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NI 43-101 Technical Report for the Jacobina Gold Mine, Bahia State, Brazil

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Effective date: June 30, 2023
Signature Date: December 22, 2023

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CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS

This National Instrument 43-101 *Standards of Disclosure for Mineral Projects* (NI 43-101) technical report (the Technical Report) contains or incorporates by reference “forward-looking statements” and “forward-looking information” under applicable Canadian securities legislation within the meaning of the United States Private Securities Litigation Reform Act of 1995. Forward-looking information includes, but is not limited to: cash flow forecasts, projected capital, operating and exploration expenditures, targeted cost reductions, mine life and production rates, grades, infrastructure, capital, operating and sustaining costs, the future price of gold, potential mineralization and metal or mineral recoveries, estimates of mineral resources and mineral reserves and the realization of such mineral resources and mineral reserves, the ability to replace mineral reserves net of depletion, information pertaining to potential improvements to financial and operating performance and mine life at Jacobina (as defined herein) that may result from expansion projects or other initiatives, the timing and expected outcomes of the optimization projects, maintenance and renewal of permits or mineral tenure, estimates of mine closure obligations, leverage ratios and information with respect to the Company’s (as defined herein) strategy, plans or future financial or operating performance. Forward-looking statements are characterized by words such as “plan,” “expect”, “budget”, “target”, “project”, “intend”, “believe”, “anticipate”, “estimate” and other similar words, or statements that certain events or conditions “may” or “will” occur, including the negative connotations of such terms. Forward-looking statements are statements that are not historical facts and are based on the opinions, assumptions and estimates of qualified persons, as defined in NI 43-101, (Qualified Persons) considered reasonable at the date the statements are made, and are inherently subject to a variety of risks and uncertainties and other known and unknown factors that could cause actual events or results to differ materially from those projected in the forward-looking statements. These factors include, but are not limited to: the impact of general domestic and foreign business; economic and political conditions; global liquidity and credit availability on the timing of cash flows and the values of assets and liabilities based on projected future conditions; fluctuating metal and commodity prices (such as gold, silver, diesel fuel, natural gas and electricity); currency exchange rates (such as the Brazilian real and the Canadian dollar versus the United States dollar); changes in interest rates; possible variations in ore grade or recovery rates; the speculative nature of mineral exploration and development; changes in mineral production performance, exploitation and exploration successes; diminishing quantities or grades of reserves; increased costs, delays, suspensions, and technical challenges associated with the construction of capital projects; operating or technical difficulties in connection with mining or development activities, including disruptions in the maintenance or provision of required infrastructure and information technology systems; damage to the Company’s or Jacobina’s reputation due to the actual or perceived occurrence of any number of events, including negative publicity with respect to the handling of environmental matters or dealings with community groups, whether true or not; risk of loss due to acts of war, terrorism, sabotage and civil disturbances; risks associated with infectious diseases, including COVID-19; risks associated with nature and climatic conditions; uncertainty regarding whether Jacobina will meet the Company’s capital allocation objectives; the impact of global liquidity and credit availability on the timing of cash flows and the values of assets and liabilities based on projected future cash flows; the impact of inflation; fluctuations in the currency markets; changes in national and local government legislation, taxation, controls or regulations and/or changes in the administration of laws, policies and practices, expropriation or nationalization of property and political or economic developments in Brazil; failure to comply with environmental and health and safety laws and regulations; timing of receipt of, or failure to comply with, necessary permits and approvals; changes in project parameters as plans continue to be refined; changes in project development, construction, production and commissioning time frames; contests over title to properties or over access to water, power, and other required infrastructure; increased costs and physical risks including extreme weather events and resource shortages related to climate change; availability and increased costs associated with mining inputs and labor; the possibility of project cost overruns or unanticipated costs and expenses, potential impairment charges, higher prices for fuel, steel, power, labour, and other consumables contributing to higher costs; unexpected changes in mine life; final pricing for concentrate sales; unanticipated results of future studies;

seasonality and unanticipated weather changes; costs and timing of the development of new deposits; success of exploration activities; risks related to relying on local advisors and consultants in foreign jurisdictions; unanticipated reclamation expenses; limitations on insurance coverage; timing and possible outcome of pending and outstanding litigation and labour disputes; risks related to enforcing legal rights in foreign jurisdictions, vulnerability of information systems and risks related to global financial conditions. In addition, there are risks and hazards associated with the business of mineral exploration, development, and mining, including environmental hazards, industrial accidents, unusual or unexpected formations, pressures, cave-ins, flooding, failure of plant, equipment, or processes to operate as anticipated (and the risk of inadequate insurance, or inability to obtain insurance, to cover these risks), as well as those risk factors discussed or referred to herein and in the Company's Annual Information Form filed with the securities regulatory authorities in all of the provinces and territories of Canada and available under the Company’s profile at www.sedarplus.ca, and the Company’s Annual Report on Form 40-F filed with the United States Securities and Exchange Commission. Although the Company has attempted to identify important factors that could cause actual actions, events, or results to differ materially from those described in forward-looking statements, there may be other factors that cause actions, events, or results not to be anticipated, estimated or intended. There can be no assurance that forward-looking statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. The Company undertakes no obligation to update forward-looking statements if circumstances or management’s estimates, assumptions, or opinions should change, except as required by applicable law. The reader is cautioned not to place undue reliance on forward-looking statements. The forward-looking information contained herein is presented for the purpose of assisting investors in understanding the Company’s expected financial and operational performance and results as at and for the periods ended on the dates presented in the Company’s plans and objectives and may not be appropriate for other purposes.

Cautionary Note to United States Investors Concerning Estimates of Mineral Reserves and Mineral Resources

This Technical Report has been prepared in accordance with the requirements of the securities laws in effect in Canada, which differ in certain material respects from the disclosure requirements promulgated by the Securities and Exchange Commission (SEC). For example, the terms “Mineral Reserve”, “Proven Mineral Reserve”, “Probable Mineral Reserve”, “Mineral Resource”, “Measured Mineral Resource”, “Indicated Mineral Resource” and “Inferred Mineral Resource” are Canadian mining terms as defined in accordance with NI 43-101 and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves 2014 (the CIM Definition Standards), adopted by the CIM Council, as amended. These definitions differ from the definitions in the disclosure requirements promulgated by the SEC. Accordingly, information contained in this Technical Report may not be comparable to similar information made public by U.S. companies reporting pursuant to SEC disclosure requirements.

List of Abbreviations

Units of measurement used in this report conform to the metric system. All currency in this report is listed in US dollars (US$) unless noted otherwise.

°	degrees
>	greater than
<	less than
%	percent
3D	three-dimensional
a	annum
A	ampere
AAS	atomic absorption spectrometry
Ag	silver
ANM	National Mining Agency
ARD	acid rock drainage
Au	gold
BRL, R$	Brazilian real
°C	degree Celsius
CIP	carbon-in-pulp
cm	centimetre
CRM	certified reference material
CV	coefficient of variation
d	day
DL	detection limit
g	gram
g	gravity of Earth ($1\ g = 9.81\ m/s^2$)
G	giga (billion)
Ga	billion years ago
g/t	grams per tonne
ha	hectare
hp	horsepower
h	hour
HSEC	Health, safety, environment and community
IFRS	international financial reporting standards
ID^3	inverse distance to the power of three
JMC	Jacobina Mineração e Comércio Ltda.
k	kilo (thousand)
kg	kilogram
km	kilometre

kVA	kilovolt-amperes
kW	kilowatt
IFC	International Finance Corporation
L	litre
LOM	life of mine
m	metre
M	Mega, million
m^2	square metre
m^3	cubic metre
masl	metres above sea level
Ma	million years ago
m^3/s	cubic metres per second
ML	metal leaching
µm	micrometre, micron
mm	millimetre
MSO	mineable shape optimizer
MVA	mega volt amp
MW	megawatt
MWh	megawatt-hour
NN	nearest neighbour
NPV	net present value
OK	ordinary kriging
oz	Troy ounce (31.1035 g)
PGA	peak ground acceleration
PFS	pre-feasibility study
PS	performance standards
ppm	parts per million
QA/QC	quality assurance/quality control
RMR	rock mass rating
ROM	run-of-mine
RPD	relative percent difference
s	second
SD	standard deviation
SLOS	sublevel longhole open stoping
SOP	standard operating procedure
t	metric tonne

tpd	metric tonnes per calendar day
tpy	metric tonnes per year
TSF	tailings storage facility
USD, US$	United States dollar
V	volt
W	watt
y	year
YDM	Yamana Desenvolvimento Mineral S.A.

Jacobina Mining Blocks	
JBN	João Belo
JBS	João Belo South
MCZ	Morro do Cuscuz
MVT	Morro do Vento
MVE	Morro do Vento East
SCO	Serra do Córrego
CAS	Canavieiras South
CAC	Canavieiras Central
CAN	Canavieiras North
CAV	Canavieiras Sector

1 Summary

This report documents the Jacobina Mine (Jacobina), an underground gold mine located in the state of Bahia of northeastern Brazil. Pan American Silver Corp. (Pan American) holds a 100% interest in the property through its subsidiary, Jacobina Mineração e Comércio Ltda. (JMC).

With nearly 30 years of experience in the Americas, Pan American is a Canadian-based leader in producing precious metals in the region. The company operates mines that produce silver and gold in Canada, Mexico, Peru, Bolivia, Argentina, Chile, and Brazil. In addition, Pan American owns the Escobal Mine in Guatemala, which is not currently in operation. The company has earned a reputation for excellence in sustainability performance, operational efficiency, and financial prudence.

This document is a technical report that complies with the National Instrument 43-101 – Standards of Disclosure for Mineral Projects (NI 43-101) guidelines. It presents the mineral resource and mineral reserve estimates for Jacobina as of June 30, 2023, describes the current mining operation at the Jacobina gold mine, and summarizes the LOM plan and cost estimates based on a plant throughput of 8,500 tpd.

1.1 Property Description

The Jacobina mine complex is located approximately 340 road-km northwest of the city of Salvador. The Jacobina project area forms a long rectangle measuring 155 km in a north-south direction and 5 to 25 km in an east-west direction. The shape of the claim package reflects the underlying geology as the stratigraphy favourable for hosting gold mineralization trends north-south.

The core mine area measures roughly 8 km in length, extending from João Belo North (JBN) in the south through Morro do Vento (MVT), Morro do Cuscuz (MCZ), Serra do Córrego (SCO), and the Canavieiras Sector (CAV) this includes Canavieiras South (Sul) (CAS), Canavieiras Central (CAC), and Canavieiras North (Norte) (CAN)). All mine sectors are connected by roads and underground development. Mineral rights for the core mine and the extension to the south consist of mining leases while rights to the exploration potential area to the north consists of exploration permits.

Pan American acquired Jacobina when it purchased Yamana Gold Inc. (Yamana) in March 2023, following the sale by Yamana of its Canadian assets to Agnico Eagle Mines Limited (Agnico Eagle). The mineral rights of the Jacobina property consist of approximately 5,954 ha of non-contiguous mining concessions, 58,010 ha of exploration permits, and one 650 ha mining claim; all of these are held by JMC.

JMC does not pay royalties; however, it does pay taxes to the federal mineral sector agency. These taxes, called Compensação Financeira pela Exploração de Recursos Minerais (CFEM), also known as the Brazilian mining royalty, are set at a rate of 1.5%. JMC does not have any obligations in respect to back-in rights, payments, or other agreements or encumbrances.

1.2 Geology and Mineralization

The Serra de Jacobina Mountains have been mined for gold since the late 17th century. Numerous old workings from artisanal miners (garimpeiros) can be seen along a 15-km strike length, following the ridges of the Serra Do Ouro mountain chain. Since mining commenced at Jacobina in 1983, over 33 Mt have been processed at an average grade of 2.19 g/t gold, for a total production of over 2.8 Moz of gold.

The gold mineralization at Jacobina is almost entirely hosted within quartz pebble conglomerates of the Serra do Córrego Formation, the lowermost sequence of the Proterozoic Jacobina Group. The gold-bearing reefs range from less than 1.5 m to 25 m in thickness and can be followed along strike for hundreds of metres, and in some cases for kilometres. Although the gold-bearing conglomerates are quite continuous along their strike and dip extensions, they vary in stratigraphic position and pattern of gold distribution. The differences are likely due to variations in sedimentary source regions, erosion and transportation mechanisms, and the nature of the depositional environments. Not all conglomerates of the Serra do Córrego Formation are gold-bearing.

1.3 Exploration Status

Regional mapping and sampling have been carried out since 2006 with the goal of identifying additional surface occurrences of mineralized conglomerates along the strike length of the Jacobina belt. The favourable gold-bearing stratigraphy at Jacobina has been traced along a strike length of approximately 150 km.

Exploration and drilling activities have expanded the known deposits (Canavieiras, Morro do Vento, João Belo, and Serra do Córrego) and led to the discovery of new mineralized zones such as Maricota and Morro da Viúva.

Two new deposits have been defined since 2019: João Belo South, which is the southern continuation of the João Belo North Mine (with similar reefs and average gold grades), and Morro do Vento East, which is the eastern continuation of the Upper Conglomerate of Morro do Vento Mine (with similar reefs and average gold grades). The mineralization in both new deposits still shows potential for extension along strike and down dip.

Analytical samples include both drill core and channel samples. The drill core samples are generated from exploration and infill drilling programs that are conducted on surface and underground; they are used for target generation and estimation of mineral resources and reserves. The sample preparation, sample security, and analytical procedures at Jacobina are adequate and consistent with industry standards. The verification of the sampling data by Pan American, including the analytical quality control data produced by JMC for samples submitted to various laboratories, suggests that the analytical results delivered by the laboratories are sufficiently reliable for the purpose of mineral resource and mineral reserve estimation.

1.4 Mineral Resource and Mineral Reserve Estimates

Building the mineralized wireframe models that were used to estimate the block grades began with the development of a structural model that reflected the current understanding of the location and offsets of the many post-mineralization faults present in the mining areas. Lithological wireframe models were then prepared to depict the overall location and distribution of quartz-pebble conglomerate reefs and interbedded massive quartzite beds. These lithological models were subsequently used to prepare wireframe models of the mineralized intervals. No minimum thickness was applied to the mineralized wireframes used to generate the grade estimation domains. Resource domains were modeled within the reefs using a combination of lithology and assay criteria. Domains were modelled along the stratigraphic orientation of the conglomerates, prioritizing gold grades above 0.5 g/t gold. Domains could be extended to include gold grades below 0.5 g/t where needed to avoid non-geological discontinuities in the model.

The mineral resources for Jacobina have been estimated in conformity with generally accepted standards set out in CIM Mineral Resource and Mineral Reserves Estimation Best Practices Guidelines (November 2019) and were classified according to CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014) guidelines. Mineral resources are reported exclusive of mineral reserves. Mineral resources are not mineral reserves and have not demonstrated economic viability. Mineral resources are reported at a cut-off grade of 0.84 g/t gold inside conceptual underground mining shapes. The cut-off grade is based on a gold price of US$1,700 per troy ounce and a metallurgical recovery of 96%. A minimum mining width of 1.5 m is used to construct the conceptual mining shapes. An overbreak of 0.5 m is also applied to account for dilution. Mineral resources are reported fully diluted within the conceptual shapes.

The Mineral Resource Statement of Jacobina as of June 30, 2023, exclusive of mineral reserves, is presented in Table 1-1.

