility study. By the end of the third quarter in 2008, all necessary permits and licences for the construction and commissioning phase of the Caeté Project had been received and Jaguar initiated civil works for the milling and treatment circuits.

In November 2008, due to the decline in gold prices, the financial markets and worldwide equity values, including the gold sector, Jaguar temporarily suspended development of the Caeté Project pending an assessment of market conditions and the availability of capital to move the project forward. Consistent with the decision to suspend the development of the Caeté Project, underground work at the Roça Grande Mine was temporarily suspended; however, development at the Pilar Mine continued.

In December 2008, Jaguar began transporting ore by truck from the Pilar Mine to the Paciência Plant to supplement the ore being supplied from Paciência's Santa Isabel Mine.

In March 2009, Jaguar completed an \$86.3 million equity offering, the proceeds of which were primarily used to restart development and construction at Caeté. During 2009 and part of 2010, Jaguar focused on the implementation and construction of the Caeté Project.

The Caeté plant was commissioned in June 2010. The first gold pour was conducted in August 2010 and commercial production was declared in October 2010. Capital expenditures for the Caeté Project totalled US\$127 million (Jaguar 2015b).

At the Roça Grande Mine, mining activities focussed on the RG01 deposit. The principal access to the mine is provided by an adit and ramp system that has been developed to the 925 m elevation, approximately 175 m below the elevation of the adit collar. A cross-cut to the south was begun from the 1,070 m elevation to provide access to the RG02 deposit but was abandoned when it encountered poor ground conditions (Figure 6-1).

The principal access to the Pilar Mine is provided by an adit and ramp system that has been developed to the 245 m elevation, approximately 500 m below the elevation of the adit collar (Figure 6-2). Mining activities are focussed on a number of separate zones, however, the bulk of the production is being derived from the BA, BF, and BF II zones. It is important to note that the previous naming system for the different mineralized zones has been updated as a result of the current work due to a better understanding of the controls on the gold distribution. A comparison of the new naming convention with the previous naming convention is presented in Table 6-2.

**TABLE 6-2 COMPARISON OF NAMING CONVENTIONS AT THE  
PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

<b>Previous Orebody Name</b>	<b>Revised Orebody Name</b>
AB	101-BA (111=FW, 112=HW) 102-BF (121=FW, 122=HW) 103-BF II (131=FW, 132=HW) 200-LFW 300-LPA 400-LHW
C	500-C
Southwest	600-SW

### View Towards Azimuth 340°

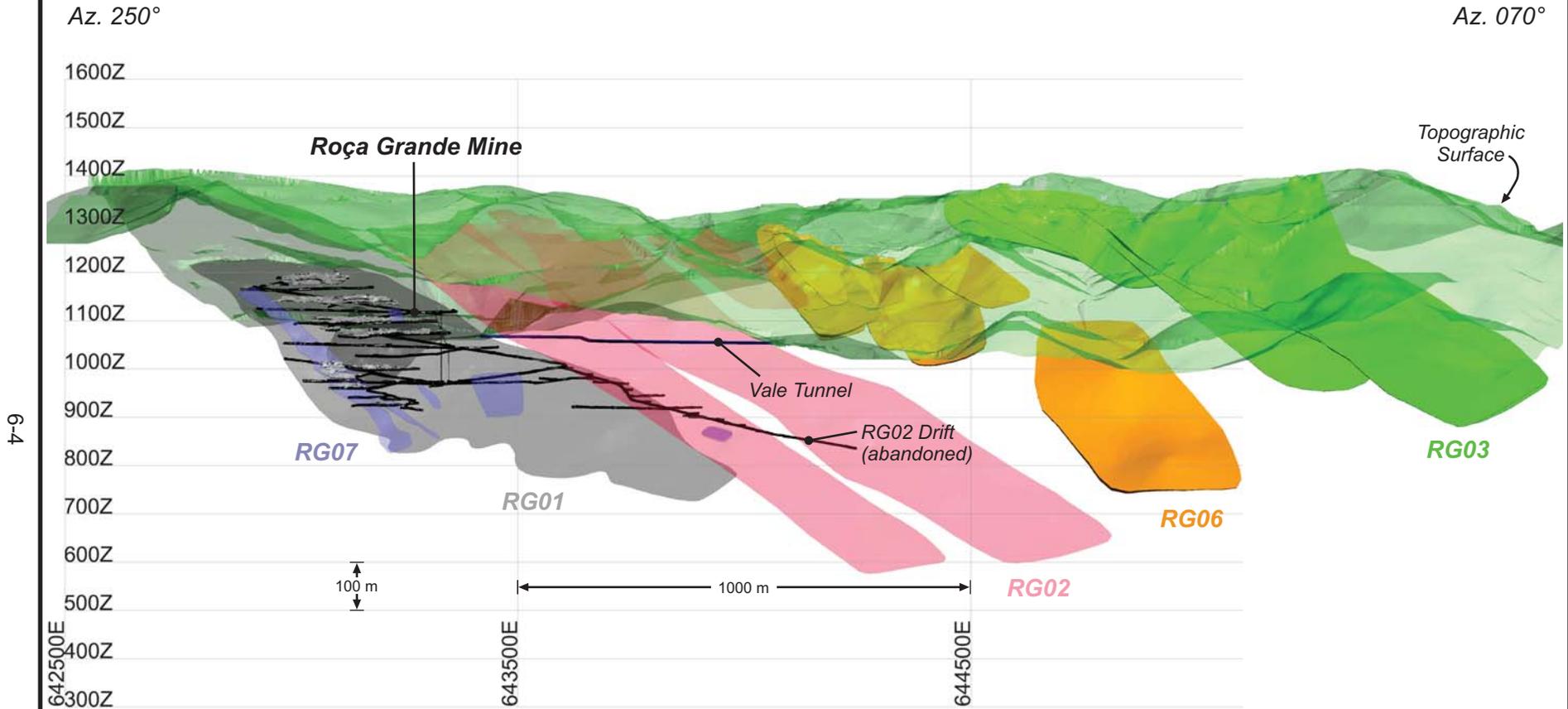
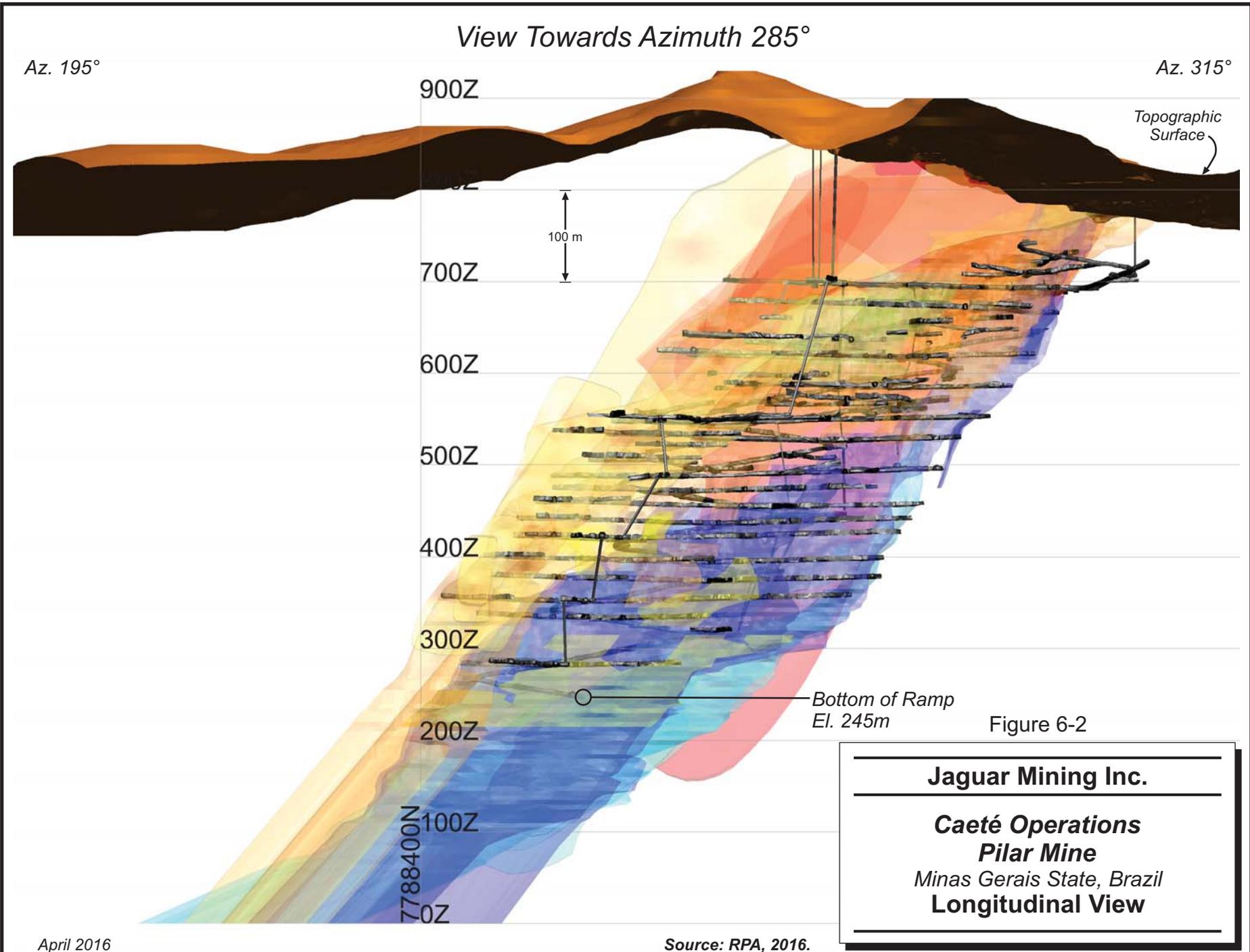


Figure 6-1

**Jaguar Mining Inc.**

**Caeté Operations**  
**Roça Grande Mine**  
Minas Gerais State, Brazil  
**Longitudinal View**



6-5

Figure 6-2

**Jaguar Mining Inc.**

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**Caeté Operations**  
**Pilar Mine**  
Minas Gerais State, Brazil

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**Longitudinal View**

## PAST PRODUCTION

A small amount of gold was produced by DOCEGEO from the Roça Grande deposits (RG02, 03, 04, 05 and 06) during the 1996 to 2000 period. In total, approximately 1.02 Mt of material at an average grade of 2.2 g/t Au was mined by open pit mining methods and processed by heap leaching. A total of approximately 66,800 oz of gold was recovered (Machado, 2010).

Since 2010, the Caeté Mining Complex has processed material from various local deposits including Roça Grande, Pilar, and Rio de Peixe. Since 2010, the Roça Grande Mine has recovered approximately 62,000 oz of gold from 911,000 t of ore at an average mill feed grade of 2.45 g/t Au to the end of 2015.

Initial production from the Pilar Mine was processed at the Paciência Mining Complex during the 2008 to 2010 period. After 2010 the ore from the Pilar Mine was processed at the Caeté processing facility. Since 2008, the Pilar Mine has recovered approximately 221,000 oz of gold from 2,517,000 t of ore at an average mill feed grade of 3.18 g/t Au to the end of 2015.

Production for the Caeté Mining Complex is summarized in Table 6-3.

**TABLE 6-3 CAETÉ MINING COMPLEX PRODUCTION**  
**Jaguar Mining Inc. – Caeté Operations**

Year	Pilar Production		Roça Grande Production		Caeté Plant Production			Ounces Produced
	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Recovery	
2008	6,000	5.95						
2009	121,000	4.20						
2010	311,000	3.39	80,000	2.30	258,000	2.87	93%	17,595
2011	473,000	3.35	166,000	2.30	634,000	3.08	87%	53,175
2012	422,000	3.11	172,000	2.72	594,000	3.00	89%	50,331
2013	454,000	3.04	158,000	2.72	612,000	2.96	88%	51,429
2014	421,000	2.66	175,000	2.32	596,000	2.56	88%	43,228
2015	309,000	3.27	159,000	2.26	468,000	2.93	90%	39,763
<b>Total</b>	<b>2,517,000</b>	<b>3.18</b>	<b>910,000</b>	<b>2.45</b>	<b>3,162,000</b>	<b>2.90</b>	<b>89%</b>	<b>255,521</b>

Note: From 2008 to 2011, some or all of Pilar ore was processed at Paciência.

## 7 GEOLOGICAL SETTING AND MINERALIZATION

### REGIONAL GEOLOGY

The Roça Grande and Pilar deposits are located in the eastern part of the Iron Quadrangle, which had been the largest and most important mineral province in Brazil for centuries until the early 1980s, when the Carajás mineral province, in the state of Pará, attained equal status. Many commodities are mined in the Iron Quadrangle, the most important being gold, iron, manganese, bauxite, imperial topaz, and limestone. The Iron Quadrangle was the principal region for the Brazilian hard rock gold mining until 1983 and accounted for approximately 40% of Brazil's total gold production. Gold was produced from numerous deposits, primarily in the northern and southeastern parts of the Iron Quadrangle, most hosted by Archean or Early Proterozoic banded iron formations (BIF) contained within greenstone belt supracrustal sequences.

In the Brumal region, outcrops belonging to the granitic gneiss basement of the Nova Lima and Quebra subgroups of the Rio das Velhas Supergroup occur. The granitic gneiss basement is comprised of leucocratic and homogeneous gneisses and migmatites, making up a complex of an initial tonalitic composition intruded by Archean-aged rocks of granitic composition. The upper contact of the sequence is discordant and tectonically induced by reverse faulting. The Rio das Velhas Supergroup is regionally represented by schists of the Nova Lima Group and meta-ultramafic rocks of the Quebra Group including serpentinites, talc schists, and metabasalts (Figure 7-1). The rocks of the Nova Lima Group have been folded and sheared along a northeast-southwest regional trend.

Iron formations occur as the only metasediments in layers with thicknesses up to 10 m. The Nova Lima Group can be subdivided into two units: a unit consisting of talc chlorites and intercalations of iron formation, fuchsite schist, quartz sericite schist, and carbonaceous phyllite; and a unit hosting sulphidized gold bearing iron formation and quartz sericite schists.





Figure 7-1A

**Jaguar Mining Inc.**

**Caeté Operations**

**Roça Grande & Pilar Mines**

*Minas Gerais State, Brazil*

**Regional Geology Legend**

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## LOCAL AND PROPERTY GEOLOGY

### ROÇA GRANDE DEPOSIT

The Roça Grande Mine is located in the upper unit of the Nova Lima Group. The dominant rock types found in the mine are a mixed assemblage of meta-volcanoclastics and meta-tuffs. These are represented by quartz sericite and chlorite schists with variable amounts of carbonate facies BIF, oxide-facies BIF, metacherts, and graphitic schists. The iron formations, chert units, and graphitic schist units are intimately inter-bedded with each other, such that they form an assemblage of chemical and clastic sedimentary units.

Two important BIF horizons are present at the Roça Grande Mine and they are separated by a central unit of sericitic phyllites and schists (Figure 7-2). The two BIF horizons are roughly parallel and are called Structures 1 and 2. In general, the southern BIF unit (Structure 2) is thicker than the northern BIF unit (Structure 1). The North Structure (Structure 1) hosts the RG01 mineralized body and the South Structure (Structure 2) hosts the RG02, RG03, and RG06 mineralized bodies (Figure 7-3). The RG07 mineralized body is located immediately in the hanging wall of Structure 1 and is hosted mostly by a quartz vein. The bedding is well defined by the carbonate-facies iron formation and chert found in the BIF horizons, with an overall strike of azimuth 70° to 80°, and dipping approximately 30° to 35° south (Figure 7-4).

At the mine scale, folding of the iron formation stratigraphy is generally absent. Local folding and faulting in the Structure 2 has been observed at the RG06 mineralized body where a 200 m to 300 m strike length of the stratigraphy has been folded.

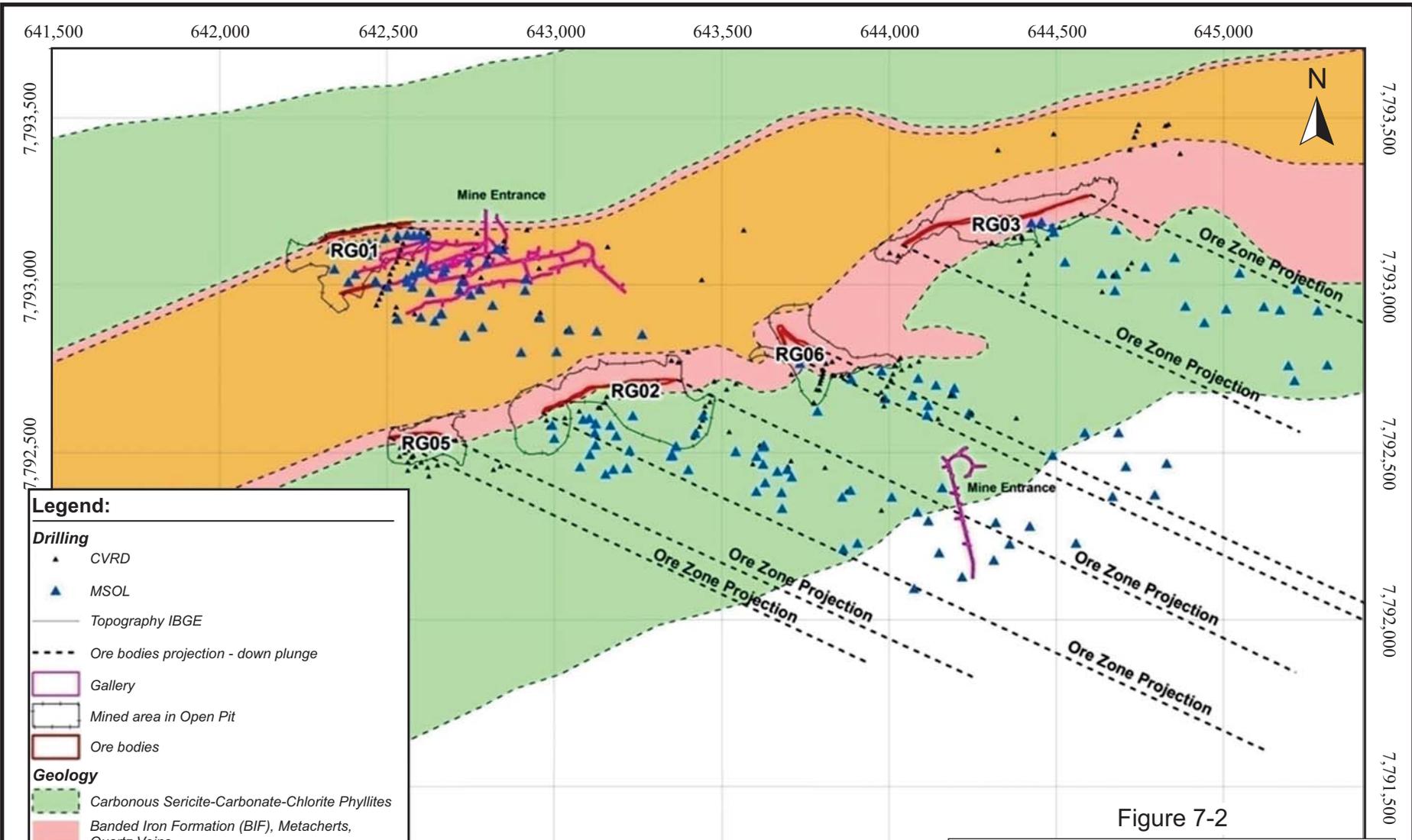


Figure 7-2

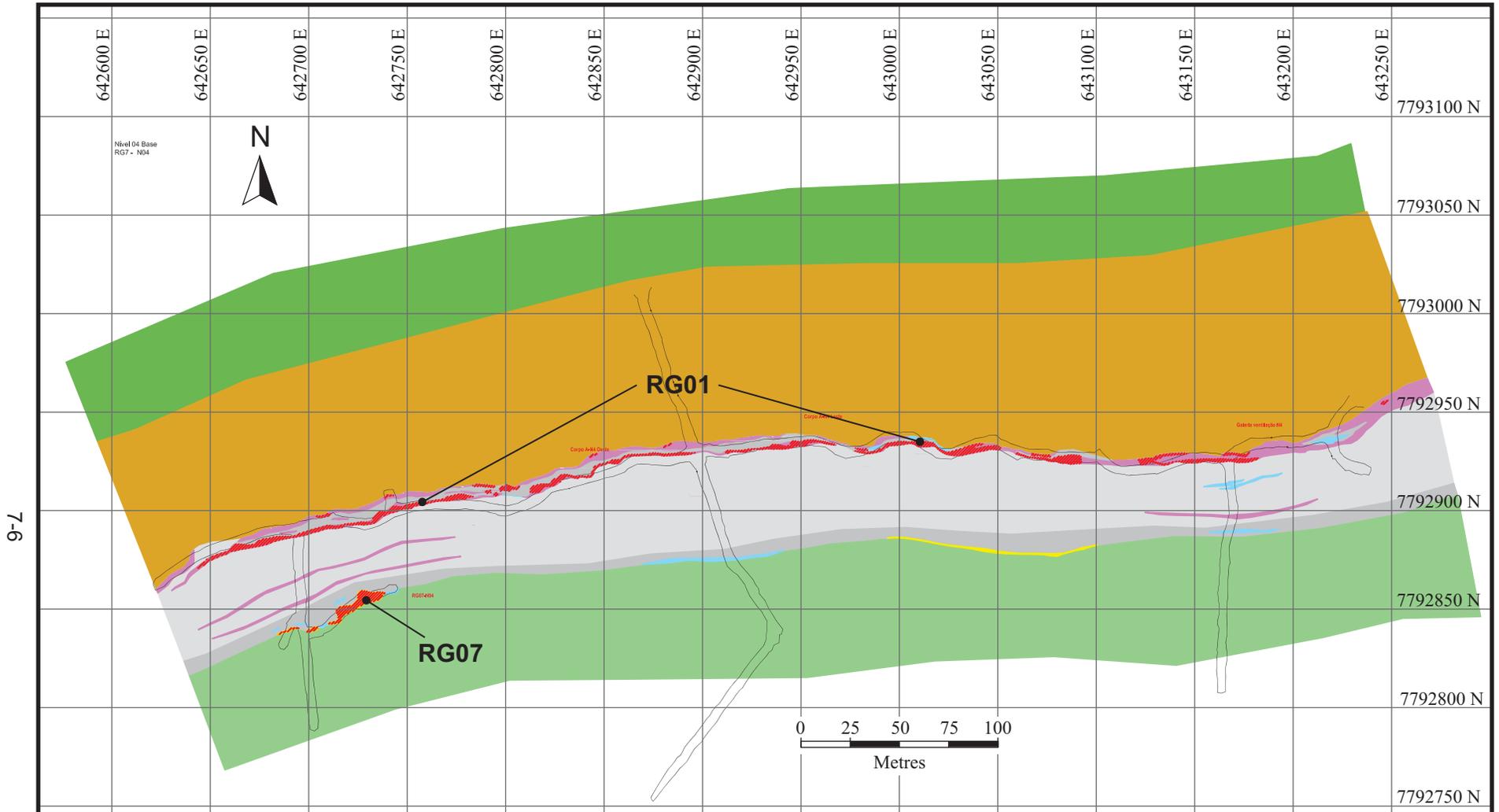
**Jaguar Mining Inc.**

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**Caeté Operations**  
**Roça Grande Mine**  
 Minas Gerais State, Brazil

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**Property Geology**

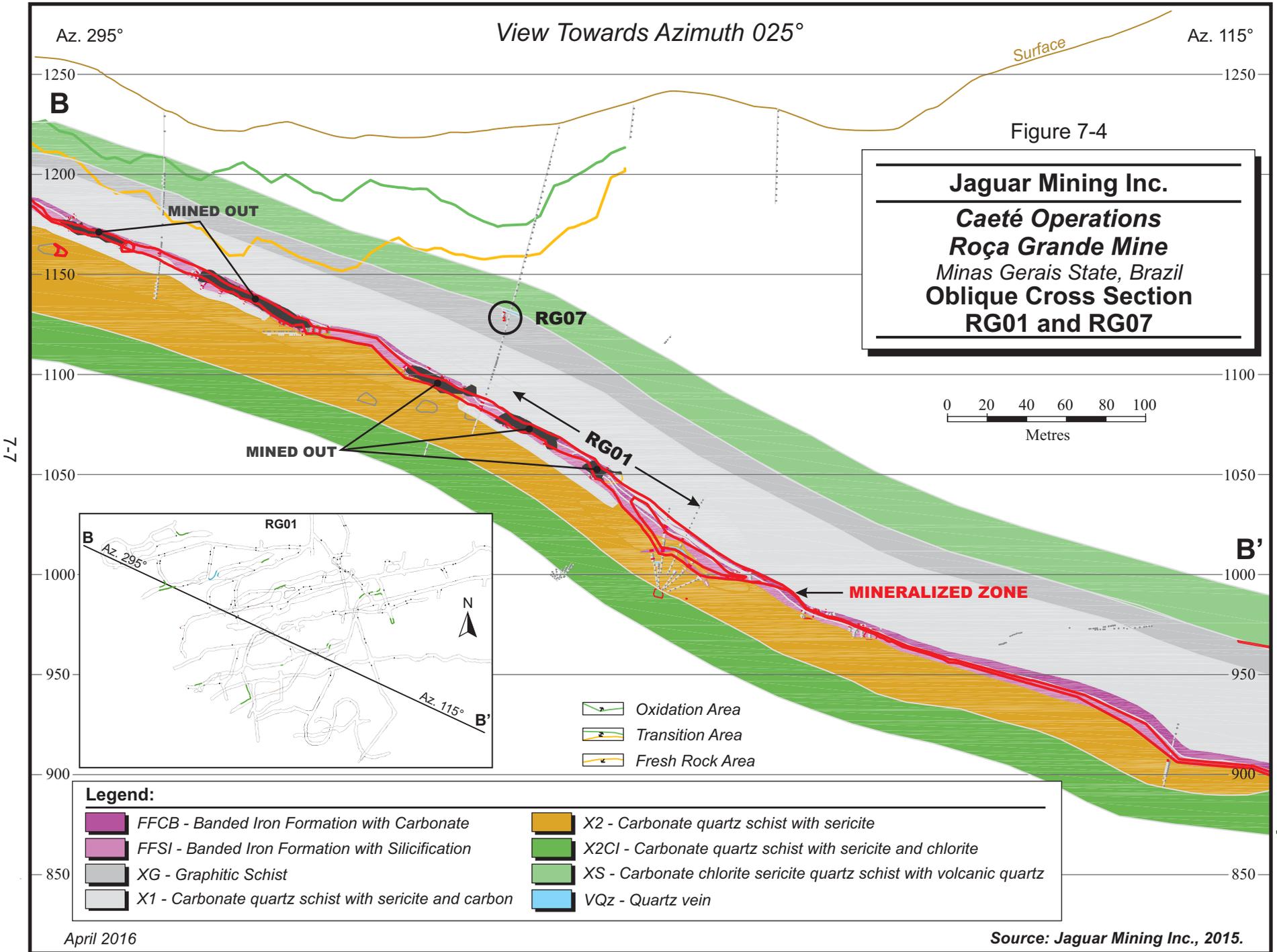


7-7

Figure 7-3

Legend:	
FF - Banded Iron Formation	VQz - Quartz vein
XG - Graphitic Schist	VQz - Smoky Quartz vein with free gold
X1 - Carbonate quartz schist with sericite and carbon	Ore Zone
X2 - Carbonate quartz schist with sericite	
X2Cl - Carbonate quartz schist with sericite and clorite	
XS - Carbonate clorite sericite quartz schist with volcanic quartz	

**Jaguar Mining Inc.**  
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**Roça Grande Mine**  
 Minas Gerais State, Brazil  
**Level Plan, 4th Level**



## **PILAR DEPOSIT**

The Pilar deposit is hosted by the basal units of the Nova Lima Group (Figure 7-5). The rocks in the region of the mine are comprised of tholeiitic basalts and komatiite flows of the Ouro Fino and Morro Vermelho Units, along with their intrusive equivalents. To the west, these basal units are in fault contact with mica-quartz schists, chlorite-quartz schists, chlorite-sericite schists, and chemical and clastic sedimentary rocks of the Santa Quitéria Unit. The chemical sedimentary rocks include chert and BIF. To the east, the units are in fault contact with migmatites and granitic gneisses of the Bação Complex that form the basement sequence.

On the mine property, all rock units strike in a northeasterly direction. The regional strike of the units changes to a southeasterly direction to the south of the mine property. Regional mapping has found that the foliations mostly dip steeply to the southeast. The regional-scale thrust faults also strike in a northeasterly direction and dip steeply to the southeast on the mine property.

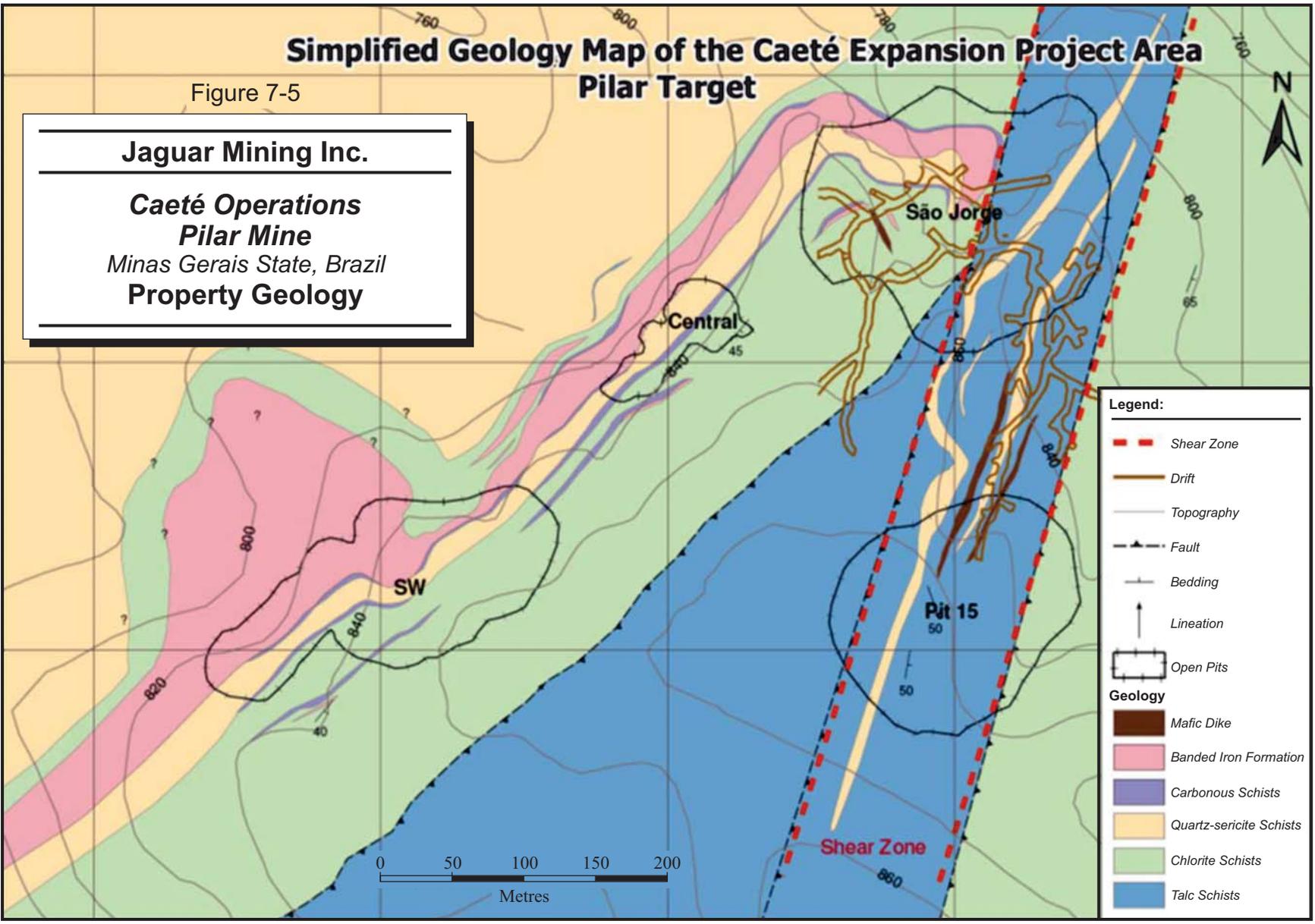
On the property scale, at least three different orientations of faults are recognized. The earliest fault is the northeasterly-striking regional-scale thrust fault that forms the contact between the Santa Quitéria Unit and the Ouro Fino and Morro Vermelho Units. This thrust fault cross-cuts and terminates a more northerly set of faults that have a strike of approximately 020° and dip steeply to the east. The third set of faults are oriented in an east-west orientation and have subvertical dips. The displacement along these faults has been observed in underground exposures to be in the order of one to two metres (Figure 7-6).

The host rocks of the mine have been affected by at least one period of folding (Figure 7-7). Structural mapping on the property has shown that the orientation of the fold axes dip approximately 45° to the southeast (azimuth 135°).

# Simplified Geology Map of the Caeté Expansion Project Area Pilar Target

Figure 7-5

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
Minas Gerais State, Brazil  
Property Geology



- Legend:**
- Shear Zone
  - Drift
  - Topography
  - Fault
  - Bedding
  - Lineation
  - Open Pits
  - Geology**
  - Mafic Dike
  - Banded Iron Formation
  - Carbonous Schists
  - Quartz-sericite Schists
  - Chlorite Schists
  - Talc Schists



Figure 7-6

**Jaguar Mining Inc.**

**Caeté Operations  
Pilar Mine**

*Minas Gerais State, Brazil*

**Late-Stage Cross Faults**



Figure 7-7

**Jaguar Mining Inc.**

**Caeté Operations  
Pilar Mine**

*Minas Gerais State, Brazil*  
**Folded Iron Formation**

## MINERALIZATION

### ROÇA GRANDE

At Roça Grande, gold mineralization is more commonly associated with BIF horizons. In RG01, RG02, RG03, and RG06 mineralized bodies, the gold mineralization is developed roughly parallel to the primary bedding and is related to centimetre-scale bands of massive to disseminated pyrrhotite and arsenopyrite. In many cases, better gold values are located along the hangingwall contact of the iron formation sequence and is hosted by carbonate-facies iron formation (Figure 7-8). The grades generally decrease towards the footwall where the iron formation becomes more silica-rich. The thicknesses of the iron formations are observed to be affected by broad-scale boudinaged structures (Figure 7-9). Better gold grades are found in the thicker portions while the narrower portions of the boudinaged structures have lower grades. Late-stage, barren quartz veins are also ubiquitously present and also display a boudinaged form (Figure 7-10).

RPA recommends that structural mapping information be integrated with of isopach maps of the carbonate iron formation and trend analyses of the gold distribution to identify any primary controls on the distribution of the BIF-hosted gold mineralization.

In the RG07 mineralized body, gold is found to be hosted in quartz veins that are contained within a sericite (chlorite) schist associated with an east-west oriented shear zone (Machado 2010).

*View Looking West*



Figure 7-8

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
*Minas Gerais State, Brazil*  
**Iron Formation Sequence,**  
**RG01 Deposit**



Figure 7-9

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
*Minas Gerais State, Brazil*  
**Up-Dip View of Boudinage Structure in  
Carbonate Iron Formation, RG01 Deposit**



Figure 7-10

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
*Minas Gerais State, Brazil*  
**Late Stage, Barren, Boudinaged Quartz  
Vein in Iron Formation, RG01 Deposit**

## **PILAR**

The mineralization at the Pilar Mine is hosted by a number of the host rock units including the BIFs along with mafic schists and talc-chlorite schists. Gold mineralization is associated with sulphide mineralization consisting of arsenopyrite and pyrrhotite. Quartz veins and veinlets can also be present, but the presence of quartz is not a prerequisite for higher gold values. The sulphide minerals occur mostly as disseminations in the host rock, but can achieve semi-massive to massive concentrations locally over a few tens of centimetres (Figure 7-11). Quartz veins are typically less than one metre in width and can be observed to be of two generations. The quartz veins of the first generation are typically associated with the gold mineralization and are folded. The quartz veins of the second generation are typically lower grade or barren and not affected by folding.

The SW Orebody is hosted by iron formation of the Santa Quitéria Unit. The remaining mineralized lenses are hosted by the mafic and ultramafic schists of the Ouro Fino and Morro Vermelho Units.



Figure 7-11

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
*Minas Gerais State, Brazil*  
**Arsenopyrite-Pyrrhotite**  
**Mineralization**

## 8 DEPOSIT TYPES

Gold mineralization has been found mainly within three general types of deposits in the Iron Quadrangle:

1. Syngenetic deposits. These are hosted by BIF and chemical sedimentary rocks (meta-chert). Gold is typically associated with fresh to limonite-rich sulphide masses, ranging from disseminated to massive, in association with the BIF layers or in hydrothermally altered schists rich in quartz, chlorite, and sericite. Disseminated sulphides hosted in quartz schist, BIFs, and meta-cherts have also been economically exploited.
2. Epigenetic deposits dominated by hydrothermal quartz veins (silicification zones). Gold is related with masses of milky to microcrystalline quartz containing fresh to limonite-rich sulphides and, sometimes, visible gold. The veins are hosted by hydrothermally altered schists rich in quartz, chlorite, carbonate, and sericite.
3. Paleo-placer deposits. Conglomerates are found in the geologic section that contain clasts of quartzite, milky quartz, massive and banded chert, felsic volcanic rocks, and quartz schists. The matrix can be quartzitic, arkosic, or carbonaceous. Locally, round (buckshot) pyrite and crystalline pyrite are abundant in the matrix.