Table 1-1: Jacobina Mineral Resource Statement, June 30, 2023

Category	Tonnage (kt)	Gold Grade (g/t Au)	Contained Gold (koz)
Measured	49,099	1.61	2,541
Indicated	45,333	1.48	2,162
Total Measured + Indicated	94,432	1.55	4,704
Inferred	40,128	1.56	2,015

1. *Mineral resources have been estimated by the Jacobina Resources Geology Team under the supervision of Danilo Ribeiro dos Santos, Geology Coordinator, Registered Chartered Professional Member of Australasian Institute of Mining and Metallurgy, MAusIMM CP(Geo) Number 3052712, a fulltime employee of JMC, and Camila Passos, Exploration Coordinator, P.Geo. (APGO#2431), a fulltime employee of Yamana Desenvolvimento Mineral S.A. (YDM). Camila Passos is a qualified person as defined by National Instrument 43-101. The mineral resource estimate conforms to the CIM Definition Standards on Mineral Resources and Reserves (2014).*
2. *Mineral resources are reported exclusive of mineral reserves.*
3. *Mineral resources were evaluated using an ordinary kriging algorithm informed by capped composites and constrained by three-dimensional mineralization wireframes.*
4. *Individual bulk density values are used for each estimation domain according to experimental test results.*
5. *Mineral resources are not mineral reserves and have not demonstrated economic viability.*
6. *Mineral resources are reported at a cut-off grade of 0.84 g/t gold within conceptual mining shapes. The cut-off grade is based on a gold price of US$1,700 per troy ounce and a metallurgical recovery of 96%.*
7. *A minimum mining width of 1.5m is used to construct the conceptual mining shapes. An overbreak of 0.5m is also applied to account for dilution. Mineral resources are reported fully diluted within the conceptual shapes.*
8. *All figures are rounded to reflect the relative accuracy of the estimate. Numbers may not add up due to rounding.*

The methodology used at Jacobina to convert mineral resources to mineral reserves is summarized as follows:

- Verify geometries for the block model and resource domains.
- Confirm accurate block model depletion with current excavated development and stope solids up to the effective reporting date.
- Discard any resources within 30 m of the surface topography (crown pillar).
- Using the MSO (mineable shape optimizer) planning tool in Datamine software, create automated stope shapes using variable break-even cut-off grades by zone. Stopes planned to be mined in the first two years of the LOM are manually re-designed in Maptek Vulcan software,

using stope polygons at a section spacing of 5 to 10 m, and using the continuity of the mineralization and the MSO stope shapes as guides for design.

- Complete both manual and automatic stopes designs using specific stability graphs for each mine. Stope spans are adjusted to sizes assuming 15% additional dilution, which is included in the design.
- Design primary and secondary development shapes and cut secondary development shapes from stope shapes.
- Evaluate all shapes against the block model and report ore tonnes and grade by classification. Exclude stope shapes and associated development below the cut-off grades.
- Exclude all stopes that contain a majority proportion of inferred mineral resources.
- Design capital and auxiliary development such as ramps, ventilation, escape ways, dewatering, materials handling, access, and other infrastructure.
- In addition to the evaluation against the cut-off grade, perform an economic analysis of the designed zones, levels, and individual shapes to ensure that mining them will produce the expected operational cash flow needed for the required development and infrastructure. As a result, isolated zones, levels or shapes with grades higher than the cut-off grade that do not pay for the necessary development are excluded from the mineral reserves.
- Complete a geotechnical analysis of each sector and adjust the design where required.
- List designed stopes as “approved” or “not approved” based on cut-off grade, economic and geotechnical analyzes prior to conversion to mineral reserves. Apply the mining extraction factor.
- Apply the mining recovery factor on “approved” stopes prior to conversion to mineral reserves.
- Convert “approved” stopes and development shapes containing a majority proportion of measured or indicated blocks to proven or probable mineral reserves respectively.

The Mineral Reserve Statement for Jacobina as of June 30, 2023, is presented in Table 1-2.

Table 1-2: Jacobina Mineral Reserve Statement, June 30, 2023

Category	Tonnes (kt)	Gold Grade (g/t Au)	Contained Gold (koz)
Proven	26,990	2.00	1,738
Probable	21,252	2.06	1,405
Total Reserves	48,242	2.03	3,143

1. *Mineral reserves have been estimated by the Jacobina long-term mine planning team and reviewed by Martin Wafforn, Senior Vice President, Technical Services and Process Optimization at Pan American, and a qualified person as defined by National Instrument 43-101. The mineral reserve estimate conforms to the CIM Standards for Mineral Resources and Mineral Reserves (2014).*

2. *Mineral reserves are reported by zone at variable cut-off grades ranging from 1.12 to 1.30 g/t gold. The cut-off grade is based on metal price assumptions of US$1,500/oz for gold, a gold processing recovery assumption of 96%, operating cost assumptions ranging from US$34.68 to 40.19/t processed and sustaining capital cost assumption of US$3.16/t processed. Mine development cost assumptions average US$ 12.40/t and are excluded from the cut-off grade calculation. Development costs are considered during the economic evaluation*

stage before conversion of mineral resources to mineral reserves, considering the specific development requirements of each mining panel.

3. *Mineral reserves are stated at a mill feed reference point and account for minimum mining widths, diluting material, and mining losses.*

4. *All stope shapes contain a majority of measured and indicated mineral resources and may include minority portions of inferred mineral resources and unclassified material.*

5. *Numbers may not add up due to rounding.*

1.5 Mining and Processing Methods

Jacobina utilizes the sublevel long-hole open stoping (SLOS) method without backfill to achieve an average production rate of approximately 8,500 tpd from the ramp-accessed underground mines; these include João Belo, Morro do Vento, Morro do Cuscuz, Serra do Córrego and Canavieiras. Backfill is not required for the SLOS mining method since pillars are left in place to provide ground support and control dilution. However, the practice of depositing development waste in underground voids to reduce waste haulage distances is on the increase.

The major assets and facilities associated with Jacobina are: the mining and processing infrastructure, including office buildings, shops, and equipment; a conventional processing plant which produces gold doré and is equipped with crushers, ball mills, leach tanks and carbon-in-pulp (CIP) tanks; and a TSF with sufficient capacity to store tailings until 2032 at current production rates. Studies are ongoing to conceive of a filtration plant and filtered tailings TSF to handle the tailings that exceed the current TSF capacity.

The Jacobina Mine is connected to the National Electric Grid via a 138 kV transmission line connected to the Jacobina II electric substation in the city of Jacobina.

The Jacobina mineral processing plant uses conventional gold processing methodologies to treat run-of-mine (ROM) material from the underground mines. Comminution comprises three stages of crushing followed by wet grinding. Within the grinding circuit, gravity concentration of gold is performed on a bleed stream of classification cyclone feed. Rejects from the gravity circuit are returned to the grinding circuit and the cyclone overflow is sent to leaching in a conventional cyanide leaching process, and gold extraction from the leach solution is performed by carbon adsorption in the CIP tanks. Gold is stripped in an elution circuit and final gold recovery is performed in an electrowinning circuit. The sludge and solids from electrowinning are dried and smelted in an induction furnace to produce doré bars.

The tailings produced at the Jacobina mill are currently stored in a fully lined tailings storage facility, TSF B2, located 2.5 km north of the mineral processing plant. TSF B2 consists of a cyclone sand dam built following a downstream construction method. TSF B1, located immediately upstream of TSF B2, is a legacy tailings facility that ceased operations in 2012. In response to new Brazilian legislation regarding TSF decharacterization (transitioning from a dam to an earthen structure that is not a dam), the decharacterization design of TSF B1 was initiated in 2023 and is moving forward.

The LOM plan models an integrated operation from various underground mines that currently supply the processing plant with an average throughput of 8,450 tpd. This leads to a mine life of 15.5 years at the target throughput rates and with a subsequent ramp-down period. Assuming a 96% metallurgical recovery, projections from the LOM plan predict an average gold production of 200,000 oz per year for the first 10.5 years, with mining of lower grade mineral reserves deferred until later in the mine life where possible. The LOM plan is supported by mineral reserves only. There is a significant inferred mineral resource that could potentially be converted to measured and indicated mineral resources with the required infill drilling; this has the potential to further extend the LOM plan.

Pan American has initiated mining, mineral processing and tailings management optimization studies to determine the optimum production rate and to evaluate potential expansion of the production capacity at Jacobina. A prelimimary evaluation of alternative mining methods was conducted; these include using paste backfill to improve stability and mining extraction, potentially increasing the conversion of mineral resources to mineral reserves, and providing additional flexibility for tailings management.

1.6 Environmental Studies, Permitting, and Social or Community Impact

Jacobina has the operational licences required for operation according to the national legislation. The approved licences address the authority's requirements for mining extraction and operation activities. Annual environmental assurance technical reports are submitted to the authorities, in compliance with conditions established in the operating licences.

JMC has implemented an integrated management system covering health, safety, environment, and community through internationally accredited systems , including the ISO 14001 Environmental Management System, the ISO 45001 Occupational Health and Safety Management System, TSM – Towards Sustainable Mining, and the International Cyanide Management Code. JMC is also certified on ESG - Environmental, Social, and Governance by the Brazilian Association of Technical Standards ABNT (Associacao Brasileira de Normas Tecnicas).

An environmental monitoring program is in place at Jacobina that includes meteorological conditions, surface water quality, groundwater quality, air quality and emissions, ambient noise, and flora and fauna.

The ore processing system was designed to maximize the recirculation of process water and minimize the requirement for freshwater. The mine water is pumped back to the underground operations. The water collected in the active TSF B2 is recirculated to the process plant. Freshwater required for ore processing is supplied from a reservoir built in the Cuia River. There is no discharge of industrial water to the environment. The site wide water balance mitigates the risk to water supply due to drought as well as the risk of excess water to the operation.

A conceptual mine closure plan was developed in 2018 for the mine components that include a closure cost estimate. The latest version was completed in December 2018. The potential for impacts from ARD/ML to water and the existing sulphate/metals plume collection system may require long-term water management and treatment post-closure. Long-term closure costs could potentially extend for several years beyond closure. The next iteration of the closure plan will consider additional information on the costs for management of water and for monitoring and maintenance of dams during the post-closure period.

At present, JMC's operations at Jacobina are a positive contribution to sustainability and to the community's well-being. JMC has demonstrated a commitment to employee health, safety, and well-being; community programs; and ongoing outreach and data collection to support issues management and mitigation. JMC has established and continues to implement its various policies, procedures, and practices in a manner broadly consistent with relevant IFC Performance Standards.

1.7 Conclusions and Recommendations

Since modern mining commenced in 1983, Jacobina has produced more than 2.8 Moz of gold. Through increases in plant throughput and gold feed grade, annual gold production has risen year-over-year from 74 koz in 2013 to over 195 koz in 2022.

Drilling in previous years has successfully defined the plunge of the higher-grade portions of the mineralized zones and led to the discovery of new mineralized zones, such as João Belo South and Morro do Vento East. There is good potential for discovering new mineralized zones and/or the strike and dip extents of known mineralized horizons in the proximity of the current mine infrastructure, based on the exploration successes and production history at Jacobina.

The favourable host stratigraphy to the gold mineralization at Jacobina has been traced along a strike length of approximately 150 km and many gold occurrences were discovered along this favourable horizon through regional exploration programs. The Jacobina Norte project is one such occurrence, where gold mineralization was discovered along a continuous 15 km-long trend. As of the end of June 30, 2023, 8,796 drill holes were drilled in the project area, for a total of 1,175,524 m. Almost all of this drilling is located within the 11 km-long main mining area, leaving the majority of the 58,000 ha of exploration concessions still yet to be drilled.

Jacobina mineral resources and mineral reserves have been estimated in conformity with generally accepted CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (November 2019) and are reported in accordance with CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014). The total proven and probable mineral reserve at Jacobina as of June 30, 2023, is 48.2 Mt averaging 2.03 g/t gold, for approximately 3.1 Moz of contained gold. In addition, measured and indicated mineral resources total 94.4 Mt grading 1.55 g/t gold (4.7 Moz gold) and inferred mineral resources of 40.1 Mt grading 1.56 g/t gold (2.0 Moz gold).

Jacobina started to improve the plant's performance in 2019, aiming to reach a steady output of 6,500 tpd. This goal was met earlier than expected in the first quarter of 2020. The plant continued to undergo enhancements in 2020, 2021 and 2022, with the addition of new equipment such as high frequency screens, Knelson and Falcon gravimetric concentrators, an additional electrowinning cell, and more. Other support infrastructure upgrades included a new cyanide warehouse and a larger diameter tailings pipeline. These changes, along with a new permit to process up to 10,000 tpd, enabled Jacobina to increase its processing capacity further, surpassing 8,500 tpd in the first half of 2023.

The mineral reserves inventory of Jacobina informs a LOM plan that considers the increases and improvements in the processing capacity. The LOM plan models an integrated operation from various underground mines that supply the processing plant with an average throughput of 8,450 tpd. This leads to a mine life of 15.5 years at the target throughput rates followed by a subsequent ramp-down period. Assuming a 96% metallurgical recovery, projections from the LOM plan projects an average gold production of 200,000 oz per year for the first 10.5 years, with mining of lower-grade mineral reserves deferred until later in the mine life where feasible.

The LOM plan does not include any inferred mineral resources or areas of exploration potential. However, a significant portion of the inferred mineral resource could be upgraded to indicated and measured mineral resources with the necessary infill drilling; this could extend the LOM plan, given that Jacobina has consistently replenished its reserves after depletion since 2017, even with growing production rates.

The mine budget data and operating experience provide the basis for the capital and operating cost estimates, which reflect the known mining methods and production schedule. The capital cost estimates also include appropriate sustaining capital cost estimates. The costs for building and running a filtration plant to handle the tailings that exceeds the current B2 dam capacity over the LOM and to store it in a filtered tailings TSF are also accounted for. These costs are estimated at a conceptual level, pending the completion of feasibility studies. The mineral reserve estimate is supported by the positive project economics of Jacobina until the end of the mine life, under the assumptions stated in this technical report. The LOM average unit operating costs are estimated to be US$59.30/t over the LOM.

Pan American is conducting studies to optimize its operations in mining, mineral processing and tailings management. The studies aim to explore alternative mining methods, mine designs, material handling, mineral processing, and waste and tailings disposal options to find the best production rate and plan for a possible expansion of Jacobina. Using alternative mining methods and paste backfill could help increase the mining extraction, convert more mineral resources to mineral reserves and offer more options for tailings management.

Jacobina has all the operational licences required for operation according to the national legislation. The approved licences address the authority’s requirements for mining extraction and operation activities. JMC is already permitted for throughput of up to 10,000 tpd.

JMC's commitment to sustainability and responsible mining practices is evident through the implementation of an integrated management system. The certification of Jacobina under ISO 14001, ISO 45001, and the International Cyanide Management Code, along with the endorsement from the Brazilian Association of Technical Standards for ESG, underscores the company's pursuit of excellence in Environmental, Social, and Governance aspects, addressing the main risks associated with the mining activities.

Pan American's operations at Jacobina are a positive contribution to the hosting communities. Jacobina has also demonstrated a commitment to employee health, safety, and well-being; community programs; and ongoing outreach and data collection to support issues management and mitigation. JMC and Pan American have established and continue to implement their various policies, procedures, and practices in a manner broadly consistent with relevant IFC Performance Standards.

The results of this technical report are subject to variations in operational conditions including, but not limited to the following:

- Assumptions related to commodity and foreign exchange (in particular, the relative movement of gold and the Brazilian real/US dollar exchange rate)
- Unanticipated inflation of capital or operating costs
- Significant changes in equipment productivities
- Geological continuity of the mineralized structures
- Geotechnical assumptions in underground designs
- Ore dilution or loss
- Throughput and recovery rate assumptions
- Changes in political and regulatory requirements that may affect the operation or future closure plans
- Changes in closure plan costs
- Availability of financing and changes in modelled taxes

Pan American’s business involves many risks and uncertainties, both known and unknown, that affect its ability to operate successfully and accurately estimate mineral reserves and mineral resources. The qualified persons and

Pan American do not expect any significant negative impact from external factors such as environmental, permitting, title, access, legal, taxation, availability of resources, and other similar factors, but these factors may change and are unpredictable in the mining industry and may have a material impact on Pan American's business and performance. Changes in metal and commodity prices and the political, economic, regulatory, judicial and social risks of doing business in foreign jurisdictions are especially challenging and uncertain for Pan American. In addition to external factors and risks, the accuracy of any mineral reserve and mineral resource estimate is, among other things, the function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Drilling, testing, production, metal prices, mining method, or operating factors may change after the date of the estimate and may require revision of the estimate and may differ significantly from what is currently expected. Readers are cautioned against attributing undue certainty to estimates of mineral reserves and mineral resources.

Based on success in extending known mineral resources, Pan American should continue exploration at the mining operations. Due to the quantity of material in the mineral reserve category and its impact on mine life, Pan American's focus is to continue infill drilling programs in support of converting mineral resources to mineral reserves. An additional focus will be to carry out exploration programs in the vicinity of the current mines to search for the strike extensions of known mineralization.

Drilling programs should continue to be carried out to accomplish the following objectives:

- Replace the mined-out mineral reserves by converting inferred mineral resources to indicated and measured mineral resources. The focus of the drilling programs should be on the higher-grade sectors of the known mineralized zones.
- Increase the inferred mineral resources by converting material that has been identified by exploration drilling in close proximity to the current mining infrastructure into the inferred mineral resource category. The focus of this activity will be on those areas which have higher gold grades, with the goal of building a higher-grade inventory of inferred mineral resources.
- Develop a long-term pipeline of brownfields exploration discoveries through testing of exploration targets.
- Evaluate the known gold mineralization at the Jacobina Norte project with the goal of developing a greenfield mineral resource target of over 1 Moz gold.

Jacobina has been able to replace and increase its mineral reserves net of depletion since 2017, despite higher production rates. Meanwhile, engineering studies should continue to find the best and sustainable production rate for Jacobina, considering not only mining and processing capacities, but also a long-term tailings management strategy. This strategy may involve different tailings disposal methods, such as filtered tailings deposition on surface and paste backfill underground. This would extend the life of the current TSF and reduce its environmental footprint. Combining the use of alternative mining methods with paste backfill should also aim to increase mining recovery, which will help convert more mineral resources to mineral reserves and lower the lateral development needs compared to the current mining method. As the engineering studies progress, cost optimization alternatives should be explored, such as evaluating different materials handling strategies.

Pan American should initiate the application of permits for the installation of additional infrastructure as soon as the initial engineering studies are completed. Jacobina already has a permit to produce 10,000 tpd, so it will need to obtain new permits to increase its production capacity beyond that level.

Regarding environmental and social management, it is recommended to:

- Conduct geochemical sampling and characterization of waste rock before developing a new waste rock stockpile.
- Examine the water management plan with a focus on identifying key studies to be conducted, ensuring timely updates to the water balance, and pinpointing opportunities for infrastructure enhancements.
- Maintain a robust water quality monitoring program to verify compliance with applicable environmental standards and evaluate the appropriateness of the water management strategies that are in place.
- Continue to implement the environmental monitoring program, which monitors and manages potential environmental impacts resulting from the mine operations, to inform future permit applications and mine closure plan updates.
- Maintain a noise- and vibrations-monitoring program, consistent with local procedures and regulations.
- Consider establishing an energy and emissions strategy/plan to determine, on a defined frequency, sources of energy consumption and associated greenhouse gas (GHG) emissions, consistent with internal standards.
- The existing sulphate/metals plume originating from the decommissioned TSF B1 may potentially cause ongoing effects on water. This could result in long-term closure costs extending beyond the five-year post-closure treatment period that is currently outlined in the conceptual 2018 mine closure plan. It’s recommended to evaluate necessary studies to understand exactly the behaviour of the underground water and evaluate potential solutions for treating the water.
- Review closure cost estimate as needed. Costs for long-term monitoring and maintenance of dams should also be reviewed.
- Incorporate a strategy for closure of the inactive open pit into the mine closure plan.

2 Introduction

The Jacobina Mine (Jacobina) is an underground gold mine located in the state of Bahia of northeastern Brazil, approximately 340 road-km northwest of the city of Salvador. Pan American Silver Corp. (Pan American) holds a 100% interest in the property through its subsidiary, Jacobina Mineração e Comércio Ltda. (JMC).

Pan American is a Canadian-based leading producer of precious metals in the Americas, operating silver and gold mines in Canada, Mexico, Peru, Bolivia, Argentina, Chile and Brazil. Pan American also owns the Escobal Mine in Guatemala, which is not currently in operation. Pan American has been operating in the Americas for nearly three decades, earning an industry-leading reputation for sustainability performance, operational excellence and prudent financial management.

Pan American acquired Jacobina when it purchased Yamana Gold Inc. (Yamana) in March 2023, following the sale by Yamana of its Canadian assets to Agnico Eagle Mines Limited (Agnico Eagle).

Pan American's other operations include:

- 100% ownership of the El Peñón underground and open-pit gold-silver mine near Antofagasta in northern Chile.
- 100% ownership of the La Colorada silver-lead-zinc underground mine in Zacatecas, Mexico. The property hosts a large polymetallic skarn discovered through brownfield exploration in 2018.
- 100% ownership of the Timmins operation in Ontario, Canada, consisting of two underground gold mines, the Timmins West Mine and the Bell Creek Mine, which both feed the Bell Creek mill.
- 100% ownership of the Shahuindo open-pit gold mine in Cajamarca, Peru.
- 100% ownership of the La Arena open-pit gold mine in La Libertad, Peru.
- 100% ownership of the Huaron underground silver, zinc, copper, and lead mine in Pasco, Peru.
- 100% ownership in the Cerro Moro underground and open-pit gold-silver mine located in Santa Cruz Province, Argentina.
- 100% ownership of the Minera Florida underground gold-silver mine located south of Santiago, Chile.
- 95% ownership of the San Vicente underground silver, zinc, copper, and lead mine in Potosí, Bolivia.
- 100% ownership of the Escobal silver, gold, lead, and zinc underground mine, in Santa Rosa, Guatemala. The operation is currently on care and maintenance pending completion of an ILO 169 consultation.

This technical report was prepared by Pan American in accordance with National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (NI 43-101) to disclose relevant information about Jacobina; it documents the mineral resource and mineral reserve estimates as of June 30, 2023.

This technical report was prepared by Pan American following the guidelines of NI 43-101 and Form 43-101F1. The mineral resource and mineral reserve estimates reported herein were prepared in conformity with generally accepted standards set out in the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Mineral Resource and Mineral Reserves Estimation Best Practices Guidelines (November 2019) and were classified according to CIM Definition Standards for Mineral Resources and Mineral Reserves (CIM Standards (2014)).

2.1 Sources of Information

The qualified persons for this technical report are Martin Wafforn, P.Eng.; Camila Passos, P.Geo.; Americo Delgado, P.Eng.; Carlos Iturralde, P.Eng.; and Matthew Andrews, FAusIMM, all full-time employees of Pan American. Table 2-1 lists the qualified persons, their responsibilities, and personal inspections on the property.

Table 2-1: Qualified persons and personal inspections

Qualified Persons
Martin Wafforn, P.Eng., Senior Vice President, Technical Services and Process Optimization
Responsible for Sections: 15: Mineral Reserve Estimates; 16: Mining Methods; 18: Project Infrastructure (excluding 18.2); 19: Market Studies and Contracts; 21: Capital and Operating Costs; 22: Economic Analysis; 24: Other Relevant Data and Information.
Personal Inspection: Visited the project on four occasions since December 2022 and most recently between October 12 and 14, 2023.
Camila Passos, P.Geo., Exploration Coordinator, Brazil
Responsible for Sections: 4: Property Description and Location; 5: Accessibility, Climate, Local Resources, Infrastructure and Physiography; 6: History; 7: Geological Setting and Mineralization; 8: Deposit Types, 9: Exploration; 10: Drilling; 11: Sample Preparation, Analyzes and Security; 14: Mineral Resource Estimates; 23: Adjacent Properties.
Personal Inspection: Visits the project regularly, most recently between December 4 and 7, 2023.
Americo Delgado, P.Eng., Vice President, Mineral Processing, Tailings, and Dams
Responsible for Sections: 13: Mineral Processing and Metallurgical Testing; 17: Recovery Methods.
Personal Inspection: Visited the project between March 26 and 29, 2023.
Carlos Iturralde, P.Eng., Director, Tailings
Responsible for Sections: 18.2: Tailings Dam Design and Construction; 20.2.2: Tailings Management and Monitoring.
Personal Inspection: Visited the project on numerous occasions since January 2021 and most recently between August 8 and 9, 2023.
Matthew Andrews, FAusIMM, Vice President, Environment
Responsible for Sections: 20: Environmental Studies, Permitting and Social or Community Impact (excluding 20.2.2.
Personal Inspection: Visited the project on three occasions since November 2022 and most recently between October 10 and 12, 2023.
Shared Responsibility by all QPs for Related Disclosure in Sections: 1: Summary; 2: Introduction; 3: Reliance on Other Experts; 12: Data Verification; 25: Interpretation and Conclusions; 26: Recommendations; 27: References.

In preparation of this technical report, the qualified persons reviewed technical documents and reports on Jacobina supplied by on-site personnel. The documentation reviewed, and other sources of information, are listed at the end of this technical report in Section 27- References.

The most recent technical report on Jacobina was compiled by Yamana, titled “NI 43-101 Technical Report Jacobina Gold Mine Bahia State, Brazil”, with an effective date of December 31, 2019 and a signature date of May 29, 2020 (Soares et al., 2020)(the 2020 Yamana Report). This 2020 Yamana Report served as the foundation for this current technical report which updates the information as of an effective date of June 30, 2023.

3 Reliance on Other Experts

The qualified persons have relied on information derived from Pan American's internal records for information regarding legal matters related to land title and tenure information, and taxes (including royalties and other government levies or interests) applicable to revenue or income from the Jacobina Mines, as described in Sections 4, 16, 19, 21, and 22.

The qualified persons have also relied on an internet-based system maintained by the Brazilian government department responsible for mining lands, Agência Nacional de Mineração (ANM), for accessing information on exploration concessions granted in Brazil. The qualified persons have not performed an independent verification of the land title and tenure information, as summarized in Section 4 of this technical report, nor have they verified the legality of any underlying agreement(s) that may exist concerning the permits or other agreement(s) between third parties, as summarized in Section 4 of this technical report.

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

4 Property Description and Location

4.1 Location

The Jacobina mine complex, as shown in Figure 4-1, is located in the state of Bahia in northeastern Brazil (11°15′ S and 40°31′ W), approximately 340 km by road northwest of the city of Salvador. Salvador is the state capital of Bahia and has a population of approximately 2.9 million inhabitants.

The Jacobina project area forms a long non-contiguous rectangle measuring 155 km in a north-south direction and 5 to 25 km in an east-west direction. The shape of the claim package reflects the underlying geology as the stratigraphy favourable for hosting gold mineralization trends north-south.

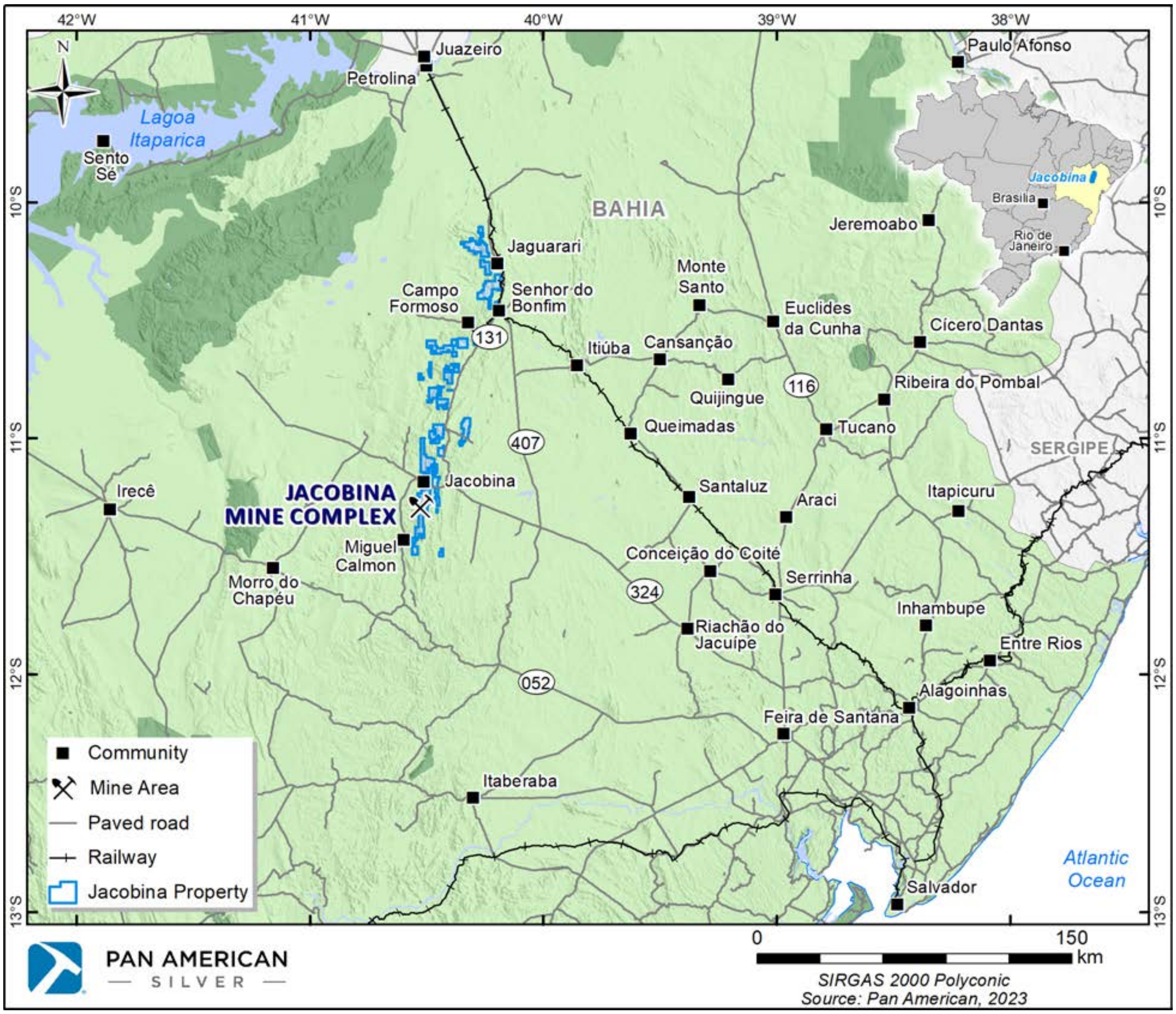


Figure 4-1: General location map

4.2 Property Description

The Jacobina property covers the core mine area as well as the on-strike exploration potential in the remainder of the Jacobina basin. The core mine area measures roughly 8 km in length, extending from João Belo North (JBN) in the south through Morro do Vento (MVT), Morro do Cuscuz (MCZ), Serra do Córrego (SCO), and the Canavieiras Sector (CAV) in the north (this includes Canavieiras South (Sul) (CAS), Canavieiras Central (CAC), and Canavieiras North (Norte) (CAN)). All mine sectors are connected by roads and underground development. Mineral rights for the core mine and the extension to the south consist of mining leases while rights to the exploration potential area to the north consists of exploration permits.

4.3 Land Tenure

4.3.1 Surface Rights

JMC has the rights of ownership of the lands that allow the title holder to occupy and sell the land. JMC holds all the surface rights required for the development of its activities. There are no restrictions to surface rights in any of the areas encompassed by the project.

In March 2021, JMC unified its property titles into 3 large registries, totalling 1,211 hectares (surface rights) (Table 4-1), in Itapicuru, District of Jacobina, Bahia State, encompassing the entire project area.