Most gold-bearing units in the Iron Quadrangle, with the exception of the gold-bearing conglomerates, are strongly controlled by linear structures such as fold axes, stretching lineations, and intersection foliations. The orebodies form cigar or pencil shapes, showing continuity along the plunge and relatively small distances laterally. They can be longer than 5 km, such as at the Morro Velho and Cuiabá Mines. The thickness of the deposits varies from a few centimetres to more than 30 m.

Gold is associated with sulphides, mainly pyrite, pyrrhotite, and arsenopyrite. The distribution of the mineralized bodies is often controlled by mineral stretching lineations and fold axes.

## 9 EXPLORATION

### ROÇA GRANDE

Jaguar has not carried out any surface-based exploration programs on the Roça Grande Mine property other than the drilling programs described in Section 10.

### PILAR

The following exploration activities were carried out by Jaguar on the Pilar Mine property:

2014: Re-processing of magnetic data from the airborne CODEMIG survey

2015: High definition induced polarization (IP) ground survey covering the south extension of the Pilar Mine. The estimated depth of penetration of the survey was up to 1,000 m.

Geological mapping and soil sampling on the Pacheca and Cubas targets.

Soil sampling campaign, 744 samples. Anomalous values (0.15 g/t Au to 0.48 g/t Au) were outlined along an 800 m long area oriented in northeast-southwest direction.

## 10 DRILLING

### ROÇA GRANDE

Jaguar has carried out a number of surface-based and underground-based drilling programs at the Roça Grande Mine since entering into a mutual exploration and option agreement with Vale in 2005. These in-fill and exploration drilling programs were focussed primarily on the RG01/07, RG02, RG03, and RG06 deposits.

Jaguar started diamond drilling at Roça Grande in August 2006. Following the completion of the first exploratory holes drilled at the RG01/07, RG02, RG03, and RG06 mineralized zones, Jaguar carried out an infill program to delineate these zones.

The drill hole lengths ranged from 40 m to 559 m. Holes were targeted to investigate the continuity of the mineralized zones laterally and at depth. Core diameters are consistently HQ (63.5 mm) from surface through the weathered rock to bedrock. At one to three metres into the bedrock, the holes were reduced to NQ diameter (47.6 mm). Surface diamond drilling was carried out by the drilling contractor Mata Nativa while the underground in-fill drilling programs were carried out by Jaguar staff using company-owned equipment.

The diamond drill core procedures adopted by Jaguar are described below:

- Only drill holes with more than 90% core recovery from the mineralized zone were accepted.
- Drill hole deviations (surveys) were measured by Sperry-Sun or DDI/Maxibore equipment.
- The cores were stored in wooden boxes of one metre length with three metres of core per box (HQ diameter) or four metres of core per box (NQ diameter). The hole's number, depth, and location were identified in the boxes by an aluminum plate on the front of the box and by a water-resistant ink mark on its side. The progress interval and core recovery are identified inside the boxes by small wooden or aluminum plates.

Drill collars were set out using a theodolite or global positioning system (GPS). All holes were drilled within three metres of the intended planned location. Azimuth and inclination for the angle holes were set by Brunton compass, deemed accurate to within 2° azimuth and <1° inclination.

Following completion of the holes, the collars were surveyed with theodolite and cement markers were emplaced. Downhole surveys were completed on all holes more than 100 m long using Maxibor equipment.

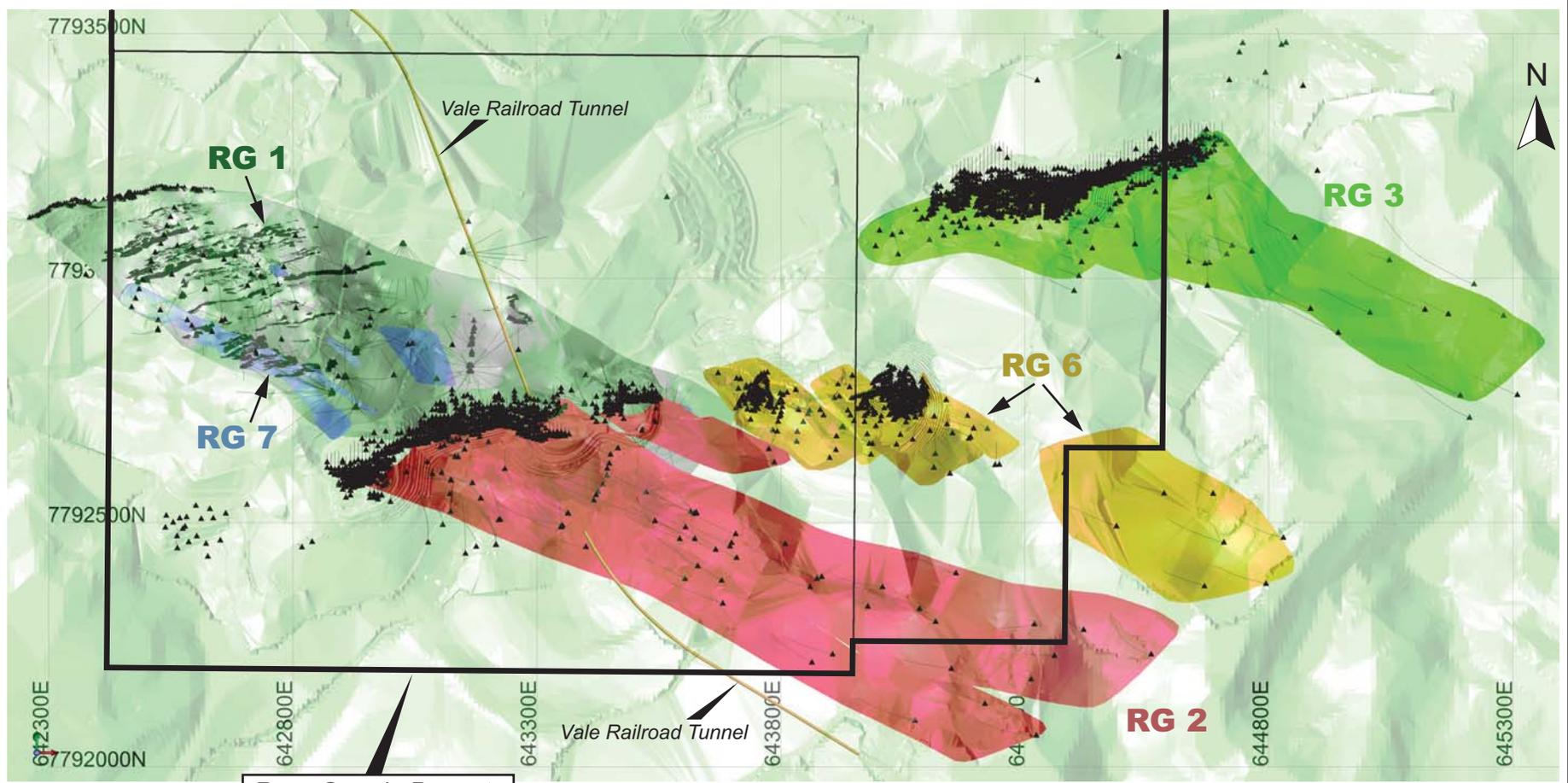
A small program of 14 surface-based exploration holes, for a total length of 794 m, was completed in September 2014 to test targets in the areas of the existing open pit mines.

A summary of the drilling campaigns completed at the Roça Grande Mine is provided in Table 10-1. The distribution of drill holes and channel samples taken from the open pit mines is shown in Figure 10-1.

**TABLE 10-1 SUMMARY OF DRILLING CAMPAIGNS, ROÇA GRANDE MINE  
Jaguar Mining Inc. – Caeté Operations**

Period	Target	Diamond Drilling		Roto-Percussive Drilling	
		No. Holes	Total Length (m)	No. Holes	Total Length (m)
<b>Vale</b>					
1973-1993	Roça Grande	116	18,288		
1994-1995	Roça Grande			313	17,270
1996-1999	RG01	8	550		
	RG02	9	910		
	RG05	18	1,530		
	RG03,04 and 06	10	625		
2000	RG02	4	410		
	RG03	8	571		
	RG05	1	63		
	RG06	3	379		
<b>Sub-Total, Vale</b>		<b>177</b>	<b>23,325</b>	<b>313</b>	<b>17,270</b>
<b>Jaguar</b>					
2004-2010	RG01/07	111	10,625		
	RG02	59	16,580		
	RG03	56	9,407		
	RG06	55	7,954		
2011	RG01/07	71	9,983		
2012	RG01/07		19,922		
2013	RG01/07		10,142		
2014	RG03/RG06	14	794		
<b>Sub-Total, Jaguar</b>			<b>79,407</b>		

RPA has not identified any drilling, sampling, or core recovery issues that could materially affect the accuracy or reliability of the core samples at the Roça Grande Mine.



Roça Grande Property Boundary

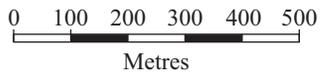


Figure 10-1

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
*Minas Gerais State, Brazil*  
**Drill Hole and Channel Sample Locations**

## **PILAR**

In 2004, Jaguar started an exploration campaign at the Pilar property that targeted the Pilar Sul, São Jorge, and São Jorge Extensão sectors of the deposit. The exploration effort comprised three phases as follows:

### ***PHASE 1***

After interpretation of the available data, an exploratory diamond drilling program was carried out to test the structural controls and the continuity of the mineralization to 200 m below the surface. Mineralized shoots mainly occurred within the BIF. The holes intercepted several significant mineralized intervals and pointed out the need for additional investigation of the structural geology of the area. During this phase, a total 6,489 m was drilled in 36 diamond drill holes.

### ***PHASE 2***

Diamond drill holes tested the structural control and the continuity of the mineralization to 300 m below surface. Mineralized shoots occurred both within the BIF and the shear zone. A total of 12,926 m in 41 holes was drilled during Phase 2.

### ***PHASE 3***

Phase 3 included underground exploration and underground and surface diamond drilling. Infill underground drilling was completed to delineate mineralization at 693 MASL. Surface drilling was carried out to obtain more data on the structural control and the main zones of mineralization. Through December 2010, Jaguar completed a total of 10,390 m in ramps and drifts, 11,200 m of underground drilling in 180 holes, and 10,186 m of surface drilling in 19 holes.

Late in 2010 and during 2011 (subsequent to the Caeté Feasibility Study), Jaguar completed an underground drilling program to investigate the down plunge continuation of the mineralization to Level 11, approximately 860 m from surface. A total of 12,574 m in 44 drill holes were completed, confirming the extension of the mineralized zones to depth. Delineation drilling underground continued in 2012 and 2013 (Jaguar 2015b).

A small program of exploration drilling (9 holes, 910 m) was carried out in November 2014 to test near surface targets in the proximity of the crown pillar of the Pilar Mine. In late 2014 to May 2015, Jaguar carried out an underground exploration drilling program focussed on testing

for additional gold mineralization along the down-plunge projections of the AB and C orebodies. In all, 90 holes were completed for a total length of 14,875 m.

The drilling procedures at the Pilar Mine were similar to those used at the Roça Grande Mine. Surface diamond drilling was carried out by the drilling contractor Mata Nativa. The underground drilling program in 2015 was completed by Geosol Ltd. of Belo Horizonte using BQ (36.5 mm) and LTK (36.3 mm) sized equipment. In-fill drilling programs carried out from underground stations were completed by Jaguar staff and company-owned equipment.

A summary of the drilling campaigns completed at the Pilar Mine is provided in Table 10-2 and a summary of significant intersections from the 2104/2015 exploration program is provided in Table 10-3 (Jaguar 2015d). It is important to note that the reported intersections do not represent true thicknesses as they have been drilled from underground-based platforms and consequently have intersected the mineralized zones at varying angles. The distribution of drill holes and channel samples is shown in Figure 10-2.

RPA has not identified any drilling, sampling, or core recovery issues that could materially affect the accuracy or reliability of the core samples.

**TABLE 10-2 SUMMARY OF DRILLING CAMPAIGNS, PILAR MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Period	Target	Diamond Drilling		Roto-Percussive Drilling	
		No. Holes	Total Length (m)	No. Holes	Total Length (m)
<b>VALE</b>					
1989-1994		65	11,812	60	2,960
2002-2003		10	3,069		
<b>Sub-Total, Vale</b>		<b>75</b>	<b>14,881</b>	<b>60</b>	<b>2,960</b>
<b>JAGUAR</b>					
2004-2010	Phase 1	36	6,489		
	Phase 2	41	12,926		
	Phase 3-UG	180	11,200		
	Phase 3-Surface	19	10,186		
Q4 2010-2011		44	12,574		
2012	UG-Exploration	31	4,005		
	UG-Definition	121	9,705		
2013	UG- Exploration	40	5,978		
	UG-Definition	51	3,557		
2014	UG- Exploration	60	8,398		
	UG-Definition	125	10,818		
	Surface Expl.	9	910		
2015	UG- Exploration	30	6,477		
	UG-Definition	12	879		
<b>Sub-Total, Jaguar</b>		<b>799</b>	<b>104,102</b>		

**TABLE 10-3 SUMMARY OF SIGNIFICANT INTERSECTIONS, Q3 2014-MAY**  
**2015 EXPLORATION DRILLING PROGRAM, PILAR MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Hole ID	Orebody	From	To	Length (m)	Average Grade Au (g/t)	Elevation
PPL261	BF	70.40	74.00	3.60	7.52	262
PPL287	BFII	110.50	126.95	16.45	5.07	302
PPL299	BFII	203.50	222.50	19.00	4.06	142
Including	BFII	203.50	210.35	6.85	6.93	142
PPL300	BF	163.35	183.40	20.05	3.83	162
PPL300	BFII	197.60	208.00	10.40	4.64	144
PPL301	BF	203.40	209.85	6.45	5.29	124
PPL301	BFII	211.40	219.40	8.00	4.76	119
PPL301	BFII	243.70	246.20	2.50	22.24	99
PPL303	BF	151.20	153.60	2.40	12.44	176
PPL303	BFII	166.50	193.40	26.90	3.03	159
PPL305	BF	136.10	142.90	6.80	4.67	180
PPL306	BFII	213.20	220.70	7.50	9.43	100

Hole ID	Orebody	From	To	Length (m)	Average Grade Au (g/t)	Elevation
Including	BFII	218.00	220.70	2.70	22.32	100
PPL306	BFII	239.35	247.20	7.85	5.65	79
PPL309	BFII	48.40	51.80	3.40	8.68	236
PPL312	BF	108.35	113.55	5.20	5.38	217
PPL313	BF	89.30	93.05	3.75	8.33	228
PPL313	LPA	99.15	102.05	2.90	12.31	224
PPL314	BF	87.00	96.25	9.25	7.26	247
PPL314	BF	115.30	123.10	7.80	7.11	245
PPL316	BF	99.60	109.70	10.10	6.59	211
PPL316	BFII	131.10	137.30	6.20	7.57	193
PPL317	BF	91.90	98.70	6.80	3.88	228
PPL317	BFII	112.00	118.50	6.50	8.32	218
PPL318	BF	122.95	130.50	7.55	8.57	192
PPL318	BFII	154.65	159.40	4.75	5.69	172
PPL319	BFII	135.20	146.35	11.15	9.48	158
FSB553	BFII	26.80	29.50	2.70	8.69	293
FSB552 A	BFII	18.80	28.60	9.80	13.74	275
FSB551	BFII	29.90	33.60	3.70	10.12	284

Note: No capping values applied when calculating the weighted average grades.

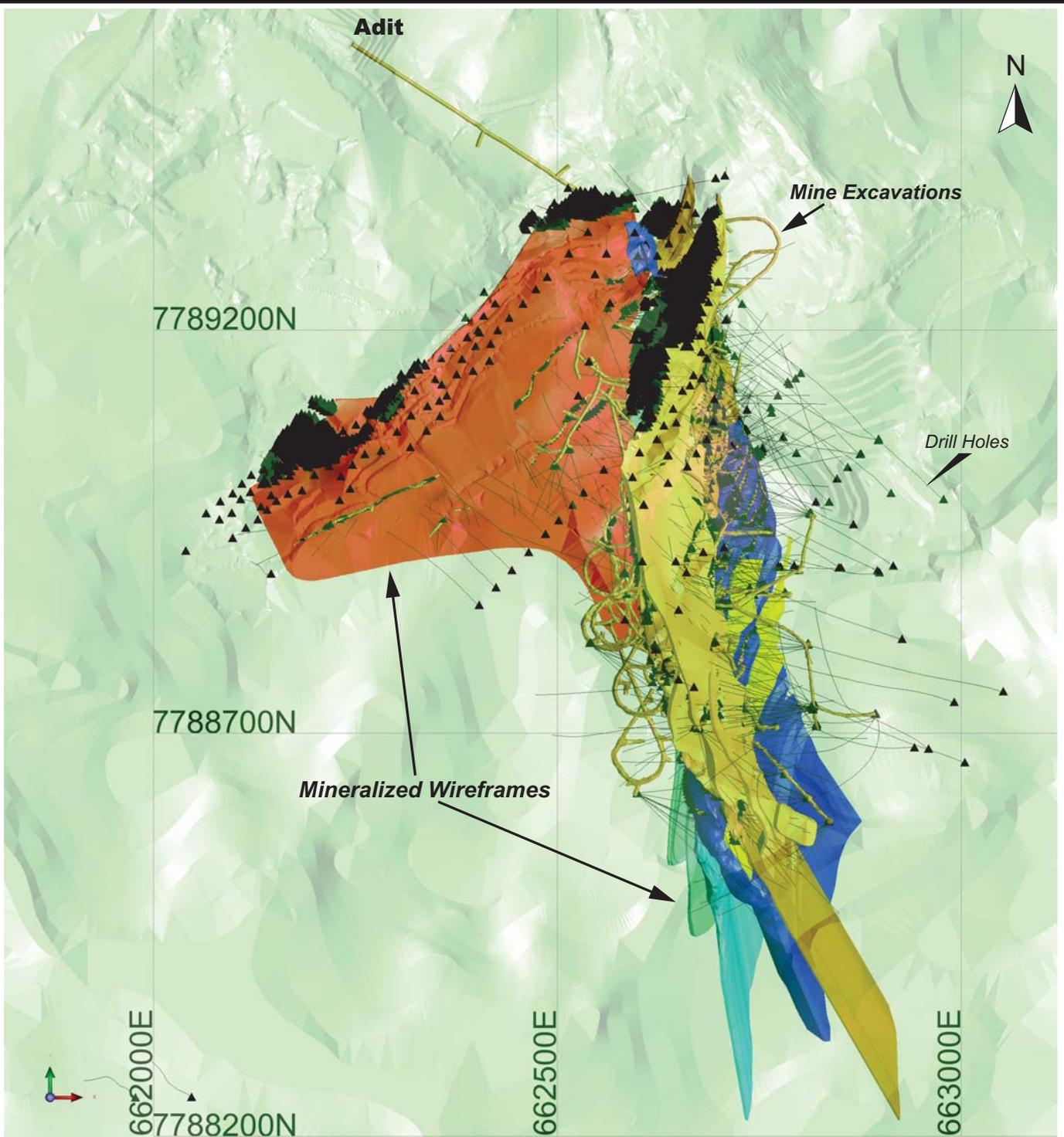
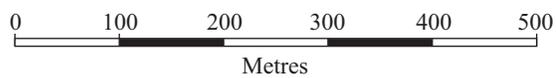


Figure 10-2



**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
Minas Gerais State, Brazil  
**Drill Hole and**  
**Channel Sample Locations**

## **REGIONAL EXPLORATION DRILLING**

During 2008 and 2009, Jaguar completed 92 (31,501 m) and 53 (8,650 m) drill holes, respectively, in the exploration concessions that are part of the Caeté Project.

During the third quarter of 2012, Jaguar completed a Phase 1 diamond drilling campaign at the Moita target, located four kilometres northwest of the Caeté processing plant. A total of 16 drill holes for 1,115 m was carried out to test a 400 m by 50 m mineralized zone identified by soil sampling and trenching within hydrothermally altered metasediments hosted by a shear zone. Drilling results confirmed the southeast down plunge extension of the mineralization.

# 11 SAMPLE PREPARATION, ANALYSES AND SECURITY

## SAMPLING

The sampling procedures used by Jaguar are as follows.

### SURFACE/EXPLORATION CHANNEL SAMPLING

- Channel samples are collected from outcrops and trenches as needed.
- The sites to be sampled are cleaned with a hoe, exposing the material by scraping it.
- Structures are mapped and the lithologic contacts defined, and samples marked so that no sample has more than one lithology.
- Samples have a maximum length of one metre and are from one kilogram to two kilograms in weight.
- Each sample is collected manually in channels with average widths between five and ten centimetres, and about three centimetres deep, using a hammer and a chisel.
- Either an aluminum tray or a thick plastic canvas drop sheet is used to collect the material.
- The samples are then stored in a thick plastic bag and identified by a numbered label, which is protected by a thin plastic cover and placed with the sample.
- At the sampling site, samples are identified by small aluminum plates, labels, or small wooden poles.
- Sketches are drawn with lithological and structural information. The sample locations are surveyed.

### DIAMOND DRILLING CORE SAMPLING

- Surface drilling is performed by contractors with holes in HQ or NQ diameters.
- Underground drilling is performed either by Jaguar or contractors with holes in BQ and LTK diameters.
- Drill holes are accepted only if they have more than 85% of core recovery from the mineralized zone.
- All the drill holes have their deviations measured by Maxibor or equivalent survey tool.

- The cores are stored in wooden boxes of one metre length with three metres of core per box (HQ diameter) or four metres of core per box (BQ or LTK diameters).
- The number, depth, and location of each hole are identified in the boxes by an aluminum plate or by a water-resistant ink mark in front of the box.
- The progress interval and core recovery are identified inside the boxes by small wooden plates.
- During logging, all of the geological information, progress, and recovery measures are verified and the significant intervals are defined for sampling.
- Samples are identified in the boxes by highlighting their side or by labels.
- Samples are cut lengthwise with the help of a diamond saw and a hammer into approximately equal halves.
- One half of the sample is placed in a highly resistant plastic bag, identified by a label, and the other half is kept in the box at a warehouse.
- The remaining drill core from the surface-based drill holes is stored at a dedicated core storage facility that is located at the Roça Grande Mine.
- For many of the underground-based drill holes, samples are cut lengthwise with the help of a diamond saw and a hammer into approximately equal halves.
- For the shorter-length, bazooka-type drill holes completed from underground set-ups, the whole core is sampled as the core diameter does not permit splitting into halves.

## **UNDERGROUND PRODUCTION CHANNEL SAMPLING**

- The sector of wall to be sampled is cleaned with pressurized water. Structures are mapped and lithologic contacts defined, and samples marked so that no sample has more than one lithology. Samples have a maximum length of one metre and are from two to three kilograms in weight.
- Channel samples were taken by manually opening the channels, using a hammer and a small steel pointer crowned by carbide or a small jackhammer.
- The channel samples have lengths ranging from 50 cm to one metre, average widths between five and ten centimetres, and are approximately three centimetres deep.
- Two sets of channel samples are regularly collected on the face. One set of channel samples is taken from the top of the muck pile once the work area has been secured. The second set of channel samples is taken at the waist height once the heading has been mucked clean and secured.
- Channel samples from the walls and back are collected at approximately 5 m intervals. The channel samples are collected starting at the floor level on one side and continue over the drift back to the floor on the opposite side.

- Either an aluminum tray or a thick plastic canvas is used to collect the material. The samples are then stored in a thick plastic bag and identified by a numbered label, which is protected by a thin plastic cover and placed with the sample.
- At the sampling site, samples are identified with paint.
- Sketches are drawn with lithological and structural information. The sample locations are surveyed.

## **SAMPLE PREPARATION AND ANALYSIS**

For surface-based exploration drill holes, samples were prepared at the SGS laboratories in Belo Horizonte. For other drill holes and channels, samples are prepared at Jaguar's mine site laboratories by drying, crushing to 90% minus 2 mm, quartering with a Jones splitter to produce a 250 g sample, and pulverizing to 95% minus 150 mesh. Analysis for gold is by standard fire assay procedures, using a 50 g or 30 g sample and an atomic absorption (AA) finish.

All samples from the 2015 exploration drilling programs executed at the Pilar and Roça Grande mines were analyzed for gold at Jaguar's mine site laboratory.

The SGS laboratory based in Belo Horizonte meets international analytical standards and ISO 17025 compliance protocols. Analytical results from the SGS laboratory were forwarded to Jaguar's Exploration or Mine Departments by e-mail, followed by a hard copy.

At Jaguar's Caeté laboratory, samples from the Roça Grande and Pilar mines are dried and then crushed. A one kilogram sub-sample of the crushed material is selected for pulverization to approximately 70% minus 200 mesh. The ring-and-puck pulverizers are cleaned after each sample using compressed air and a polyester bristle brush. The analytical protocol for all samples employs a standard fire assay fusion using a standard 30 g aliquot, with the final gold content being determined by means of AA. The detection limit for fire assay analyses is 0.05 g/t Au. A second cut from the pulps is taken and re-assayed for those drill core samples where the grade is found to be greater than 30 g/t Au. If the two assays are in good agreement, only the first assay is reported. The AA unit is calibrated to directly read gold grades up to 3.3 g/t Au; samples with grades greater than this are re-assayed by diluting the solute until it falls within the direct-read range.

RPA has reviewed the field and underground sampling procedures and is of the opinion that they meet accepted industry standards. In RPA's opinion, the sample preparation, analysis, and security procedures at the Roça Grande and Pilar mines are adequate for use in the estimation of Mineral Resources.

## **QUALITY ASSURANCE AND QUALITY CONTROL**

The Caeté laboratory carries out an internal program of Quality Assurance/Quality Control (QA/QC) for all drill core samples. The QA/QC protocol includes carrying out a duplicate analysis after every 20 samples, representing an insertion frequency of 5%.

Commercially sourced standard reference materials (Rocklab standards Si64 (recommended value of 1.780 g/t Au), SH69 (recommended value of 1.346 g/t Au) and SK78 (recommended value of 4.134 g/t Au)) are inserted at a frequency of every 45 to 50 samples. In 2015, the Jaguar Caeté laboratory used 1,880 samples of standard Si64, 324 samples of standard SH69, and 1,556 samples of standard SK78.

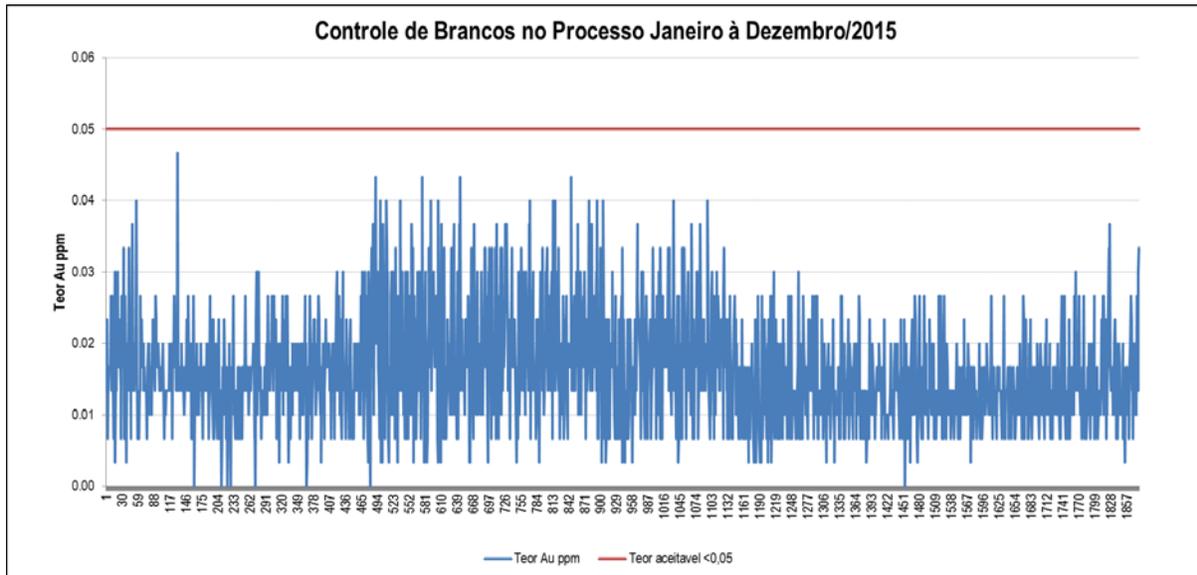
Blank samples are inserted at a rate of one in every 20 samples, representing an insertion frequency of 5%. Blank samples are composed of crushed, barren quartzite or gneiss and are used to check for contamination and carry-over during the crushing and pulverization stage. A total of 1,880 blank samples were used by the Caeté laboratory in 2015.

A total of 480 samples were forwarded to the SGS Intertek laboratory for third-party check analyses and the analytical results compared favourably with the Caeté analyses.

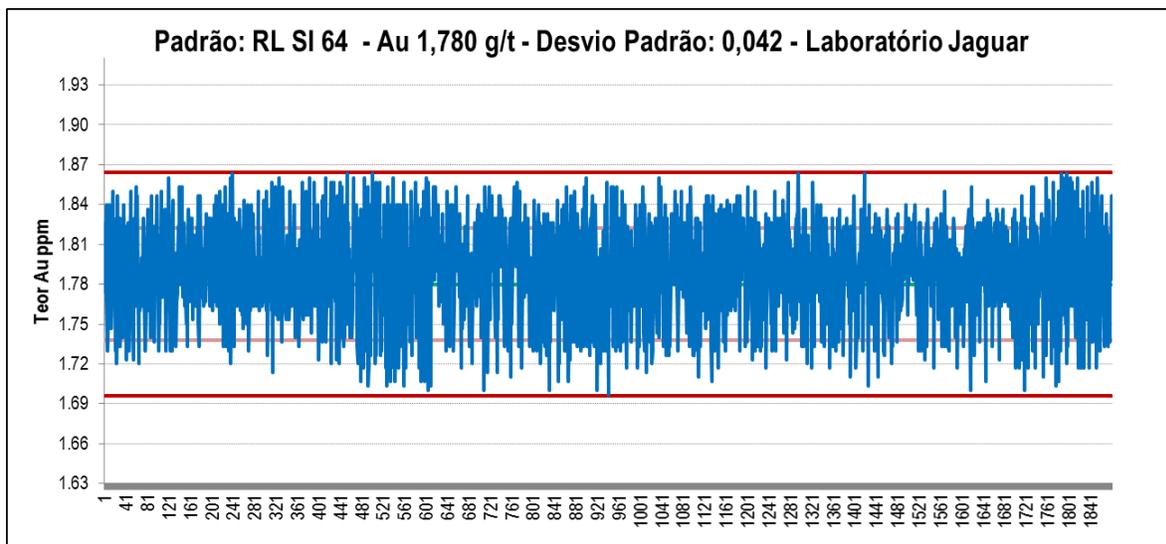
The results of the blanks, duplicates, and standards are forwarded to Jaguar's head office on a monthly basis for insertion into the Jaguar's internal database (BDI). There, the results from the standards samples are scanned visually for out-of-range values on a regular basis. When failures are detected, a request for re-analysis is sent to the laboratory. Only those assays that have passed the validation tests are inserted into the main database.

Sample control charts are presented in Figures 11-1 to 11-5.

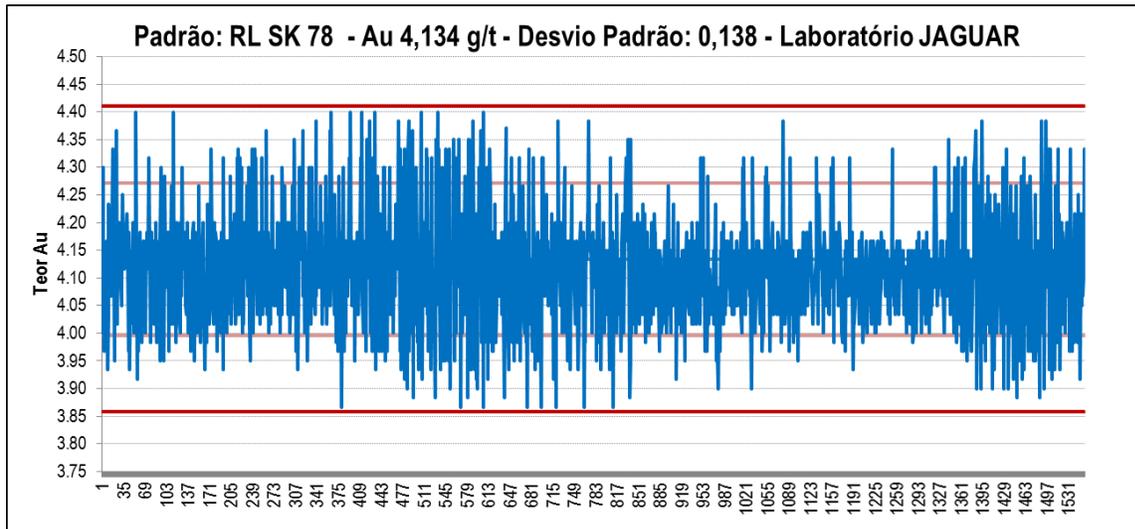
**FIGURE 11-1 CONTROL CHART FOR BLANK SAMPLES, CAETE LABORATORY, JANUARY TO DECEMBER 2015**



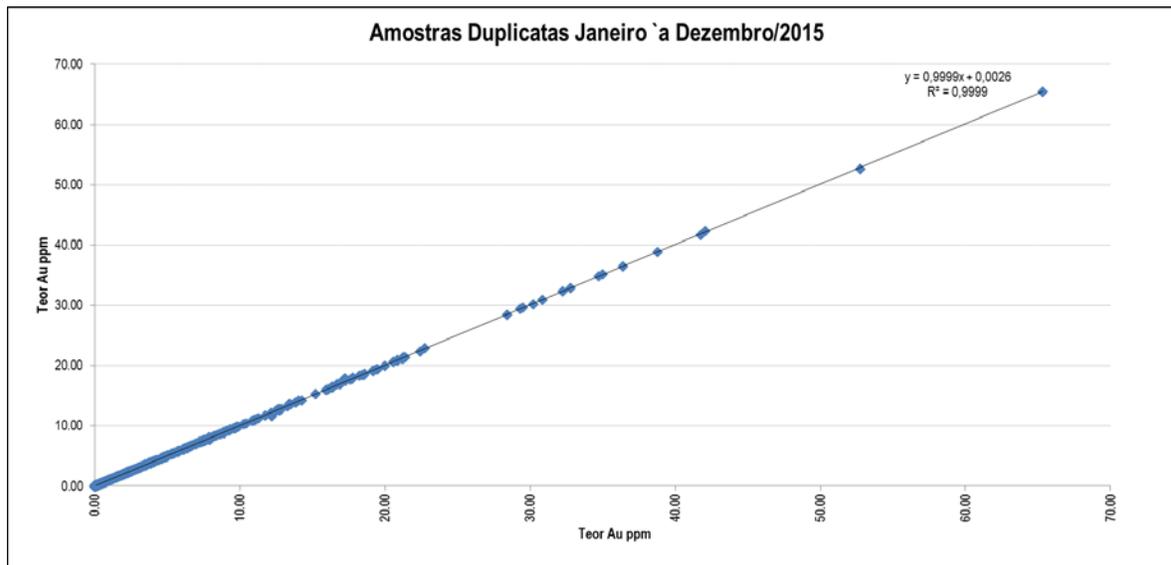
**FIGURE 11-2 CONTROL CHART FOR CERTIFIED REFERENCE MATERIAL RL SI64, JANUARY TO DECEMBER 2015**



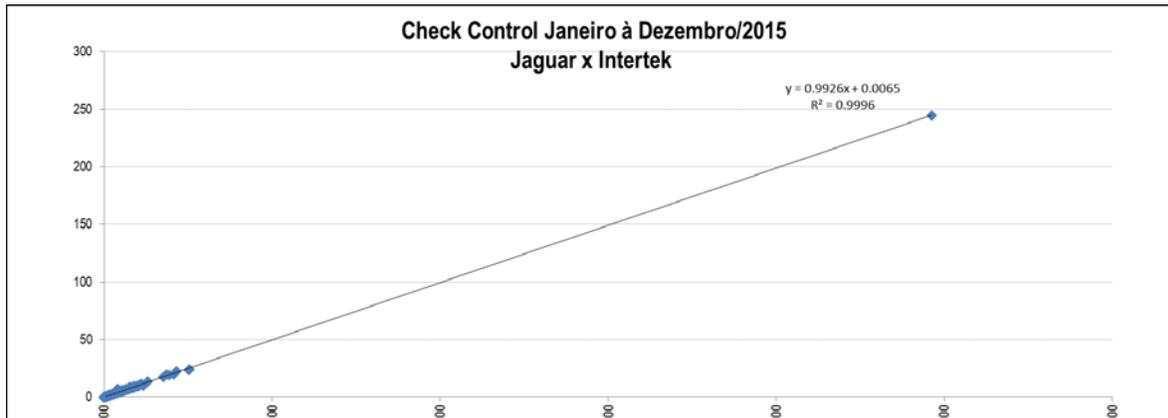
**FIGURE 11-3 CONTROL CHART FOR CERTIFIED REFERENCE MATERIAL RL SK78, JANUARY TO DECEMBER 2015**



**FIGURE 11-4 CONTROL CHART FOR DUPLICATE SAMPLES, CAETE LABORATORY, JANUARY TO DECEMBER 2015**



**FIGURE 11-5 CONTROL CHART FOR EXTERNAL CHECK SAMPLES, JANUARY TO DECEMBER 2015**



In RPA’s opinion, the QA/QC program as designed and implemented by Jaguar is adequate and the assay results within the database are suitable for use in a Mineral Resource estimate.