Table 4-1: Jacobina – rights of ownership

Name	Owner	Location	Municipality / State	Area (ha)	Registration Number	Registration Date	Registration Place
Fazenda Itapicuru I	Jacobina Mineração e Comércio Ltda.	Fazenda Itapicuru, s/n, Centro	Jacobina, Bahia	526	10,477	23-Feb-21	2° Ofício Jacobina
Fazenda Itapicuru II	Jacobina Mineração e Comércio Ltda.	Fazenda Itapicuru, s/n, Centro	Jacobina, Bahia	478	10,478	23-Feb-21	2° Ofício Jacobina
Fazenda Córrego da Barra e Laginha	Jacobina Mineração e Comércio Ltda.	Fazenda Itapicuru, s/n, Centro	Jacobina, Bahia	207	10,476	23-Feb-21	2° Ofício Jacobina
Total				**1,211**			

4.3.2 Mineral Rights

The mineral rights of the Jacobina property consist of approximately 5,954 ha of non contiguous mining concessions, 58,010 ha of exploration permits, and one 650 ha mining claim; all of these are held by JMC (Figure 4-2). The leases and granted exploration concessions have been surveyed and are marked by permanent concrete monuments at each corner. A complete list of the mining and exploration concessions with their current status as of June 2023 is included in Appendix A. Exploration concessions are renewable on a three-year basis and have annual fees ranging from US$1.00/ha to US$1.55/ha.

Most of mining concessions numbered 815.712/72, 815.714/72, and 815.715/72 are located within the boundary of Parque Sete Passagens (Seven Passages State Park) or in the park's buffer zone. While mining is not permitted within Seven Passages State Park, JMC has valid mining concessions issued by the National Mining Agency, Agência Nacional de Mineração (ANM) and is currently negotiating for access into Seven Passages State Park with state government and park officials.

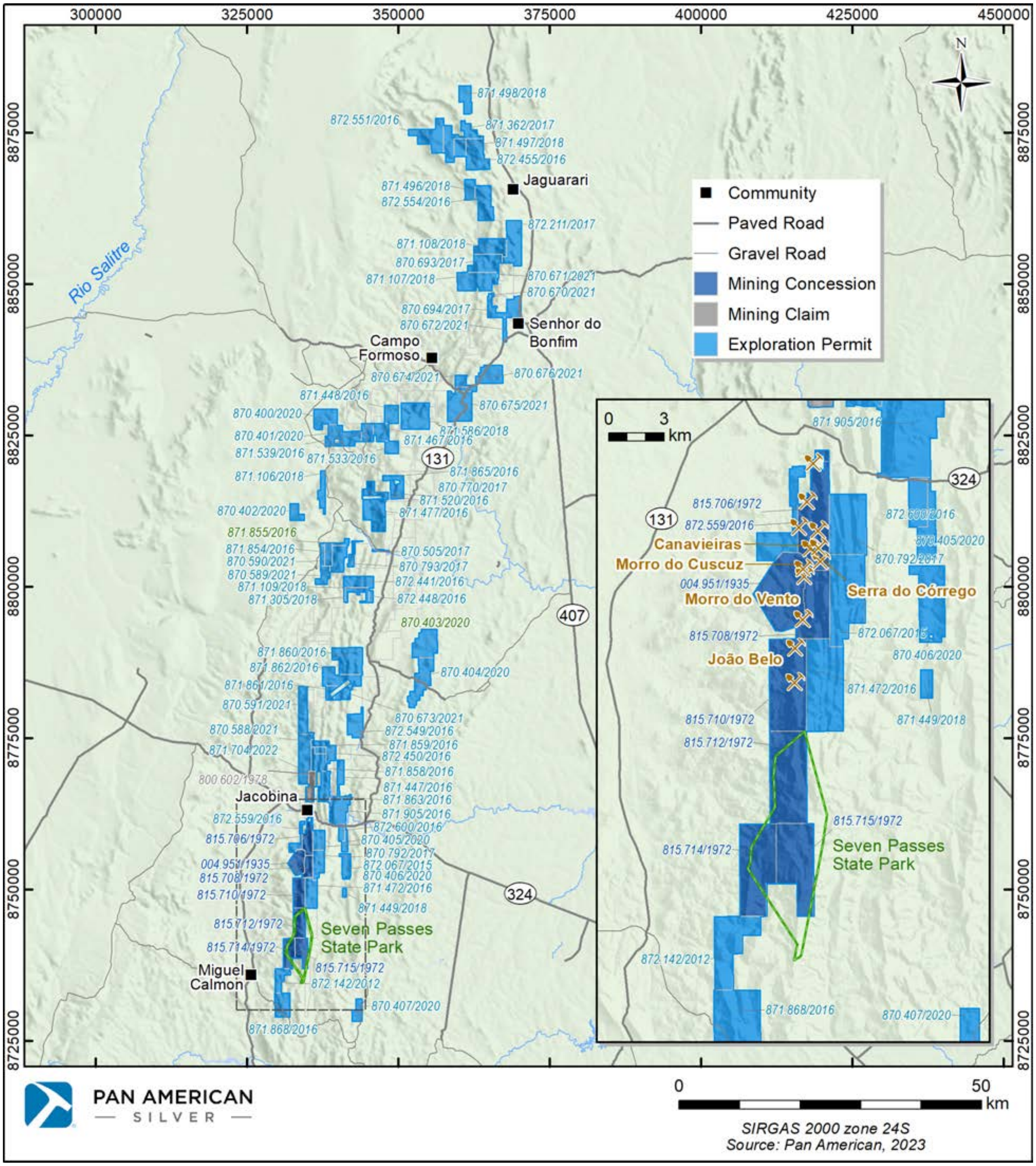


Figure 4-2: Mining and exploration concessions

JMC does not pay royalties, however, it does pay taxes to the federal mineral sector agency. These taxes, called Compensação Financeira pela Exploração de Recursos Minerais (CFEM) and also known as the Brazilian mining royalty, are set at a rate of 1.5%. JMC does not have any obligations in respect to back-in rights, payments, or other agreements or encumbrances.

JMC has all required permits to continue carrying out the proposed mining operations on the Jacobina property. Further details of these permits can be found in Section 20 of this report.

Table 4-2: Mineral titles: mining concessions, mining claims, and exploration permits

Mining Concessions						
Process Number	Area (ha)	Application Date	ANM Licence Number	Final Report Submission	Granting Mining Concession	Status
004.951/35	889	25/06/1935	—	—	—	Mining Concession
815.706/72	821	28/07/1972	374	11/01/1978	02/09/2008	Mining Concession
815.708/72	533	28/07/1972	2279	13/03/1982	15/02/1985	Mining Concession
815.710/72	1,000	28/07/1972	1208	03/02/1978	23/06/1981	Mining Concession
815.712/72	1,000	28/07/1972	1210	11/01/1978	19/10/1981	Mining Concession
815.714/72	904	28/07/1972	1300	10/03/1982	07/02/1985	Mining Concession
815.715/72	808	28/07/1972	73002478	03/02/1978	21/05/1981	Mining Concession
Total	**5,954**					
Mining Claim						
Process Number	**Area (ha)**	**Application Date**	**ANM Licence Number**	**Final Report Submission**	**Granting Mining Concession**	**Status**
800.602/78	650	13/02/1978	1236	27/12/1989	Under review by ANM	Mining Claim*
Total	**650**					
Exploration Permits						
Process Number	**Area (ha)**	**Application Date**	**ANM Licence Number**	**Expiry Date**	**Status**	
872.067/15	821	23/09/2015	16555	22/03/2023	Renewal report under review by ANM	
871.448/18	25	18/09/2018	2008	10/10/2023	Extension request submitted to ANM	
871.449/18	100	18/09/2018	4894	07/01/2024	Exploration Permit	
870.400/20	1,094	02/06/2020	4118	31/07/2024	Exploration Permit	
870.401/20	1,519	02/06/2020	4119	31/07/2024	Exploration Permit	
870.402/20	482	02/06/2020	4120	31/07/2024	Exploration Permit	
870.403/20	1,676	02/06/2020	4121	31/07/2024	Exploration Permit	
870.404/20	1,765	02/06/2020	4122	31/07/2024	Exploration Permit	
870.405/20	280	02/06/2020	4123	31/07/2024	Exploration Permit	
870.406/20	587	02/06/2020	4124	31/07/2024	Exploration Permit	
870.407/20	485	02/06/2020	4125	31/07/2024	Exploration Permit	
870.588/21	1,688	24/05/2021	5007	01/08/2024	Exploration Permit	
870.589/21	500	24/05/2021	5008	01/08/2024	Exploration Permit	
870.590/21	475	24/05/2021	5009	01/08/2024	Exploration Permit	
870.591/21	1,202	24/05/2021	5010	01/08/2024	Exploration Permit	
870.670/21	46	02/06/2021	6570	01/08/2024	Exploration Permit	
870.671/21	15	02/06/2021	6571	01/08/2024	Exploration Permit	
870.672/21	247	02/06/2021	6572	01/08/2024	Exploration Permit	
870.673/21	456	02/06/2021	6573	01/08/2024	Exploration Permit	
870.674/21	367	02/06/2021	6574	01/08/2024	Exploration Permit	
870.675/21	1,957	02/06/2021	6575	01/08/2024	Exploration Permit	
870.676/21	1,495	02/06/2021	6576	01/08/2024	Exploration Permit	
870.693/17	1,447	17/03/2017	6248	29/09/2024	Exploration Permit	
870.694/17	1,261	17/03/2017	6249	29/09/2024	Exploration Permit	
871.447/16	528	12/07/2016	11196	29/09/2024	Exploration Permit	
871.448/16	682	12/07/2016	11197	29/09/2024	Exploration Permit	
871.467/16	686	12/07/2016	10970	29/09/2024	Exploration Permit	
871.472/16	968	12/07/2016	10971	29/09/2024	Exploration Permit	
871.477/16	1,695	12/07/2016	11417	29/09/2024	Exploration Permit	

871.520/16	553	14/07/2016	11420	29/09/2024	Exploration Permit
871.533/16	443	14/07/2016	10978	29/09/2024	Exploration Permit
871.539/16	579	14/07/2016	60	29/09/2024	Exploration Permit
871.855/16	211	11/08/2016	2099	29/09/2024	Exploration Permit
871.858/16	779	11/08/2016	2101	29/09/2024	Exploration Permit
871.859/16	713	11/08/2016	2102	29/09/2024	Exploration Permit
871.860/16	1,948	11/08/2016	2103	29/09/2024	Exploration Permit
871.861/16	267	11/08/2016	2104	29/09/2024	Exploration Permit
871.862/16	1,365	11/08/2016	2105	29/09/2024	Exploration Permit
871.863/16	831	11/08/2016	2106	29/09/2024	Exploration Permit
871.865/16	875	11/08/2016	2276	29/09/2024	Exploration Permit
871.868/16	1,000	11/08/2016	2277	29/09/2024	Exploration Permit
871.905/16	1,420	12/08/2016	2582	29/09/2024	Exploration Permit
872.441/16	951	07/11/2016	1572	29/09/2024	Exploration Permit
872.450/16	219	07/11/2016	1576	29/09/2024	Exploration Permit
872.549/16	1,009	10/11/2016	1593	29/09/2024	Exploration Permit
872.551/16	1,721	10/11/2016	1594	29/09/2024	Exploration Permit
872.554/16	1,421	10/11/2016	1595	29/09/2024	Exploration Permit
872.559/16	451	10/11/2016	1596	29/09/2024	Exploration Permit
872.455/16	1,614	07/11/2016	1577	30/09/2024	Exploration Permit
872.600/16	263	21/11/2016	1597	30/09/2024	Exploration Permit
872.142/12	597	10/10/2012	9258	23/03/2025	Exploration Permit
871.362/17	1,618	29/06/2017	9408	05/04/2025	Exploration Permit
871.854/16	1,208	11/08/2016	2098	14/04/2025	Exploration Permit
870.505/17	73	21/02/2017	9345	19/08/2025	Exploration Permit
870.770/17	20	28/03/2017	9347	19/08/2025	Exploration Permit
870.792/17	654	30/03/2017	9349	19/08/2025	Exploration Permit
870.793/17	322	30/03/2017	9350	19/08/2025	Exploration Permit
872.211/17	1,875	20/12/2017	3140	20/12/2025	Exploration Permit
871.704/22	29	14/10/2022	756	30/01/2026	Exploration Permit
871.106/18	598	30/07/2018	274	14/06/2026	Exploration Permit
871.107/18	1,864	30/07/2018	275	14/06/2026	Exploration Permit
871.108/18	1,337	30/07/2018	276	14/06/2026	Exploration Permit
871.109/18	517	30/07/2018	277	14/06/2026	Exploration Permit
872.448/16	123	07/11/2016	238	14/06/2026	Exploration Permit
871.305/18	42	04/09/2018	1397	14/08/2023	Extension request submitted to ANM
871.586/18	1,989	09/10/2018	2031	06/09/2023	Extension request submitted to ANM
871.497/18	578	25/09/2018	2020	06/09/2023	Extension request submitted to ANM
871.496/18	582	25/09/2018	2019	06/09/2023	Extension request submitted to ANM
871.498/18	804	25/09/2018	2021	06/09/2023	Extension request submitted to ANM
Total	**58,010**				

** Application for Mining Concession submitted on May 12, 2006 is still under review by ANM due to proximity to city of Jacobina and environmental considerations.*

4.4 Environmental Considerations

The primary environmental considerations and potential liabilities for the Jacobina Mine are related to the operations of the tailings storage facility (TSF) and the management of seepage water and mine water. JMC prioritizes the management of tailings and is aligned with best practices proposed by the Mining Association of Canada (MAC), Toward Sustainable Management (TSM) Protocol, and the Canadian Dam Association (CDA) guidelines.

Tailings produced at the mill are currently managed in TSF B2, located approximately 2.5 km north of the main processing plant. TSF B2 is fully lined; this lining limits the flow of tailings or process water into the environment.

Rainfall that is not diverted by the perimeter diversion channels, in addition to some of the water that seeps from the old tailings facility (TSF B1) is collected and pumped into the TSF B2 impoundment. Similarly, acid rock drainage (ARD) and run-off water in contact with the waste rock piles are monitored and collected for proper containment and/or treatment.

As stated in the Environmental Permit, the TSF area will be allowed to dry and consolidate once operations have ceased; this will allow for the installation of a geomorphic low-permeability closure cover and subsequent rehabilitation activities similar to reclamation activities being completed in TSF B1.

Additional details on tailings infrastructure and management at Jacobina are provided in Sections 18 and 20 of this technical report.

4.5 Significant Factors and Risks

Pan American is exposed to many risks in conducting its business, both known and unknown, and there are numerous uncertainties inherent in estimating mineral reserves and mineral resources and in maintaining viable operations. Although the qualified persons and Pan American have no current expectation that the mineral reserve and mineral resource estimates in this technical report will be materially negatively impacted by external factors such as environmental, permitting, title, access, legal, taxation, availability of resources, and other similar factors, changes in relation to such factors are not uncommon in the mining industry and there can be no assurance that these factors will not have a material impact. Changes in metal and commodity prices and the political, economic, regulatory, judicial and social risks related to conducting business in foreign jurisdictions pose particular risk and uncertainty to Pan American and could result in material impacts to Pan American's business and performance. In addition to external factors and risks, the accuracy of any mineral reserve and mineral resource estimate is, among other things, the function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Results from drilling, testing, and production, as well as a material change in metal prices, changes in the planned mining method, or various operating factors that occur subsequent to the date of the estimate may justify revision of such estimates and may differ, perhaps materially, from those currently anticipated, and readers are cautioned against attributing undue certainty to estimates of mineral reserves and mineral resources.

5 Accessibility, Climate, Local Resources, Infrastructure, and Physiography

5.1 Accessibility

The Jacobina Mine is located 10 km from the town of Jacobina, which is accessible by paved secondary highway (Routes 130 and 324) from Salvador, the state capital of Bahia, located 340 km to the south-southeast (Figure 4-1) of the mine complex. Paved roads from the town of Jacobina provide access to the project.

5.2 Climate

The town of Jacobina is located in a region of subtropical semi-arid climate. Summer months are much rainier than the winter months. Precipitation at Jacobina is somewhat higher than the regional average, likely due to the influence of the mountain range which hosts the deposits. Average annual precipitation is 840 mm, with May to October experiencing relatively less precipitation than the rest of the year. Temperatures vary little throughout the year. July is the coldest month with average daytime highs of 26°C and nightly lows of 17°C. February is the warmest month with average daily highs of 32°C and nightly lows of 20°C. Mining operations can be carried out on a year-round basis.

5.3 Local Resources

The town of Jacobina was founded in 1722 and is a regional agricultural centre with an official population of 82,590 as reported in 2022 by the Instituto Brasileiro de Geografia e Estatística (IBGE). It provides all the accommodation, shopping, and social amenities necessary for the mine's labour force. Electrical services are supplied to the mine by Companhia de Eletricidade do Estado da Bahia (COELBA). Telephone and high-speed internet service are available via the town of Jacobina. A combination of water wells, storm water catchment basins, and mine dewatering features satisfies the project's water requirements.

5.4 Infrastructure

JMC holds sufficient surface rights for mining operations. Currently, the major assets and facilities associated with Jacobina are as follows:

- Mine and mill infrastructure including office buildings, shops, and equipment.
- A conventional flotation mill, with leach and carbon-in-pulp (CIP) tanks, which produces gold doré. Several optimizations are being implemented at the processing plant to stabilize throughput at 8,500 tpd targeting a metallurgical recovery of at least 96%. Implementation of the optimizations is expected to be completed in 2024.
- TSF.

5.5 Physiography

The town of Jacobina is located at an approximate elevation of 500 m with topography varying from flat terrain to low rolling hills. The immediate area surrounding the Jacobina Mine consists of steep-sided ridges rising to 1,200 m that are underlain by the resistive quartzites, metaconglomerates, and schists in the Serra de Jacobina mountain range (Figure 5-1).

The project is located in the upper reaches of the Itapicuru watershed, more precisely in the Upper Itapicuru region. The Itapicuru-Mirim River, an important tributary of the Itapicuru River, represents the main drainage in the mine site area. Groundwater recharge occurs by direct rainfall infiltration. In the Serra de Jacobina, which is underlain by quartzite and conglomerate, rainwater infiltration occurs through fractures, whereas in the recessive topography of the crystalline basement, the recharge occurs mainly through infiltration of porous strata. The recharge is estimated to be higher in the mountains.

5.6 Vegetation

The area of Jacobina and its surroundings host several ecosystems, including seasonal semi-deciduous forest, the Caatinga (shrublands) in the lower portions of the terrain and Cerrado (dry savannah) vegetation in the upper elevations. The town of Jacobina is located in a region of transition between several vegetation types: (1) the Atlantic Forest and the Caatinga and (2) between the Caatinga and the Cerrado.

The main phyto-physiognomy in the drainage region of the Itapicuruzinho watershed is represented by the seasonal semi-deciduous forest, one of the most important phyto-physiognomies of the Atlantic Forest biome. Due to local soil variations and land use over time, the development of secondary forests is observed riparian forests to the slopes and flat areas, where they occur in transition with the Caatinga and Cerrado. In some instances, vegetation of the Caatinga has even been observed along the riverbanks.

The alluvial seasonal forest, commonly referred to as a riparian forest or gallery forest, is observed along the most enclosed and narrow watercourses. Within the project and the surrounding area, alluvial seasonal forests are observed along the Cuia, Itapicuruzinho, and Canavieiras rivers and their tributaries. Due to its location, this phyto-physiognomy corresponds to the Permanent Preservation Areas. Within the alluvial seasonal forests, the occurrence of dominant arboreal stratum and canopy formation is observed, in addition to the presence of species of ferns and epiphytes (bromeliads and orchids). There is still, however, a strong presence of ecotones, transition zones between areas with distinct abiotic conditions, with undifferentiated communities, where the floras interpenetrate. Shrub-tree Caatinga in particular is observed around the tailing dams, in the Legal Reserve area, on the banks of the Santo Antônio stream at its intersection with the Itapicuruzinho River around the EMBASA dam, and around the Cuia dam.

5.7 Avian Fauna

In the Jacobina area, a total of 100 taxa were documented in the alluvial seasonal forests, belonging to 33 families and 16 orders. The composition of the avifauna found is characterized by approximately 50% of general habitat species, those that use open areas of both the Caatinga and forests. The most representative families are Tyranidae, Thraupidae, Thamnophilidae and Trochilidae. Finally, approximately 60% of the documented species need forest areas and the majority of these (70%) presented low sensitivity to anthropogenic disturbances, as most Caatinga birds present low and medium sensitivity.

Source: Pan American, 2023

Figure 5-1: Infrastructure and typical landscape

A: Serra de Jacobina and mineral processing plant
B: João Belo mine entrance
C: Mineral processing plant

6 History

The Serra de Jacobina hill range has been mined for gold since the late 17th century. Numerous old workings from artisanal miners (garimpeiros) can be seen along a 15 km strike length, following the ridges of the Serra Do Ouro mountain chain (Golder Associates, 2008). Companhia Minas do Jacobina operated the Gomes Costa Mine in the Morro do Vento area between 1889 and 1896, with total reported production of 84 kg of gold from a 130 m long drift. The Canavieiras, João Belo, and Serra Branca mines opened in the 1950s. The Canavieiras Mine was the largest of these operations, and at a capacity of 30 tpd, produced 115,653 t with an average recovered grade of 18.13 g/t gold during the 1950s and 1960s.

6.1 Prior Ownership

The modern history of the Jacobina mining camp began in the early 1970s with extensive geological studies and exploration carried out by Anglo American Corporation (Anglo American). A feasibility study recommended that a mine be developed at Itapicuru (Morro do Vento area) with an initial plant capacity of 20,000 t per month. Mine development commenced in October 1980 and the processing plant was commissioned in November 1982. In 1983, the first full year of operation, production was 241,703 t with a recovered grade of 5.73 g/t gold, yielding 38,054 oz of gold.

Exploration between 1984 and 1987 at the João Belo North hill outlined sufficient mineral reserves to warrant an open pit operation, the development of which commenced in August 1989. Concurrently, the processing plant capacity was increased to 75,000 t of ore per month. In 1990, 538,000 t grading 1.44 g/t gold were produced, mainly from the open pit. Total production at Jacobina in 1990 was 45,482 oz of gold from 680,114 t processed, for a recovered grade of 2.08 g/t gold. Underground development at João Belo commenced in 1990.

William Multi-Tech Inc. operated the João Belo and Itapicuru mines from August 1996 until December 1998, when the mines were closed due to depressed gold prices and the strong Brazilian currency. From 1983 to 1998, the project processed 7.96 Mt of ore at a recovered grade of 2.62 g/t gold, to produce approximately 670,000 oz of gold. The bulk of historical production came from the Itapicuru (Morro do Vento Intermediate and Morro do Vento Extension) and João Belo areas.

In September 2003, Desert Sun completed the required exploration expenditures to earn a 51% interest in the project and then exercised its option to acquire the remaining 49% interest in the project, comprising the mineral rights, mines, and a 4,000 tpd plant located on the Jacobina property. Desert Sun had initiated exploration in the project area in the fall of 2002 and this program was substantially expanded in September 2003. The original property holdings, which extended approximately 62 km along strike, were expanded considerably so that the current property covers a strike length of 155 km.

Reactivation of the João Belo Mine started in April 2004 and ore extraction began in July 2004. The cost of the capital project, including development of the João Belo mine, refurbishment of the mill facilities, and the purchase of all machinery, equipment, and vehicles, was approximately US$37 M. Desert Sun poured the first gold bar at the João Belo Mine in March 2005 and declared commercial production effective July 1, 2005.

Desert Sun reactivated the Morro do Vento Mine in August 2005, starting with the 720 Level portal and increasing the profile dimensions of the access adit. In November 2005, Desert Sun reported in the third quarter ending September 30, 2005, that total ore mined was 340,913 t and ore processed was 300,505 t at an average grade of 2.03 g/t gold. Gold production was 18,683 oz at an average cash cost of US$292/oz. The average recovery rate at the mill was 95.4%.

Yamana acquired Jacobina when it completed the purchase of Desert Sun on April 5, 2006. In 2008, Yamana completed a plant expansion to increase throughput to over 6,000 tpd. Following further development work in 2009, Jacobina reached production throughput levels of 6,000 tpd earlier than originally planned date of 2010. This production rate continued into 2013 with four mines in production. Due to depressed gold prices, and more complex geology, production was decreased between 2013 and 2015 to 4,000 tpd.

A 30,000 m drilling program in 2015 focused on the Canavieiras mines and continued into 2016 testing for down dip and fault offsets of known mineralized reefs in the Morro do Cuscuz system, down dip extensions of mineralization at João Belo, and extensions to mineralization in producing reefs at Canavieiras South. An underground access ramp connecting the Morro do Cuscuz to the Canavieiras South mines was constructed. Following geotechnical and ground stability studies, the mining method was optimized in 2017 to stagger vertical pillars allowing increased mining recovery. The aggressive investment by Yamana in delineation drilling and underground development, as well as mining optimizations, allowed for production growth between 2016 and 2017, reaching 5,400 tpd in 2017.

In 2019, Yamana internalized mine development to reduce operating costs. In 2020, the plant throughput was increased to 6,500 tpd and a pre-feasibility study on further plant expansions was completed (Ausenco, 2020). A stepwise approach was taken to increase mining, mineral processing, and tailings disposal capacity: plant throughput first increased to 7,500 tpd and then to the current 8,500 tpd. These optimizations implemented between 2018 and 2022, in parallel with aggressive drilling and development, has allowed Jacobina to reach record production rates of over 8,200 tpd and a record annual production of over 195 koz of gold in 2022. Pan American acquired Jacobina when it purchased Yamana on March 31, 2023, following the sale by Yamana of its Canadian assets to Agnico Eagle.

6.2 Historical Mineral Resource and Mineral Reserve Estimates

Although a number of historical mineral resource estimates and mineral reserve estimates have been prepared for Jacobina throughout its life, none of these estimates are currently regarded as significant.

6.3 Past Production

Total production for Jacobina since mining commenced in 1983 is shown in Table 6-1.

Table 6-1: Summary of gold production at the Jacobina mine, 1983 to 2023

Year	Tonnes Processed (t)	Gold Feed Grade (g/t Au)	Metallurgical Recovery (% Au)	Gold Produced (oz Au)
1983	241,703	5.73	85.5 %	38,054
1984	301,946	5.18	92.5 %	46,529
1985	282,878	4.56	92.5 %	38,345
1986	311,174	3.60	92.5 %	33,312
1987	247,838	5.10	96.0 %	38,991
1988	244,628	5.33	96.0 %	40,238
1989	257,247	3.02	96.0 %	23,979
1990	681,955	2.01	96.0 %	42,202
1991	775,839	2.70	90.3 %	60,847
1992	594,181	2.57	89.9 %	44,184
1993	518,889	2.32	93.2 %	36,039
1994	551,141	2.54	90.0 %	40,582
1995	579,913	2.57	95.6 %	45,813
1996	591,107	2.36	94.6 %	42,390
1997	865,681	2.13	92.2 %	54,778
1998	741,089	1.91	93.0 %	42,386
1999-2004	—	—	—	—
2005	906,759	1.90	96.0 %	53,170
2006	1,418,508	1.86	96.0 %	81,272
2007	1,040,174	1.70	95.0 %	54,068
2008	1,388,087	1.83	89.9 %	73,241
2009	1,996,989	1.88	91.8 %	110,514
2010	2,158,096	1.89	93.3 %	122,152
2011	2,148,275	1.89	93.1 %	121,675
2012	2,104,683	1.84	93.7 %	116,862
2013	1,575,628	1.57	92.5 %	73,695
2014	1,419,031	1.78	92.9 %	75,650
2015	1,469,095	2.17	94.4 %	96,715
2016	1,802,855	2.17	95.7 %	120,478
2017	1,978,409	2.22	96.4 %	135,806
2018	2,035,457	2.30	96.2 %	144,695
2019	2,254,793	2.28	96.7 %	159,499
2020	2,425,886	2.37	96.4 %	177,830
2021	2,657,590	2.26	96.4 %	186,206
2022	3,025,361	2.10	95.5 %	195,427
2023*	1,554,655	2.05	94.4 %	96,658
Total	**43,147,539**	**2.19**	**94.3 %**	**2,864,281**

**2023 results up to June 30, 2023*

7 Geological Setting and Mineralization

The gold mineralization at Jacobina is almost entirely hosted within quartz pebble conglomerates of the Serra do Córrego Formation, the lowermost sequence of the Proterozoic Jacobina Group. This formation is typically 500-m thick but locally achieves thicknesses of up to 1 km.

The gold-bearing conglomerate units, known as reefs, range from less than 1.5 m to 25 m in width and can be followed along strike for hundreds of metres, and in some cases for kilometres. Some contacts between the reefs and crosscutting mafic and ultramafic intrusive rocks are enriched in gold. Although the gold-bearing conglomerates are quite continuous along their strike and dip extensions, they vary in stratigraphic position and pattern of gold distribution. The differences are likely due to variations in the sedimentary source regions, in the erosion and transportation mechanisms, and in the nature of the depositional environments. Not all conglomerates of the Serra do Córrego Formation are gold-bearing.

7.1 Regional Geology

The Precambrian terranes of the northeastern part of the São Francisco Craton in the state of Bahia show evidence of prolonged terrane accretion history (Almeida, 1977). The three major Archean crustal units, the Gavião, Serrinha, and Jequié blocks, underwent several episodes of tectonism and metamorphism that culminated in a continent-continent collision during the Paleoproterozoic, when the consolidation of the craton took place along a main orogenic belt named the Itabuna-Salvador-Curaçá mobile belt, as shown in Figure 7-1. All rocks described in this technical report are metamorphic but as the protoliths are typically evident they are described in the following text by their protolith name. While metamorphic grade may vary considerably in the district, the rocks at the Jacobina Mine are characterized by the development of white mica, andalusite, and locally, kyanite.

A prominent zone of crustal weakness within this portion of the craton is the Contendas–Mirante–Jacobina lineament, a 500-km long and approximately north-trending suture zone located close to the eastern margin of the Gavião block (Figure 7-1). A reactivation of the Contendas–Mirante–Jacobina lineament during the Paleoproterozoic, prior to and during the continent-continent collision, gave rise to a continental margin rift-type basin where the siliciclastic sedimentary rocks of the Jacobina Group were deposited.