RPA recommends that the site geologists insert blind certified reference materials, blank samples, and duplicate samples at an insertion rate of 1% to 2% for on-going external, independent monitoring of the on-site laboratory performance.

## 12 DATA VERIFICATION

In the fall 2014, Jaguar commissioned MCB Serviços e Mineração (MCB) to carry out a detailed validation of the geological databases (Alvim, 2014). The scope also included an audit of the procedures and processes used to collect and process the geological data and to manage the geological database.

Approximately 5% of the drill hole and channel sample information used to prepare the current Mineral Resource estimate for the Roça Grande and Pilar mines was selected for review (Table 12-1). To carry out the comparison, all information was digitally re-coded and the results then compared with the source data contained in the master database.

**TABLE 12-1 SUMMARY OF MCB DATABASE VALIDATION DATA**  
**Jaguar Mining Inc. – Caeté Operations**

	Roça Grande Mine	
	Drill Holes	Channel Samples
Total Data	250	766
5% subset	12	38
	Pilar Mine	
	Drill Holes	Channel Samples
Total Data	505	5,580
5% subset	25	279

While a small number of errors were detected in the Collar and Survey tables, no errors were detected in the Geology or Assay tables. The main areas of concern identified by MCB include:

- The shortfall in the preparation of written procedures regarding data collection,
- Database management and the database software used to manage the information, and
- Lack of a QA/QC program for the grade control channel samples.

RPA’s validation checks on the drilling and sampling database for the Roça Grande and Pilar mines provided by Jaguar included:

- Conducted site visits to personally inspect the style and structural complexity of the gold mineralization and its host rocks at the Roça Grande and Pilar mines.

- Carried out a site visit to the Jaguar assay laboratory where the sample preparation and analytical procedures and equipment were reviewed.
- Carried out independent validation of the Pilar Mine drill hole database by means of spot checking of ten drill holes completed in the 2014 drilling program which intersected significant gold mineralization below Level 7 (elevation 280 m).
- Carried out independent validation of the Roça Grande Mine drill hole database by means of spot checking of 32 drill holes.
- Checked collar locations relative to either the digital topographic surface or the location of the underground excavation digital model as appropriate.
- Reviewed drill hole and sample orientations (azimuth/dip) relative to the location of the mineralized zones.
- Completed validity checks for out-of-range values, overlapping intervals, and mismatched sample intervals.
- Reviewed the reasonableness of the geological interpretations relative to the nature of the previously extracted mineralization.
- Reviewed the geological wireframes to ensure that a minimum mining width was honoured.
- Reviewed the coding of the mined out material in the block model to ensure a reasonable match with the excavation model.

No material errors were noted for the Collar, Survey, Lithology, or Assay records reviewed for the Pilar Mine. A small number of errors were noticed in the Downhole Survey records of the drill holes contained in the Roça Grande database. RPA recommends a slight modification to the logging procedures whereby detailed information regarding the mineralized intervals be brought forward from the Remarks column and be inserted as a major level entry in the drill logs to assist in preparation of future updates of the Mineral Resources.

RPA observes that the surface and underground drill hole collar locations are reasonable and channel samples are appropriately located with respect to the existing underground infrastructures. RPA is of the opinion that the drilling and sampling databases are appropriate to be used in the preparation of Mineral Resource and Mineral Reserve estimates.

## **13 MINERAL PROCESSING AND METALLURGICAL TESTING**

The following information on mineral processing and metallurgical testing on the Caeté Gold Project, which includes Roça Grande and Pilar mines, was extracted from TechnoMine Services, LLC's (TechnoMine) Amended Feasibility Study (Amended FS) dated October 2010 (Machado, 2010).

### **MINERALIZATION**

In the Pilar and Roça Grande deposits, the mineralized rocks occur within banded iron formation (BIF) and shear zones, represented by disseminated gold-bearing sulphides associated with silica-sericitic-carbonatic solutions originating from hydrothermal activity. Gold is associated with sulphides (arsenopyrite, pyrite and pyrrhotite) or "free" in the quartz veins or in the contact quartz/sericite schist.

### **MINERAL PROCESSING AND METALLURGICAL TESTWORK**

Jaguar constructed a centralized leaching carbon-in-pulp adsorption/desorption/ recovery (CIP-ADR) metallurgical plant to process the sulphide, transition and oxide ore from Pilar and Roça Grande.

Jaguar also carried out additional metallurgical testwork to assess the inclusion of a Flotation Plant before the CIP-ADR plant to reduce the mass of solids to be leached (flotation concentrate only). All of the backfill material (flotation tailings) could then be directed to the underground mines and would be cyanide-free. Comprehensive testing was carried out by FLSmidth-Dawson Laboratories Inc (Dawson) in Salt Lake City, Utah USA, which included gravity separation, flotation, leaching, and adsorption tests. The testing by Dawson was conducted on a representative sample of mill feed containing 40% Roça Grande, 40% Pilar, and 20% Roça Grande oxide ore (referred to as the Dawson sample). Test results reported in 2009 indicated that the CIP-ADR Plant would need to treat only 10% of the solids mass contained in the Mill Feed, while 90% of the material would be available (fully cyanide-free and geotechnically-appropriate) to feed the Backfill Plant. After cycloning and thickening, 56% of

the flotation tailings is transported to underground mines and the remaining 34% of the material is conveyed to an unlined Rejects Dam (exhausted mine pits).

Based on Dawson laboratory test work, TechnoMine estimated the overall gold recovery to be:

$$\text{Recovery} = 54\% + (46\% \times 0.90 \times 0.93 \times 0.985) = 91.9\%$$

- Gravity recovery = 54%
- Flotation recovery = 90%
- Leaching recovery = 93%
- ADR (Adsorption, Desorption, Electrowinning) recovery = 98.5%

This information was included as part of the process design criteria for the expansion of the Caeté plant.

# 14 MINERAL RESOURCE ESTIMATE

## SUMMARY

RPA has audited and accepted the Mineral Resource estimates prepared by Jaguar for the Roça Grande and Pilar mines. Table 14-1 summarizes the Mineral Resources as of December 31, 2015 based on a US\$1,400/oz gold price. The total Mineral Resources for the Caeté Mine Complex comprise 4.71 million tonnes at an average grade of 4.13 g/t Au containing 625,000 ounces of gold in the Measured and Indicated Resource category and 3.0 million tonnes at an average grade of 4.29 g/t Au containing 409,000 ounces of gold in the Inferred Mineral Resource category. The Mineral Resources include the Roça Grande and Pilar mines. A cut-off grade of 1.46 g/t Au was used to report the Mineral Resources for the Roça Grande Mine, and a cut-off grade of 1.93 g/t Au was used to report the Mineral Resources for the Pilar Mine.

**TABLE 14-1 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2015**  
**Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
<b>Roça Grande Mine:</b>			
Measured	217	2.17	15
Indicated	1,014	2.95	96
<b>Sub-total M&amp;I</b>	<b>1,231</b>	<b>2.81</b>	<b>111</b>
Inferred	1,759	3.48	197
<b>Pilar Mine:</b>			
Measured	709	4.25	97
Indicated	2,770	4.68	417
<b>Sub-total M&amp;I</b>	<b>3,479</b>	<b>4.59</b>	<b>514</b>
Inferred	1,208	5.45	212
<b>Total, Caeté Operations:</b>			
Measured	926	3.76	112
Indicated	3,784	4.22	513
<b>Sub-total M&amp;I</b>	<b>4,710</b>	<b>4.13</b>	<b>625</b>
Inferred	2,967	4.29	409

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au for the Roça Grande Mine and 1.93 g/t Au for the Pilar Mine.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reals: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.

6. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
7. No Mineral Reserves are currently present at the Roça Grande Mine. Mineral Resources are inclusive of Mineral Reserves for the Pilar Mine
8. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
9. Numbers may not add due to rounding.

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

It is RPA's opinion that the Roça Grande and Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

## **ROÇA GRANDE**

The updated block model for the Roça Grande Mine is based on drilling and channel sample data using a data cut-off date of June 30, 2015. The database comprises 649 drill holes and 6,517 channel samples. The estimate was generated from a block model constrained by three-dimensional (3D) wireframe models that were constructed using a minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A minimum width criteria was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres.

The gold grades are estimated using the inverse distance cubed interpolation (ID<sup>3</sup>) algorithm using capped composited assays. A capping value of 30 g/t Au was applied for the RG01 and RG06 Orebodies while a capping value of 50 g/t Au was applied for the RG02, RG03 and RG07 Orebodies. The Mineral Resources are reported using the gold grades estimated by the inverse distance cubed (ID<sup>3</sup>) method. The wireframe models of the mineralization and excavated material for the Roça Grande Mine were constructed using the excavation information as of December 31, 2015.

The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with these orebodies.

## **PILAR**

The updated block model for the Pilar Mine is based on drilling and channel sample data using a data cut-off date of July 1, 2015. The database comprises 984 drill holes and 16,445 channel samples. The estimate was generated from a block model constrained by three-dimensional (3D) wireframe models that were constructed using a minimum width of two metres. The gold grades are estimated using the inverse distance cubed interpolation (ID<sup>3</sup>) algorithm using capped composited assays. Various capping values were applied to each of the different Orebodies, ranging from 60 g/t Au for the BA Orebody to 10 g/t Au for the LHW Orebody. The Mineral Resources are reported using the gold grades estimated by the inverse distance cubed (ID<sup>3</sup>) method. The wireframe models of the mineralization and excavated material for the Pilar Mine were constructed using the excavation information as of December 31, 2015.

The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with this deposit.

## **ROÇA GRANDE MINE**

### **DESCRIPTION OF THE DATABASE**

Current drilling and sampling practices involve the initial delineation of the location of the various mineralized lenses using surface-based and underground-based drill holes at a nominal spacing of 25 m to 50 m. Underground-based drilling is used to delineate the RG1 and RG7 mineralized lenses only, as no underground development has been carried out on the RG2, RG3 and RG6 lenses. As development of the underground access progresses on the RG1 and RG7 lenses, a series of channel samples are taken in two locales (one set on the face and one set along the back) for each round. The average sample spacing along development drifts is five metres. Channel samples that were taken during excavation of the open pit mines on the RG2, RG3 and RG6 lenses were also included into the drill hole database.

Jaguar maintains an internal database which is used to store and manage all of the digital information for all of its operations. The drill hole and channel sample information for the Roça Grande Mine were extracted from this internal database into separate files for use in preparation of the Mineral Resource estimates.

The cut-off date for the channel sample assays in the drill hole database is March 31, 2015, while the cut-off date for the drill core sample assays in the drill hole database is June 30, 2015. The drill hole and channel sample information were grouped into five sets to reflect the known mineralized lenses at Roça Grande. The drilling and sampling was carried out using the UTM Datum Córrego Alegre, Zone 23S grid coordinate system.

A summary of the drilling and channel sampling information is provided in Table 14-2.

**TABLE 14-2 DESCRIPTION OF THE ROÇA GRANDE DATABASE AS AT AUGUST 24, 2015**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Data Type</b>	<b>Description</b>
Collars, Drill Holes	649 (total 97,250 m)
Collars, Chip & Channel Samples	6,517 (total 74,041 m)
Survey, Drill Holes	23,694
Survey, Chip & Channel Samples	72,321
Lithology, Drill Holes	11,328
Lithology, Chip & Channel Samples	29,791
Assays, Drill Holes	33,327
Assays, Chip & Channel Samples	77,035

This drill hole information was modified slightly so as to be compatible with the format requirements of the MineSight v.7.60 mine planning software and was imported into that software package by Jaguar. A number of new tables were created during the estimation process to capture such information as the intersection information between the drill holes and the wireframe models, density readings, capped assay records, and composited assay records.

The database included a number of assay records which contained entries of negative values to represent intervals of no sampling, lost core, lost sample, or no core recovery, some of which are contained within the mineralized wireframes. Depending upon the specific local conditions, these null values can introduce an undesired positive bias upon the grade estimations. Jaguar therefore elected to pursue a conservative approach by inserting a very low gold value of 0.01 g/t Au for these intervals of null values. A total of 33,033 records were adjusted in this process.

RPA notes that the controls on the gold mineralization at the Roça Grande Mine are well understood and that the mineralized lenses are well drilled and well sampled. The drilling and sampling protocols employed by Jaguar permit the identification and delineation of the

mineralized areas with confidence. The drilling and sampling practices are carried out to a high standard. RPA is of the opinion that the drill hole and sampling database is suitable for use in preparation of Mineral Resource estimates.

## **MINERALIZATION WIREFRAMES**

The interpreted 3D wireframe models of the gold mineralization have been created using the geology information and assay values from surface- and underground-based drill holes, and channel sample data as available. Wireframe models of the gold distribution for the three Orebodies were created using the LeapFrog Geo version 2.0.2 software packages.

The wireframe limits were drawn using a cut-off grade of 0.50 g/t Au and a nominal minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A minimum width criteria was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres. The wireframe models were clipped to the original, pre-mining topography surface.

The main underground production of the mine has been from the RG1 and RG7 lenses. The RG1 lens is a shallowly dipping stratiform deposit that is generally associated with an iron formation assemblage comprised of carbonate, oxide and sulphide facies iron formation, chert, clastic sediments (including graphitic argillite), and fine grained tuffaceous units. The average strike of the lens is to azimuth 075° and the average dip is 40° to 50° to the south (Figure 14-1). The RG7 lens in contrast is composed largely of vein quartz which is oriented sub-parallel to the RG1 mineralized lens. The mineralization in the RG1 lens has been outlined along a strike length of approximately 500 m and along the down-dip direction of approximately 1,400 m to 1,500 m (approximately 400 m vertically below surface). The deposit is accessed by a ramp and a system of levels that provides access to a depth of approximately 230 m vertically from surface. The bottom of the ramp is currently located approximately 300 m vertically from surface. The mineralization in the RG1 lens has been defined by drilling below the lowest working level and good potential remains for discovering additional mineralization along the down-plunge projection with additional drilling.

Separate surfaces were also created to represent the bottom of the weathered material as well as representing the bottom of the transitional weathering zone. It is important to note that due

to the presence of deeply penetrating fault structures, the bottom of the transition zone has been interpreted to penetrate deeper near the RG1 and RG2 lenses. This interpretation is supported by the rock quality information gained in the Vale railroad tunnel, the ramp access from the RG1 mine to the RG2 lens, and from drill holes that tested the RG2 lens which were collared from the RG2 decline.

### TOPOGRAPHY AND EXCAVATION MODELS

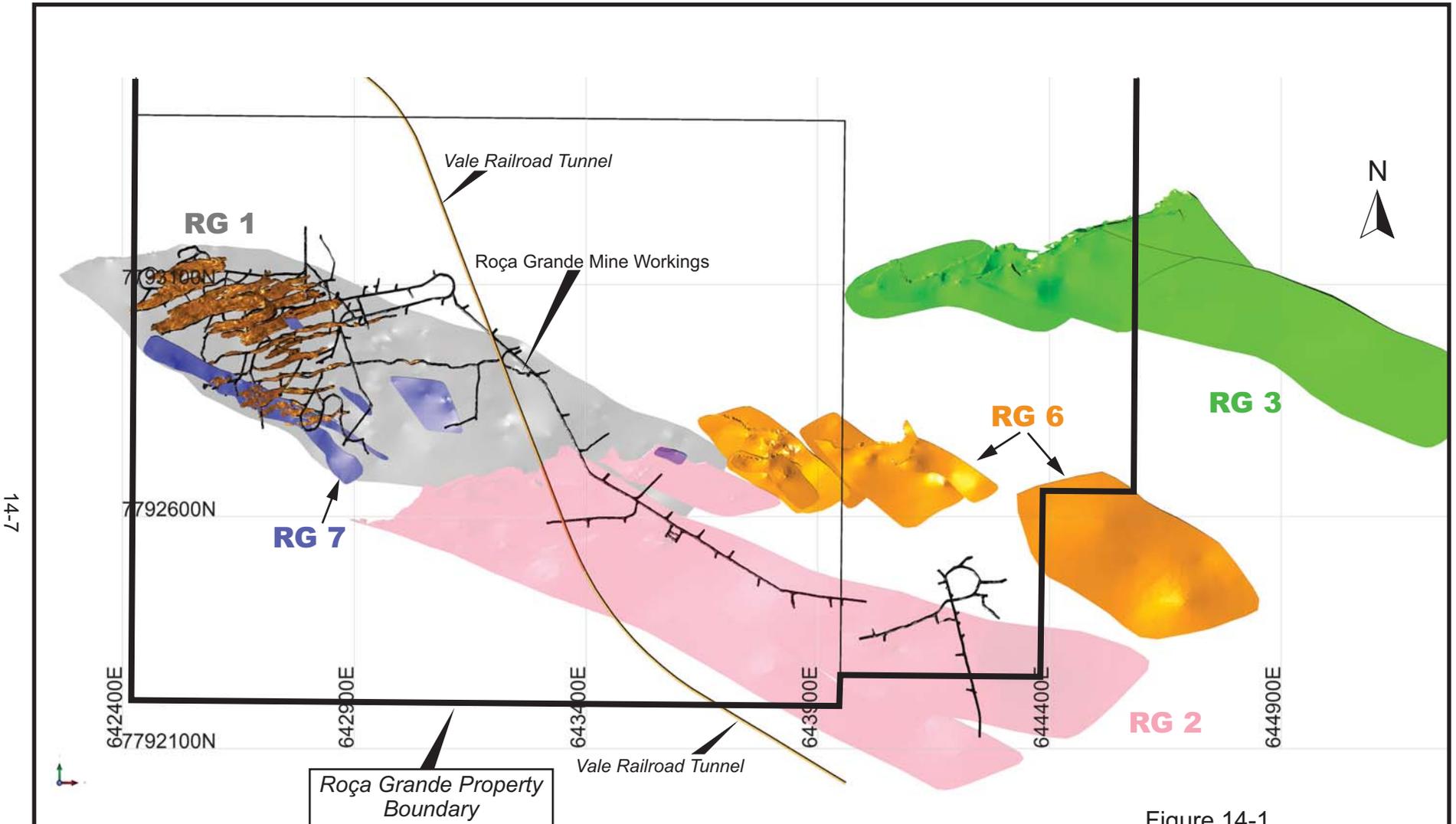
A topographic surface of the mine area that is current as of May 2015 was used to code the block model for those portions of the RG2, RG3, and RG6 lenses that have been excavated by means of open pit mining methods. A wireframe model of the completed underground excavations as of August 2015 was prepared and was used to code the block model for the portions of the RG1 and RG7 lenses that have been mined out.

The mineralization at the Roça Grande Mine is accessed by means of a ramp with a collar elevation at approximately 1,110 MASL. The bottom of the ramp is currently at an elevation of approximately 915 MASL. Due to the dip of the mineralization, the chief mining method that has been employed to-date has been a drift-and-fill method. In all, five levels have been developed to access the RG1 and RG7 lenses (Table 14-3). An attempt was made to access the RG2 lens by deepening and extending the RG1 ramp, however the attempt was stopped due to poor ground conditions. A second ramp has been excavated with the portal located in the hangingwall of the RG2 lens at an elevation of approximately 1,035 MASL. The bottom of this ramp is currently at an elevation of approximately 945 MASL, and has not penetrated the RG2 mineralized lens.

A railroad tunnel has been constructed by Vale in support of its mining operations in the area. A digital model of this tunnel has been prepared which shows that it penetrates the mineralized wireframe of the RG2 lens (Figure 14-1).

**TABLE 14-3 DESCRIPTION OF THE ROÇA GRANDE MINE LEVELS  
Jaguar Mining Inc. – Caeté Operations**

Level	Floor Elevation (m)
Crown Pillar	1220
1	1160
2	1120
3	1044
4	970
5	922



14-7

Figure 14-1

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
*Minas Gerais State, Brazil*  
**Plan View of the Mineralized**  
**Wireframes and Underground Workings**

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## SAMPLE STATISTICS AND GRADE CAPPING

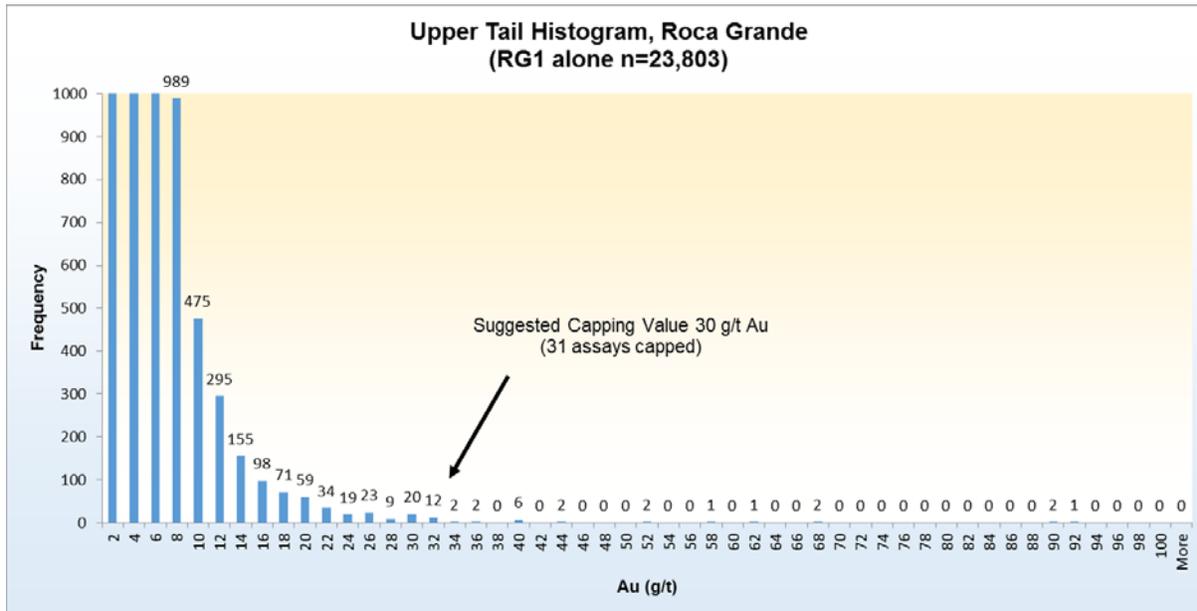
The mineralization wireframe models were used to code the drill hole database and identify the raw assay samples that are contained within the mineralized wireframes. These samples were extracted from the database into their respective domains, and then subjected to statistical analyses by means of histograms, probability plots, and decile analyses. A total of 65,964 samples were contained within the mineralized wireframes, of which approximately 3% comprised samples with null values which had been replaced by near-zero values. The sample statistics are summarized in Table 14-4. Selected histograms are provided in Figures 14-2 and 14-3.

On the basis of its review of the assay statistics, RPA believes that a capping value of 30 g/t Au is appropriate for the RG1 and RG6 mineralized lenses and a capping value of 50 g/t Au is appropriate for the RG2, RG3, and RG7 mineralized lenses. The selection of capping values can be re-examined in light of grade reconciliation information and adjusted accordingly as necessary.

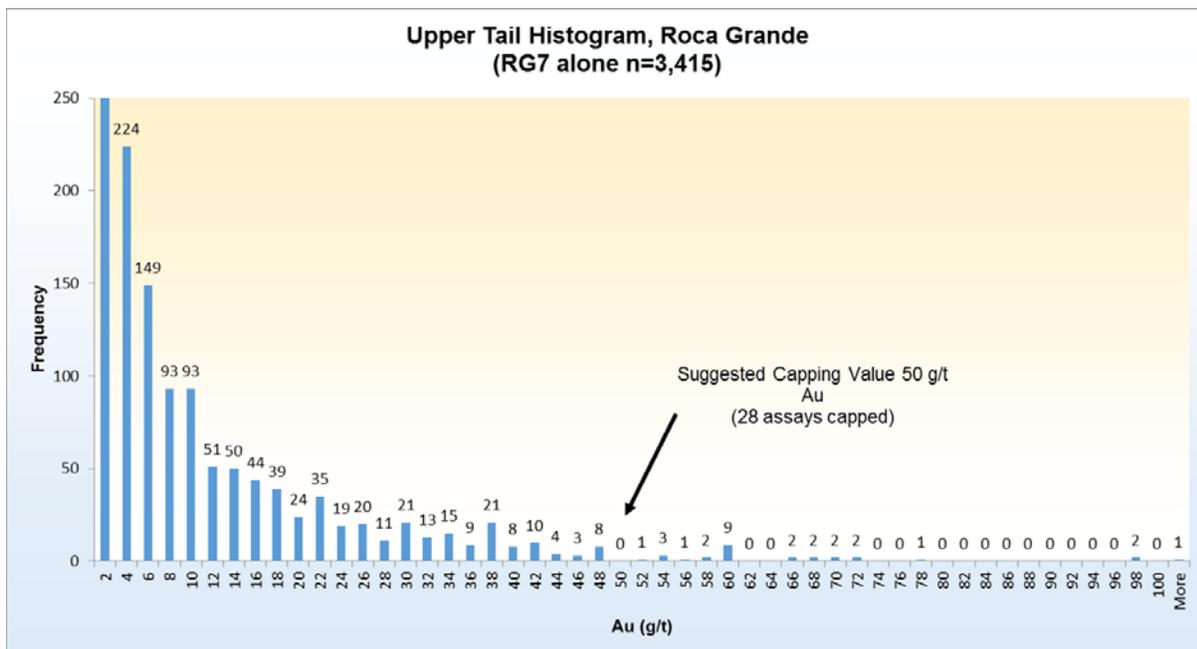
**TABLE 14-4 DESCRIPTIVE STATISTICS OF THE RAW ASSAYS, ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Item	RG1		RG7		RG2		RG3		RG6	
	Au Raw	Au Cap								
Length-Weighted Mean	2.17	2.16	5.40	4.99	3.04	2.98	1.51	1.48	1.66	1.59
Median	0.89	0.89	0.34	0.34	1.17	1.17	0.36	0.36	0.31	0.31
Mode	0.01	0.01	0.01	0.01	0.01	0.01	0.07	0.07	0.01	0.01
Standard Deviation	3.60	3.41	13.84	9.46	6.14	5.44	4.15	3.62	4.71	3.49
CV	1.66	1.58	2.56	1.90	2.02	1.83	2.76	2.44	2.85	2.20
Sample Variance	12.96	11.64	191.45	89.57	37.67	29.61	17.24	13.09	22.23	12.21
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum	88.17	30.00	385.00	50.00	165.03	50.00	196.00	50.00	115.80	30.00
Count	22,834	22,834	3,060	3,060	13,386	13,386	22,307	22,307	2,299	2,299
Capping Value	30		50		50		50		30	

**FIGURE 14-2 FREQUENCY HISTOGRAM OF THE RAW ASSAYS, RG1 WIREFRAME**



**FIGURE 14-3 FREQUENCY HISTOGRAM OF THE RAW ASSAYS, RG7 WIREFRAME**



## COMPOSITING METHODS

The selection of an appropriate composite length began with examination of the descriptive statistics of the raw assay samples and preparation of sample length frequency histograms. Consideration was also given to the size of the blocks in the model.

Many of the sample lengths in the various mineralized wireframes were found to be approximately one metre in length. Consequently, on the basis of the available information, RPA believes that a composite length of one metre for all samples is reasonable. All samples contained within the mineralized wireframes were composited to a nominal one metre length using the best-fit function of the MineSight software package. The descriptive statistics of the composite samples are provided in Table 14-5.

**TABLE 14-5 DESCRIPTIVE STATISTICS OF THE COMPOSITE SAMPLES, ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Item	RG1		RG7		RG2		RG3		RG6	
	Comp Raw	Comp Cap								
Length-Weighted Mean	2.17	2.16	5.39	4.99	3.04	2.98	1.51	1.49	1.66	1.59
Median	1.15	1.15	0.98	0.98	1.19	1.19	0.45	0.45	0.40	0.40
Mode	0.01	0.01	0.01	0.01	0.07	0.07	0.07	0.07	0.01	0.01
Standard Deviation	3.07	2.94	14.33	8.96	6.06	5.33	3.84	3.32	3.82	3.06
CV	1.41	1.36	2.66	1.80	1.99	1.79	2.55	2.23	2.31	1.92
Sample Variance	9.39	8.67	205.3	80.25	36.75	28.38	14.76	10.99	14.62	9.35
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum	59.99	30.00	385.0	50.00	165.03	50.00	196.00	50.00	89.33	30.00
Count	11,500	11,500	1,541	1,541	7,091	7,091	12,103	12,103	1,817	1,817

## BULK DENSITY

Jaguar has initiated a program of bulk density measurements on the various lithologies that are present at the Roça Grande Mine in 2015. The density measurements were made on representative samples of drill core from intervals of iron formation and quartz vein that are located within the mineralized wireframes, along with measurements carried out on samples of adjoining waste rock units. The density measurements were carried out at the Jaguar analytical laboratory located at the Roça Grande Mine using the water displacement method. In all, a total of 261 density measurements were completed in 2015. A summary of the results is presented in Table 14-6. A density of 2.00 tonnes/m<sup>3</sup> was applied to all material located

above the oxidized surface and a density of 2.25 tonnes/m<sup>3</sup> was applied to all material located in the transition zone between the oxidized and fresh rock surfaces.

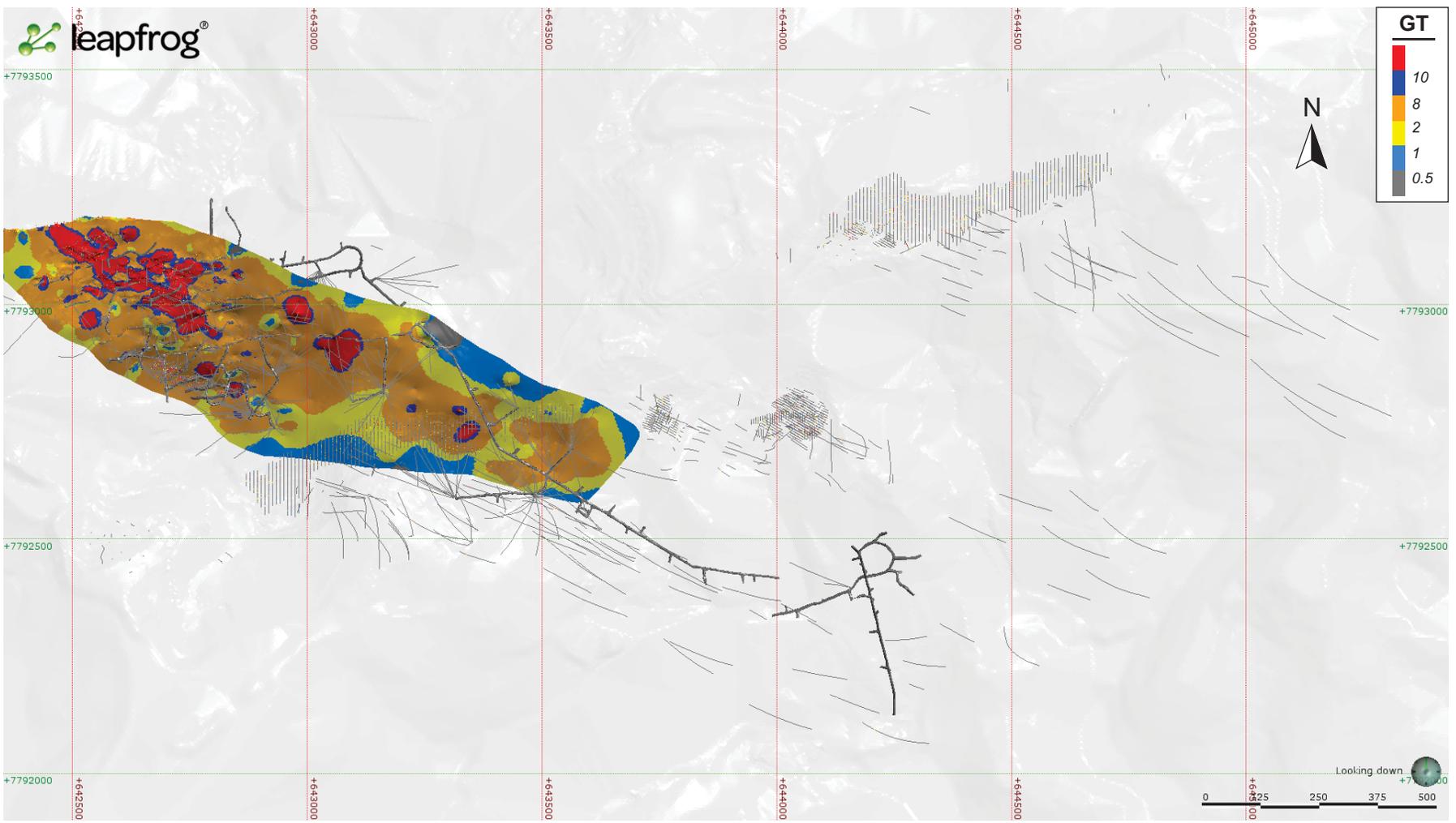
**TABLE 14-6 SUMMARY OF 2015 DENSITY MEASUREMENTS, ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Item	Iron Formation RG1, 2, 3, & 6	Quartz Vein RG7	Waste Rock
Mean	2.87	2.75	2.73
Median	2.86	2.73	2.73
Mode	2.75	#N/A	2.60
Standard Deviation	0.29	0.17	0.28
Sample Variance	0.08	0.03	0.08
Minimum	2.24	2.45	2.00
Maximum	4.13	3.19	3.88
Count	164	13	84

## TREND ANALYSIS

As an aid in carrying out variography studies of the continuity of the gold grades in the mineralized domain models, a short study to examine the overall trends was carried out. For this exercise, a data file was prepared that contained the gold values for each drill hole and channel sample contained within the respective mineralized domain model. The resulting gold grade times thickness (GT) product were digitally contoured using the LeapFrog software package and the results are shown in Figures 14-4 and 14-5.

It can be seen that an overall down-plunge of the gold grade-thickness product is present for the RG1 and RG2 orebodies. The trends further along the down-plunge projection are not as well defined, as the density of drill hole and channel sample information is lower in these areas.