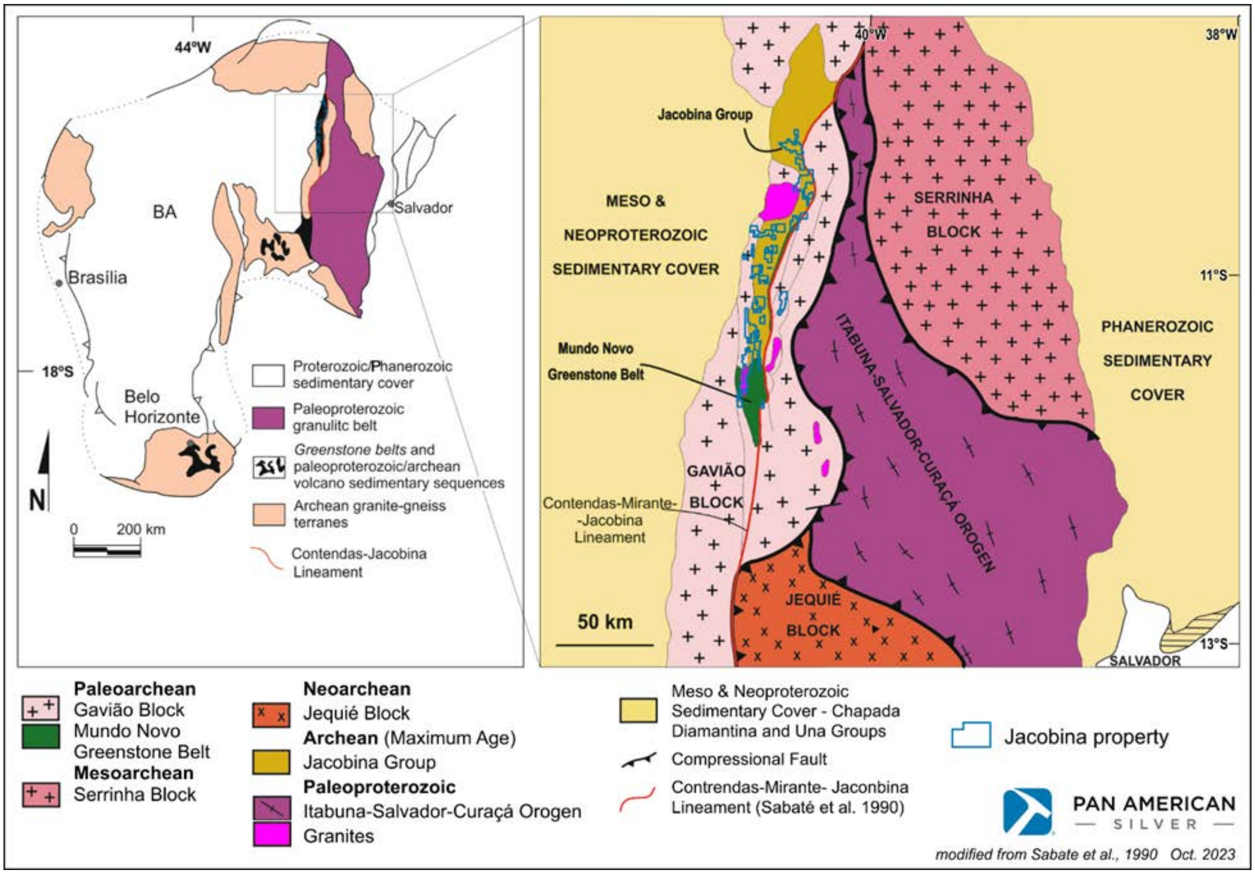


Figure 7-1: Tectonic assemblage map

7.2 Local and Property Geology

The Jacobina gold district coincides with most of the Jacobina Range, where quartzite, conglomerate, and schist units of the Paleoproterozoic Jacobina Group form a series of north-south-trending mountain ranges that rise up to 1,200 masl (Figure 7-2). The longitudinal north-south valleys as well as the east-west oriented valleys often correspond to recessive ultramafic sills and dykes. The Mairi Complex consists of a group of Archean-aged tonalitic, trondhjemitic, and granodioritic gneiss-dominated basement and related remnants supracrustal rocks of the Gavião Block; it underlies the flatter terrain east of the Jacobina range. East of the Mairi Complex, the fine-grained biotite gneisses of the Archean Saúde Complex also underlie a flat landscape. The transition between the hilly and the flatter topography of the eastern domains corresponds to the exposures of the Archean Mundo Novo Greenstone Belt.

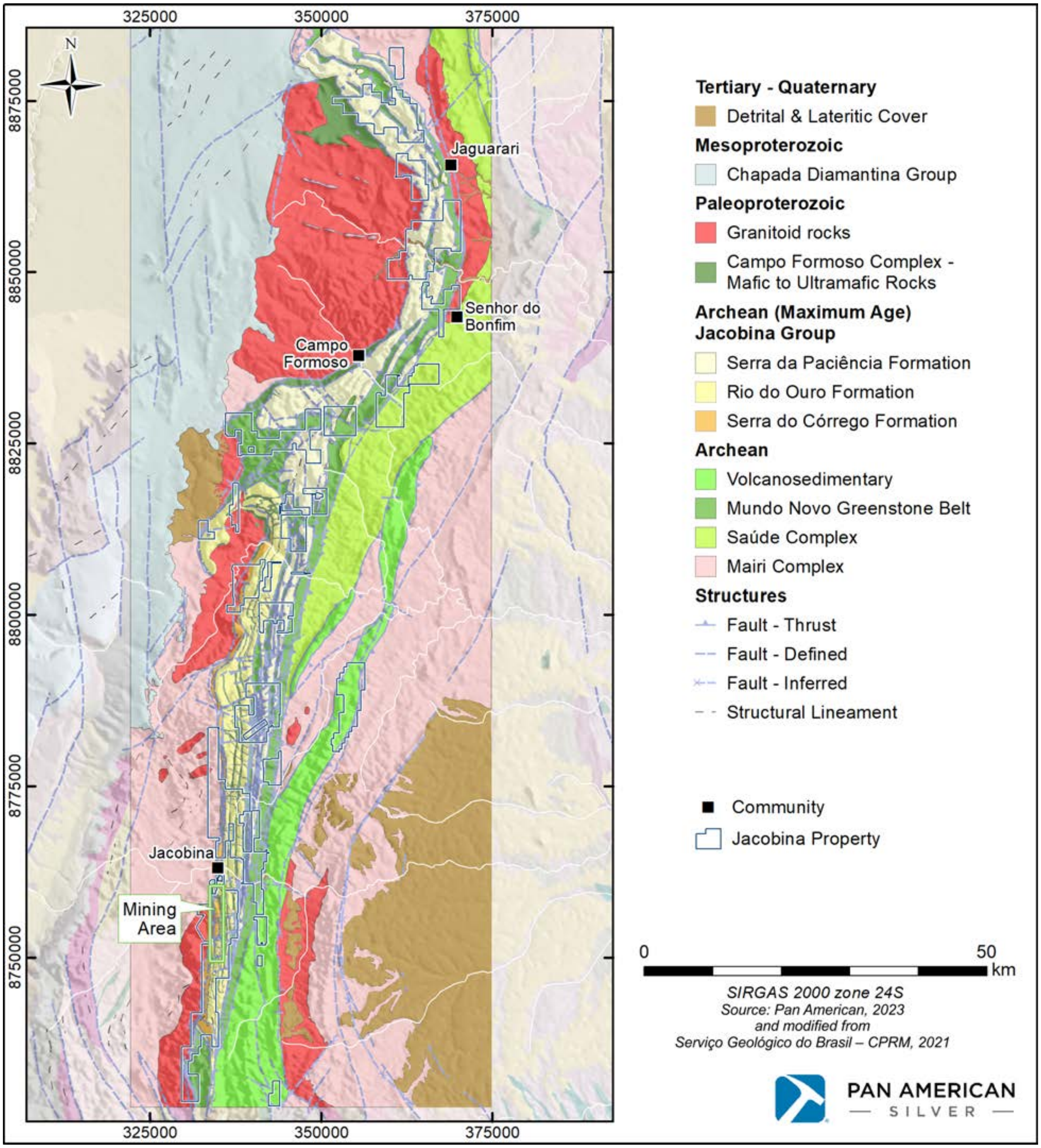


Figure 7-2: Geology of project area

7.2.1 Jacobina Group

The stratigraphic subdivisions of the Jacobina Group (Griffon, 1967; Mascarenhas et al., 1998) have long been controversial. While the stratigraphy in the project area is well documented, it is challenging to develop a usable nomenclature to define the upper formations of the Jacobina Group, specifically the Cruz das Almas, Serra do Meio, and the Serra da Paciência Formations. Pearson et al. (2005) considers that the Jacobina Group only comprises the lower Serra do Córrego and the upper Rio do Ouro formations, according to sedimentary and stratigraphic studies carried out by Oram (1975), Minter (1975), Strydom and Minter (1976), Couto et al. (1978), and Molinari et al. (1986). The stratigraphic nomenclature developed by these writers has been successfully employed within the project area for over 25 years and its usage has been maintained by Pan American.

Serra do Córrego Formation

The Serra do Córrego Formation forms the western ridge of the Serra da Jacobina mountain range and is exposed for a strike length of about 90 km. It consists of an interbedded series of orthoquartzite and oligomictic conglomerate units that collectively range in total thickness from 500 to 1,000 m. The conglomerate pebbles are composed of polycrystalline quartz with rare, fine-grained, fuchsite- and rutile-bearing quartzite. The conglomerate matrix is composed of quartz, sericite, and fuchsite with detrital zircon, non-chromiferous rutile, tourmaline, and chromite grains (Ledru et al., 1964).

The geological map (Figure 7-3) of the Jacobina area shows the distribution of the Serra do Córrego Formation. Figure 7-4 shows the stratigraphy of the Serra do Córrego Formation and the stratigraphic correlations between the various mine centres at Jacobina. Within the project area, the Serra do Córrego Formation is divided into three units:

- The Lower Conglomerate (40–200-m thick) outcrops along the lower parts of the western slopes of the Serra do Córrego, Morro do Cuscuz, and Morro do Vento areas and is composed of interbedded quartzite, pebbly quartzite, and conglomerate units. The reef zones consist of oligomictic conglomerates that are interbedded with orthoquartzite. Pebble sizes range from 35 to 60 mm. This unit hosts the gold deposits of the Basal Reef and the Main Reef.

- The Intermediate Quartzite (130–425-m thick) consists primarily of orthoquartzite with little or no conglomerate. The upper part of this unit is characterized by a distinct horizon known as the “marker schist,” a highly sheared quartz-sericite-chlorite-andalusite schist.

- The Upper Conglomerate (120–400-m thick) comprises quartzite and pebbly quartzite interbedded with a number of conglomerate layers. The reef zones consist of interbedded conglomerate and orthoquartzite units with pebble sizes ranging from 50 mm at Canavieiras in the north to 100 mm at the João Belo Mine in the south. The Upper Conglomerate Unit hosts the main gold mineralization of the Canavieiras, Morro do Vento, João Belo and Serra do Córrego mining zones.

Oram (1975), Minter (1975), and Strydom and Minter (1976) concluded, based on isopachs and pebble size data, that the paleoslope during the sedimentation of the Serra do Córrego Formation was inclined to the west. The westerly paleocurrent direction, indicated by the vector data, drained a provenance area to the east of the present outcrop area, and deposited these sediments in a fluvial environment.

Rio do Ouro Formation

The Rio do Ouro Formation is composed of mostly pure, fine-grained to medium-grained quartzite which can be either white, gray, or light green in colour. The formation contains subordinate quantities of calcareous pelitic rocks which are intercalated with the various quartzite beds.

The presence of this formation is interpreted to mark the change from the fluvial sedimentary environment of the Serra do Córrego Formation to a shallow marine, intertidal depositional environment. This change in depositional environment is suggested by a change in the paleocurrent patterns as indicated by ripple marks, small-scale cross-bedding, and larger-scale herringbone cross-bedded features. The transition from the Serra do Córrego Formation to the Rio do Ouro Formation is marked by the presence of conglomerate units with limited lateral continuity. These locally developed conglomerate beds are present at the base of the Rio do Ouro Formation.

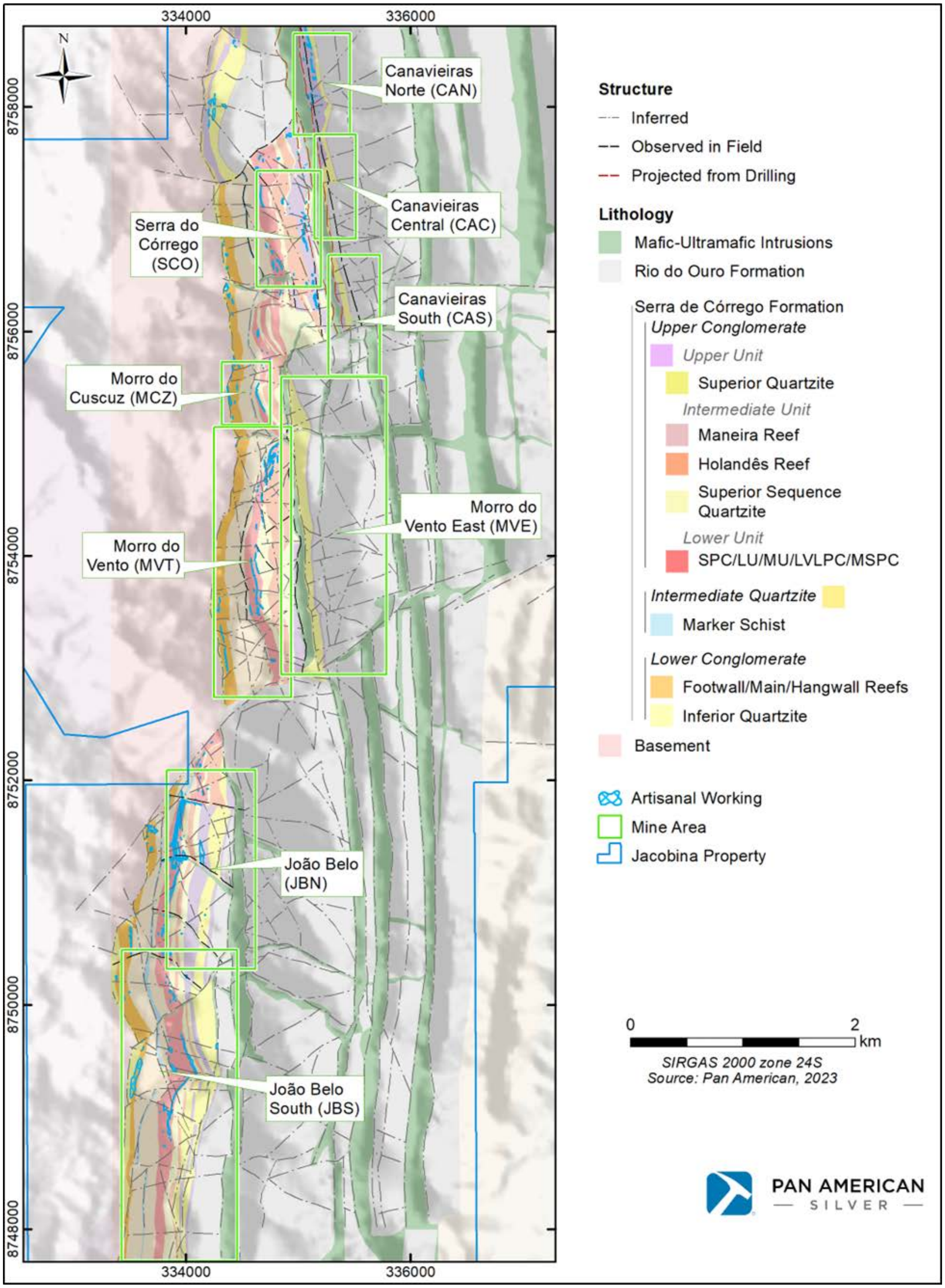


Figure 7-3: Geology of the Jacobina Mine Area

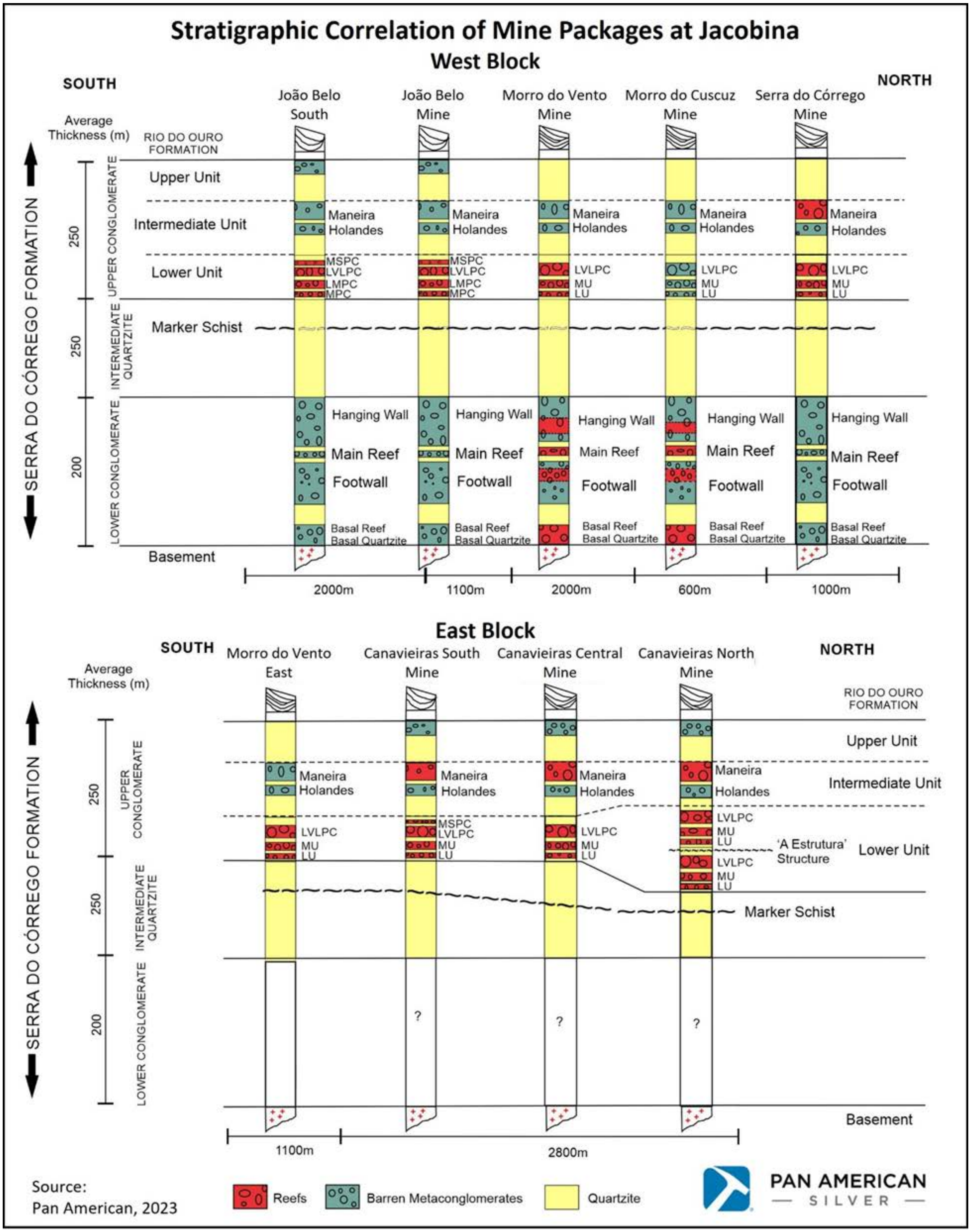


Figure 7-4: Stratigraphic correlation between mining blocks

7.2.2 Ultramafic Sills and Dykes

The deep longitudinal valleys bordering the mountains which form the Jacobina range often correspond to weathered pre- to syn-tectonic mafic to ultramafic sills and dykes. These intrusive rocks include dark green peridotite and pyroxenite, which acquire a brownish stain where weathered (Teixeira et al., 2001). According to these authors, deformation and metamorphism, coupled with hydrothermal alteration, have transformed these rocks into fine-grained schists containing talc, serpentine, chlorite, tremolite, and carbonate. In the project area, the ultramafic rocks, which were emplaced along both north-trending and east-trending structures, affected and reacted with the host rocks (quartzite and conglomerates of the Serra do Córrego and Rio do Ouro formations) producing metre-scale alteration zones in the hosts. The ultramafic rocks display textural variation from aphanitic borders to a medium to coarse-grained core, typical intrusive textures.

These intrusive rocks are known to locally host minor gold mineralization within the project area, and at several other places like Rio Coxo, Jaqueira, Mina Velha, and Várzea Comprida. The age of these sills and dykes is still unknown, but since they are deformed, they are interpreted to be of Archean or Paleoproterozoic age.

7.3 Structural Geology

Different styles of deformation are recognized within the Jacobina Group and surrounding Archean rocks, along and across the northern portion of the 50-km long north-trending Contendas–Mirante–Jacobina lineament. Thrust faults, oblique sinistral-reverse faults, and regional tight and open folds were developed in response to the strong westward-verging mass transport event caused by the Paleoproterozoic continent/continent collision.

To the west, the Jacobina Group is thrust over the Archean Mairi Complex, the Campo Formoso Mafic–Ultramafic Complex, and the late- to post-tectonic granitic intrusions (Miguel Calmon-Itapicuru, Mirangaba-Carnaíba and Campo Formoso intrusions), along a thrust fault named the Jacobina Fault. This structural setting changes eastwards to a series of steeply east-dipping blocks, bounded by east-dipping subparallel reverse faults.

As a result of the regional compression associated with the development of the Itabuna- Salvador-Curaçá fold belt, a series of ductile shear zones and brittle faults have developed in the area. The main elements of these include a series of north-trending strike-slip faults with a sinistral sense of movement, east-trending strike-slip faults with a dextral sense of movement, and northwest-trending shear zones with a sinistral sense of movement. These post-mineralization structures displaced and offset the various gold-bearing zones (Figure 7-5).

The Serra do Córrego Formation is exposed on the west side of the Jacobina Range where it forms part of an extensive homocline that dips consistently 50° to 70° to the east and youngs to the east, as indicated by ripple marks and cross-bedding. This orientation is interpreted to be the result of tilting during the intrusion of the late- to post-tectonic Mirangaba-Carnaíba granite.

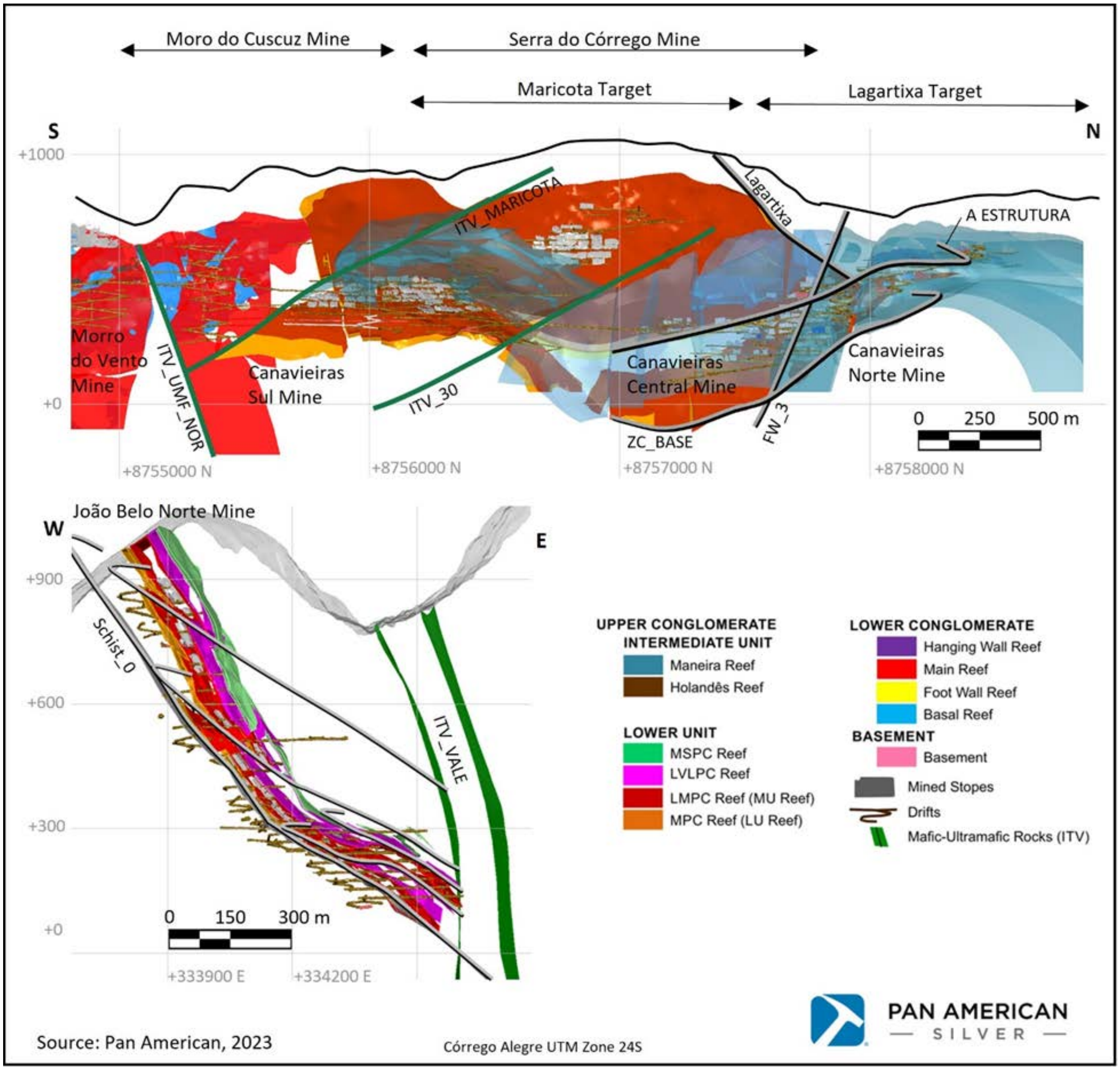


Figure 7-5: Examples of post-mineralization faults and shear zone

7.4 Mineralization

The Jacobina gold district is defined by a 40 km long belt that extends from Campo Limpo, in the south, to Santa Cruz do Coqueiro, in the north. The vast majority of significant gold mineralization occurs within the matrix of the conglomerates; these include the Canavieiras, Morro do Vento, João Belo, Serra Branca deposits as well as other minor occurrences.

At Jacobina, the age of deposition of the host sedimentary sequence was broadly bracketed between 3.2 Ga and 2.3 Ga; however, the conglomerates yielded more restricted detrital zircon U-Pb ages of 3.4 to 3.2 Ga. (Teles at al., 2014), providing a maximum age. The deposit was overprinted by deformation and hydrothermal alteration associated with a younger orogenic event (at 1.9 Ga (Ledru et al. 1997)) that generated pervasive silicification, the development of chrome-sericite (fuchsite), and some gold remobilization along fractures and faults.

The gold found at Jacobina occurs as two styles of mineralization (Texeira et al, 2001):

- Conglomerate-hosted placer gold mineralization (the most important mineralization type in the Jacobina district)
- Post-depositional gold-bearing stockwork, shear zones, and associated extensional quartz veins. These styles of mineralization are relatively minor and do not contribute to the established resources at Jacobina.

The characteristics of these two styles of mineralization are described in the following subsections.

7.4.1 Conglomerate-Hosted Placer Gold Mineralization

Conglomerate-hosted deposits contain very fine grains of native gold, typically 20 to 50 µm in size, hosted in the matrix of the conglomerate. Gold may also be associated with rounded pyritic aggregates believed to be of sedimentary origin. There are no other significant elements present, with detailed studies of the reef chemistry showing only very minor enrichment in iron, titanium and uranium in some reefs associated with rounded grans of uraninite, ilmenite and rutile. Mineralization is typically hosted by well sorted, clast-supported conglomerate and may comprise micro-fractured, gold-bearing, recrystallized, silicified, and pyritic conglomerate units of the Serra do Córrego Formation, with a greenish fuchsite matrix and common hematite coatings along shear planes, joints, and fracture surfaces. Gold mineralization does not display a correlation with the pyrite or fuchsite content of the rock, although well-mineralized reefs are typically enriched in hematite and may contain red-coloured, oxidized pebbles.

A north-trending and steeply dipping ultramafic dyke (Vale_ITV on Figure 7-5) subdivides the area into West and East blocks. All mineralized reefs that are exposed at surface along the west flank of the Serra do Córrego Formation (Figure 7-3) to the west of this dyke are considered on the West Block, whereas their down-dip extensions that are located east of the dyke, such as all of the Canavieiras zones, are considered on the East Block.

Gold mineralization rarely occurs in the pebbles themselves; however, when it does, it is along fractures. The interbedded quartzite units also host gold mineralization but almost exclusively along fractures, especially near late mafic dykes.

Historically, the most important past producers have been the Basal and Main reefs of the Lower Conglomerate Unit and the lower part of the Upper Conglomerate Unit. It is important to note, however, that only certain reefs within particular lithological units are gold-bearing. Other nearby subparallel reefs with similar sedimentary features may not be gold-bearing.

In addition, there is considerable local lateral variation in grade within particular reefs. For example, the Main and Basal reefs are well mineralized in the Morro do Vento Sector but are essentially barren to sub-economic in the João Belo and Canavieiras sectors. Despite this local grade variation, the overall average grade, based on production records, is remarkably consistent both along strike and down dip within specific ore shoots.

Figure 7-6 shows a generalized cross-section of the Canavieiras Central area. In the mine area, stratigraphy dips consistently eastward at 50° to 70°, with some local flatter zones. Cross-bedding and ripple marks indicate that the sequence youngs upwards (i.e., stratigraphic tops are towards the east). Table 7-1 summarizes the principal characteristics of the main gold-mineralized reefs at Jacobina and lists the abbreviations for each reef.