Plan View

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roca Grande Mine**  
Mina Gerais State, Brazil  
**Grade x Thickness Product**  
**RG1 Orebody**

14-12

14-13

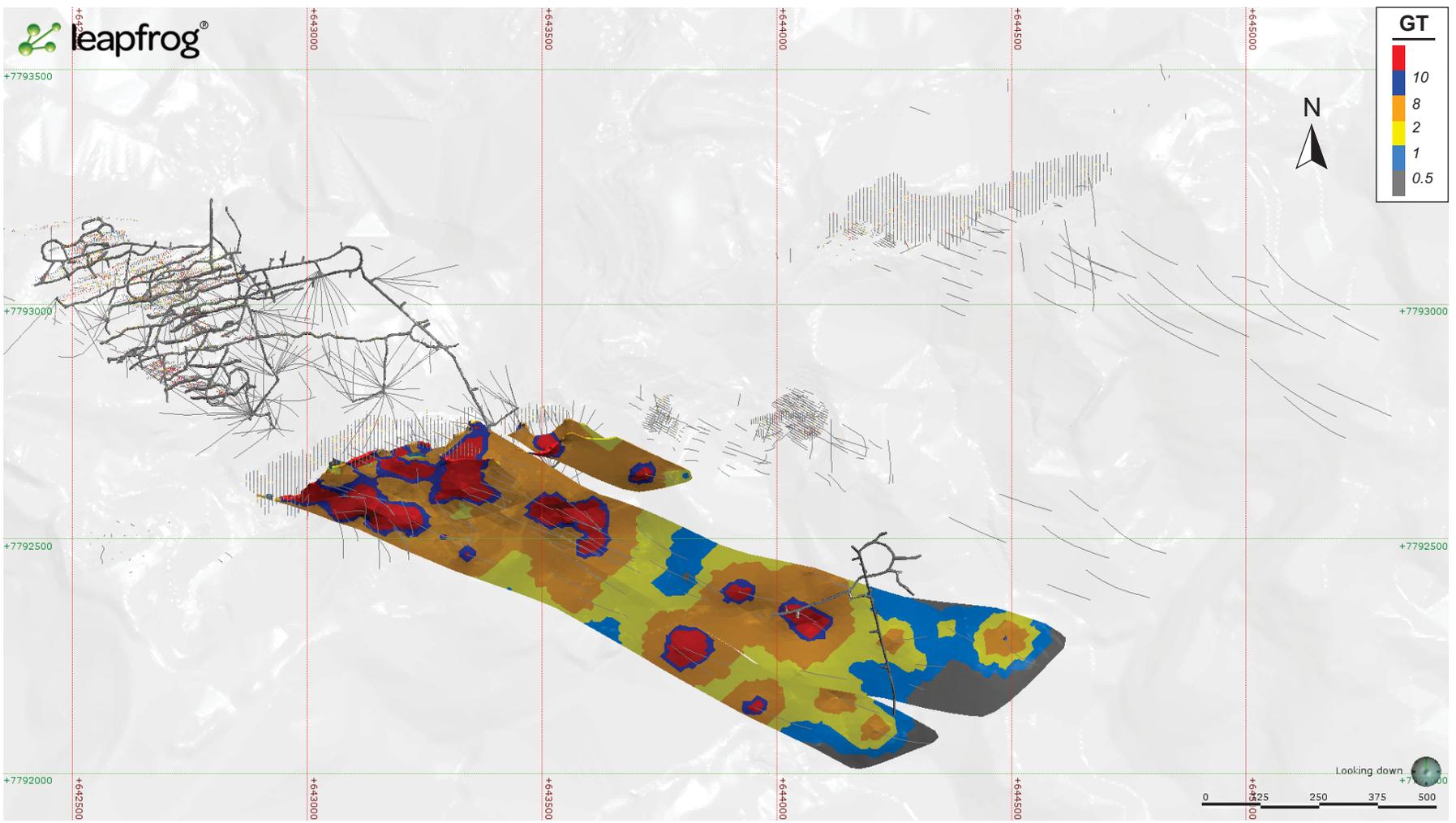


Figure 14-5

*Plan View*

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roca Grande Mine**  
*Mina Gerais State, Brazil*  
**Grade x Thickness Product**  
**RG2 Orebody**

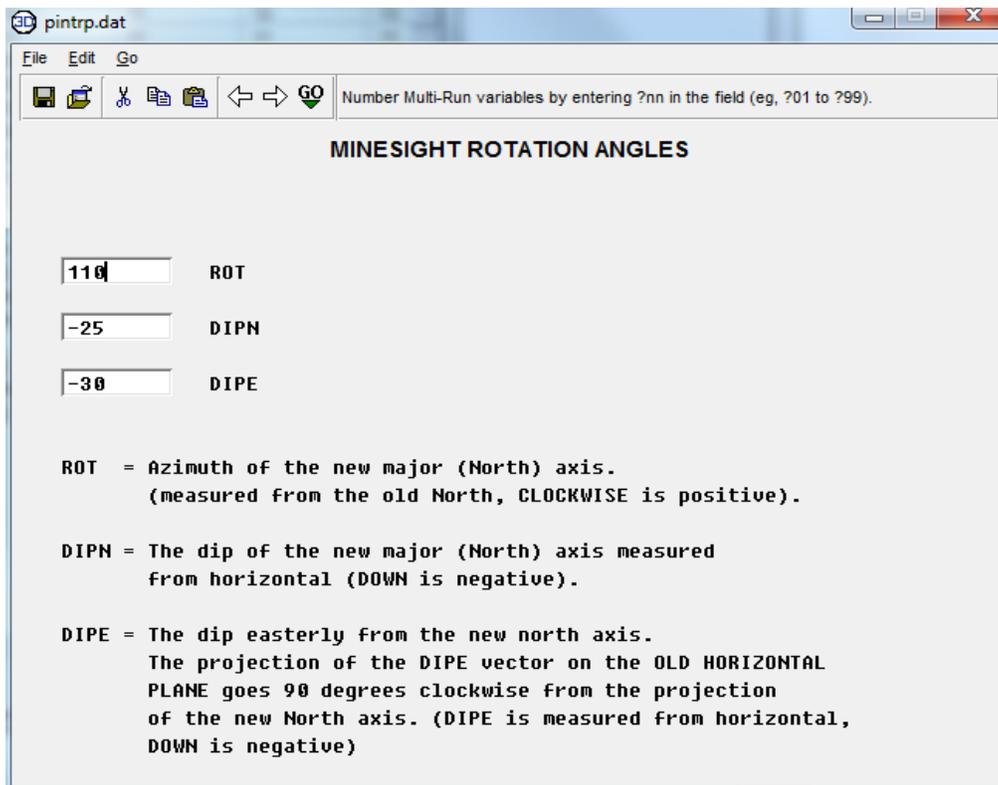
## VARIOGRAPHY

Jaguar began its analysis of the spatial continuity by constructing separate downhole and omnidirectional variograms using the capped, composited sample data for each of the Orebodies, with the objective of determining an appropriate value for the global nugget (C0). The analysis proceeded with the evaluation of any anisotropies that may be present in the data, which resulted in successful variograms with reasonably good model fits. The variography package of the MineSight software package was used to construct the variograms. A summary of the variogram parameters derived for each of the five Orebodies is presented in Table 14-7. The MineSight software package uses the azimuth/dip/plunge rotation convention (Figure 14-6).

**TABLE 14-7 SUMMARY OF VARIOGRAPHY AND INTERPOLATION PARAMETERS, ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Orebody	RG1	RG2	RG3	RG6	RG7
<b>Variography Parameters:</b>					
Nugget	3	15	5	2	30
Sill, Major Axis C1	4.00 (8 m)	8.00 (22 m)	3.50 (12 m)	4.00 (6 m)	30.00 (5 m)
Sill, Major Axis C2	1.44 (26 m)	6.20 (38 m)	2.57 (20 m)	1.34 (26 m)	14.40 (20 m)
Model type	Spherical	Spherical	Spherical	Spherical	Spherical
Orientation	110/-25/-30	110/-20/-40	110/-25/-40	130/-37/-40	115/-35/-30
Anisotropy Ratio (Major/Semi-Major)	3.25	1.27	1.67	1.30	1.67
Anisotropy Ratio (Major/Minor)	4.33	7.60	3.33	2.60	3.33
Minimum Number of Samples	3	3	3	3	3
Maximum Number of Samples	8	8	8	8	8
Max. No. of Samples per Hole	2	2	2	2	2
Max. No. of Samples per Quadrant	2	2	2	2	2
<b>Search Ellipse Axis Ranges (m):</b>					
Main	26	38	20	26	20
Secondary	8	30	12	20	12
Minor	6	5	6	10	6

FIGURE 14-6 MINESIGHT ROTATION ANGLES



## BLOCK MODEL CONSTRUCTION

The block model was constructed using the MineSight version 7.60 software package and comprised an array of 2 m x 2 m x 2 m sized blocks using a partial percentage attribute. The model is oriented parallel to the coordinate grid system (i.e., no rotation or tilt). The selection of the block size for this model was based upon the block sizes previously employed at the mine. The block model origin, dimensions, and attribute list are provided in Table 14-8. A number of attributes were created to store such information as rock code, material densities, estimated gold grades, mineral resource classification, mined out material and the like (Table 14-9).

Gold grades were estimated into the blocks by means of inverse distance cubed (ID<sup>3</sup>), ordinary kriging (OK), and nearest neighbour (NN) interpolation algorithms using the capped composited sample information. A total of four interpolation passes were carried out using distances derived from the variography results and the search ellipse parameters presented above.

In general, “hard” domain boundaries were used along the contacts of the mineralized domain models. Only data contained within the respective wireframe model were allowed to be used to estimate the grades of the blocks within the wireframe in question, and only those blocks within the wireframe limits were allowed to receive grade estimates.

**TABLE 14-8 BLOCK MODEL DEFINITION, ROÇA GRANDE MINE  
Jaguar Mining Inc. – Caeté Operations**

Type	Y (Northing)	X (Easting)	Z (Elevation)
Minimum Coordinates (m)	7,791,900	642,200	500
Maximum Coordinates (m)	7,793,700	645,600	1,500
Block Size (m)	2	2	2
Rotation (°)	0.000	0.000	0.000

**TABLE 14-9 BLOCK MODEL ATTRIBUTES, ROÇA GRANDE MINE  
Jaguar Mining Inc. – Caeté Operations**

Attribute Name	Type	Decimals	Description
au_id3_c	Real	2	Gold by Inverse Distance, Power 3, Capped Composites
au_nn_c	Real	2	Gold by Nearest Neighbour, Capped Composites
au_ok_c	Real	2	Gold by Ordinary Kriging, Capped Composites
avd	Real	2	Average Distance of Informing Samples
class	Integer	-	Mineral Resource Classification (1=measured, 2=indicated, 3=inferred)
density	Real	2	Material Density
dm	Real	-	Code for Property Boundary (1=with RG claim boundary)
mined	Real	-	Mined Out (-1=Remaining Material, 1=Mined Out)
nsmp	Real	-	Number of Informing Samples
ore_pct	Real	2	Percent of Block Inside the Wireframe
rock	Integer	-	Material / Wireframe Code
rsrc	Integer	-	Resource/Reserve Reporting Flag (by wireframe)
topo_pct	Real	-	Percent of Block Below Topography Surface
vokc	Real	2	Kriging Variance using Uncapped Composites
weath	Real	-	Weathering Code

Those portions of the mineralized wireframes that sit beyond the Roça Grande Mine property boundary were appropriately coded in the block model and omitted from the Mineral Resource statement.

## BLOCK MODEL VALIDATION

Block model validation exercises consisted of comparing the volume of the coded blocks in the block model against the volume report of the respective wireframe models as a high level check that the block model has been correctly coded for each of the wireframes (Table 14-10). In general, the block model volumes compared well with the wireframe volumes for all domains except for the RG07 domain where the block model has been coded with slightly less volume.

A second validation exercise consisted of comparing the descriptive statistics from the capped composited samples against the block model estimated gold grades. In general, the block estimated mean grades compared well with the average of the capped, composited samples for all domains except for the RG07 domain. RPA attributes this difference to the clustering of the composite samples (channel samples) and to the relatively small number of composite samples that are used to interpolate some of the sub-domains for this wireframe. Swath plots for northing, easting and elevations are presented in Figure 14-7.

A third validation exercise consisted of comparing the mill production statistics with the predicted volumes of diluted and recovered tonnes and grade from the block model for the period of January 2014 to March 2015 (Table 14-11 and Figure 14-8). The reconciliation results are showing that there is a good correlation between the block model predicted tonnages and grades against the mill production statistics for the period examined.

**TABLE 14-10 BLOCK MODEL VALIDATION RESULTS, ROÇA GRANDE MINE  
Jaguar Mining Inc. – Caeté Operations**

Orebody	RG01	RG02	RG03	RG06	RG07
<b>Block Model:</b>					
Volume (m <sup>3</sup> )	1,147,049	1,482,279	1,661,810	833,864	75,097
Tonnes	3,220,488	3,387,371	4,184,455	1,919,079	195,646
Grade (g/t Au)	1.73	2.85	1.48	1.51	6.15
<b>Wireframe:</b>					
Volume (m <sup>3</sup> )	1,170,422	1,512,104	1,694,232	850,421	79,948
Difference (BM-Wf)	-23,373	-29,825	-32,422	-16,557	-4,851
% Difference	-2%	-2%	-2%	-2%	-6%
<b>Composites:</b>					
Grade (g/t Au)	2.04	2.92	1.46	1.36	4.13

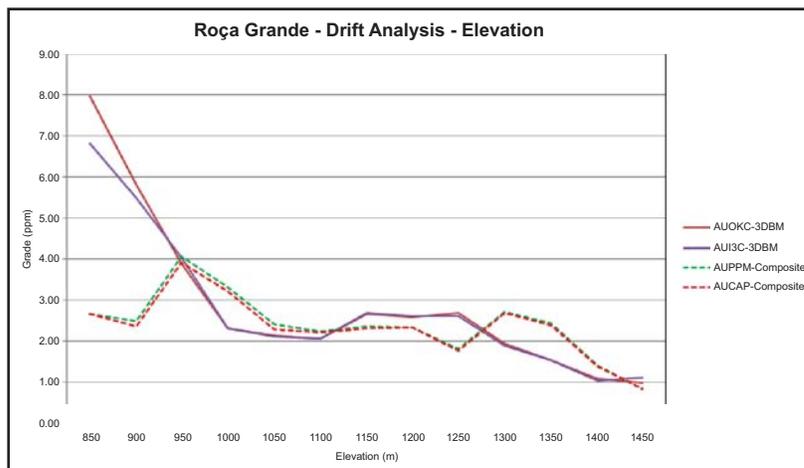
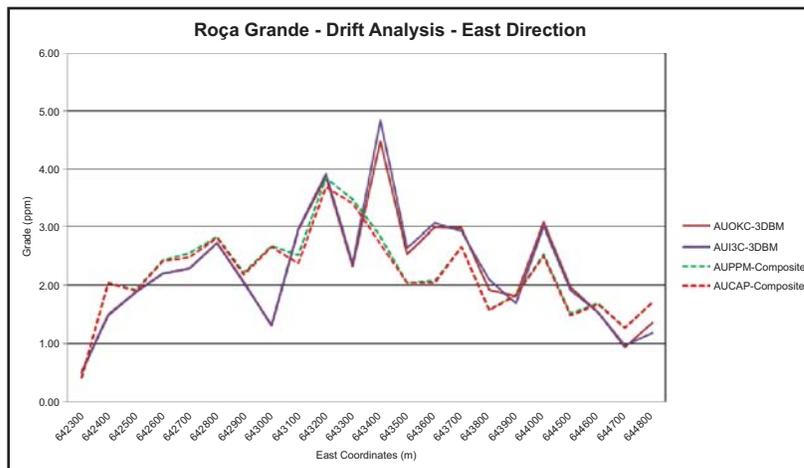
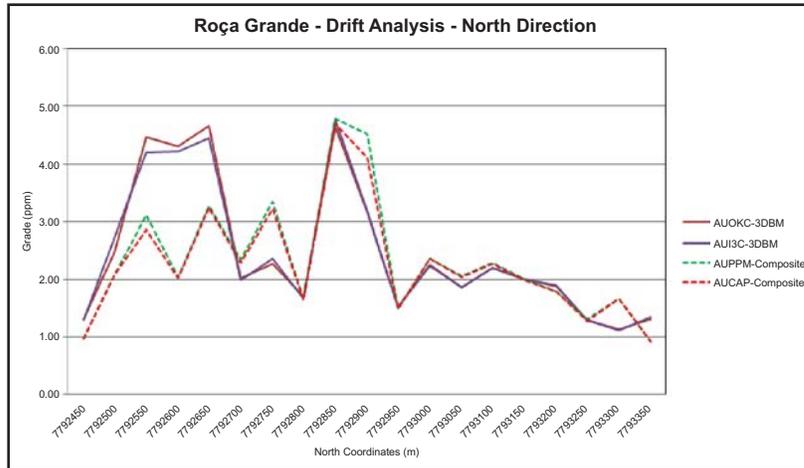


Figure 14-7

**Jaguar Mining Inc.**

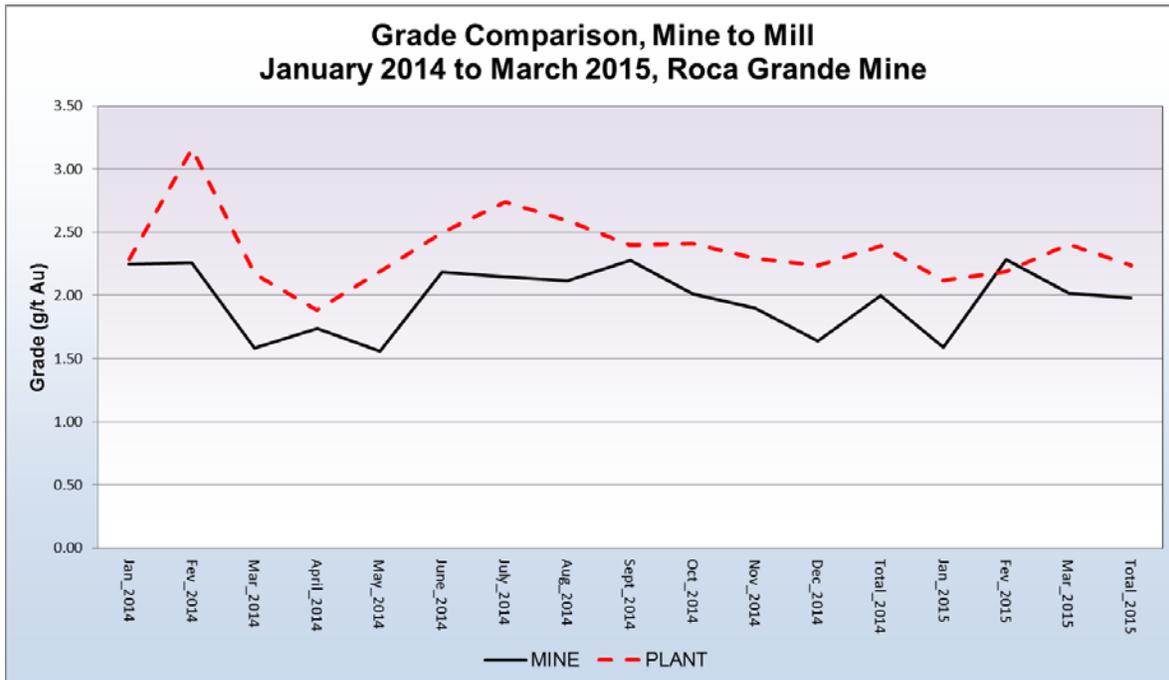
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**Caeté Operations**  
**Roça Grande Mine**  
 Minas Gerais State, Brazil  
**Swath Plots**

**TABLE 14-11 MINE TO MILL (F1') COMPARISON, JANUARY 2014 TO MARCH 2015 – ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Month	MINE PRODUCTION			PLANT PRODUCTION		
	Recovered Tonnes	Recovered Grade (g/t Au)	Oz Au	Mill Feed Tonnes	Mill Feed Grade (g/t Au)	Oz Au
<b>2014</b>						
January	16,407	2.25	1,186	14,916	2.29	1,096
February	11,007	2.26	801	12,030	3.16	1,223
March	12,390	1.59	632	14,155	2.17	988
April	16,426	1.74	920	15,563	1.88	942
May	10,079	1.56	506	12,032	2.19	846
June	14,624	2.18	1,027	12,617	2.50	1,015
July	15,416	2.15	1,063	14,702	2.74	1,295
August	15,045	2.12	1,024	14,174	2.59	1,180
September	17,511	2.28	1,284	15,589	2.40	1,203
October	14,650	2.01	948	16,296	2.41	1,263
November	14,182	1.90	867	14,857	2.30	1,097
December	11,566	1.64	611	15,043	2.24	1,083
<b>Total - 2014</b>	<b>169,303</b>	<b>2.00</b>	<b>10,868</b>	<b>171,975</b>	<b>2.39</b>	<b>13,231</b>
<b>2015</b>						
January	10,293	1.59	527	11,426	2.12	778
February	11,676	2.29	859	12,755	2.19	897
March	11,111	2.02	721	11,742	2.41	909
<b>Total - 2015</b>	<b>33,080</b>	<b>1.98</b>	<b>2,106</b>	<b>35,923</b>	<b>2.24</b>	<b>2,585</b>
<b>Variance</b>						
<b>Period</b>	<b>Tonnes</b>	<b>Grade</b>	<b>Oz Au</b>	<b>Tonnes</b>	<b>Grade</b>	<b>Oz</b>
2014	+2,672	+0.39	+2,363	1.02	1.12	1.22
M-T-D 2015	+2,843	+0.26	+479	1.09	1.13	1.23

**FIGURE 14-8 MINE TO MILL GRADE COMPARISON, JANUARY 2014 TO MARCH 2015, ROÇA GRANDE MINE**



### MINERAL RESOURCE CLASSIFICATION

The Mineral Resources in this report were estimated in accordance with the definitions contained in CIM (2014).

The mineralized material for each wireframe was classified into the Measured, Indicated, or Inferred Mineral Resource category on the basis of the search ellipse ranges obtained from the variography study, the demonstrated continuity of the gold mineralization, the density of drill hole and chip sample information, and the presence of underground access.

On the basis of these criteria, Measured Mineral Resources comprise that material that has been estimated using Pass #1 that is located between developed levels. Indicated Mineral Resources comprise that material that has been estimated using Pass #2, and Inferred Mineral Resources comprise that material that has been estimated using Pass #3. Clipping polygons were used in a final stage of the classification process to ensure continuity and consistency of the classified blocks in the model. Jaguar employs an additional block model code to denote those areas considered to display good exploration potential for use in the decision process.

## **RESPONSIBILITY FOR THE ESTIMATE**

The estimate of the Mineral Resources for the Roça Grande Mine presented in this report was prepared by Mr. Helbert Taylor Vieira, Senior Geologist with Jaguar under the supervision of Mr. Jean-Marc Lopez, Director – Mine Geology with Jaguar, and Mr. Reno Pressacco, M.Sc.(A), P.Geo., Principal Geologist with RPA. Mr. Pressacco is a Qualified Person as defined in NI 43-101, is independent of Jaguar, and takes responsibility for this Mineral Resource estimate.

## **CUT-OFF GRADE**

A cut-off grade of 1.46 g/t Au is used for reporting of Mineral Resources. This cut-off grade was arrived at using a gold price of US\$1,400/oz, average gold recovery of 88%, and 2014 actual cost data for the Roça Grande Mine. Gold prices used for reserves are based on consensus, long term forecasts from banks, financial institutions, and other sources. For resources, gold prices used are slightly higher than those for reserves.

## **MINERAL RESOURCE ESTIMATE**

There are no Mineral Reserves present at the Roça Grande Mine for the current reporting period. The Mineral Resource reports were prepared by creating clipping polygons that were used to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, were located completely within the boundaries of Jaguar's mineral rights holdings at the Roça Grande Mine, possessed a grade times thickness product of at least 3 gram-metres, and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.

At a cut-off grade of 1.46 g/t Au, the Mineral Resources at the Roça Grande Mine comprise 1,231,000 million tonnes at an average grade of 2.81 g/t Au containing 111,000 ounces of gold in the Measured and Indicated Resource category and 1.759 million tonnes at an average grade of 3.48 g/t Au containing 197,000 ounces of gold in the Inferred Mineral Resource category. The Mineral Resources are presented in further detail in Tables 14-12 and 14-13.

A plan view of the Mineral Resources for the RG 01 and RG02 domains is presented in Figures 14-9 and 14-10.

**TABLE 14-12 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2015 – ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	217	2.17	15
Indicated	1,014	2.95	96
<b>Sub-total M&amp;I</b>	<b>1,231</b>	<b>2.81</b>	<b>111</b>
Inferred	1,759	3.48	197

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reals: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.
6. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
7. No Mineral Reserves are currently present at the Roça Grande Mine.
8. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
9. Numbers may not add due to rounding.

**TABLE 14-13 SUMMARY OF MINERAL RESOURCES BY OREBODY AS OF DECEMBER 31, 2015 – ROÇA GRANDE MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
<b>Orebody RG01:</b>			
Measured	188	2.25	14
Indicated	499	2.27	37
<b>Sub-total M&amp;I</b>	<b>687</b>	<b>2.27</b>	<b>50</b>
Inferred	300	2.92	28
<b>Orebody RG02:</b>			
Measured	-	-	-
Indicated	215	4.08	28
<b>Sub-total M&amp;I</b>	<b>215</b>	<b>4.08</b>	<b>28</b>
Inferred	756	3.91	95
<b>Orebody RG03:</b>			
Measured	-	-	-
Indicated	74	1.65	4
<b>Sub-total M&amp;I</b>	<b>74</b>	<b>1.65</b>	<b>4</b>
Inferred	365	2.58	30
<b>Orebody RG06:</b>			

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	29	1.63	2
Indicated	184	3.16	19
<b>Sub-total M&amp;I</b>	<b>213</b>	<b>2.95</b>	<b>20</b>
Inferred	287	2.88	27
<b>Orebody RG07:</b>			
Measured	-	-	-
Indicated	42	6.55	9
<b>Sub-total M&amp;I</b>	<b>42</b>	<b>6.55</b>	<b>9</b>
Inferred	51	10.34	17
<b>Total Roça Grande Mine:</b>			
Total, Measured	217	2.17	15
Total, Indicated	1,014	2.95	96
<b>Total Measured &amp; Indicated</b>	<b>1,231</b>	<b>2.81</b>	<b>111</b>
Total, Inferred	1,759	3.48	197

Notes:

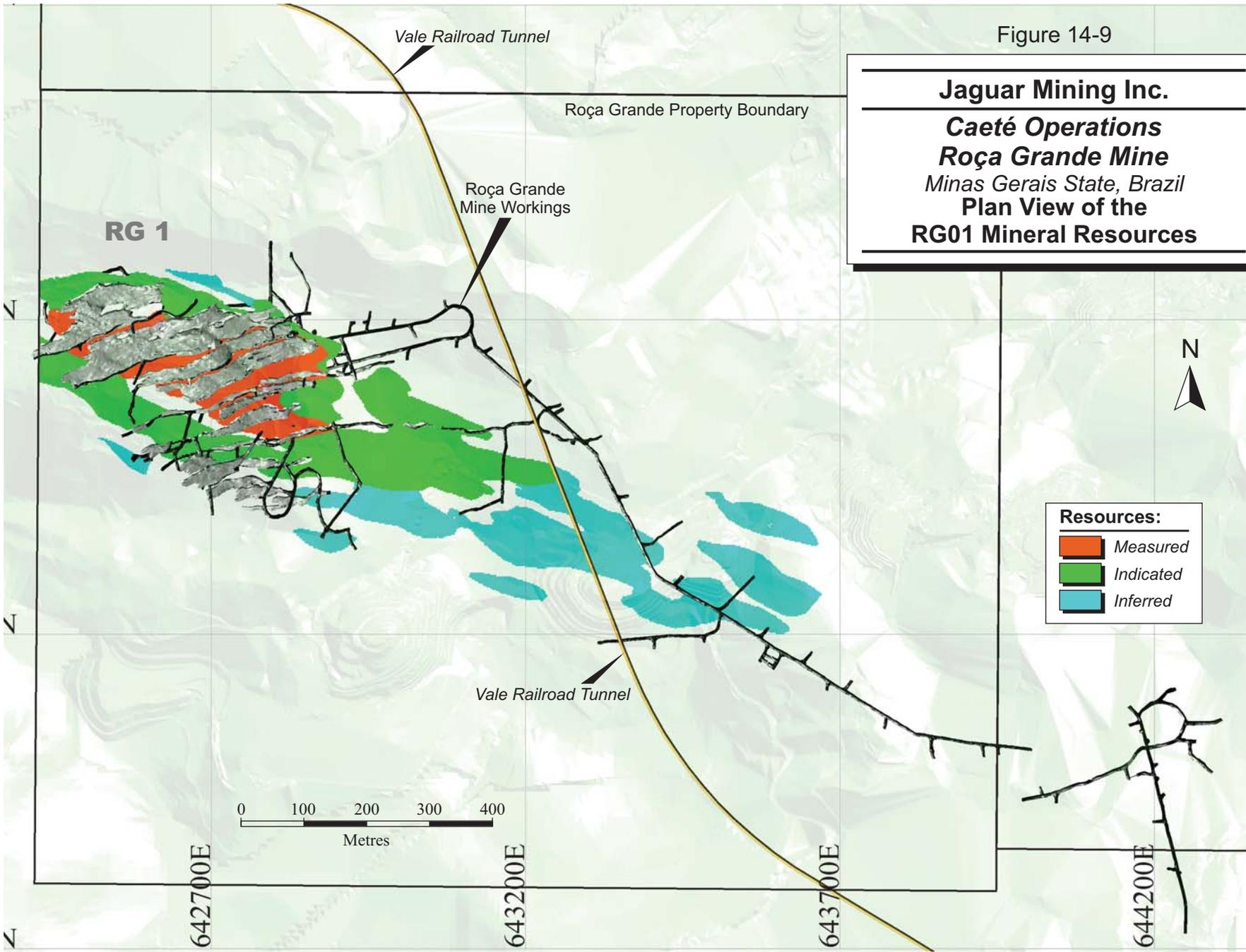
1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.46 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reais: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.
6. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
7. No Mineral Reserves are currently present at the Roça Grande Mine.
8. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
9. Numbers may not add due to rounding.

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

It is RPA's opinion that the Roça Grande Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

Figure 14-9

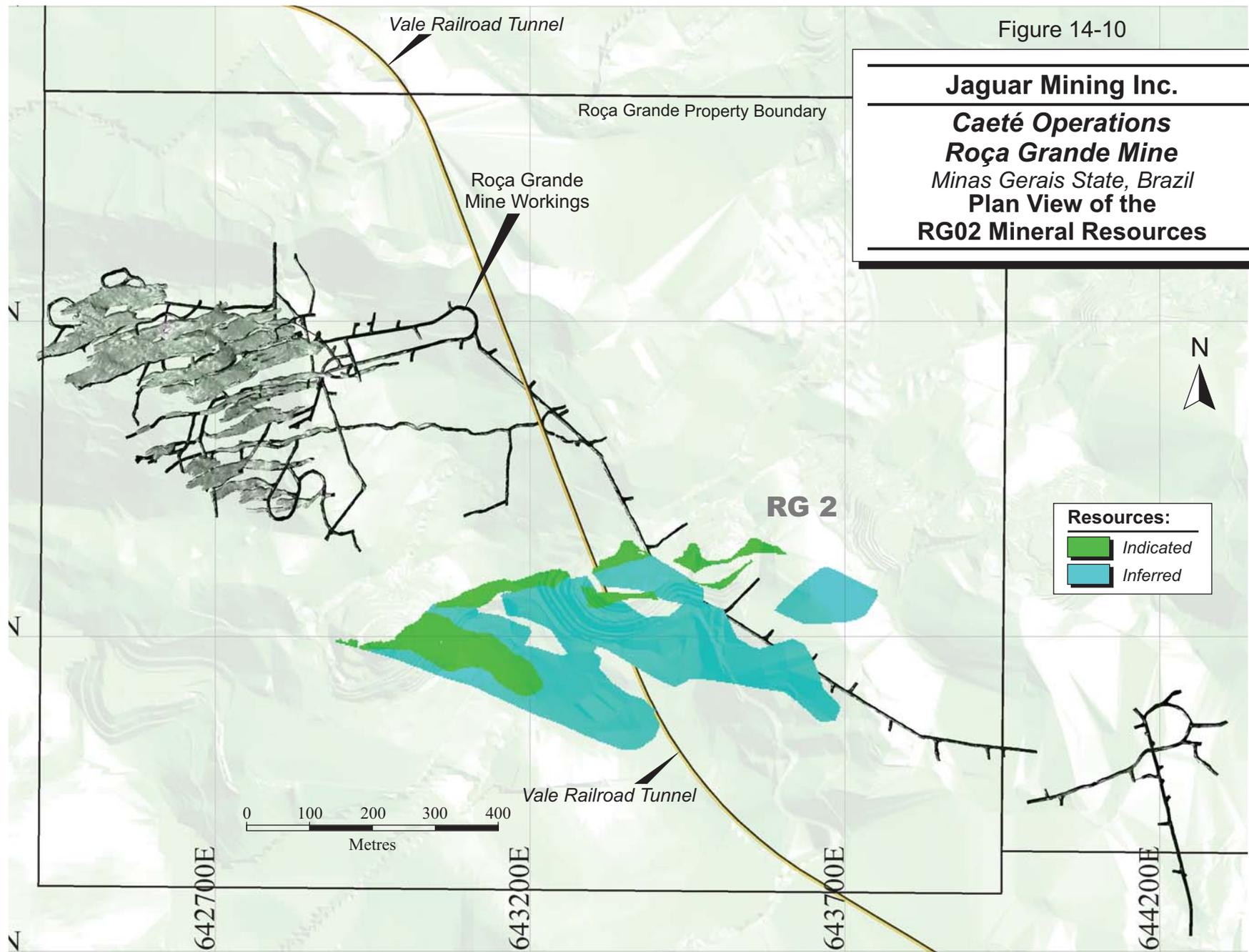
**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
 Minas Gerais State, Brazil  
**Plan View of the**  
**RG01 Mineral Resources**



14-24

Figure 14-10

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
*Minas Gerais State, Brazil*  
**Plan View of the**  
**RG02 Mineral Resources**



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## PILAR MINE

### DESCRIPTION OF THE DATABASE

Current drilling and sampling practices employed by Jaguar involve the initial delineation of the location of the various mineralized lenses using surface-based and underground-based drill holes at a nominal spacing of 25 m to 50 m. Underground-based drilling is used to delineate the down-plunge projection of the Pilar mineralization. As development of the underground access progresses, a series of channel samples are taken in two locales (one set on the face and one set along the back) for each round. The average sample spacing along development drifts is five metres.

Jaguar maintains an internal database which is used to store and manage all of the digital information for all of its operations. The drill hole and channel sample information for the Pilar Mine were extracted from this internal database into separate files for use in preparation of the Mineral Resource estimates.

The cut-off date for the assays in the drill hole database is August 31, 2015. The drilling was carried out using the UTM Datum Córrego Alegre, Zone 23S grid coordinate system.

A summary of the drilling and channel sampling information is provided in Table 14-14. The location of the drill hole and channel samples is presented in Figure 14-11.

**TABLE 14-14 DESCRIPTION OF THE PILAR MINE DATABASE AS AT JULY 1, 2015**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Data Type</b>	<b>Description</b>
Collars, Drill Holes	984 (total 129,362 m)
Collars, Chip & Channel Samples	16,445 (total 46,596 m)
Survey, Drill Holes	28,692
Survey, Chip & Channel Samples	50,560
Lithology, Drill Holes	16,517
Lithology, Chip & Channel Samples	50,537
Assays, Drill Holes	50,335
Assays, Chip & Channel Samples	50,560

This drill hole information was modified slightly so as to be compatible with the format requirements of the MineSight v.7.60 mine planning software and was imported into that software package by Jaguar. A number of new tables were created during the estimation process to capture such information as the intersection information between the drill holes and the wireframe models, density readings, capped assay records, and composited assay records.

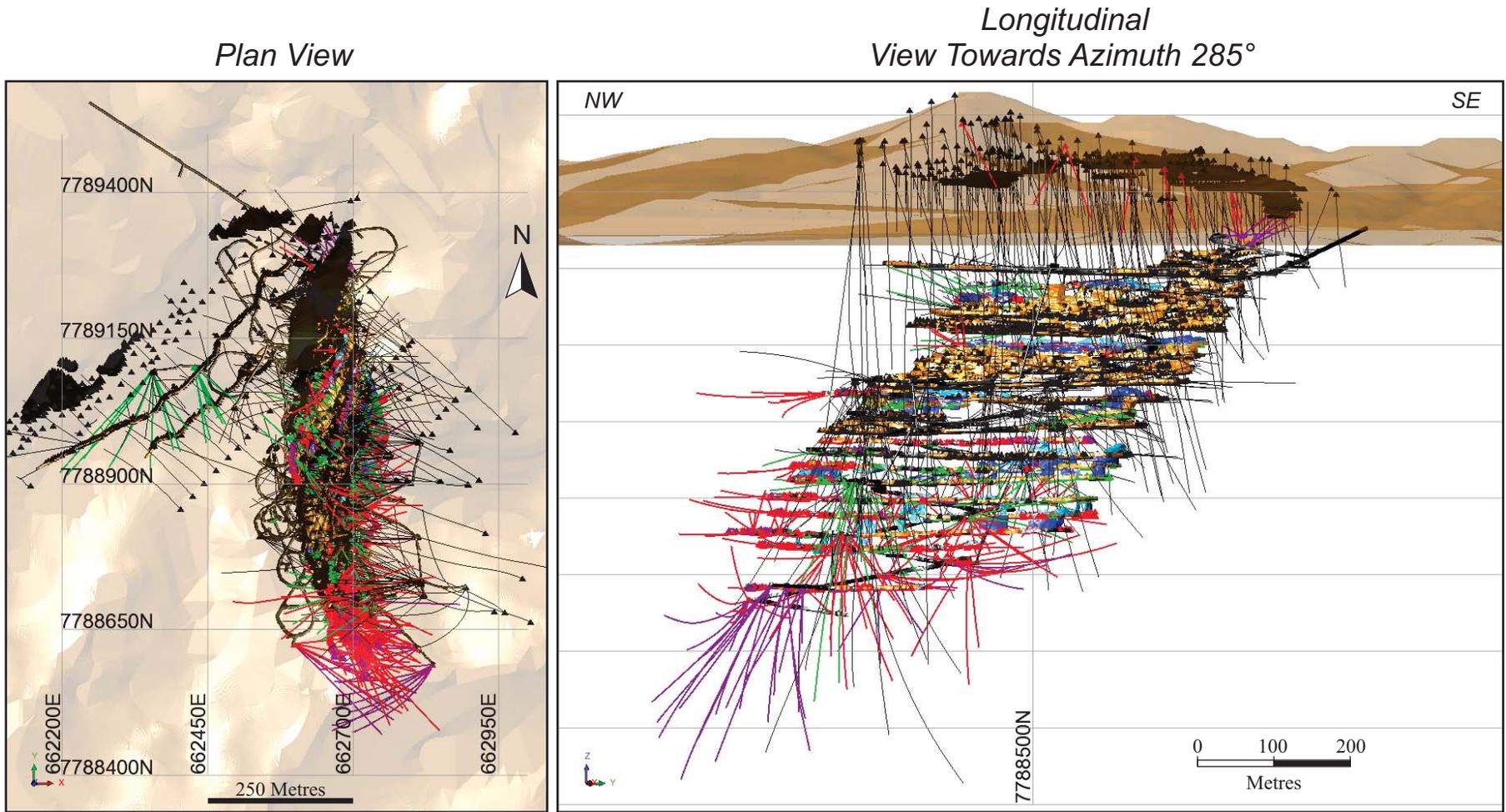


Figure 14-11

Drilling / Channel Sample Legend	
■ Pre-2013	■ 2014 - 2015
■ 2013 - 2014	■ 2015 - 2016

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Minas Gerais State, Brazil  
**Locations of Channel Samples  
 and Drill Holes**

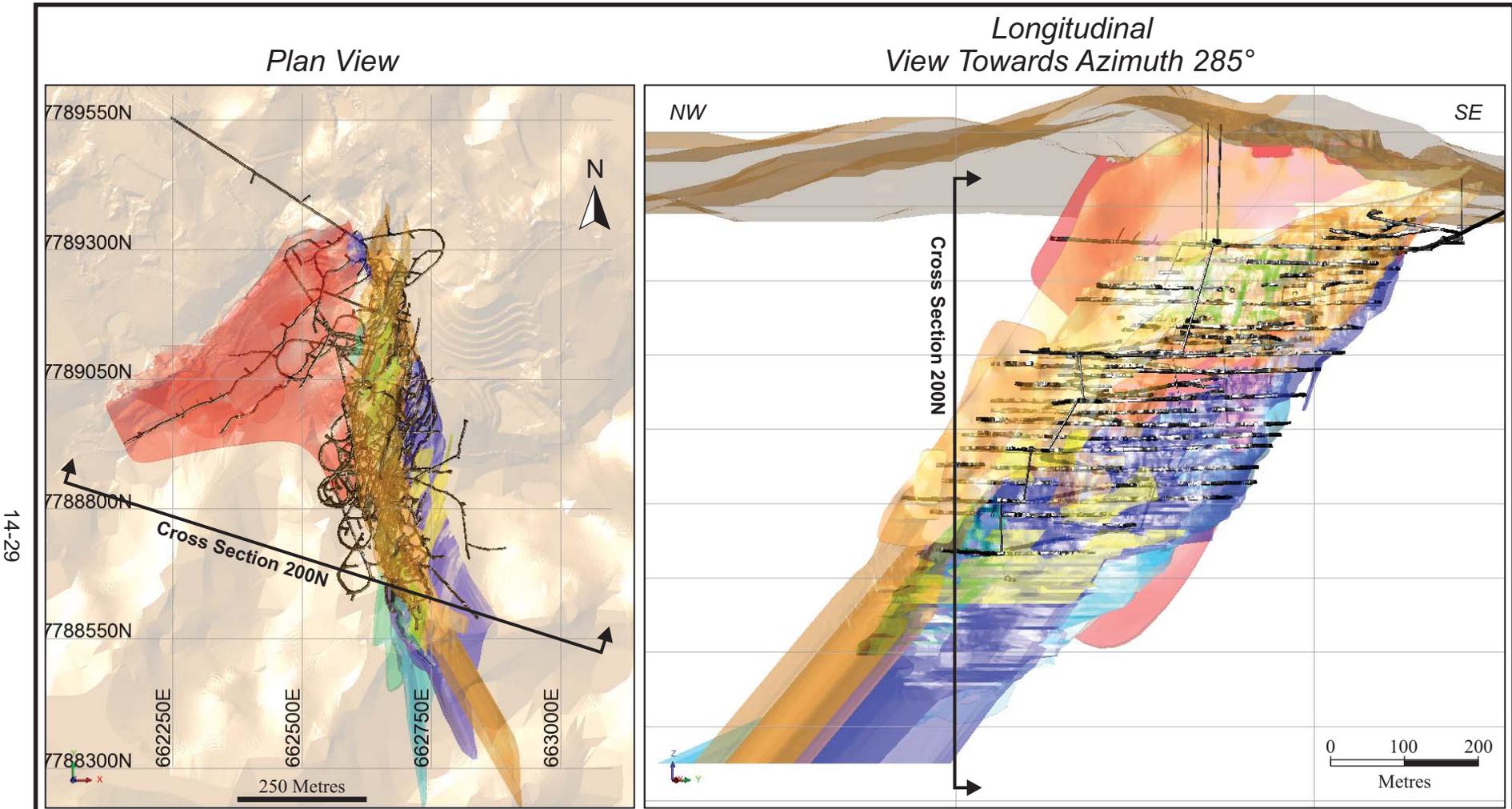
The database included a number of assay records which contained entries of negative values to represent intervals of no sampling, lost core, lost sample, or no core recovery, some of which are contained within the mineralized wireframes. Depending upon the specific local conditions, these null values can introduce an undesired positive bias upon the grade estimations. Jaguar therefore elected to pursue a conservative approach by inserting a very low gold value of 0.01 g/t Au for these intervals of null values. A total of 42,275 records were adjusted in this process.

RPA notes that the understanding of the structural setting and controls on the gold mineralization at the Pilar Mine by the mine geologists is increasing. The mineralized lenses are well drilled and well sampled. The drilling and sampling protocols employed by Jaguar permit the identification and delineation of the mineralized areas with confidence. The drilling and sampling practices are carried out to a high standard. RPA is of the opinion that the drill hole and sampling database is suitable for use in preparation of Mineral Resource estimates.

### **MINERALIZATION WIREFRAMES**

The interpreted 3D wireframe models of the gold mineralization have been created using the geology information and assay values from surface- and underground-based drill holes, and channel sample data as available. Wireframe models of the gold distribution for the various mineralized lenses were created using the LeapFrog Geo version 2.0.2 software packages.

The wireframe limits were drawn using a cut-off grade of 0.50 g/t Au and a nominal minimum width of 2.0 m. The wireframe models were clipped to the original, pre-mining topography surface. In total, eight separate orebodies were modeled which reflect the current understanding of the spatial distribution and structural controls on the gold mineralization (Figure 14-12). Each of the domains was identified in the block model by a series of integer codes (Table 14-15). Of the eight orebodies, the BA, BF and BF II account for the majority of the contained metal in the block model.



14-29

Figure 14-12

**Domain Legend:**

BA (101)	LPA
BF (102)	LHW
BF II (103)	C Orebody
LFW	SW Orebody

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Minas Gerais State, Brazil  
**Mineralized Wireframes and**  
**Mine Workings**

**TABLE 14-15 DESCRIPTION OF THE MINERALIZED DOMAINS, PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

<b>Domain</b>	<b>Block Model Codes</b>
BA (101)	111 - FW 112 - HW
BF (102)	121 – FW 122 – HW
BF II (103)	131 – FW 132 – HW
LFW	201 to 206
LPA	301 to 303
LHW	401 to 403
C Orebody	501 to 505
SW Orebody	601 to 605

All of the mineralized lenses, with the exception of the SW Orebody, are located to the east of the São Jorge fault. In general terms, the mineralized lenses are sub-parallel to each other, have an average strike of 015°, and dip steeply to the east with an average dip of 65°. The available drill hole information suggests that the dip of the mineralized zones may begin to flatten to approximately 45° below the 120 m elevation (Figure 14-13). Three of the mineralized zones (BA, BF, and BF II) have been identified by drill hole and channel sample data to be isoclinally folded, with fold axes that plunge at approximately -40° to the southwest (approximately azimuth 210° to 225°). Many of the remaining mineralized zones (LFW, LPA, LHW, and the C Orebody) are interpreted to be more tabular in overall form. The LPA zone resides in the axial plane of the folded BF zone and thus provides evidence for multiple ages of gold mineralization.

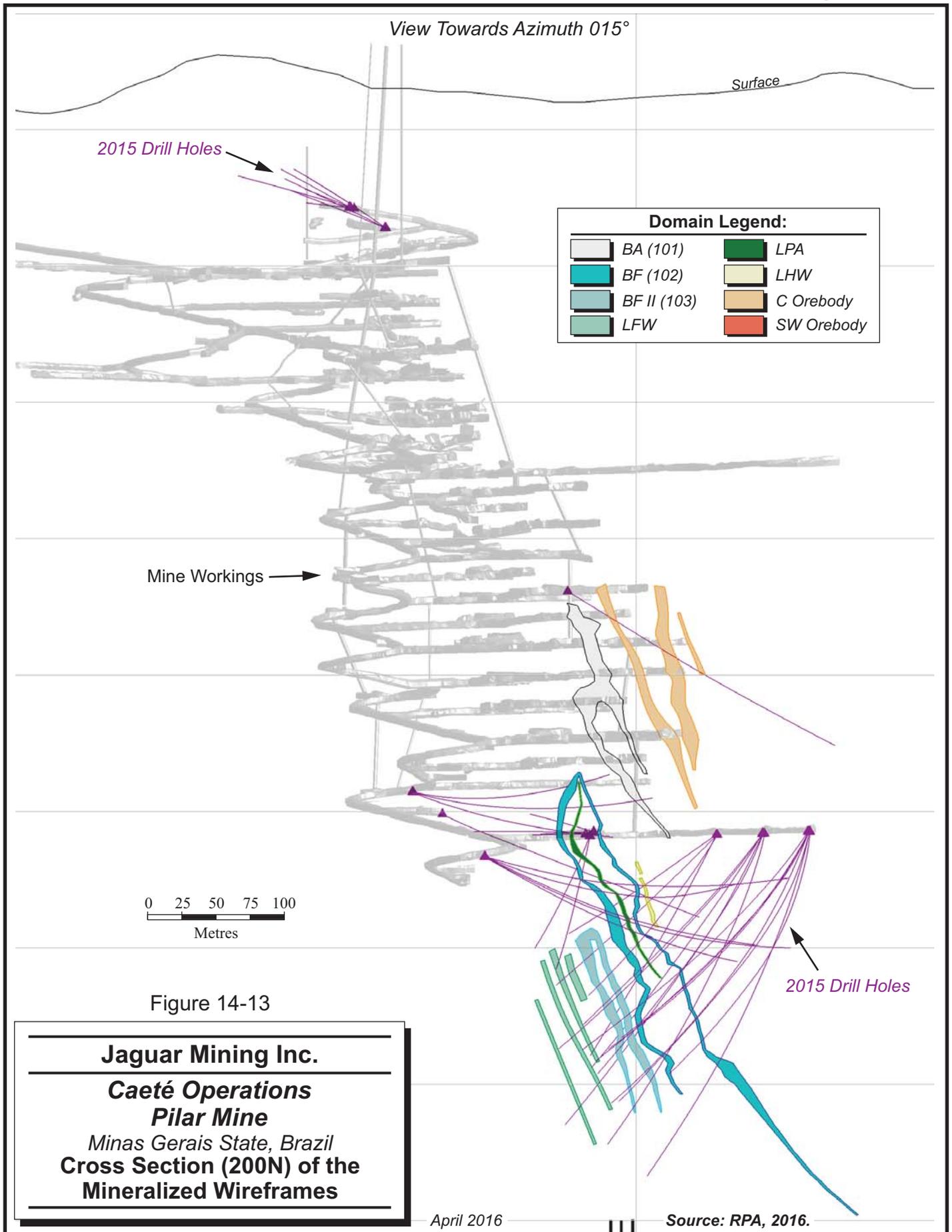


Figure 14-13

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Minas Gerais State, Brazil  
**Cross Section (200N) of the**  
**Mineralized Wireframes**

April 2016

Source: RPA, 2016.

## TOPOGRAPHY AND EXCAVATION MODELS

A topographic surface of the Pilar Mine area that is current as of May 2015 was used to code the block model. The topographic map includes two open pit mines that are now depleted. A wireframe model of the completed underground excavations as of December 31, 2015 was prepared and was used to code the block model for the portions of the mineralized zones that have been mined out.

The mineralization at the Pilar Mine is accessed by means of a ramp with a collar elevation at approximately 750 MASL. The bottom of the ramp is currently at an elevation of approximately 250 MASL. There are two mining methods currently in use. The cut and fill method is utilized in the narrower sections of the deposit whereas the long hole method is used in the thicker areas. In all, seven levels have been developed to access the various mineralized zones (Table 14-16).

**TABLE 14-16 DESCRIPTION OF THE PILAR MINE LEVELS  
Jaguar Mining Inc. – Caeté Operations**

Level	Elevation (m)
1	690
2	615
3	545
4	485
5	415
6	350
7	280
8 (planned)	200
9 (planned)	120
10 (planned)	40

## SAMPLE STATISTICS AND GRADE CAPPING

The mineralization wireframe models were used to code the drill hole database and identify the raw assay samples that are contained within the mineralized wireframes. These samples were extracted from the database into their respective domains, and then subjected to statistical analyses by means of histograms, probability plots, and decile analyses. A total of 66,728 samples were contained within the mineralized wireframes, of which approximately 4% comprised samples with null values which had been replaced by near-zero values. The sample statistics are summarized in Table 14-17. Selected histograms are provided in Figures 14-14 to 14-16.

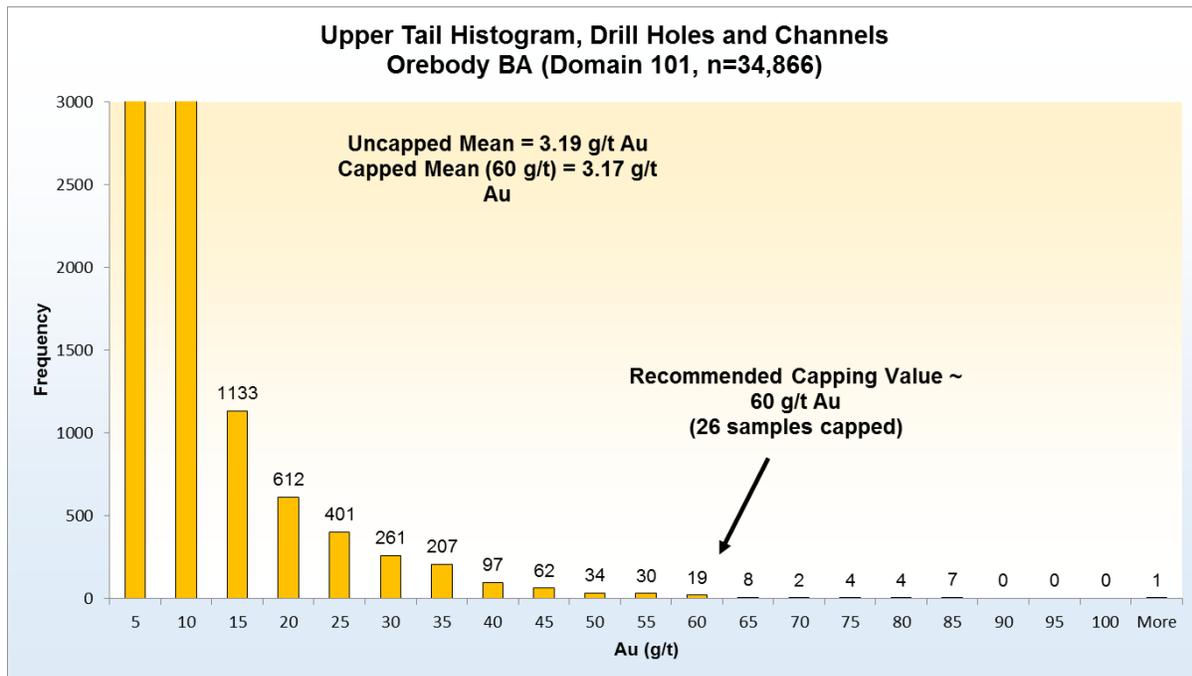
On the basis of its review of the assay statistics, RPA believes that a capping value of 10 g/t Au is appropriate for the LHW lenses, 20 g/t Au for the LFW, LPA and SW Orebody lenses, 30 g/t Au for the BF II and C Orebody lenses, and 60 g/t Au for the BA and BF mineralized lenses. The selection of capping values can be re-examined in light of grade reconciliation information and adjusted accordingly as necessary.

**TABLE 14-17 DESCRIPTIVE STATISTICS OF THE RAW ASSAYS, PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

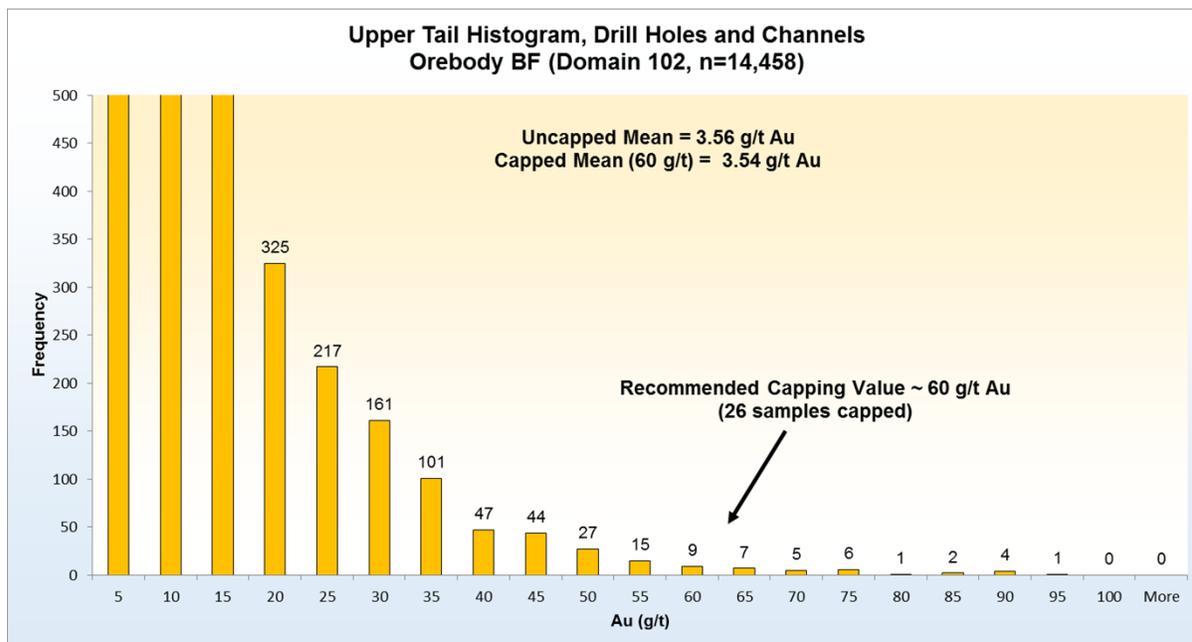
Item	BA		BF		BF II		LFW	
	Au Raw	Au Cap						
Length-Weighted Mean	3.19	3.17	3.56	3.54	4.13	3.95	2.11	2.03
Median	0.98	0.98	0.89	0.89	1.07	1.07	1.02	1.02
Mode	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Standard Deviation	6.46	6.35	7.60	7.39	7.18	6.18	3.77	3.20
CV	2.03	2.00	2.14	2.09	1.74	1.57	1.79	1.58
Sample Variance	41.77	40.34	57.75	54.62	51.57	38.20	14.19	10.24
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum	109.00	60.00	91.60	60.00	76.50	30.00	61.50	20.00
Count	34,886	34,886	14,458	14,458	1,313	1,313	2,486	2,486
Capping Value		60		60		30		20

Item	LPA		LHW		C		SW	
	Au Raw	Au Cap						
Length-Weighted Mean	2.12	2.09	1.38	1.13	2.01	1.88	1.40	1.29
Median	0.95	0.95	0.38	0.38	0.62	0.62	0.33	0.33
Mode	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Standard Deviation	3.69	3.36	8.26	2.09	5.76	4.53	4.14	2.96
CV	1.73	1.61	5.98	1.86	2.87	2.42	2.96	2.29
Sample Variance	13.59	11.30	68.20	4.38	33.19	20.52	17.18	8.74
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum	38.50	20.00	116.00	10.00	128.33	30.00	70.70	20.00
Count	2,118	2,118	424	424	7,025	7,025	4,018	4,018
Capping Value		20		10		30		20

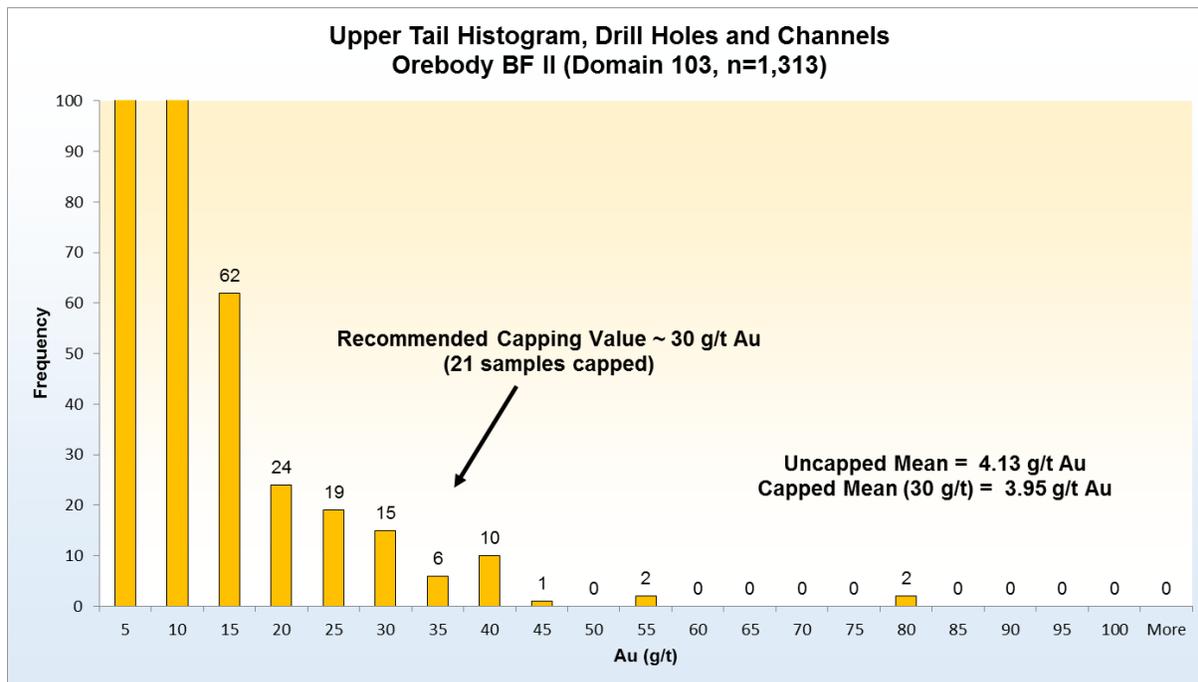
**FIGURE 14-14 FREQUENCY HISTOGRAM OF THE RAW ASSAYS CONTAINED WITHIN THE BA MINERALIZED WIREFRAME**



**FIGURE 14-15 FREQUENCY HISTOGRAM OF THE RAW ASSAYS CONTAINED WITHIN THE BF MINERALIZED WIREFRAME**



**FIGURE 14-16 FREQUENCY HISTOGRAM OF THE RAW ASSAYS CONTAINED WITHIN THE BF II MINERALIZED WIREFRAME**



### COMPOSITING METHODS

The selection of an appropriate composite length began with examination of the descriptive statistics of the raw assay samples and preparation of sample length frequency histograms. Consideration was also given to the size of the blocks in the model.

Many of the sample lengths in the various mineralized wireframes were found to range from 0.5 m to one metre in length. Consequently, on the basis of the available information, RPA believes that a composite length of one metre for all samples is reasonable. All samples contained within the mineralized wireframes were composited to a nominal one metre length using the best-fit function of the MineSight software package. The descriptive statistics of the composite samples are provided in Table 14-18.

**TABLE 14-18 DESCRIPTIVE STATISTICS OF THE COMPOSITE SAMPLES, PILAR MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Item	BA		BF		BF II		LFW	
	Comp Raw	Comp Cap						
Mean	3.18	3.17	3.53	3.51	4.12	3.95	2.08	2.01
Median	1.17	1.17	1.15	1.15	1.76	1.76	1.04	1.04
Mode	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Standard Deviation	5.72	5.60	6.10	5.97	6.46	5.61	3.35	2.74
CV	1.80	1.77	1.73	1.70	1.57	1.42	1.61	1.37
Sample Variance	32.71	31.36	37.23	35.59	41.74	31.43	11.23	7.51
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Maximum	109.00	60.00	69.93	60.00	76.50	30.00	61.50	20.00
Count	20,137	20,137	8,530	8,530	904	904	1,693	1,693

Item	LPA		LHW		C		SW	
	Comp Raw	Comp Cap						
Mean	2.16	2.13	1.35	1.11	2.02	1.89	1.32	1.22
Median	1.03	1.03	0.42	0.42	0.58	0.58	0.27	0.27
Mode	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Standard Deviation	3.10	2.96	3.61	1.81	5.24	4.06	3.55	2.57
CV	1.43	1.39	2.68	1.63	2.59	2.15	2.68	2.10
Sample Variance	9.60	8.75	13.04	3.28	27.48	16.47	12.57	6.61
Minimum	0.01	0.01	0.01	0.01	0.01	0.01	70.70	20.00
Maximum	30.97	20.00	52.56	10.00	128.33	30.00	4748.63	4395.22
Count	1,280	1,280	349	349	5,348	5,348	3,596	3,596

## BULK DENSITY

Jaguar has initiated a program of bulk density measurements on the various lithologies that are present at the Pilar Mine in 2015. The density measurements were made on representative samples of drill core from intervals of iron formation and quartz vein that are located within the mineralized wireframes, along with measurements carried out on samples of adjoining waste rock units. The density measurements were carried out at the Jaguar analytical laboratory located at the Roça Grande Mine using the water displacement method. In all, a total of 380 density measurements were completed in 2015. A summary of the results is presented in Table 14-19.

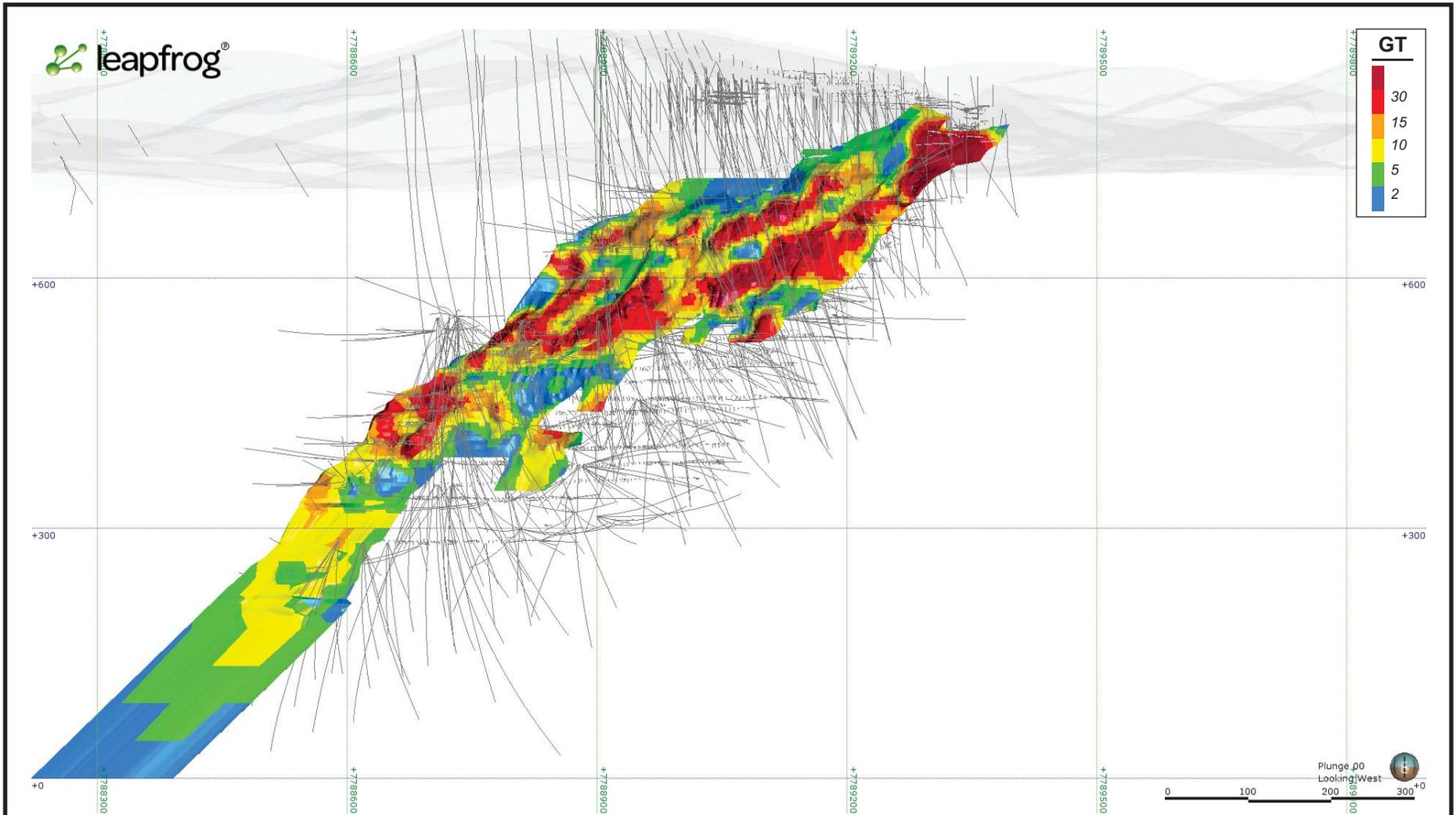
**TABLE 14-19 SUMMARY OF 2015 DENSITY MEASUREMENTS, PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

<b>Zone</b>	<b>Density</b>
BA	2.89
BF	3.05
BF II	3.05
LFW	289
LPA	
Lens 301	3.05
Lens 302	2.89
Lens 303	2.89
LHW	3.05
C	2.89
SW	
Lens 601	3.05
Lens 602	2.89
Lens 603	3.05
Lens 604	2.89
Lens 605	2.89

### **TREND ANALYSIS**

As an aid in carrying out variography studies of the continuity of the gold grades in the mineralized domain models, a short study to examine the overall trends was carried out. For this exercise, a data file was prepared that contained the gold values for each drill hole and channel sample contained within the respective mineralized domain model. The resulting gold grade times thickness product (GT) were digitally contoured using the LeapFrog software package and the results are shown in Figures 14-17 to 14-19.

It can be seen that an overall down-plunge of the gold grade is present for Orebodies BA and BF. The gold distribution in Orebody BF II does not show any clear trends, however, this may be due to the density of information combined with the isotropic search ellipse used to prepare the contours.

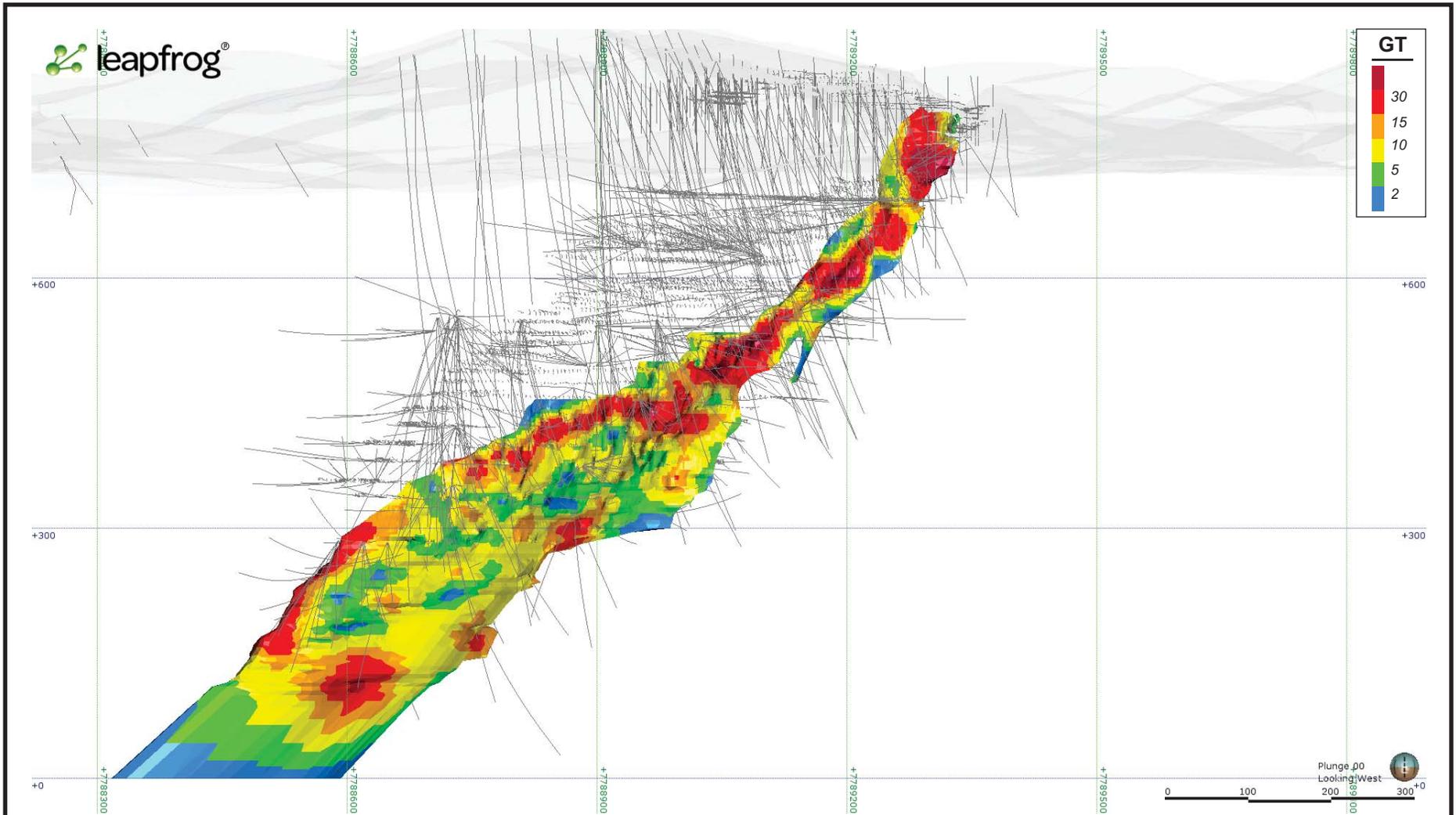


14-38

Figure 14-17

*View Towards West*

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
*Mina Gerais State, Brazil*  
**Grade x Thickness Product**  
**Orebody BA**

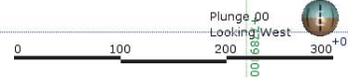
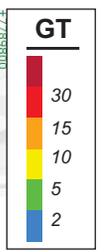
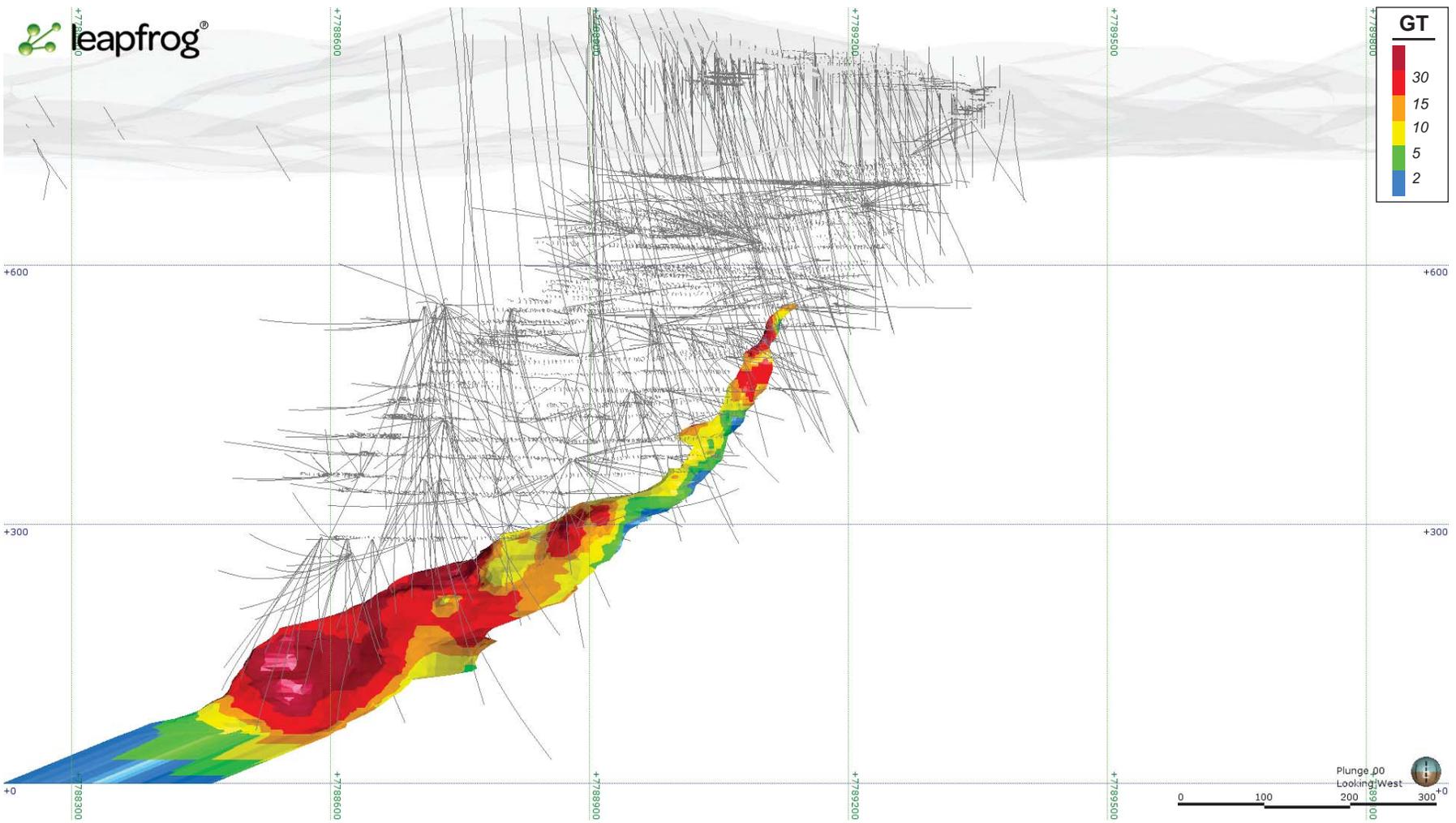


14-39

View Towards West

Figure 14-18

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
*Mina Gerais State, Brazil*  
**Grade x Thickness Product**  
**Orebody BF**



14-40

*View Towards West*

Figure 14-19

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Mina Gerais State, Brazil  
**Grade x Thickness Product**  
**Orebody BF II**

## VARIOGRAPHY

The analysis of the spatial continuity was carried out by Digamma Consulting (Digamma), a third-party consultant located in Belo Horizonte which evaluated the spatial continuity of the drill hole information alone and the combined drill hole plus channel sample data set. Digamma began its analysis of the spatial continuity by constructing separate omnidirectional correlograms using the capped, composited sample data for each of the orebodies, with the objective of determining an appropriate value for the global nugget. The analysis proceeded with the evaluation of any anisotropies that may be present in the data, which resulted in successful correlograms with reasonably good model fits. Example correlograms are presented in Figures 14-20 to 14-22. A summary of the correlogram parameters derived for each of the mineralized domains is presented in Tables 14-20 and 14-21.

FIGURE 14-20 CORRELOGRAM MODELS FOR THE BA DOMAIN

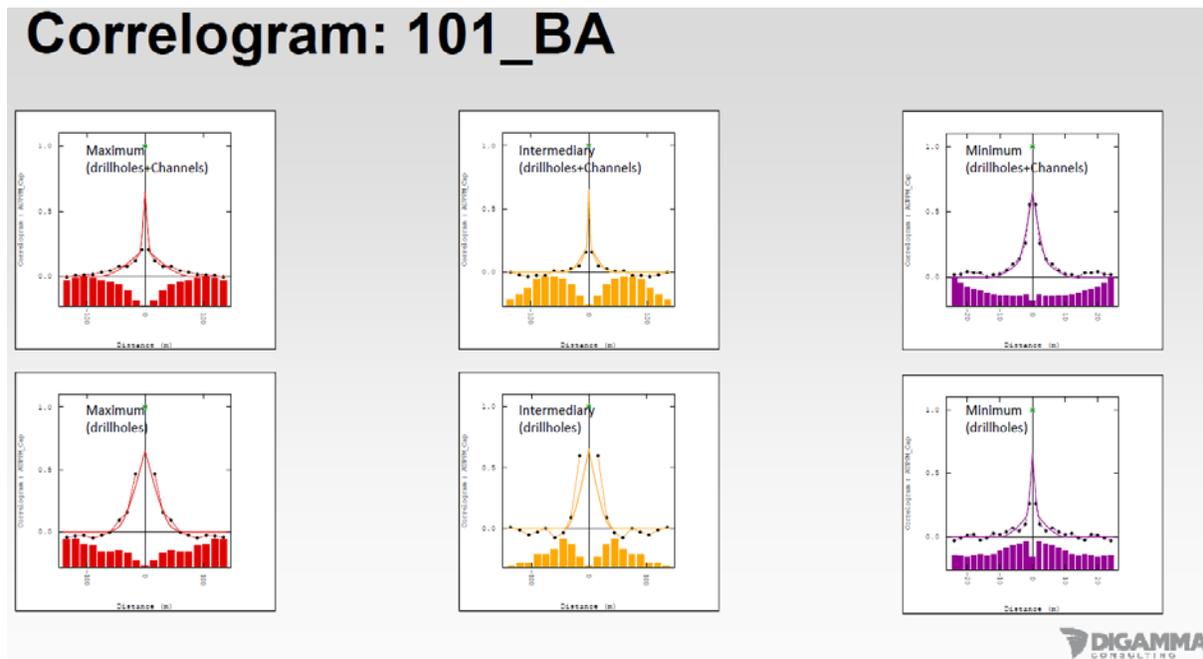


FIGURE 14-21 CORRELOGRAM MODELS FOR THE BF DOMAIN

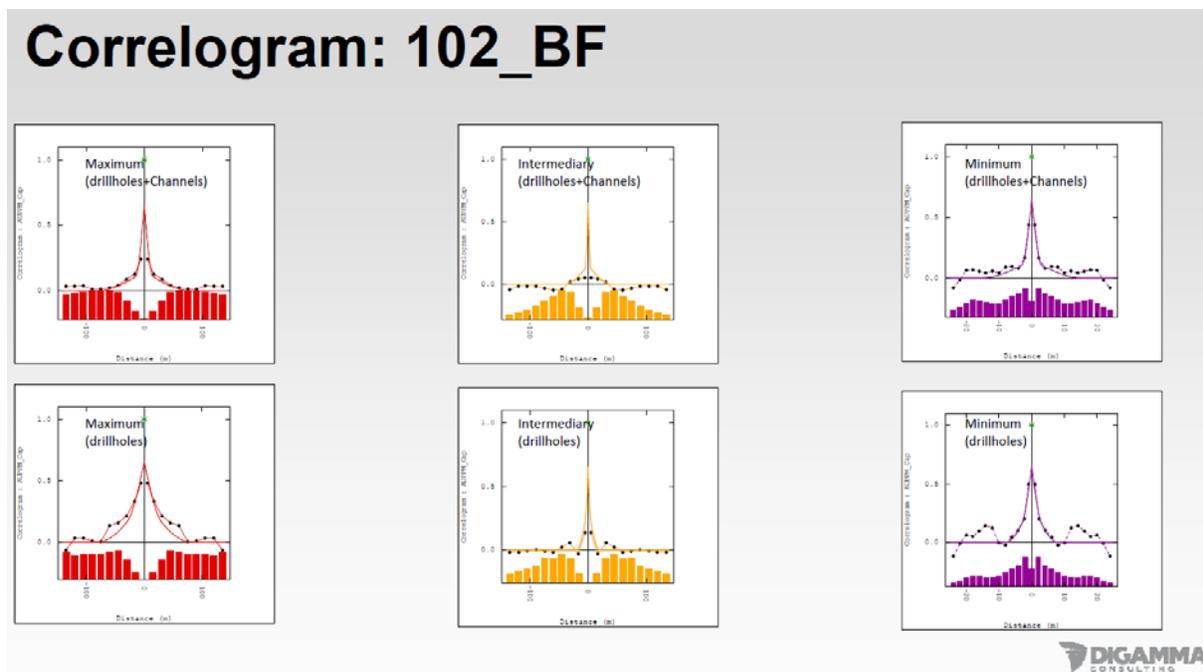


FIGURE 14-22 CORRELOGRAM MODELS FOR THE BF II DOMAIN

# Correlogram: 103\_BFII

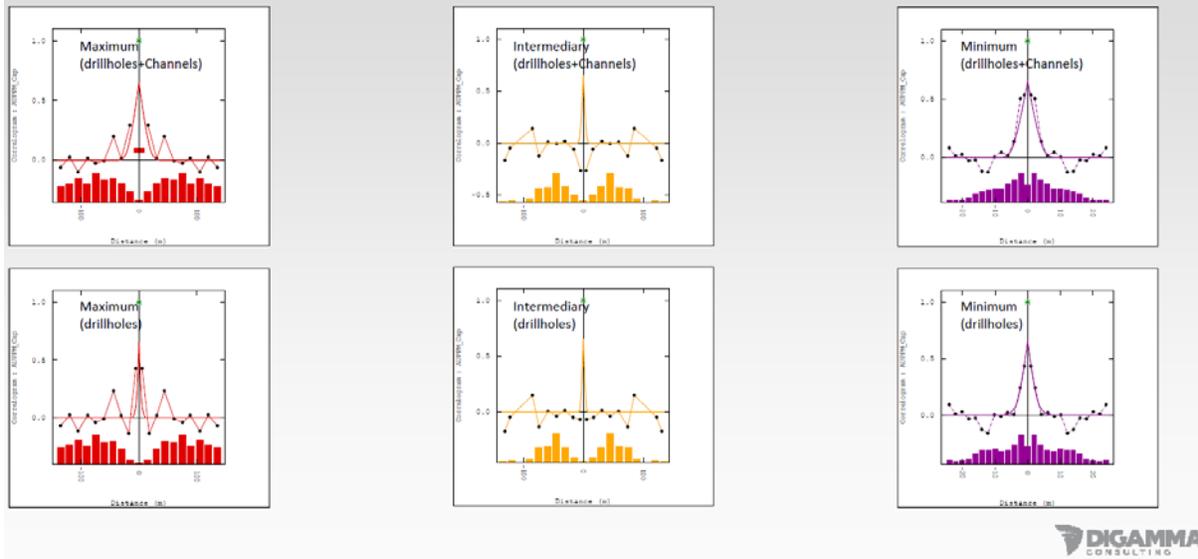


TABLE 14-20 SUMMARY OF CORRELOGRAM PARAMETERS, DRILL HOLE AND CHANNEL SAMPLES COMBINED  
Jaguar Mining Inc. – Caeté Operations

Domain	Model (correlogram)	Nugget Effect	1° Structure				2° structure			
			Sill	Minor	Intermediary	Major	Sill	Minor	Intermediary	Major
101_BA	Omni	0.35	0.5		8		0.15		50	
101_BA	Directional	0.35	0.43	5	5	10	0.22	13	40	80
102_BF	Omni	0.35	0.5		8		0.15		50	
102_BF	Directional	0.35	0.5	3	5	8	0.15	15	40	80
103_BFII	Omni	0.35	0.4		6		0.25		8	
103_BFII	Directional	0.35	0.4	6	6	6	0.25	8	8	8
200_LFW	Omni	0.3	0.5		3		0.2		25	
200_LFW	Directional	0.3	0.6	6	15	15	0.1	8	30	60
300_LPA	Omni	0.3	0.45		3		0.25		18	
300_LPA	Directional	0.25	0.5	5	7	10	0.25	10	28	30
400_LHW	Omni	0.3	0.3		3		0.4		8	
400_LHW	Directional	-	-	-	-	-	-	-	-	-
500_C	Omni	0.35	0.55		5		0.1		30	
500_C	Directional	0.35	0.43	3	5	10	0.22	8	12	500
600_SW	Omni	0.35	0.45		5		0.2		40	
600_SW	Directional	0.35	0.5	4	22	22	0.15	7	60	80
Group_100-301	Omni	0.35	0.5		8		0.15		50	
Group_100-300	Directional	0.35	0.43	5	5	10	0.22	13	40	80

**TABLE 14-21 SUMMARY OF CORRELOGRAM PARAMETERS, DRILL HOLE SAMPLES ALONE**  
**Jaguar Mining Inc. – Caeté Operations**

Domain	Model (correlogram)	Nugget Effect	1° Structure				2° structure			
			Sill	Minor	Intermediary	Major	Sill	Minor	Intermediary	Major
101_BA	Omni	0.35	0.3	4			0.35	50		
101_BA	Directional	0.35	0.43	2	40	50	0.22	10	45	70
102_BF	Omni	0.35	0.4	6			0.25	45		
102_BF	Directional	0.35	0.3	3	5	30	0.35	8	20	80
103_BFII	Omni	0.35	0.4	6			0.25	8		
103_BFII	Directional	0.35	0.4	4	6	6	0.25	7	8	12
200_LFW	Omni	0.3	0.5	3			0.2	8		
200_LFW	Directional	0.3	0.6	6	15	15	0.1	8	30	60
300_LPA	Omni	0.2	0.2	3			0.6	10		
300_LPA	Directional	0.2	0.5	10	10	18	0.3	10	20	50
400_LHW	Omni	0.25	0.45	3			0.3	9		
400_LHW	Directional	-	-	-	-	-	-	-	-	-
500_C	Omni	0.35	0.55	4			0.1	25		
500_C	Directional	0.3	0.5	4	15	15	0.2	13	25	70
600_SW	Omni	0.35	0.45	3			0.2	9		
600_SW	Directional	0.35	0.5	4	22	22	0.15	8	70	80
Group_100-301	Omni	0.35	0.35	5			0.3	55		
Group_100-300	Directional	0.35	0.4	2	23	38	0.25	15	55	80



## BLOCK MODEL CONSTRUCTION

The block model was constructed by Jaguar using the MineSight version 7.60 software package and comprised an array of 2 m x 2 m x 2 m sized blocks using a partial percentage attribute. The model is oriented parallel to the coordinate grid system (i.e., no rotation or tilt). The selection of the block size for this model was based upon the block sizes previously employed at the mine. The block model origin, dimensions, and attribute list are provided in Table 14-22. A number of attributes were created to store such information as rock code, material densities, estimated gold grades, mineral resource classification, mined out material and the like (Table 14-23).

**TABLE 14-22 BLOCK MODEL DEFINITION, PILAR MINE**  
**Jaguar Mining Inc. – Caeté Operations**

Type	Y (Northing)	X (Easting)	Z (Elevation)
Minimum Coordinates (m)	7,788,100	662,000	-100
Maximum Coordinates (m)	7,789,500	663,100	1,000
Block Size (m)	2	2	2
Rotation (°)	0.000	0.000	0.000

**TABLE 14-23 BLOCK MODEL ATTRIBUTES, PILAR MINE**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Variables</b>	<b>Description</b>
TOPO%	Percent below topography
ROCK	Rock Code
ORE%	Percent inside Rock
DENS	Density
WEATH	Weathering zones. 1 = Surface Altered, 2 = Transition and 3 = Sulphide
PASS	Tracking of Interpolation Pass
CLASS	Post processed classification (1=Measured, 2=Indicted, 3=Inferred, 4=Potential)
CLADG	Initial Mineral Resource classification
AUI3C	Au grade estimated by Inverse Distance Power 3 using capped composites
NSMP	Number of composites used to estimate the block
CLOD	Distance to the closest composite used to estimate the block
AVD	Average distance of the composites used to estimate the block
FTHD	Distance to the farthest composite used to estimate the block
NDH	Number of the drill holes used to estimate the block
NQ	Number of quadrants with composite data
SD	Standard deviation calculated in kriging estimation process
MINED	Mined out areas. 1 = Areas already mined
LEVEL	Mine production level

Gold grades were estimated into the blocks by means of inverse distance cubed (ID<sup>3</sup>) interpolation algorithms using the capped composited sample information. A total of four interpolation passes were carried out using distances derived from the correlogram results and the search ellipse parameters presented above (Table 14-24). In general, all search ellipses were oriented along the overall down-plunge direction of the mineralized domains (Figure 14-23).

**TABLE 14-24 ESTIMATION RANGES BY INTERPOLATION PASS**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Axis</b>	<b>Pass 1 (m)</b>	<b>Pass 2 (m)</b>	<b>Pass 3 (m)</b>	<b>Pass 4 (m)</b>
Major	35	70	140	210
Semi-major	24	48	96	144
Minor	7	13	26	39

View Looking Towards Azimuth 285°

South (195°)

North (015°)

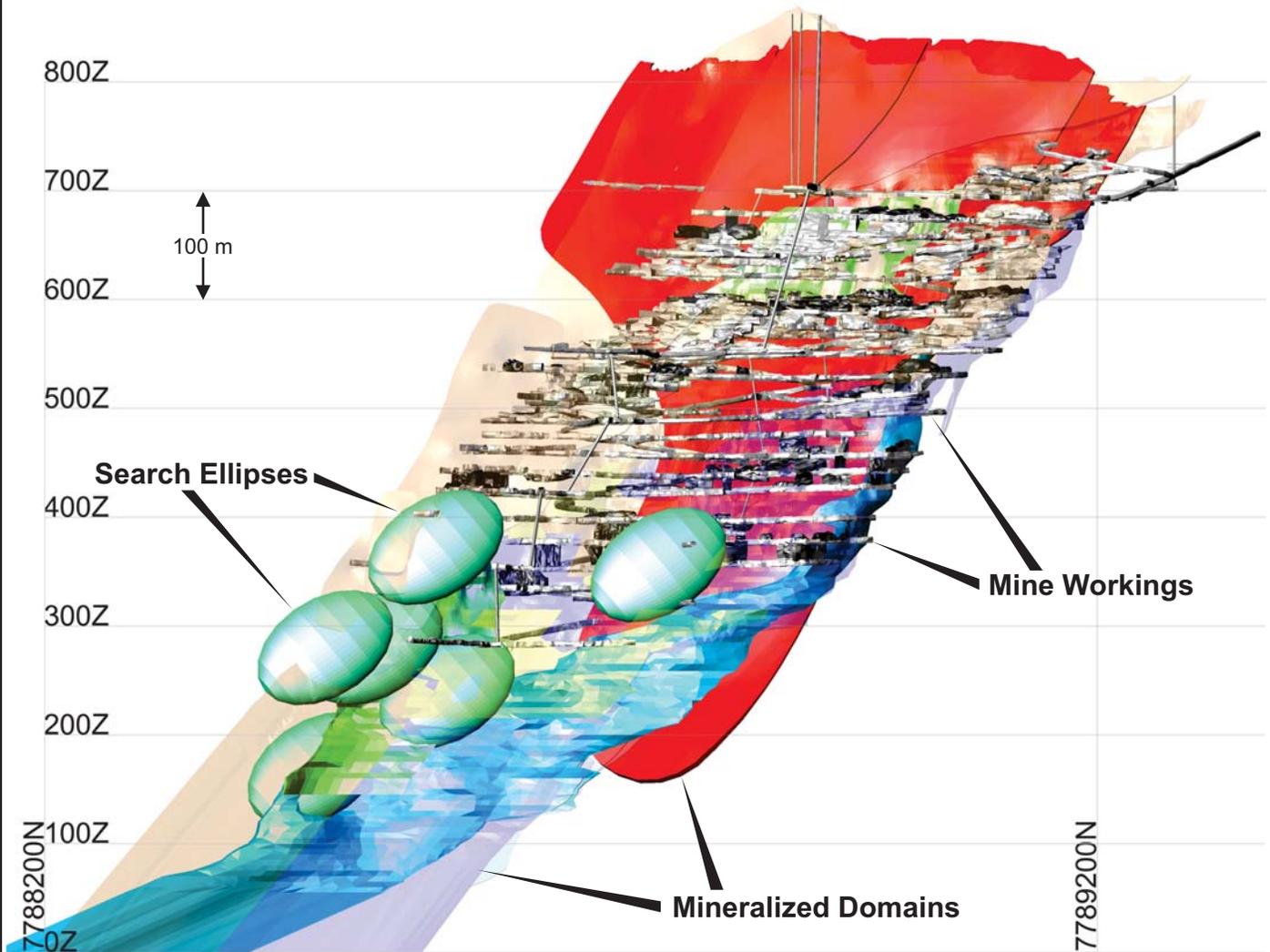
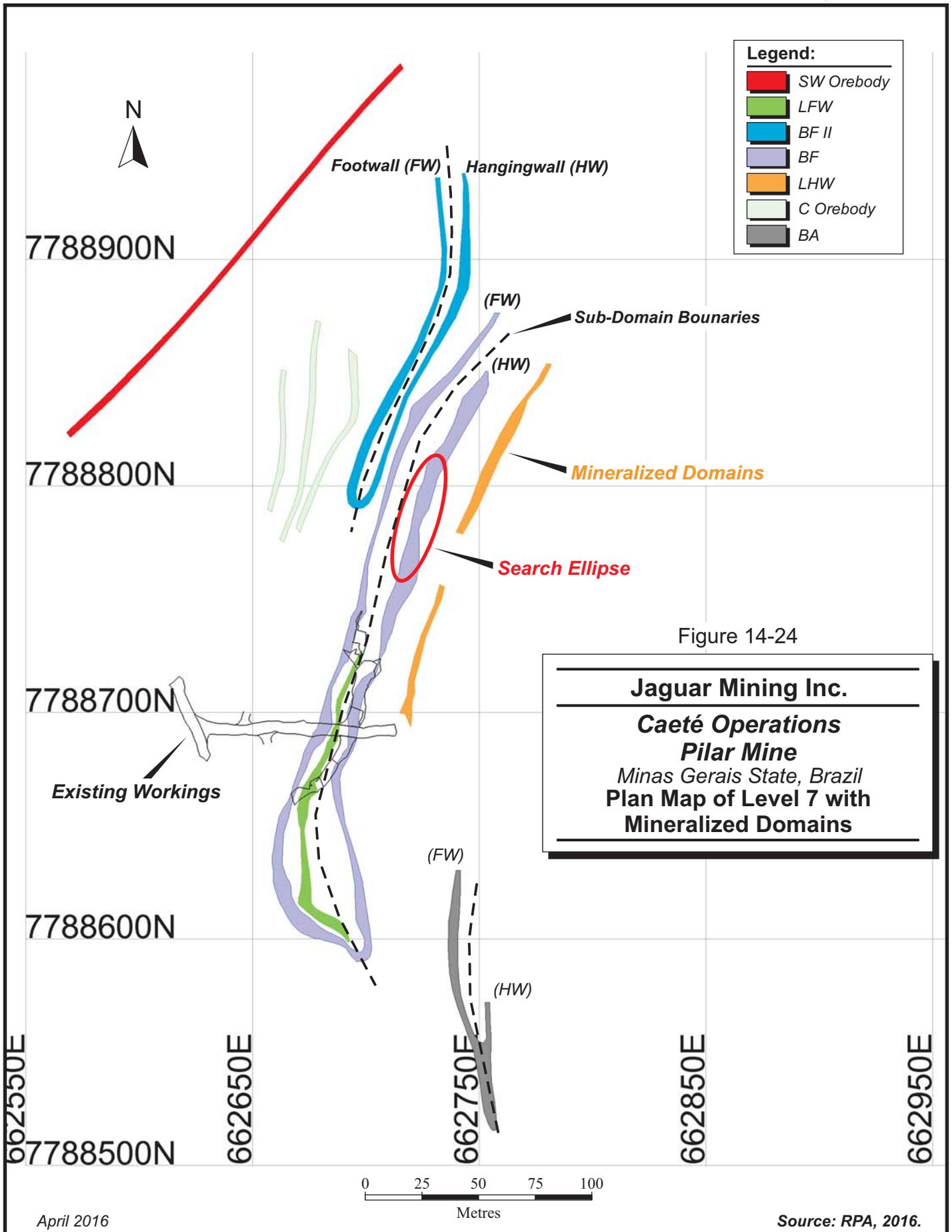


Figure 14-23

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
*Minas Gerais State, Brazil*  
**Longitudinal Projection Showing**  
**Orientation of the Search Ellipses**

In general, “hard” domain boundaries were used along the contacts of the mineralized domain models. Only data contained within the respective wireframe model were allowed to be used to estimate the grades of the blocks within the wireframe in question, and only those blocks within the wireframe limits were allowed to receive grade estimates. For those mineralized lenses that exhibited tight folding, the individual wireframe models were further sub-domained into their two separate limbs and each were assigned unique block model codes for the hangingwall and footwall limbs (Figure 14-24). In order to avoid smearing of gold grades across the limbs, separate estimation passes were run for the hangingwall and footwall limbs of the isoclinally folded domains (BA, BF, and BF II) using the respective drill hole composite samples.



## BLOCK MODEL VALIDATION

Block model validation exercises consisted of comparing the volume of the coded blocks in the block model against the volume report of the respective wireframe models as a high level check that the block model has been correctly coded for each of the wireframes (Table 14-25).

A second validation exercise consisted of comparing the descriptive statistics from the capped composited samples against the block model estimated gold grades. In general, the block estimated mean grades for all of the mineralized domains were lower than the capped, composited informing samples. RPA attributes this difference to the clustering of the composite samples (channel samples) and to the interpolation of grades along the down-plunge projections of the wireframes for Orebodies BA, BF and BF II where a low density of drilling information is present.

A third validation exercise consisted of comparing the mill production statistics with the predicted volumes of diluted and recovered tonnes and grade from the block model for the period of January 2014 to June 2015 (Table 14-26 and Figure 14-25). The reconciliation results are showing that there is a good correlation between the block model predicted tonnages and grades against the mill production statistics for the period examined.

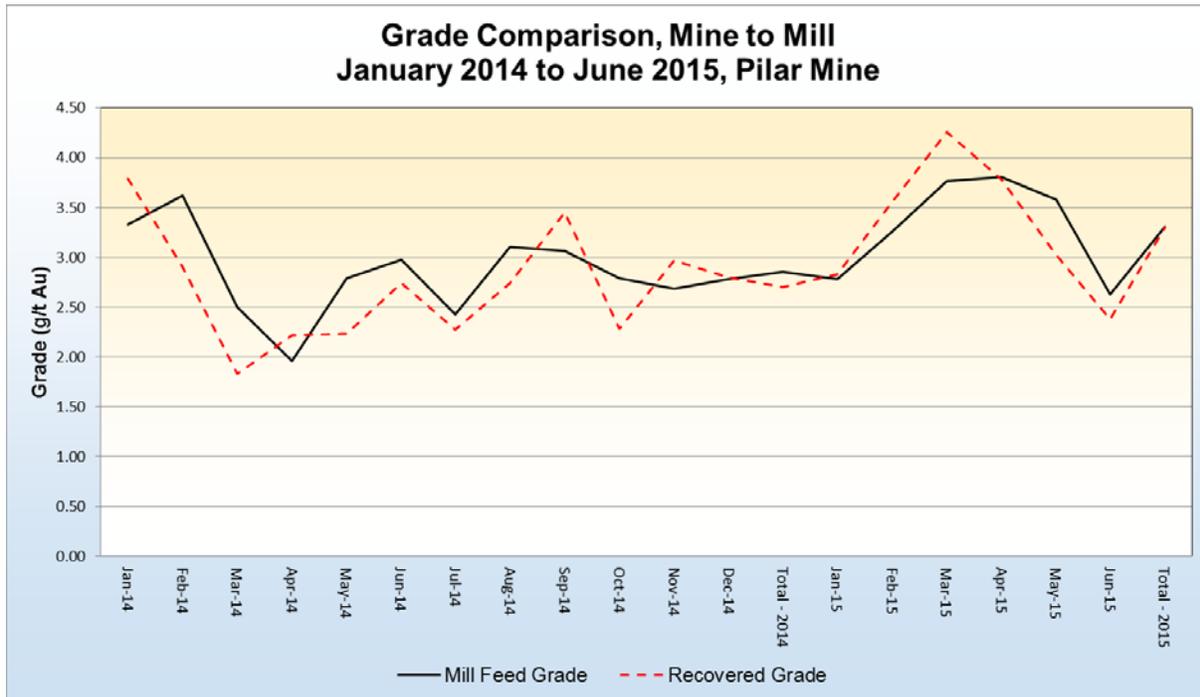
**TABLE 14-25 BLOCK MODEL VALIDATION RESULTS, PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

Orebody	BA	BF	BF II	LFW	LPA	LHW	C	SW
<b>Block Model:</b>								
Volume (m <sup>3</sup> )	1,414,859	1,235,266	598,703	506,578	137,866	91,595	918,236	1,126,447
Tonnes	4,088,825	3,767,361	1,826,046	1,464,011	407,230	279,367	2,653,703	3,397,229
Grade (g/t Au)	2.84	2.94	3.72	1.81	1.60	0.97	1.67	1.27
<b>Wireframe:</b>								
Volume (m <sup>3</sup> )	1,448,803	1,250,927	609,241	513,344	140,270	93,086	925,912	1,148,236
Difference (BM-Wf)	- 33,944	- 15,661	- 10,538	- 6,766	- 2,404	- 1,491	- 7,676	- 21,789
% Difference	-2%	-1%	-2%	-1%	-2%	-2%	-1%	-2%
<b>Composite Samples (capped):</b>								
Grade (g/t Au)	3.17	3.51	3.95	2.01	2.13	1.11	1.89	1.22

**TABLE 14-26 MINE TO MILL (F1') COMPARISON, JANUARY 2014 TO  
JUNE 2015, PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

Month	MINE PRODUCTION			PLANT PRODUCTION		
	Recovered Tonnes	Recovered Grade (g/t Au)	Oz Au	Mill Feed Tonnes	Mill Feed Grade (g/t Au)	Oz Au
<b>2014</b>						
January	36,790	3.79	4,485	38,803	3.33	4,153
February	31,384	2.90	2,929	34,175	3.62	3,975
March	30,217	1.83	1,781	30,389	2.50	2,439
April	31,640	2.22	2,256	32,378	1.96	2,044
May	36,573	2.23	2,624	35,752	2.79	3,209
June	30,327	2.74	2,670	31,852	2.97	3,046
July	30,111	2.27	2,199	29,103	2.43	2,275
August	30,491	2.74	2,688	33,469	3.10	3,341
September	32,299	3.45	3,582	33,031	3.06	3,252
October	28,197	2.29	2,072	30,010	2.79	2,694
November	30,836	2.97	2,945	31,119	2.69	2,689
December	30,370	2.80	2,731	30,839	2.78	2,758
<b>Total - 2014</b>	<b>379,235</b>	<b>2.70</b>	<b>32,960</b>	<b>390,921</b>	<b>2.85</b>	<b>35,874</b>
<b>2015</b>						
January	24,940	2.83	2,268	25,170	2.78	2,251
February	30,404	3.55	3,473	26,532	3.26	2,781
March	25,501	4.25	3,488	28,314	3.77	3,429
April	21,779	3.78	2,645	24,232	3.81	2,966
May	24,459	3.03	2,381	23,953	3.58	2,754
June	25,856	2.38	1,976	25,519	2.63	2,160
<b>Total - 2015</b>	<b>152,939</b>	<b>3.30</b>	<b>16,231</b>	<b>153,719</b>	<b>3.31</b>	<b>16,343</b>
		<b>Variance</b>			<b>Factors</b>	
<b>Period</b>	<b>Tonnes</b>	<b>Grade</b>	<b>Oz Au</b>	<b>Tonnes</b>	<b>Grade</b>	<b>Oz</b>
2014	+ 11,686	+0.15	2,914	1.03	1.06	1.09
M-T-D 2015	+780	+0.01	112	1.01	1.00	1.01

**FIGURE 14-25 MINE TO MILL GRADE COMPARISON, JANUARY 2014 TO JUNE 2015, PILAR MINE**



### MINERAL RESOURCE CLASSIFICATION

The Mineral Resources in this report were estimated in accordance with the definitions contained in CIM (2014).

The mineralized material for each wireframe was initially classified into the Measured, Indicated, or Inferred Mineral Resource category on the basis of the search ellipse ranges obtained from the spatial continuity study, the demonstrated continuity of the gold mineralization, the density of drill hole and chip sample information, and the presence of underground access.

On the basis of these criteria, Measured Mineral Resources initially comprised that material which has been estimated using Pass #1 and is located between developed levels. Indicated Mineral Resources initially comprised that material that has been estimated using Pass #2, and Inferred Mineral Resources initially comprised that material that has been estimated using Pass #3. Jaguar employs an additional block model code to denote those areas considered to display good exploration potential for use in the decision process.

A clean-up script was applied in a final stage of the classification process to ensure continuity and consistency of the classified blocks in the model. Those blocks which did not receive estimated grades in either of the four estimation passes were assigned classification codes of -1 to ensure their exclusion from Mineral Resource reports. Figure 14-26 presents an example of the final classification layouts for the BF Domain, and a list of classification codes used in the block model is provided in Table 14-27.

**TABLE 14-27 SUMMARY OF BLOCK MODEL CLASSIFICATION CODES**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Category</b>	<b>Block Model Code</b>
Measured	1
Indicated	2
Inferred	3
Exploration Potential (not used in Mineral Resource reports)	4
Default (not used in Mineral Resource reports)	-1

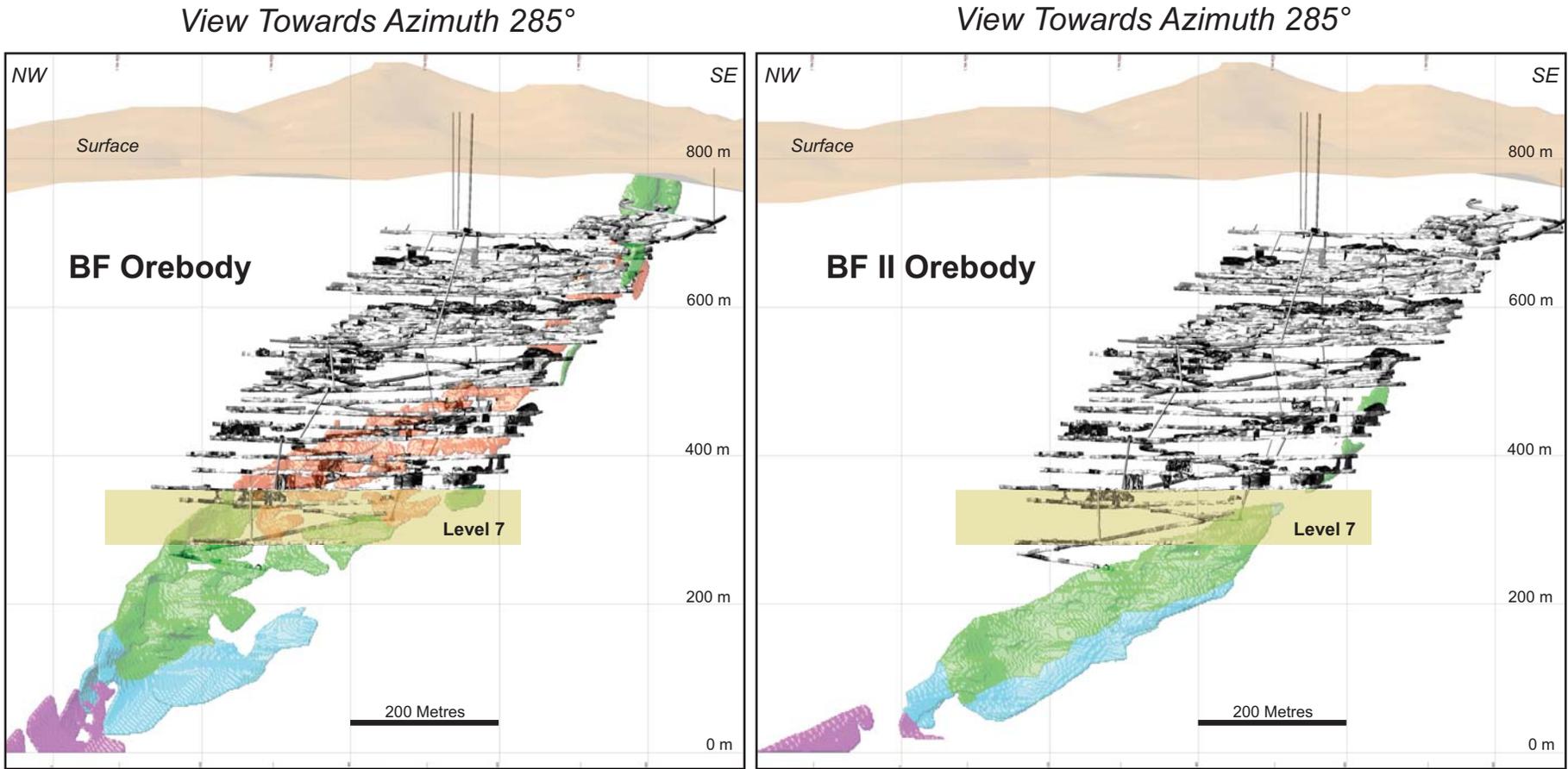


Figure 14-26

**Domain Legend:**

	Measured
	Indicated
	Inferred
	Exploration Potential

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Minas Gerais State, Brazil  
**Longitudinal Projection of the**  
**Classified Blocks, BF & BF II Domains**

## **RESPONSIBILITY FOR THE ESTIMATE**

The estimate of the Mineral Resources for the Pilar Mine presented in this report was prepared by Mr. Helbert Taylor Vieira, Senior Geologist with Jaguar under the supervision of Mr. Jean-Marc Lopez, Director – Mine Geology with Jaguar, and Mr. Reno Pressacco, M.Sc.(A), P.Geo., Principal Geologist with RPA. Mr. Pressacco is a Qualified Person as defined in NI 43-101, is independent of Jaguar, and takes responsibility for this Mineral Resource estimate.

## **CUT-OFF GRADE**

A cut-off grade of 1.93 g/t Au is used for reporting of Mineral Resources. This cut-off grade was arrived at using a gold price of US\$1,400/oz, average gold recovery of 88%, and 2014 actual cost data for the Pilar Mine. Gold prices used for reserves are based on consensus, long term forecasts from banks, financial institutions, and other sources. For resources, gold prices used are slightly higher than those for reserves.

## **MINERAL RESOURCE ESTIMATE**

The Mineral Resources are inclusive of Mineral Reserves. For those portions of the Mineral Resources that comprise the Mineral Reserve, the stope design wireframes were used to constrain the Mineral Resource reports.

Additional Mineral Resources are present that reside beyond the Mineral Reserves outlines as a result of the lower cut-off grade used for reporting of Mineral Resources. These are located as remnants above Level 7 (the limit of the current development) or as additional mineralized areas peripheral to the Mineral Reserve outlines in areas located below the current development. Three-dimensional resource polygons were prepared to aid in the estimation and reporting of the Mineral Resources to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan, section or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.

At a cut-off grade of 1.93 g/t Au, the Mineral Resources at the Pilar Mine comprise 3.479 million tonnes at an average grade of 4.59 g/t Au containing 514,000 ounces of gold in the Measured

and Indicated Resource category and 1.208 million tonnes at an average grade of 5.45 g/t Au containing 212,000 ounces of gold in the Inferred Mineral Resource category. The Mineral Resources are presented in further detail in Tables 14-28, 14-29, and 14-30. A longitudinal view of the Mineral Resources for the BF and BF II domains is presented in Figure 14-27.

**TABLE 14-29 SUMMARY OF MINERAL RESOURCES AS OF DECEMBER 31, 2015 –  
PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
Measured	709	4.25	97
Indicated	2,770	4.68	417
<b>Sub-total M&amp;I</b>	<b>3,479</b>	<b>4.59</b>	<b>514</b>
Inferred	1,208	5.45	212

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.93 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reals: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.
6. Bulk densities used are either 2.89 t/m<sup>3</sup> for iron-formation poor domains or 3.05 t/m<sup>3</sup> for iron-formation rich domains.
7. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
8. Mineral Resources are inclusive of Mineral Reserves.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

**TABLE 14-30 SUMMARY OF MINERAL RESOURCES BY DOMAIN AS OF DECEMBER  
31, 2015 – PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
<b>Orebody BA:</b>			
Measured	293	4.09	39
Indicated	174	5.58	31
<b>Sub-total M&amp;I</b>	<b>467</b>	<b>4.66</b>	<b>70</b>
Inferred	65	5.13	11
<b>Orebody BF:</b>			
Measured	259	4.57	38
Indicated	776	4.74	118
<b>Sub-total M&amp;I</b>	<b>1,035</b>	<b>4.69</b>	<b>156</b>
Inferred	293	6.77	64

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
<b>Orebody BF II:</b>			
Measured	4	4.46	1
Indicated	874	5.11	144
<b>Sub-total M&amp;I</b>	<b>878</b>	<b>5.11</b>	<b>145</b>
Inferred	198	7.89	50
<b>Orebody C:</b>			
Measured	80	4.24	11
Indicated	371	4.73	56
<b>Sub-total M&amp;I</b>	<b>451</b>	<b>4.62</b>	<b>67</b>
Inferred	140	5.10	23
<b>Orebody LFW:</b>			
Measured	68	3.82	8
Indicated	175	4.22	24
<b>Sub-total M&amp;I</b>	<b>243</b>	<b>4.10</b>	<b>32</b>
Inferred	117	4.87	18
<b>Orebody LHW:</b>			
Measured	-	-	-
Indicated	12	3.61	1
<b>Sub-total M&amp;I</b>	<b>12</b>	<b>3.61</b>	<b>1</b>
Inferred	5	3.11	1
<b>Orebody LPA:</b>			
Measured	6	2.72	1
Indicated	50	3.99	6
<b>Sub-total M&amp;I</b>	<b>56</b>	<b>3.99</b>	<b>7</b>
Inferred	-	-	-
<b>Orebody SW:</b>			
Measured	-	-	-
Indicated	338	3.28	36
<b>Sub-total M&amp;I</b>	<b>338</b>	<b>3.28</b>	<b>36</b>
Inferred	389	3.60	45
<b>Total Pilar Mine:</b>			
Total, Measured	709	4.25	97
Total, Indicated	2,770	4.68	417
<b>Total Measured &amp; Indicated</b>	<b>3,479</b>	<b>4.59</b>	<b>514</b>
Total, Inferred	1,208	5.45	212

Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.93 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reals: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.
6. Bulk densities used are either 2.89 t/m<sup>3</sup> for iron-formation poor domains or 3.05 t/m<sup>3</sup> for iron-formation rich domains.
7. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
8. Mineral Resources are inclusive of Mineral Reserves.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

**TABLE 14-31 SUMMARY OF MINERAL RESOURCES BY LEVEL AS OF DECEMBER 31,  
2015 – PILAR MINE  
Jaguar Mining Inc. – Caeté Operations**

Category	Tonnage (000 t)	Grade (g/t Au)	Contained Metal (000 oz Au)
<b>Levels 1 to 6 (within existing development):</b>			
Measured	659	4.32	91
Indicated	981	4.35	137
<b>Sub-total M&amp;I</b>	<b>1,640</b>	<b>4.32</b>	<b>228</b>
Inferred	391	4.26	54
<b>Levels 7 to 12:</b>			
Measured	50	3.35	5
Indicated	1,789	4.86	280
<b>Sub-total M&amp;I</b>	<b>1,839</b>	<b>4.82</b>	<b>285</b>
Inferred	816	6.02	158
<b>Total Pilar Mine:</b>			
Total, Measured	709	4.25	97
Total, Indicated	2,770	4.68	417
<b>Total Measured &amp; Indicated</b>	<b>3,479</b>	<b>4.59</b>	<b>514</b>
Total, Inferred	1,208	5.45	212

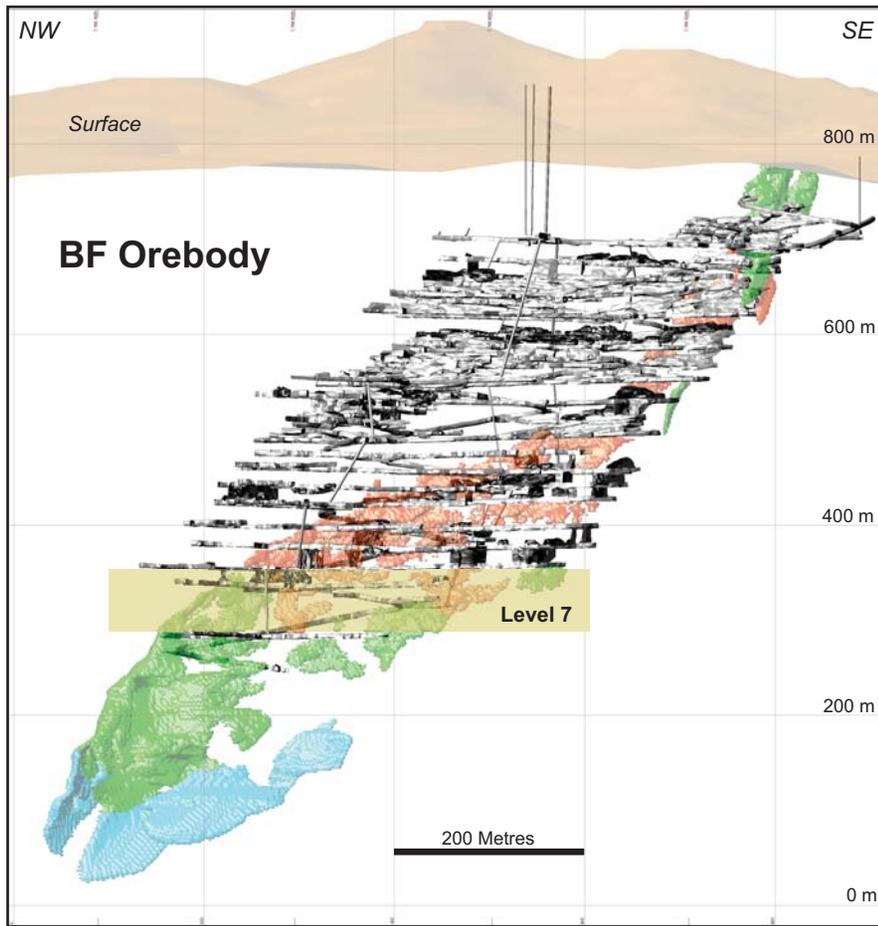
Notes:

1. CIM definitions were followed for Mineral Resources.
2. Mineral Resources are estimated at a cut-off grade of 1.93 g/t Au.
3. Mineral Resources are estimated using a long-term gold price of US\$1,400 per ounce.
4. Mineral Resources are estimated using an average long-term foreign exchange rate of 2.5 Brazilian Reais: 1 US Dollar.
5. A minimum mining width of approximately 2 m was used.
6. Bulk densities used are either 2.89 t/m<sup>3</sup> for iron-formation poor domains or 3.05 t/m<sup>3</sup> for iron-formation rich domains.
7. Gold grades are estimated by the inverse distance cubed interpolation algorithm using capped composite samples.
8. Mineral Resources are inclusive of Mineral Reserves.
9. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
10. Numbers may not add due to rounding.

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

It is RPA's opinion that the Pilar Mineral Resource estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

View Towards Azimuth 285°



View Towards Azimuth 285°

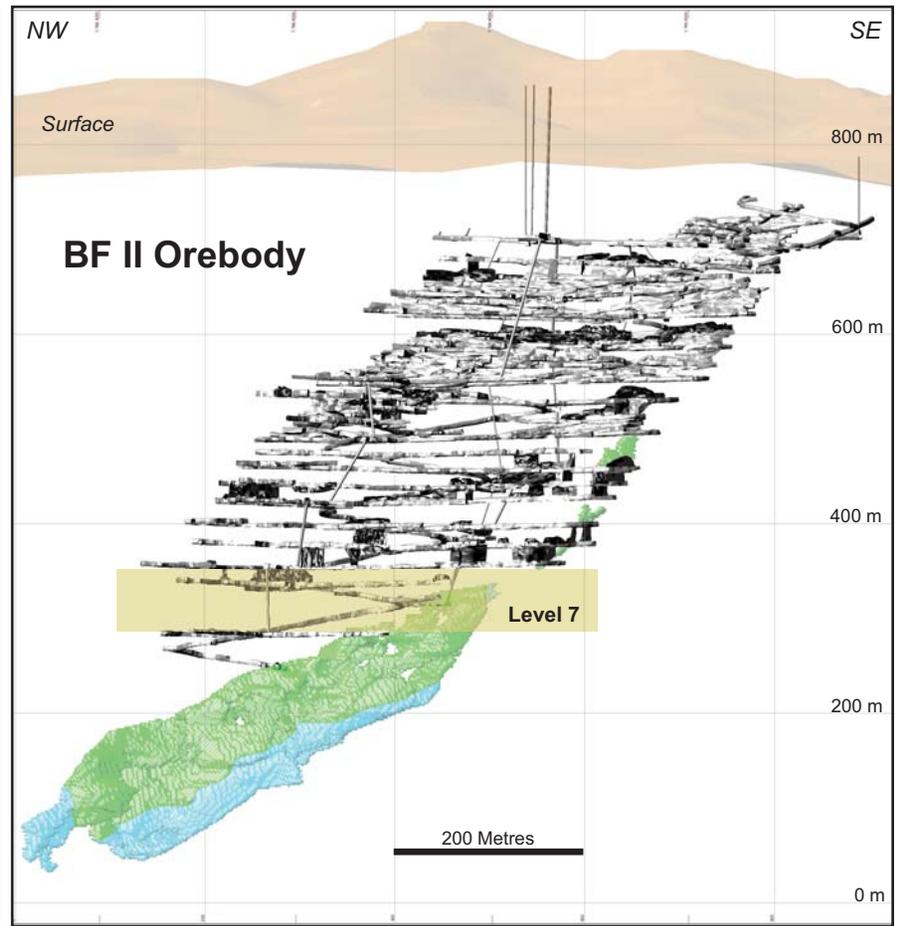


Figure 14-27

Domain Legend:	
	Measured
	Indicated
	Inferred

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Minas Gerais State, Brazil  
**Longitudinal Projection of the Mineral Resources, BF & BF II Domains**

14-58

## 15 MINERAL RESERVE ESTIMATE

Table 15-1 summarizes the Mineral Reserves for Pilar Mine as of December 31, 2015 based on a gold price of US\$1,150/oz. A break-even cut-off grade of 2.5 g/t Au was used to report the Mineral Reserves for the Pilar Mine. Due to the hiatus in production at Roça Grade Mine, Mineral Reserves have not been estimated.

**TABLE 15-1 MINERAL RESERVES – DECEMBER 31, 2015**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Category</b>	<b>Tonnage (000 t)</b>	<b>Grade (g/t Au)</b>	<b>Contained Metal (000 oz Au)</b>
Proven	164	3.15	17
Probable	1,056	4.58	156
<b>Total</b>	<b>1,220</b>	<b>4.39</b>	<b>172</b>

Notes:

1. CIM definitions were followed for Mineral Reserves.
2. Mineral Reserves are estimated at a cut-off grade of 1.90 g/t Au.
3. Mineral Reserves are estimated using an average long-term gold price of US\$1150 per ounce and a US\$/BRL\$ exchange rate of 3.8.
4. A minimum mining width of approximately 2 m was used.
5. Bulk densities used are either 2.89 t/m<sup>3</sup> for iron-formation poor domains or 3.05 t/m<sup>3</sup> for iron-formation rich domains.
6. Numbers may not add due to rounding.

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

It is RPA's opinion that the Pilar Mineral Reserve estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

### DILUTION

Dilution is addressed in two ways – internal, or planned dilution is included in the design solids where they extend beyond the resource wireframe. This occurs in order to respect minimum width for development, or to keep stope walls to achievable outlines. Additional volume included in this manner averages approximately 15% across the Mineral Reserves.

External, or unplanned dilution accounts for overbreak during blasting, minor ground failures in open stopes, and backfill mucked up from the floor of stopes. It is addressed by applying percentage factors to various excavation types, as listed in Table 15-2:

**TABLE 15-2 EXTERNAL DILUTION BY MINING METHOD**  
**Jaguar Mining Inc. – Caeté Operations**

Mining Method	Dilution (%)
Raising	10
Development	20
Cut & Fill	8
Longhole Stopping	10

Total dilution included in reserves averages approximately 25%, which is a good match for measured results for 2014 mining. Results for 2015 were available for January to June, and show several months with much lower dilution results.

RPA recommends that efforts to reduce dilution continue, and measurements using cavity monitoring systems (CMS) be used to analyse dilution by mining type. Measured results should be used to choose inputs to the reserve estimation process.

### **CUT-OFF GRADE**

Mineral Reserves were estimated using a break-even cut-off grade of 2.5 g/t Au, calculated using the following inputs:

- Gold price of US\$1,150/oz
- Exchange rate of US\$1.00=BRL3.8
- Metallurgical recovery of 89%
- Operating costs of BRL250 per tonne

Metal prices used for reserves match well with consensus, long term forecasts from banks, financial institutions, and other sources, and with prices used by major gold producers. Exchange rates are based on bank forecasts. Metallurgical recovery is in line with recent operating results, as are operating results.

An incremental cut-off grade of 1.9 g/t Au was estimated by splitting operating costs between fixed and variable, and using only the variable portions. This cut-off grade was used on development that had to be mined, and on a limited number of stopes around the edges of mining areas. A total of 17% of Mineral Reserves fall between break-even and incremental cut-off grades, an amount that RPA considers to be reasonable.

## 16 MINING METHODS

The Caeté Gold Complex includes a processing plant at the Roça Grande Mine with a nominal capacity of 2,050 tpd, with separate tailings disposal areas for both fine flotation tailings and CIP tailings.

The Roça Grande Mine recently produced approximately 500 tpd, however, it is currently on hiatus pending a review of mining plans. Ore from Pilar Mine is transported by truck 45 km to the Caeté Gold Complex for processing. Pilar Mine recently produced approximately 1,300 tpd, however, the current Life of Mine Plan (LOMP) forecasts lower production rates.

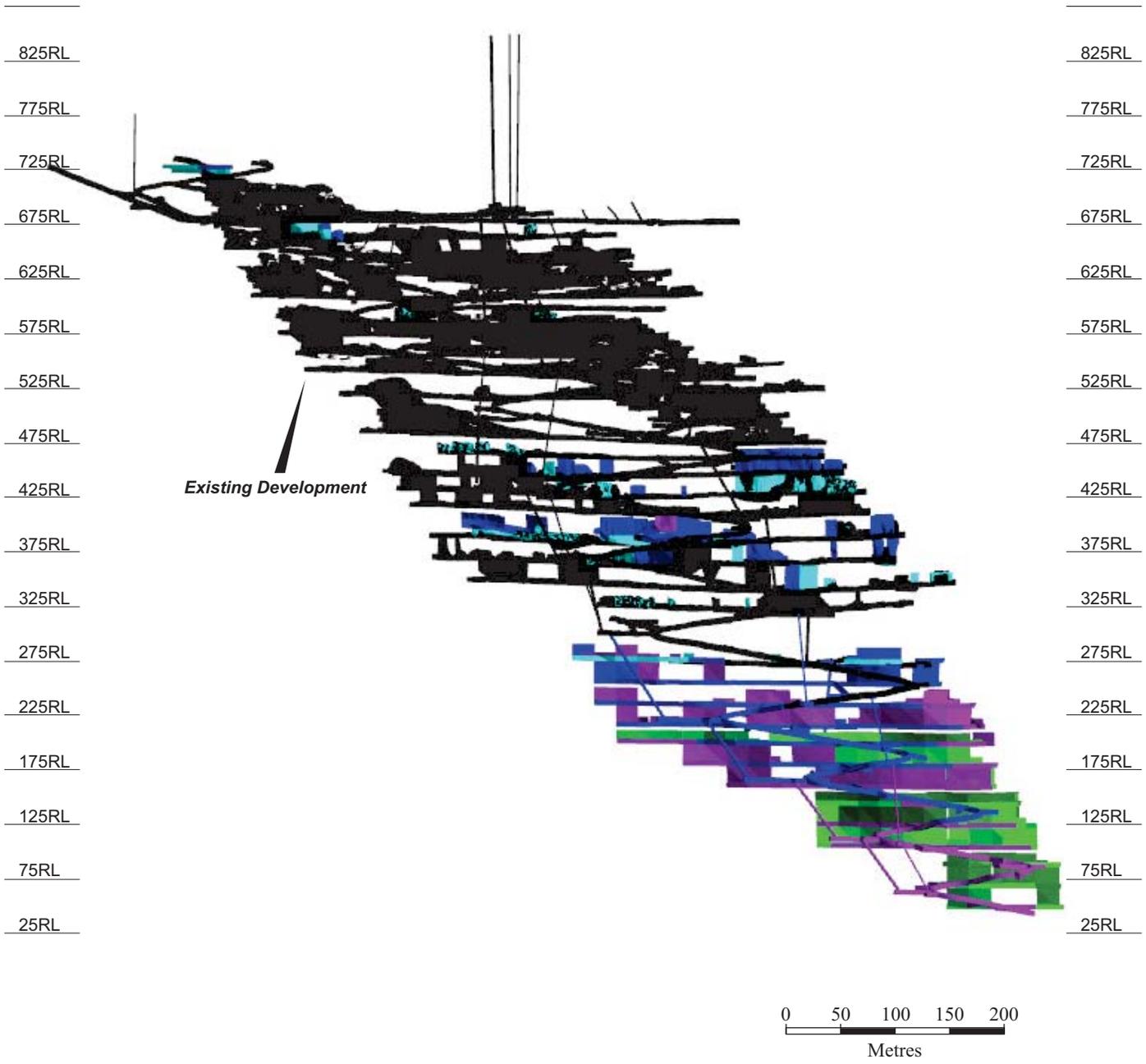
At Pilar Mine, gold mineralization is contained within a shear zone with an average 50° to 60° dip. The mineralization is structurally complex due to intense folding and displacements (up to one metre) due to local faulting. This results in direction changes and pinching and swelling of the vein over relatively short distances. The ore zone hanging wall (HW) and footwall (FW) contacts are visible by eye though sampling shows that there is, on occasion, an assay wall within the formation. The orebody is approximately 250 m to 350 m along strike and the orebody is mined along strike access via cross cuts perpendicular to the orebody.

### MINING METHODS

There are two mining methods in use. The cut and fill method is utilized in the narrower sections of the deposit whereas the longhole method is used in the thicker areas. The current LOMP forecasts longhole mining for a majority of the Mineral Reserves.

The mine is accessed from a five metre by five metre primary decline located in the footwall of the deposit. The portal is located at elevation 760 MASL. The mine is divided into levels with Level 01 established at elevation 690 m. Starting at this point, the vertical clearance is 75 m, i.e., Level 02 is at elevation 615 m, Level 03 at elevation 540 m, etc. A three-metre thick sill pillar is left between levels. Sublevels have also been excavated from the main ramp at 15 m vertical intervals to provide for intermediate access to the mining panels. The decline has reached Level 07, a vertical depth of approximately 500 m (Figure 16-1).

Looking South



LOM Year:	
<span style="color: lightblue;">■</span>	2015
<span style="color: blue;">■</span>	2016
<span style="color: purple;">■</span>	2017
<span style="color: lightgreen;">■</span>	2018
<span style="color: green;">■</span>	2019
<span style="color: darkgreen;">■</span>	2020

Figure 16-1

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Pilar Mine**  
 Minas Gerais State, Brazil  
**Life of Mine**  
**Longitudinal Section**

At each level and sublevel, drifts are developed near the centre of the mineralized zone to expose the FW and HW contacts. The drift is extended in both directions along strike, under geological control for alignment, continuing to expose the contacts until the limits of the deposit are reached. This provides for two working faces per sublevel.

Longhole mining is carried out on a longitudinal retreat sequence, towards the central access. Stopes are 50 m in length and separated by three metre to five metre wide pillars, depending on the thickness of the zone. When the mining of each longhole stope has been completed, the excavation is filled using a combination of development waste and hydraulically placed cemented classified flotation tailings. A drainage bund is constructed using development waste to contain the backfill. The backfill is then placed in the mined-out excavation. Once the cement is allowed to set, the next stope in the sequence is drained of excess water and can be mined. The sequence continues until the entire sublevel is mined. Mining then proceeds upward to the next sublevel and the sequence is repeated until the sill pillar is reached. Stopes are mined from several individual levels simultaneously in order to provide the required number of active workplaces needed to meet production targets.

For cut and fill mining, the level development is carried out to the extent of the ore, then backfilled. Once drained of excess water and allowed to cure, the access drift is back-slashed to allow vehicle access to the top of the backfill elevation. The subsequent cut is advanced using the breasting technique. Mining progresses in two directions from the access towards the ends of the orebody. Drilling of the breasts is completed using two-boom electric-hydraulic jumbos equipped with extension steel. This configuration allows for the normal 3.5 m long rounds to be extended to seven metres. Mucking is performed using six cubic yard Load-Haul-Dump (LHD) units and haulage to surface is by a fleet of off-highway surface trucks varying in size from 10 t to 25 t. Initial access to each mining panel is from the main level (at the base of the panel). As mining progresses, a 20% slope ramp is constructed in the fill to provide access to the next cut above the previously placed backfill. As this internal ramp is constructed, the roof immediately above it is raised, maintaining a clearance of 4.2 m. The excavation and backfill sequence is repeated until the next sublevel (15 m above) is reached. The sequence is then repeated for a total of five sublevels until the next level is reached.

Backfill is sourced from the filtered coarse portion of the flotation tailings from the Caeté Mining Complex mill, supplemented with available development waste. The filtered tailings are

backhauled using the same highway trucks used to transport the ore from the mine to the mill. The fill is re-pulped on surface prior to being pumped underground.

## **MINE EQUIPMENT**

The mine is highly mechanized. Development and mining activities are accomplished with a fleet of five two-boom electric-hydraulic jumbos. Longhole drilling is completed with two Atlas Copco Simba drills. Three six cubic yard LHD units are used for mucking. A fleet of eight Iveco 25 t trucks and four 10 t trucks are used to haul broken rock to surface. This type of truck was designed for surface use and are often found to be insufficiently robust for underground use. Mechanical availability of these units can be lower than normally observed with haulage trucks specifically designed for underground mining applications.

## **GROUND CONDITIONS**

Ground conditions were observed by RPA to be good. The main decline, portions of which were developed up to ten years ago, did not exhibit any roof or wall deterioration. Primary support in the mine is provided by the use of split sets, grouted rebar and, in the wider areas, grouted cable bolts. Two single-boom electric-hydraulic jumbos are used for rock bolting.

## **LIFE OF MINE PLAN**

Stope and development designs, and production scheduling were carried out by MCB using Deswik mine design software, and modified by Jaguar to deplete for stopes mined out as of December 31, 2015.

The production schedule covers a mine life of four years based on Mineral Reserves, and it is summarized in Table 16-1.

**TABLE 16-1 LOMP PRODUCTION SCHEDULE**  
**Jaguar Mining Inc. – Caeté Operations**

<b>Item</b>	<b>Units</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
Ore Tonnes	Tonnes	287,000	336,000	281,000	241,000	1,144,000
	g/t Au	3.68	4.71	5.25	4.88	4.62
Total Mill Feed	Tonnes	331,000	372,000	291,000	243,000	1,238,000
	g/t Au	3.39	4.40	5.11	4.84	4.39
	Ounces	36,031	52,705	47,900	37,906	174,542
Recovery	%	90%	90%	90%	90%	90%
Gold Produced	Ounces	32,428	47,434	43,109	34,115	157,085

RPA notes that the LOMP production schedule includes a small amount of Inferred material (18,000 tonnes at 4.2 g/t Au). This material is not included in Mineral Reserves.

The current LOMP leaves significant capacity for processing more material, should it become available, or conversely, to explore cost saving measures at the plant such as weekend shutdowns or campaign milling.

## 17 RECOVERY METHODS

The Caeté processing plant has a design capacity of 720,000 tpa of run-of-mine (ROM) ore. In 2015, the plant processed feed from the Pilar and Roça Grande mines. Over the past five years of operation, the Caeté processing plant operated at approximately 84% of its design capacity. In 2015, this decreased to 65% due to lower ore production from the mines.

Following the completion of a number of modifications to improve the performance of the plant, the overall recovery achieved in 2015 was 89.5%, which is 0.5% higher than planned (89.0%) and an increase of 1.7% compared to 2014 (87.8 %). Gold recovery by flotation improved from 79.8% in 2014 to 85.5% in 2015.

The process flowsheet primarily consists of the following unit steps. A flow sheet is presented in Figure 17-1.

- Crushing
- Grinding
- Gravity Gold Recovery
- Flotation
- Leaching & Carbon-in-Pulp
- Gold Recovery
- Detoxification
- Tailings

### CRUSHING

The ore from the Pilar and Roça Grande mines is transported by trucks to the crusher circuit and placed in the ROM stockpile. The crushing circuit is made up of a primary jaw crusher in open circuit, and secondary and tertiary cone crushers, operating in closed circuit.

The ROM stockpile ore is fed to the jaw crusher through a grizzly and vibrating feeder. The jaw crusher discharge feeds a multi deck screen, which feeds either the secondary or tertiary crushing circuit or the final product conveyor. The secondary cone crusher operates in closed circuit with a double deck screen. Product from the double deck screen either recirculates

back to the secondary crusher, feeds the tertiary crusher, or goes to the final product conveyor. The tertiary cone crusher operates in closed circuit with a single deck scree, with the product recycling to the crusher or going to the final product conveyor, which goes to crushed ore stockpile. The final particle size of the crushing process is 16 mm.

## **GRINDING & GRAVITY GOLD RECOVERY**

The grinding circuit consists of a horizontal ball mill with a capacity of up to 100 tonnes per hour, operating in closed circuit with a series of hydrocyclones. The overflow from the hydrocyclones (-200 mesh (74  $\mu\text{m}$ )) proceeds to the flotation circuit and the underflow (+200 mesh (74 $\mu\text{m}$ )) either feeds the gravity concentration circuit (75%) or is recycled to the ball mill feed (25%).

Gravity concentration at the Caeté plant uses a centrifugal gravity concentrator (Knelson) to recover fine particles of free gold. The gravity concentrate proceeds to an intense cyanidation plant (Acacia), from which the gold bearing solution is pumped directly to a dedicated set of electrolytic cells. The precipitate from the cells is sent to a refinery for further processing into doré gold bars.

## **FLOTATION**

The flotation circuit consists of a series of twelve 500 ft<sup>3</sup> flotation cells, the first three operating as roughers, three operating as primary scavengers, three operating as secondary scavengers, and the last three operating as tertiary scavenger cells. The concentrate produced by the secondary scavenger cells is returned to the rougher and the tertiary scavenger concentrate is recirculated to the primary scavenger circuit. The final gold bearing concentrate (90-95% -325 mesh (45  $\mu\text{m}$ )), from the roughers and primary scavenger circuit is sent to a concentrate thickener for densification to approximately 40% solids (w/w). The thickener overflow is recycled for use as process water.

The tailings from the tertiary scavenger cells is sent to a series of hydrocyclones for separation. The cyclone underflow is sent back to the mine to be used as backfill. The cyclone overflow is sent to a tailings thickener, with the thickened underflow pumped to the RG2 West or East tailings area. The thickener overflow is recycled for use as process water.

## **LEACHING AND CARBON-IN-PULP GOLD RECOVERY**

### ***LEACHING***

The concentrate thickener underflow slurry (40% solids w/w) is pumped to an agitated conditioning tank, where lime and cyanide are added, and then further pumped to a set of three agitated leach tanks operating by gravity, in series.

The lime is used to keep the pH above 10.0 to 10.5, in order to minimize the generation of deadly hydrogen cyanide gas. Cyanide is used to dissolve the gold from the solids in the slurry. Cyanide may be added to the leach tanks as well.

Oxygen, in liquid form, is introduced through spargers to enhance the dissolution of gold, and the oxidation of unstable sulphides (e.g., pyrrhotite). This oxidation reduces cyanide consumption and increases gold recovery.

The slurry from the last leach tank flows by gravity to a series of four CIP agitated tanks that are arranged in series.

### ***CARBON IN PULP***

The four CIP tanks are designed to hold activated carbon in each tank through a designed screen which allows slurry to flow from tank to tank, but retains the carbon in each tank. The carbon interacts with the slurry, adsorbing the gold cyanide complex created in the leach tanks. The slurry flows downstream from Tank 1 to Tank 4, while the carbon is pumped counter currently from Tank 4 to Tank 1. The pumping frequency is determined by the loading of gold on the carbon. The highest loaded carbon from Tank 1 is pumped over a screen, with the slurry returning to the tank and the gold loaded carbon going to gold recovery.

The slurry exiting the last CIP tank is sent to over a safety screen to recover any carbon that may have left the tank, and then to a detoxification circuit to remove cyanide.

## **GOLD RECOVERY**

The gold loaded carbon is transferred to a desorption column. A hot solution (approximately 98°C) of caustic soda and 1% cyanide concentration is pumped upwardly through the elution column to remove or desorb the gold cyanide complex from the carbon.

The gold bearing solution leaves the top of the column and feeds the electrolysis cell, where the gold is deposited onto steel wool and stainless steel cathodes. The solution from the electrolysis cell is pumped back to the heating tank and reused. The solution is recirculated for approximately 24 hours to remove most of the gold from solution.

After the desorption cycle, the sludge, steel wool, and cathodes are withdrawn and sent to the refinery for production of gold doré containing about 80% gold. The doré gold is then further refined, obtaining pure gold bars (minimum 99.99%).

The desorbed carbon goes through an acid wash step using a 10% hydrochloric acid solution to remove carbonates. The carbon is then regenerated in a rotating dryer at 700° C to remove organic material, and return the carbon's ability to adsorb gold. This carbon is pumped to the last tank in the CIP circuit. Periodically fresh carbon is added to the tank, as some degradation will occur in the carbon, resulting in the need for replacement.

## **DETOXIFICATION**

The cyanide detoxification process consists of adding hydrogen peroxide in the slurry as it flows by pipe to the Moita tailings area located approximately four kilometres from the plant. Mixing of the hydrogen peroxide occurs in the pipe. Residence time in the HDPE-lined dam results in the free cyanide levels generally falling below detection limit. Total cyanide levels, however remain high.

The water reclaimed from the ponded clear water passes initially through two activated carbon columns to recover any soluble gold left in solution. The activated carbon is periodically recovered and sent to the gold recovery circuit for gold removal.

The solution is then dosed with a copper sulphate solution and flocculant, allowed to settle in a decantation tank. The overflow is pumped back to the plant for use as process water, with the sludge drained back into the Moita tailings area.

## **TAILINGS**

As mentioned before, the flotation tails are cycloned and sent to either underground for backfill or thickened and sent to the RG2 West or East(W/E) tailings area. Process water is pumped directly back to the plant.

The tailings from the CIP circuit are treated for cyanide removal and piped to the Moita tailings area. The reclaim water is treated to recover gold and further cyanide destruction, before being returned to the plant.

## **CONCLUSION**

In RPA's opinion, the processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been seen due to lack of plant feed.

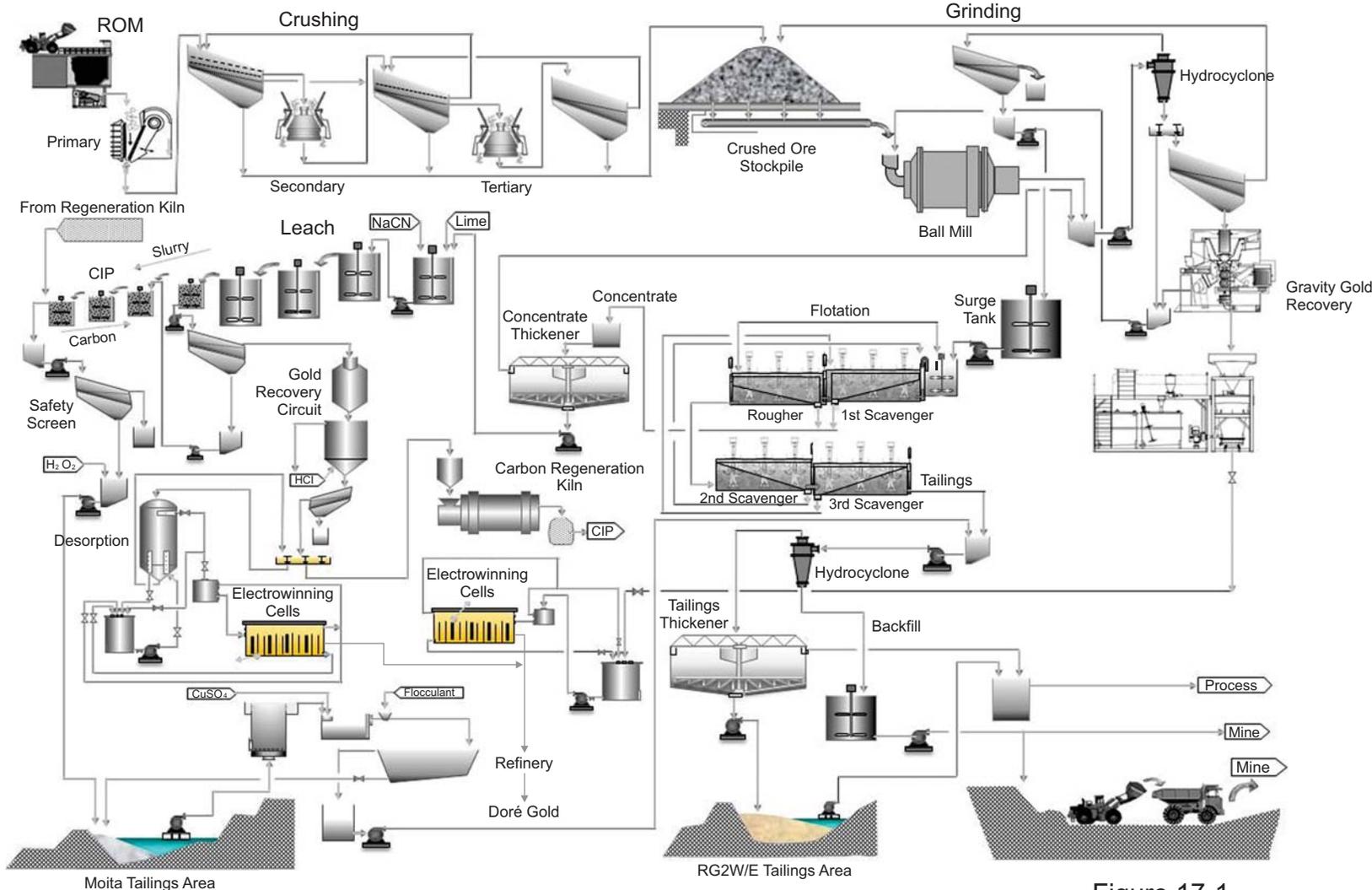


Figure 17-1

**Jaguar Mining Inc.**  
**Caeté Operations**  
**Roça Grande Mine**  
 Minas Gerais State, Brazil  
**Caeté Metallurgical Flowsheet**

17-6

## 18 PROJECT INFRASTRUCTURE

The Caeté Mining Complex includes a nominal 2,050 tpd processing plant with separate tailings disposal areas for both fine flotation tailings and CIP tailings. Electrical power supply is provided through the national power grid. The process plant is located at the Roça Grande Mine at an elevation of approximately 1,250 MASL.

An administration complex is located at the entrance to the plant site, with such ancillary buildings as offices, conference rooms, cafeteria, maintenance shops, compressors (mine and mill), a dry, a first aid station, warehouse, backfill preparation, and a water treatment plant, which is located near the process plant. The assay laboratory and process testing laboratory are also located near the process plant. The Roça Grande Mine is accessed by an adit that is located approximately 800 m to the southwest of the plant at an elevation of approximately 1,100 MASL. Trailers located at the mine adit provide local storage and office space. The explosives and blasting accessories warehouses are located 3.5 km away from the mine area, in compliance with the regulations set forth by the Brazilian Army.

The surface infrastructure at the Pilar Mine is limited to shops, offices, cafeteria, first aid, and warehouse facilities. The mine is accessed by an adit that is located at an elevation of approximately 750 MASL.

## 19 MARKET STUDIES AND CONTRACTS

Gold is freely traded, at prices that are widely known, so that prospects for sale of any production are virtually assured. A gold price of US\$1,150 per ounce was used for estimating Mineral Reserves. RPA notes that this price is consistent with consensus long-term forecasts, and prices used by other gold producers.

## 20 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

### PROJECT PERMITTING

#### ROÇA GRANDE MINE

##### *TAILINGS DAM*

MSOL began its mining activities at the Roça Grande Mine in August 2006 under the Corrective Operation Licence No. 333/2006 (COPAM process number 10022/2003/001/2005). This operating licence included the permit to operate a process plant to treat oxidized gold ore from the mines in the Sabará , Caeté and Santa Barbara project areas, as well as feed from the RG2 open pit at the Roça Grande Mine.

The processing plant was decommissioned due to changes required in the mineral treatment process as the oxidized ore reserves were depleted. The processing of sulphide gold ores from the underground mines of the Caeté Project required construction of a new treatment plant that used the CIP-ADR process (Carbon in Pulp / Adsorption Desorption Recovery). This plant has been licensed through the process COPAM No. 10022/2003/002/2007.

As a result of this new treatment process, an updated design was required for the tailings storage area. The application of the Preliminary Licence for proposed new tailings storage areas was accepted by SUPRAM on July 7, 2007. A site visit was subsequently carried out by SUPRAM on October 4, 2007, SUPRAM. The operating licence was issued on November 29, 2007 by the certificate 029/2007, COPAM process 10022/2003/003/2007. This licence certified the environmental feasibility of storage of the process tailings in the previously excavated open pit mines at the RG2 deposit (RG2-W and RG2-E), together referred to as the Moita Pits (Cava do Moita).

Although the two old open pit mines were previously permitted for storage of process tailings from the first processing plant under the preliminary licence issued on November 29, 2007, MSOL required an update to the licence for the construction of the tailings storage facilities.

On June 27, 2008, MSOL obtained the installation licence which was issued on May 11, 2009, COPAM process 10022/2003/004/2008 and generated Certificate No. 077/2009.

The construction and commissioning of each of the separate tailings containment areas were carried out under a separate licensing process. After all construction was completed, an operating licence was requested on March 25, 2010 and Certificate No. 117/2010 was subsequently issued on April 31, 2010 (COPAM process 10022/2003/008/2010). It is to be noted that an APO (provisional operating licence) for the new tailings storage areas was issued on April 15, 2010 and this operating licence is currently being renewed.

#### RG2-W Storage Area

While the tailings from the new process plant were envisioned in the preceding environmental studies to be returned to the mines for use as backfill material in the stopes, it was determined that insufficient storage volume was being generated in the mines to accept the full volume of tailings generated. This required identification and construction of an additional storage area for the tailings from the flotation circuit which do not contain cyanide. A volume of approximately 418,000 m<sup>3</sup> was estimated to be required. The tailings are transported to the RG2-W containment area by means of pipelines. It is important to note that the RG2-W open pit does not have conventional characteristics of a tailings dam such as embankments, as it was excavated for the purposes of mining.

The application for the construction of the RG2-W tailings storage area was submitted on January 29, 2010. The construction licence was issued on May 31, 2010, COPAM process 10022/2003/007/2010, certificate number 114/2010. The licence process was formalized by MSOL on June 23, 2010. An APO for the site was issued on July 7, 2010 and the operating licence was issued on August 30, 2010 as certificate 201/210, COPAM process 10022/2003/010/2010. This operating licence is currently in the renewal process.

On May 16, 2013 MSOL initiated the licensing process for raising of the upstream portion of the RG2-W tailings dam. The licensing mode set by the regulatory agency granted concurrent preliminary and construction licences (LP + LI). This lift would raise the height of the dam to and elevation of 1,296 m and would increase the storage capacity of the facility by 354 m<sup>3</sup> to a total capacity of 884 m<sup>3</sup>. The LP + LI was issued on October 29, 2013 under Certificate No. 170/2013, COPAM process 10022/2003/016/2013. On July 14, 2015 MSOL requested an operating licence for the new lift to 1,296 m. The request is currently under review by SUPRAM.

#### RG2-E Storage Area

On April 12, 2011 MSOL submitted an application for concurrent preliminary and construction licences for the expansion of the RG2-E tailings storage area, which is located within the former RG2 open pit mine.

In September 2011 SUPRAM surveyed the dam and the licence was issued on April 10, 2012. The request of the operating licence was requested on October 7, 2013 and since January 27, 2014 the dam operates through an APO.

#### **PROCESS PLANT**

The amended operation licence number 333/2006, COPAM process 10022/2003/001/2005, authorized the operation of the new decommissioned plant to process oxide gold ores. Due to the change of the process flowsheet to process the new feed stock from the underground mines, an application of a construction licence was filed with SUPRAM on April 17, 2007. SUPRAM surveyed the proposed plant site on July 2, 2007 and determined that the proposed new plant would occupy the same footprint as the previous plant and that there would be no further disturbance to either the surface or the vegetation.

The construction licence for the new processing plant was issued on January 4, 2008, certificate number 097/2008, COPAM process 1002/2003/002/2007. On March 25, 2010 MSOL made application for the operating licence which was subsequently issued on May 2, 2010, certificate number 090/2010, COPAM process 10022/2003/009/2010. An application for renewal of the operating licence was submitted by MSOL in January 2014, which is currently under review by the environmental regulatory agency, COPAM process 1002/2003/020/2014.

#### **UNDERGROUND MINE**

The underground mining activity at the Roça Grande Mine was authorized through two operating licences. Licence LO 035/2008 related to the RG1 deposit and licence LO 036/2008 relates to the development of the RG2 deposit.

Operating licence 035/2008, COPAM process 10022/2003/012/2011 was issued on April 16, 2008 and authorized the execution of underground mining activities on claim number 831.057/2010. It is to be noted that prior to this operating licence, the company had an Operation Environmental Authorization (AAF) No. 01109/2007 for the underground mining

activity. The current operating licence is currently in the renewal process through COPAM process 10022/2003/015/2012.

Operating licence 036/2008, COPAM process 22352/2011/005/2011 was requested on February 11, 2008 and was issued on April 16, 2008. This licence authorized the execution of underground mining activities on claim number 831.056/2010. It is to be noted that prior to this operating licence, the company had an Operation Environmental Authorization (AAF) No. 01109/2007 for the underground mining activity. The current operating licence is currently in the renewal process through COPAM process 22352/2011/006/2012.

#### **OPEN PIT MINES**

On April 9, 2010 MSOL formalized the previously issued concurrent open pit construction and operating licences (LP + LI) for expansion of the existing open pit mines on claim 831.056/2010. This licence relates to open pit mining activity on the RG3 and RG6 deposits.

Both the LP + LI licences were administered under certificate 173/2010, COPAM process 22352/2011/003/2011 and the APO for the open pit expansions was issued on October 7, 2011. No activities are currently taking place at the open pit mines and the LP + LI request remains under review by the environmental agency.

The Environmental Authorization Registration Operation (AAF) Registry n ° 0911149/2013, issued on May 24, 2013 and valid until May 24, 2017, approves the open-pit mining in the mining rights 831.057/2010. This activity refers to the RG6 orebody.

#### **WASTE ROCK STORAGE**

The initial waste materials from the open pit mines were placed on waste piles previously constructed by Vale. The operating licence for that activity was issued on September 22, 2009. The material was placed in cells that were created using waste rock generated from the underground mine and was compacted by the passage of the mining equipment. MSOL constructed drain structures along the bottom and peripheries of the waste rock piles to control and manage the rainwater to the appropriate containment areas.

SUPRAM issued the operating licence on November 30, 2009 under certificate 298/2009, COPAM process 1002/2003/005/2009. A renewal of the operating licence was requested by

MSOL on August 23, 2013, COPAM process 1002/2003/018/2013, and this renewal application is currently under review by SUPRAM.

On May 8, 2010, MSOL requested the LP + LI for the second expansion of the waste rock piles, as additional storage capacity was required after evaluation of the mining plans for the integrated operations. The LP + LI was issued on September 26, 2011 under certificate number 253/2011, COPAM process 10022/2003/017/2013. The technical aspects are currently under review of the by the environmental agency.

A summary of the environmental licences for the Roça Grande Mine is provided in Table 20-1 below.

**TABLE 20-1 LIST OF EXISTING LICENCES, ROÇA GRANDE  
Jaguar Mining Inc. – Caeté Operations**

Enterprise	Certificate number	Process number (PA COPAM)	DNPM	Granting date	Expiring date	Observation
Tailing Dam – “Cava do Moita”	LO 117/2010	10022/2003/008/2010	NA	31/05/2010	31/05/2014	This licence is being renewed since 2014, COPAM process 10022/2003/020/2014
Tailing Dam – “RG2-W”	LO 218/2010	10022/2003/010/2010	NA	30/08/2010	30/08/2014	This licence is being renewed since 2014, COPAM process 10022/2003/020/2014
Tailing Dam – “RG2-E”	APO	10022/2003/019/2013	NA	27/01/2014	NA	Application for an operating licence under review by environmental agency
Plant	LO 090/2010	10022/2003/009/2010	NA	03/05/2010	03/05/2014	This licence is being renewed since 2014, COPAM process 10022/2003/020/2014
Underground mining – RG-01	LO 035/2008	10022/2003/012/2011	831.057/2010	16/04/2008	16/04/2012	This licence is being renewed since 2012, COPAM process 10022/2003/015/2012
Underground mining – RG-02	LO 036/2008	22352/2011/005/2011	831.056/2010	16/04/2008	16/04/2012	This licence is being renewed since 2012, COPAM process 22352/2011/006/2012
Open pit – DNPM 831.056/2010	APO	22352/2011/004/2011	831.056/2010	07/10/2011	NA	Application for an operating licence under review by environmental agency. This licensing process refers to RG-03 and RG-06.
Open pit – DNPM 831.057/2010	AAF	01463/2004/007/2013	831.057/2010	24/05/2013	24/05/2017	RG-06.
Waste dump – First Expansion	LOC 298/2009	10022/2003/005/2009	NA	30/11/2009	30/11/2013	This licence is being renewed since 2013, COPAM process 10022/2003/018/2013
Waste dump – Second Expansion	LP+LI 253/2011	10022/2003/011/2010	NA	26/09/2011	26/09/2015	Operating licence requested on July 2013, COPAM process 10022/2003/017/2013.
Surface water pumping	Outorga 02725/2010	07024/2007	NA	11/11/2010	27/10/2015	This licence is being renewed since 2015, process 31767/2015. “Captação túnel Marembá” or “Captação túnel do Andre”

## **PILAR MINE**

The mining title for the Pilar Mine (claim 830.463/1983) initially belonged to the Companhia Vale do Rio Doce (VALE), which initiated the environmental licensing process in 1999 and obtained a preliminary licence for the open-pit mining of the oxidized ore. Due to strategic changes of VALE, they decided at that time to cease progress at the mining project.

In 2003 Vale transferred the mineral rights to the MSOL who then took over the environmental licensing process for the implementation of the open pit mining project. Thus, MSOL obtained the Preliminary Licence, Construction Licence, and finally, the Operating Licence on June 27, 2006, through the COPAM process N° 00132/1999/003/2005.

In preparation for permitting of the underground mine, MSOL acquired a preliminary licence for the activity by COPAM process 00132/1999/004/2007. SUPRAM issued the preliminary licence on August 16, 2007 under certificate number 021/2007.

MSOL subsequently carried out the required environmental studies and submitted an application for a construction licence under COPAM process number 00132/1999/006/2008. SUPRAM issued the construction licence for the mining and processing of sulphide ores by the CIP-ADR process flowsheet on August 25, 2008 under certificate number 152/2008.

On September 22, 2009, MSOL applied for an operating licence which was subsequently issued by SURPAM on June 30, 2010 under certificate number 153/2010, COPAM process 00132/1999/007/2009. On February 23, 2016 MSOL applied for a renewal of the operating licence, COPAM process 00132/1999/009/2016, and the renewal application is currently under review.

Operating licence LO 153/2010 is currently the only licence relating to the Pilar Mine. A list of the water permits is presented in Table 20-2.

**TABLE 20-2 LIST OF EXISTING WATER PERMITS, PILAR  
Jaguar Mining Inc. – Caeté Operations**

<b>Ordinance</b>	<b>Grant date</b>	<b>Expiration Date</b>	<b>Procedure number</b>	<b>Watercourse</b>	<b>Permitted Rates</b>	<b>Status</b>
00285/2008	08/04/2008	22/02/2013	02143/2006	Water well	1,4 m <sup>3</sup> /h	In revalidation process (1706/2013)
01543/2006	19/10/2006	19/10/2011	02973/2006	Conceição river	100,8 m <sup>3</sup> /h	In revalidation process (009155/2011)
02948/2011	07/10/2011	30/06/16	05713/2010	Lowering water Level for Mining	98,08 m <sup>3</sup> /h	In revalidation process (5804/2016)

## **SOCIAL OR COMMUNITY REQUIREMENTS**

### **CCA COMPLEX**

The CCA Complex are located in the cities of Caeté (RG Mine) and Santa Barbara (Pilar Mine), both located in Minas Gerais state. As a result of the ore transport route for the ore from the Pilar Mine, there is also an impact in the city of Barão de Cocais, that is located between the two municipalities.

### **ROÇA GRANDE MINE**

The city of Caeté is located approximately 48 km east of Belo Horizonte and has a territory of 542.571 km<sup>2</sup>. According to the most recent census, the population is estimates as 43,739 residents. Caeté is a historic town of over 300 years of age and its biggest feature is the religious tradition. Its main tourist attraction is the Serra da Piedade, a mountain with a peak of 1,746 meters above sea level. There, a Catholic shrine is present that shelters the Patroness of Minas Gerais and which receives pilgrims throughout the year. In the same locale sits the Astronomical Observatory Frei Rosário, an initiative of the Federal University of Minas Gerais.

Jaguar's Roça Grande Mine is located a slight distance from the urban area and has very little impact of neighbouring communities due to its isolated nature, which greatly facilitates the operation. Up to 2013, the ore coming from Pilar Mine was transported through the streets of Caeté, which caused considerable damage to asphalt and discomfort to the population. Because of this impact, Jaguar donated an asphalt plant to the municipality in compensation for the impact to the city. After a major negotiation with the city of Barão de Cocais, an alternate

route was created that brought significant cost savings regarding the ore transportation and in obtaining the social licence.

Since beginning operations, Jaguar has developed several environmental education programs with local schools, training courses for mining in cooperation with the town council, and supports the Santa Casa de Saúde, the main hospital in the region. Together with the city council, annually in honor of International Women's Day, free mammograms are donated. In addition, the company supports the municipality in various religious events that are part of the city's tradition.

Currently, the city of Caeté lives with a water crisis and Jaguar donated to SAAE (Autonomous Service of Water and Sewage) 3,000 hydrometers to help estimate the losses between the production and distribution of water. The monitoring of the data is performed constantly by the company and sent periodically to regulatory agencies as recorded.

## **PILAR MINE**

Sitting at an altitude of 732 meters, Santa Barbara has a history of mining within Minas Gerais. It is located approximately 98 km east of Belo Horizonte. Santa Barbara has an estimated population of 27,876 inhabitants and 684.060 km<sup>2</sup> of area. Situated at the foot of the impressive Serra do Caraça - Natural Heritage Private Reserve (NHPR), Santa Barbara is considered as one of the most beautiful towns in Minas Gerais. With a history of more than 300 years, the city is known by its religious and entrepreneurial traditions. The entrepreneurial potential of its people is visible and its economy is based on mining of iron and gold, on the production of honey and derivatives. In addition reforestation activities for production of cellulose and charcoal are important.

Jaguar's operations in Santa Barbará have direct interference with three communities: Brumal, Beco do Pau Comeu and André do Mato Dentro.

Brumal is situated in front of the main entrance of the mine site, across the state highway MG 436. Due to the physical proximity with this community, some complaints of detonations and trucks noise are registered. But in daily operation the company makes it possible to minimize these impacts and maintains constant dialogue with the community. Since Jaguar's involvement, various social and cultural projects were supported as well as environmental

education programs in schools in the region. The two main projects supported by Jaguar are: Tecelãs de Brumal - and Cavahada de Brumal, an event held for over 80 years.

The Beco do Pau Comeu is behind the Pilar Mine, where only 8 families live. Due to the low-lying nature of the area it becomes swampy during the rainy season, and floods are constant. Brumal is located in a valley and also faces drainage problems. To help these communities, the company developed the project of readjusting drainage for these areas and will perform works in partnership with the city hall. Because of this initiative, the company was congratulated in the City Council to commit to doing the civil work of public utility.

In André do Mato Dentro, a good relationship with the community is also observed, the main agreement with this community is cession of passage that the community has given to the company. In return, Jaguar performs maintenance on a stretch of access road that connects this community and the cities of Caeté and Santa Barbara. Another project supported by Jaguar in the locality is the traditional "Festa de São Geraldo" that has the participation of Women Cavahada.

Positive socioeconomic impacts are observed in all locations, including Barão de Cocais, through generation of employment and income through local labor hiring by Jaguar and its subcontractors. As a result, family revenue has grown and the development of the local economy has improved. Moreover, taxes collected by these municipalities have increased significantly.

## **MINE CLOSURE REQUIREMENTS**

Two years before the mine is exhausted, the company must present the "Plano de Fechamento de Mina" (Mining Closure Plan, or PAFEM) to SUPRAM for approval, according to the "Deliberação Normativa COPAM nº 127". This regulation also enforces that all mining activities in the state of Minas Gerais must include the rehabilitation plan of degraded areas.

The actions and steps for the environmental recovery of the areas impacted by mining activity were adopted when the LI was granted and will continue until after the mine is exhausted.

The recovery of the surface areas will follow the following stages:

- Removal and stockpiling of the fertile soil layer;

- Waste and backfill paste disposal;
- Rehabilitation of the mined areas;
- Topographical regularization;
- Re-vegetation of the impacted areas, mainly those in connection with ultimate slopes;
- Rehabilitation of drainage ditches, contention sumps, contention dykes, and the like;
- Spontaneous succession and creation of niches in the areas in rehabilitation.

As of December 31, 2015, Jaguar maintained progressive rehabilitation and reclamation provisions of R\$18.2 million for the Roça Grande Mine and the process plant and R\$9,636 for the Pilar Mine which represent the undiscounted, uninflated future payments for the expected rehabilitation costs (Table 20-3).

**TABLE 20-3 PROGRESSIVE REHABILITATION AND CLOSURE COST ESTIMATES**  
**Jaguar Mining Inc. – Caeté Operations**

Description	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total
<b>Roça Grande Mine and CCA Plant, R\$ (000)</b>														
Waste Pile	26	263			259									547
Pit	15				441	81								537
Dam			575	135	434	111								1,255
Infrastructure	13	180		68	4,839									5,100
Plant					215	4,932	357							5,504
G&A				785	588	696	552	576	406					3,603
Contingency			56	99	678	582	91	58	41					1,649
<b>Sub-Total</b>	<b>53</b>	<b>487</b>	<b>633</b>	<b>1,087</b>	<b>7,454</b>	<b>6,402</b>	<b>1,000</b>	<b>634</b>	<b>447</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>18,195</b>
<b>Pilar Mine, R\$ (000)</b>														
Waste Pile		60						296						356
Pit														-
Dam														-
Infrastructure	13							31	1,947					1,991
Plant								122						122
G&A	33	134	54	54	54	104	54	248	1,349	972	1,118	1,120	1,000	6,295
Contingency		19	5	5	5	10	5	70	330	97	112	112	100	872
<b>Sub-Total</b>	<b>46</b>	<b>213</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>115</b>	<b>60</b>	<b>767</b>	<b>3,625</b>	<b>1,069</b>	<b>1,230</b>	<b>1,232</b>	<b>1,099</b>	<b>9,636</b>

\*Note: Numbers may not add due to rounding. No inflation or discount factors applied.

## 21 CAPITAL AND OPERATING COSTS

### CAPITAL COSTS

Sustaining capital estimates for the Caeté Mining Complex were prepared by Jaguar and include primary access development, mine equipment replacement, plant equipment replacement, tailings dam expansion, and mine closure.

**TABLE 21-1 CAPITAL COSTS (US\$'000S)**  
**Jaguar Mining Inc. – Caeté Operations**

Description	2016	2017	2018	2019	2020	2021	2022	2023-2028	Total
Closure	26	196	194	321	2,103	1,824	297	2,828	7,788
Sustaining	9,527	7,232	1,186	961					18,906
<b>Total</b>	<b>9,554</b>	<b>7,428</b>	<b>4,250</b>	<b>1,282</b>	<b>2,103</b>	<b>1,824</b>	<b>297</b>	<b>2,828</b>	<b>26,694</b>

### OPERATING COSTS

Operating cost estimates for the Caeté Mining Complex were prepared by Jaguar and include mining, processing, and general and administration (G&A) expenses. Table 21-2 summarizes unit operating costs.

**TABLE 21-2 UNIT OPERATING COSTS**  
**Jaguar Mining Inc. – Caeté Operations**

Description	Units	2016	2017	2018	2019	Total
Mining	US\$/t milled	65	58	58	58	60
Processing	US\$/t milled	18	17	19	21	19
G&A	US\$/t milled	8	7	9	11	8
<b>Total</b>	<b>US\$/t milled</b>	<b>91</b>	<b>82</b>	<b>86</b>	<b>90</b>	<b>87</b>

RPA reviewed the cost estimates in comparison to recent operating results, and found them to be reasonable.

## 22 ECONOMIC ANALYSIS

This section is not required as the property is currently in production and there is no material expansion of current production. RPA reviewed a LOMP cash flow model that confirms the economic viability of the Mineral Reserves, at a gold price of US\$1,150/oz and an exchange rate of US\$1.00=BRL3.8.

## 23 ADJACENT PROPERTIES

RPA is not aware of any relevant adjacent properties.

## **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

Mineral Reserves at Pilar have increased by 310% year-over-year, due to positive diamond drilling results and updated resource modelling. The LOMP for the Caeté Gold Complex forecasts a mine life of four years, and production of approximately 40,000 ounces per year. The plant has capacity to process more ore, should it become available.

Conclusions by area are discussed in more detail below.

### GEOLOGY AND MINERAL RESOURCES

#### *ROÇA GRANDE MINE*

- The mineralization at the Roça Grade Mine consists of a number of thin, moderately dipping tabular bodies. These tabular bodies are grouped into five Orebodies (RG01, RG02, RG03, RG06 and RG07).
- The main production of the mine has been from the RG01 and RG07 Orebodies, although a small amount of gold was produced by means of open pit mining from the RG03 and RG06 Orebodies. The RG01, RG02, RG03, and RG06 Orebodies are strataform to stratabound mineralized portions of a banded iron formation assemblage which dip moderately to the southeast. The RG07 Orebody is comprised mostly of a quartz vein which is hosted by a banded iron formation.
- A diamond drilling program carried out in 2015 was successful in outlining significant gold grades across mineable widths along the down-plunge continuation of the RG01 Orebody, below the current active mining area. The results from these drill holes have been incorporated into the updated block model. Additional work that will provide further detailed information of the gold distribution in this area is warranted and justified.
- The updated Mineral Resource estimate for the Roça Grande Mine was prepared based on drilling and channel sample data using a data cut-off date of June 30, 2015. The database comprises 649 drill holes and 6,517 channel samples. The estimate was generated from a block model constrained by 3D wireframe models that were constructed using a minimum width of one metre. The purpose of the minimum width criteria was to attempt to identify any areas of high grade mineralization that could be candidates for extraction using highly selective underground mining methods. A minimum width criteria was subsequently applied to the Mineral Resource reporting criteria by using a minimum grade times thickness product of 3 gram-metres. Raw assays were capped to 30 g/t Au for the RG01 and RG06 Orebodies while a capping value of 50 g/t Au was applied for the RG02, RG03 and RG07 Orebodies. The Mineral Resources are reported using the gold grades estimated by the ID<sup>3</sup> method. The wireframe models of the mineralization and excavated material for the Roça Grande Mine were constructed using the excavation information as of December 31, 2015.

- The mineralized material for each Orebody was classified into the Measured, Indicated, or Inferred Mineral Resource categories on the basis of the search ellipse ranges obtained from the variography study, the observed continuity of the mineralization, the drill hole and channel sample density, and previous production experience with these orebodies.
- The Mineral Resource reports were prepared by creating clipping polygons that were used to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, were located completely within the boundaries of Jaguar's mineral rights holdings at the Roça Grande Mine, possessed a grade times thickness product of at least 3 gram-metres, and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off.
- At a cut-off grade of 1.46 g/t Au, the Mineral Resources at the Roça Grande Mine comprise 1.231 million tonnes at an average grade of 2.81 g/t Au containing 111,000 ounces of gold in the Measured and Indicated Resource category and 1.759 million tonnes at an average grade of 3.48 g/t Au containing 197,000 ounces of gold in the Inferred Mineral Resource category.

#### **PILAR MINE**

- The mineralization at the Pilar Mine comprises a number of sub-parallel, quartz-rich mineralized lenses which have an average strike of 015°, and dip steeply to the east with an average dip of 65°. The available drill hole information suggests that the dip of the mineralized zones may begin to flatten to approximately 45° below the 120 m elevation. Three of the mineralized zones (BA, BF, and BF II) have been identified by drill hole and channel sample data to be isoclinally folded, with fold axes that plunge at approximately -40° to the southwest (approximately azimuth 210° to 225°). Many of the remaining mineralized zones (LFW, LPA, LHW, and the C Orebody) are interpreted to be more tabular in overall form. The LPA zone resides in the axial plane of the folded BF zone and thus provides evidence for multiple ages of gold mineralization.
- A diamond drilling program carried out in 2015 was successful in outlining significant gold grades across mineable widths along the down-plunge continuations of the BA, BF, and BF II Orebodies, below the current active mining area. The results from these drill holes have been incorporated into the updated block model. Additional work that will provide further detailed information of the gold distribution in this area is warranted and justified.
- The updated Mineral Resource estimate for the Pilar Mine was prepared based on drilling and channel sample data using a data cut-off date of July 1, 2015. The database comprises 984 drill holes and 16,445 channel samples. The estimate was generated from a block model constrained by 3D wireframe models that were constructed using a minimum width of two metres. Raw assays were capped to 10 g/t Au for the LHW lenses, 20 g/t Au for the LFW, LPA and SW Orebody lenses, 30 g/t Au for the BF II and C Orebody lenses and 60 g/t Au for the BA and BF Orebodies. Gold grades were estimated using the inverse distance cubed (ID<sup>3</sup>) method. The wireframe models of the mineralization and excavated material for the Pilar Mine were constructed using the excavation information as of December 31, 2015.

- The mineralized material for each wireframe was initially classified into the Measured, Indicated, or Inferred Mineral Resource category on the basis of the search ellipse ranges obtained from the spatial continuity study, the demonstrated continuity of the gold mineralization, the density of drill hole and chip sample information, and the presence of underground access. A clean-up script was applied in a final stage of the classification process to ensure continuity and consistency of the classified blocks in the model.
- The Mineral Resources are inclusive of Mineral Reserves. For those portions of the Mineral Resources that comprise the Mineral Reserve, the stope design wireframes were used to constrain the Mineral Resource reports.
- Additional Mineral Resources are present that reside beyond the Mineral Reserves outlines as a result of the lower cut-off grade used for reporting of Mineral Resources. These are located as remnants above Level 7 (the limit of the current development) or as additional mineralized areas peripheral to the Mineral Reserve outlines in areas located below the current development. Three-dimensional resource polygons were prepared to aid in the estimation and reporting of the Mineral Resources to ensure that the requirement for spatial continuity is met. The reporting polygons were prepared in either plan, section or longitudinal views, as appropriate. They were drawn to include continuous volumes of blocks whose estimated grades were above the stated cut-off grade, and were not located in mined out areas. These resource polygons were also used to exclude isolated blocks with limited to no spatial continuity but containing grades above the nominated cut-off. These resource polygons were used to appropriately code the block model and were used to report the Mineral Resources.
- At a cut-off grade of 1.93 g/t Au, the Mineral Resources at the Pilar Mine comprise 3.479 million tonnes at an average grade of 4.59 g/t Au containing 514,000 ounces of gold in the Measured and Indicated Resource category and 1.208 million tonnes at an average grade of 5.45 g/t Au containing 212,000 ounces of gold in the Inferred Mineral Resource category.

## **MINING AND MINERAL RESERVES**

### ***ROÇA GRANDE MINE***

- Due to the hiatus in production at Roça Grande Mine, Mineral Reserves have not been estimated.

### ***PILAR MINE***

- At a cut-off grade of 2.5 g/t Au, the Proven and Probable Mineral Reserves at the Pilar Mine comprise 1.22 million tonnes at an average grade of 4.39 g/t Au containing 172,000 ounces of gold.
- Total dilution included in reserves averages approximately 25%, which is a good match for measured results for 2014 mining. Results for 2015 were available for January to June, and show several months with improved dilution results.
- The LOMP for Pilar Mine forecasts just under four years of production, at rates ranging from 800 tpd to 1,100 tpd. Gold production is forecast to average 40,000 ounces per year.

- RPA reviewed a LOMP cash flow model that confirms the economic viability of the Mineral Reserves, at a gold price of US\$1,150/oz and an exchange rate of US\$1.00=BRL3.8.
- It is RPA's opinion that the Pilar Mineral Reserve estimates were prepared in a professional and diligent manner by qualified professionals and that the estimates comply with CIM (2014).

## **PROCESSING**

- In RPA's opinion, the processing circuit unit operations are reasonable to recover gold and provide for adequate tailings treatment for cyanide destruction. Operations have improved over time, resulting in higher recoveries, however, full capacity has not been tested due to lack of plant feed.

## **ENVIRONMENT AND PERMITTING**

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

## **LIFE OF MINE PLAN**

- The current LOMP leaves significant capacity for processing more material, should it become available, or conversely, to explore cost saving measures at the plant such as weekend shutdowns or campaign milling.
- RPA reviewed capital and operating cost estimates prepared by Jaguar, and found them to be reasonable.

## 26 RECOMMENDATIONS

RPA's recommendations by area are summarized below.

### GEOLOGICAL DATA

- Continue updating the written procedures for the collection of geological and sampling information. The written procedures for entry of this data into the central database and its management should also be updated/prepared.
- Continue with database validation exercises focusing specifically on reducing the error rates for the collar and survey tables in the drill hole database.
- Make a slight modification to the logging procedures whereby detailed information regarding the mineralized intervals will be brought forward from the remarks column and inserted as a major level entry in the drill logs to assist in preparation of future updates to the Mineral Resources.

### ASSAY LABORATORY

- The data collected from programs implemented by the site geologists is entered into the BDI database, which is set up to automatically validate the results, however the database does not have the functionality to easily extract the data and prepare control charts. The database should be amended as a minimum to improve the data extraction functionality so that standard control charts can be prepared.
- The certificate number for each assay batch should be included into the central BDI database.
- The central BDI database should be updated to store drill core recovery, channel sample recovery, and sample tracking (lost sample) information. This will assist in deciding how to address null values in future resource estimates.
- The QA/QC program should be amended to include the channel samples.
- Analysis of the QA/QC results should be carried out on a regular and timely basis to permit correction of any out-of-bounds results.
- Disseminate the QA/QC results to all relevant parties.
- At present the pulverizers are cleaned with compressed air and a polyester fibre brush after each sample. As a minimum, the pulverizers should be cleaned with a wire brush. No special protocols are in place to clean the pulverizers after passing a sample of known high gold grade (e.g., RG7). The pulverizers should be cleaned with silica sand after processing each known high grade sample (e.g., Turmalina quartz veins).

- All gold grades are determined by fire assay (FA)–atomic absorption (AA). The AA unit is currently calibrated to direct-read gold values up to 3.3 g/t. Any samples containing gold values in excess of this are analyzed by diluting the solute. High grade samples should be determined using a gravimetric method.
- The assay laboratory automatically re-assays all samples containing gold grades greater than 30 g/t Au, and the average of the re-assays are reported to the sites. All sample results should be reported to the site, without averaging.
- The threshold of 30 g/t Au is high. Re-assay thresholds of 10 g/t Au to 15 g/t Au are commonly used in other gold operations.

## MINERAL RESOURCES

- Structural mapping information should be integrated with isopach maps of the carbonate iron formation at the Roça Grande Mine and trend analyses of the gold distribution to identify any primary controls on the distribution of the BIF-hosted gold mineralization.
- Preparation of a detailed geological model for the Roça Grande Mine will aid in understanding the controls on the distribution of the gold mineralization.
- Preparation of a detailed geological and fault model for the Pilar Mine is warranted. These models will assist in understanding the detailed relationships between the host rocks and timing of the various episodes of mineralization and faulting. The detailed fault model will assist in estimating the amount of dilution that may be experienced during the excavation phase of the operation.
- Continued collection of detailed density measurements of the mineralization at the Roça Grande and Pilar mines is warranted.
- In-fill drilling on the RG01 Orebody along the down-plunge projection of the encouraging drilling results is warranted.
- In-fill drilling of the mineralization found below Level 7 at the Pilar Mine is warranted. The goal of this drilling program is to increase the confidence in the distribution of the mineralization and to assist in preparation of mine schedules.
- A detailed geological review of the controls on the mineralization contained within the SW Orebody at the Pilar Mine should be carried out to aid in selecting high priority areas for future exploration programs.
- Collection of the excavated volumes for the Pilar Mine should be implemented using a digital cavity monitoring unit.
- Amendment of the cut-off grade strategy used for preparation of the mineralization wireframes is warranted to better reflect the potentially economic in-situ gold grades. As a minimum, mineralization wireframes should be created using the incremental cut-off grade for the Pilar and Roça Grande mines, respectively.

- Amendment of the current reconciliation procedures is warranted. As a minimum, the goal of the reconciliation program should be to develop tools and procedures to measure and monitor the accuracy of the block model as well as the amount of planned and unplanned dilution.
- Use of a partial percentage attribute in the block models for the mined out volumes will aid in improving the reconciliation results.
- A detailed evaluation of those Mineral Resources contained within the area of the current mine workings as possible additional feed sources at both the Pilar and Roça Grande mines is warranted.

### **MINERAL RESERVES**

- Efforts to reduce dilution should continue, and measurements using cavity monitoring systems (CMS) should be used to analyse dilution by mining type. Measured results should be used to choose inputs to the reserve estimation process.

### **LIFE OF MINE PLAN**

- Review alternative feed sources to utilize unused capacity at the process plant.
- Review alternatives for the plant operating schedule.

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## 28 DATE AND SIGNATURE PAGE

This report titled “Technical Report on the Roça Grande and Pilar Mines, Minas Gerais State, Brazil” and dated April 15, 2016 was prepared and signed by the following authors:

**(Signed and Sealed) “Jason J. Cox”**

Dated at Toronto, ON  
April 15, 2016

Jason J. Cox, P.Eng.  
Principal Mining Engineer

**(Signed and Sealed) “Reno Pressacco”**

Dated at Toronto, ON  
April 15, 2016

Reno Pressacco, P.Geo.  
Principal Geologist

## 29 CERTIFICATE OF QUALIFIED PERSON

### JASON J. COX

I, Jason J. Cox, P.Eng., as an author of this report entitled "Technical Report on the Roça Grande and Pilar Mines, Minas Gerais State, Brazil" prepared for Jaguar Mining Inc., and dated April 15, 2016, do hereby certify that:

1. I am a Principal Mining Engineer and Executive Vice President, Mine Engineering, with Roscoe Postle Associates Inc. of Suite 501, 55 University Ave Toronto, ON, M5J 2H7.
2. I am a graduate of the Queen's University, Kingston, Ontario, Canada, in 1996 with a Bachelor of Science degree in Mining Engineering.
3. I am registered as a Professional Engineer in the Province of Ontario (Reg. #90487158). I have worked as a Mining Engineer for a total of 20 years since my graduation. My relevant experience for the purpose of the Technical Report is:
  - Review and report as a consultant on many mining operations and projects around the world for due diligence and regulatory requirements
  - Feasibility Study project work on many mining projects, including South and Central American projects.
  - Operational experience as Planning Engineer and Senior Mine Engineer at three North American mines
  - Contract Co-ordinator for underground construction at an American mine
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 visited the Roça Grande Mine on November 22, 2014 and the Pilar Mine on November 21, 2014.
6. I am responsible for Sections 1, 3, 13, 15 to 24 and share responsibility with my co-author for Sections 2, 25, 26 and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had no prior involvement with the property that is the subject of the Technical Report.
9. I have read NI 43-101, and the Technical Report 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, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 15<sup>th</sup> day of April, 2016

**(Signed and Sealed) “Jason J. Cox”**

Jason J. Cox, P.Eng.

## RENO PRESSACCO

I, Reno Pressacco, M.Sc (A), P.Geol., as an author of this report entitled "Technical Report on the Roça Grande and Pilar Mines, Minas Gerais State, Brazil", prepared for Jaguar Mining Inc. and dated April 15, 2016, do hereby certify that:

1. I am Principal Geologist with Roscoe Postle Associates Inc. of Suite 501, 55 University Ave., Toronto, ON, M5J 2H7.
2. I am a graduate of Cambrian College of Applied Arts and Technology, Sudbury, Ontario, in 1982 with a CET Diploma in Geological Technology, Lake Superior State College, Sault Ste. Marie, Michigan, in 1984, with a B.Sc. degree in Geology and McGill University, Montreal, Québec, in 1986 with a M.Sc.(A) degree in Mineral Exploration.
3. I am registered as a Professional Geologist in the Province of Ontario (Reg. #939). I have worked as a geologist for a total of 28 years since my graduation. My relevant experience for the purpose of the Technical Report is:
  - Review and report as a consultant on numerous exploration and mining projects around the world for due diligence and regulatory requirements, including preparation of Mineral Resource estimates and NI 43-101 Technical Reports.
  - Numerous assignments in North, Central and South America, Finland, Russia, Armenia and China in a variety of deposit types and in a variety of geological environments; commodities including Au, Ag, Cu, Zn, Pb, Ni, Mo, U, PGM and industrial minerals.
  - A senior position with an international consulting firm.
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 visited the Roça Grande Mine on November 22, 2014 and the Pilar Mine on November 21, 2014.
6. I am responsible for Sections 4 to 12 and Section 14 and share responsibility with my co-author for Sections 2, 25, 26 and 27 of the Technical Report.
7. I am independent of the Issuer applying the test set out in Section 1.5 of NI 43-101.
8. I have had no prior involvement with the property that is the subject of the Technical Report.
9. I have read NI 43-101, and the Technical Report 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, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated this 15<sup>th</sup> day of April, 2016

**(Signed and Sealed) “Reno Pressacco”**

Reno Pressacco, M.Sc.(A), P.Geol.