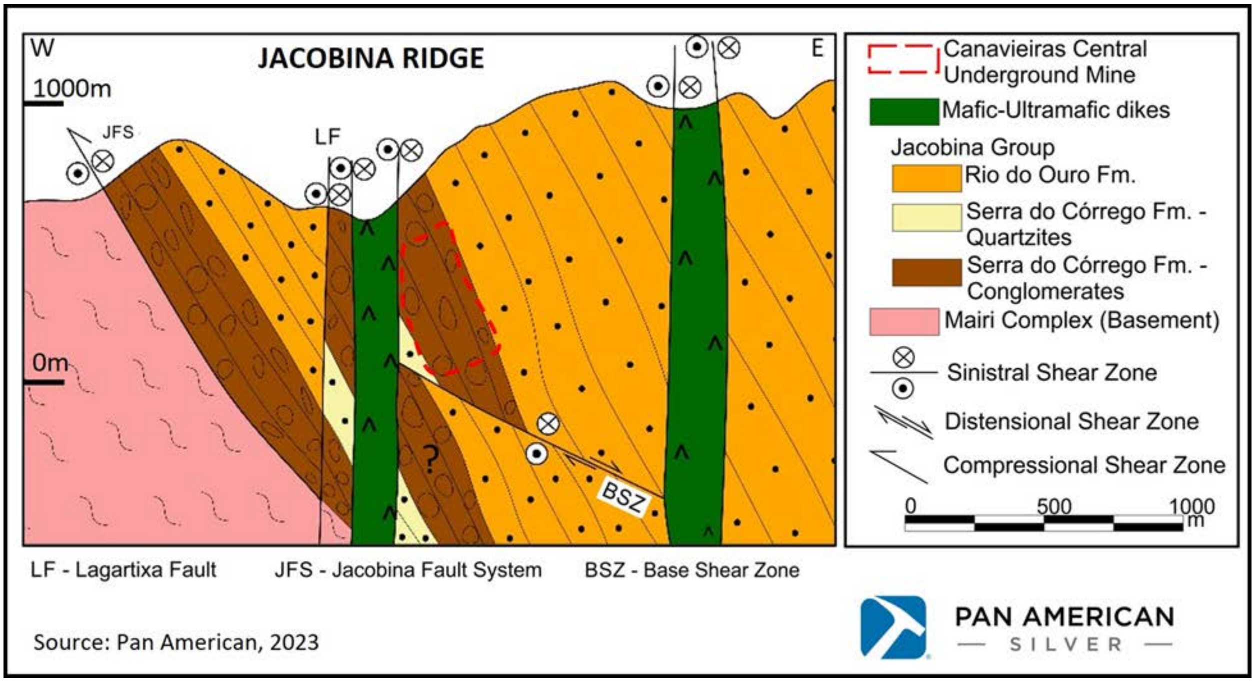
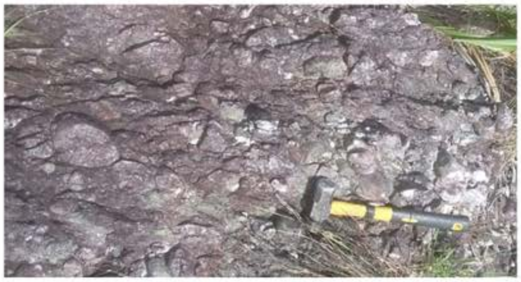


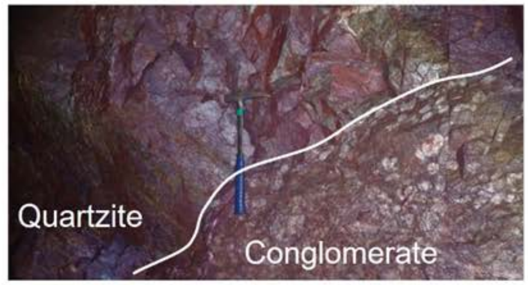
Figure 7-6: Generalized cross-section through the Canavieiras Central Mine

Table 7-1: Characteristics of gold mineralization at Jacobina

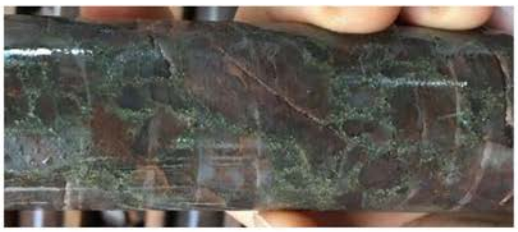
Zone	Code	Location	Strike length (m)	Thickness (m)	Average Grade (g/t Au)	Description
Morro do Vento / Morro do Vento Extension / Morro do Cuscuz (MCZ)						
LVLPC	LVLPC	Morro do Vento	400	2	4.8	Large to very large pebbles, only locally mineralized
MU (Upper) Reef	MU	Morro do Vento	1,700	3 to 10	2.0	Medium to small pebbles
LU (Lower) Reef	FLU	Morro do Vento	1,700	3 to 10	2.4	Medium to large pebbles
Hanging Wall Reef	HW	Morro do Vento/ MCZ	3,000	1 to 6	2.4	Large to medium pebbles
Main Reef	MR	Morro do Vento/ MCZ	3,000	Beds: 0.1 to 3 Zone: up to 12	6.0	Pyritic, small to medium pebble conglomerate beds. Three channels of deposition, broken by faults.
Footwall Reef	FW	Morro do Vento/ MCZ	3,000	Beds: 0.1 to 6	2.4	Pyritic, small to medium pebble conglomerate beds.
Basal Reef	BR	Morro do Vento/ MCZ	1,600	3 to 10	4.0	Small to medium pebbles, enrichment of gold at its upper and lower portions.
Canavieiras						
Maneira	MAN	Canavieiras	≥600	Beds: 0.4 to 7 Zone: up to 70	1.7	Large to very large pebbles
Holandês	HOL	Canavieiras	≥600	Beds: 0.9 to 6 Zone: up to 30	1.7	Large to medium pebbles
MSPC	MSPC	Canavieiras	800	2 to 4	4.4	Medium size pebbles with abundant pyrite
LVL	LVL	Canavieiras	2,600	0.5 to 5	2.6	Large to very large pebbles
Liberino		Canavieiras	≥600	1 to 3	6.1	10 m above Piritoso; medium to large pebbles
Piritoso		Canavieiras	≥600	1 to 3	9.5	Medium size pebbles with abundant pyrite
MU	MU	Canavieiras	≥400	10 to 25	3.2	Pyritic, medium to large pebble conglomerates
LU	LU	Canavieiras	≥400	1 to 10	2.2	Pyritic, large pebble conglomerate
João Belo						
LVLPC	LVLPC	João Belo North	≥1,000	1 to 3	4.4	Large to very large pebbles
LMPC	LMPC	João Belo North	≥1,000	10 to 25	2.2	Large to medium pebbles
MPC	MPC	João Belo North	≥1,000	1 to 4	3.6	Medium sized pebbles; locally contains gold



Outcrop of conglomerate with large, very large, and medium pebbles.



Quartzite/conglomerate contact in drift at Morro do Vento Main Reef with medium and small pebbles and strong late oxidation (hematitic alteration).



Red pebbles, which have strong correlation to the gold grades in the Jacobina conglomerates, outlined by a late pyrite-fuchsite alteration.

Relict portion of fuchsitic alteration (green portion) within pervasive late oxidation.

Dendritic gold, associated with late oxidation, cross-cutting pebbles.

Granular gold between pebble and matrix, adjacent to several rounded grains of pyrite. This aggregate (pyrite + gold) is believed to be related to sedimentary deposition processes.

Gold beside a stretched chert pebble and associated fuchsitic matrix.

Source: Pan American, 2023

PAN AMERICAN — SILVER —

Figure 7-7: Photographs of conglomerate-hosted gold mineralization

7.4.2 Post-Depositional Gold-Bearing Stockwork, Shear Zones and Extensional Quartz Veins

This group encompasses gold-bearing extensional quartz veins and veinlets related to semi-concordant shear zones hosted by quartzites, andalusite-graphite-quartz schists, and local conglomerates of the Rio do Ouro Formation (e.g., Goela da Ema, Biquinha, Cercadinho and Guardanapo gold workings). This style of gold mineralization is a very minor volumetric component at Jacobina and does not contribute significantly to the mineral resource. The main hydrothermal alterations associated with this style of mineralization are silicification, sericitization, chloritization, and pyritization (locally with chalcopyrite), and local tourmalinization.

The ultramafic and mafic rocks also host mineralization as narrow shear zones up to 4 m-thick in north-south oriented ultramafic sills and dykes, close to their footwall and hangingwall contacts with the hosting quartzite and conglomerate units of the Serra do Córrego, Rio do Ouro, and Serra da Paciência Formations. The mineralized shear zones are characterized by the development of gold-bearing quartz veins and/or stockwork. The main hydrothermal alteration types are silicification, fuchsitization, pyritization, and sericitization, with local tourmalinization. A number of examples of this group are known at the mine sites and surrounding areas (Canavieiras, Itapicuru, Serra do Córrego, Morro do Vento, and João Belo), and at Serra da Paciência (Mina Velha, Várzea Comprida, Cinquenta e Um, Cabeça de Nego and Milagres gold workings), in the north. This style of mineralization does not contribute significantly to the mineral resource at Jacobina.

7.5 Alteration

The overprinting hydrothermal alteration event at the Jacobina deposit consists of pyrite, pyrrhotite, quartz, chrome-sericite (fuchsite), chrome-rutile and chrome-tourmaline. The chromium-rich nature of this alteration assemblage is attributed to leaching of the mafic-ultramafic intrusive rock by circulating hydrothermal fluids.

8 Deposit Types

The mineralization at Jacobina consists of conglomerate-hosted gold deposits generally interpreted to represent paleoplacer gold deposits, with some post-depositional modification by structural and hydrothermal events (Bateman, 1958; Cox, 1967; Gross, 1968; Minter, 1975; Strydom and Minter, 1976; Hendrickson, 1984). This type of deposit is similar to the Witwatersrand and Tarkwa deposits in South and West Africa (Pearson et al., 2005).

Karpeta (2004) argues that the gold was detrital and brought in and concentrated by fluvial processes. Several lines of evidence, with quoted similarities to both the Tarkwa and the Witwatersrand deposits, are provided.

1. Gold is not generally evenly distributed throughout the conglomerates, but concentrated in the top of the conglomerate beds with clean cross-bedded quartzite above them. This concentration of gold result from the aggradation and then incision of a braided fluvial system.

2. Gold mineralization appears to show a strong positive relationship with pebble size. This shows that gold grade can be correlated with fluvial current dynamics.

3. Although gold is always associated with pyrite and hematite, hematite and pyrite commonly occur without gold. This suggests that gold concentration is independent of the distribution of pyrite, hematite, and chrome-sericite.

4. Gold grade is higher in better-sorted, clast-supported conglomerates and lower in more poorly sorted matrix-supported conglomerate. This indicates that gold grade appears to be related to the degree of reworking of a conglomerate (although it could be related to their relative porosity/permeability characteristics).

5. Higher-grade zones have a well-defined plunge that is postulated to coincide with the predominant paleocurrent direction.

Teles et al. (2014) further note that the mineralized conglomerates at Jacobina have rounded grains of pyrite and gold, as well as uraninite, indicating detrital deposition.

Native gold is also present as flakes and thin films along fracture surfaces within the conglomerate units, and less frequently in the quartzite, suggesting remobilization of gold during a hydrothermal event (Karpeta, 2004) as described in Section 7.5.

9 Exploration

Regional mapping and sampling have been carried out since 2006 with the goal of identifying additional surface occurrences of mineralized conglomerates along the strike length of the Jacobina belt. The geological mapping team measured the surface locations of such mineralized outcroppings of conglomerates by means of a hand-held Garmin GPS unit (using the Córrego Alegre datum). For each occurrence, data collected included the host rock, the type and size of conglomerate pebbles, descriptions of relevant geological features such as the presence of visible gold and type and intensity of alteration minerals (hematite, fuchsite, pyrite, and chlorite) and structural measurements with their descriptions. All information was entered into a master geological database.

Chip or grab samples, mainly of conglomerate, were collected; samples weighed between one and three kilograms. A total of 14,149 chip samples, 1,610 soil samples, 55 stream samples and 85 pan concentrate samples were collected on the property by Yamana between 2020 and mid-2023 (Figure 9-1). Samples were submitted to the Jacobina analytical laboratory for determination of their gold content. All chip samples were processed according to JMC's quality assurance/quality control (QA/QC) protocols.

Between 2020 and 2023, a structural mapping program was carried out on surface in the immediate vicinity of the mines. The Serra do Córrego Mine and the Lagartixa, Morro da Viúva, Maricota and João Belo South targets were mapped on surface and Canavieiras South and João Belo North mines were mapped underground. The results were used to reinterpret the structural setting and genesis of the Jacobina style of mineralization. This improved understanding informed the drilling programs completed in 2020 and mid-2023.

The qualified person responsible for this section of the technical report is of the opinion that the surface chip or grab sampling methods and sampling quality are consistent with industry standards, and that the samples are representative with no sign of sampling bias. The surface samples are not used for mineral resource estimation and so any form of potential sampling bias would be immaterial to the results disclosed in this technical report.

The significant exploration results at Jacobina that are material to this technical report were obtained by underground core drilling. This work and resulting interpretations are summarized in Sections 10, 14, and 15 of this technical report.

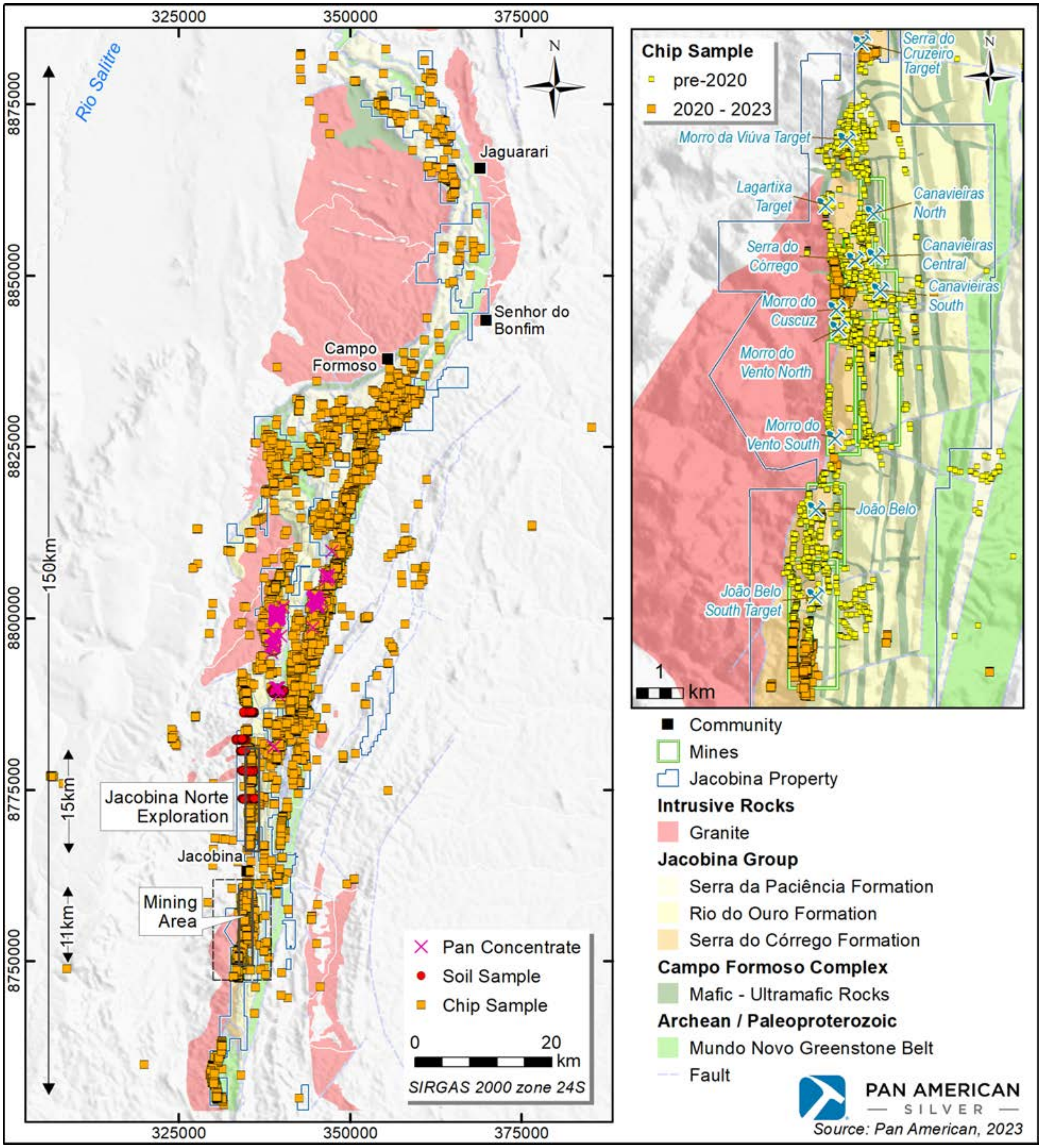


Figure 9-1: Location of geological mapping and sampling programs

9.1 Exploration Potential

The exploration programs have led to the expansion of the known deposits (Canavieiras, Morro do Vento, João Belo) and to the discovery of new mineralized zones, such as Maricota and Morro da Viúva among others. Since 2019, two news deposits have been delineated: João Belo South, that represents the southern extension of the João Belo North Mine and shows similar reefs and average gold grades; and Morro do Vento East, that represents the eastern extension of the Upper Conglomerate of Morro do Vento mine and shows similar reefs and average gold grades. The mineralization in both new deposits still shows potential for extension along strike and down dip.

At Morro do Vento Mine, exploratory drilling has successfully delineated the extension of the Main Reef zone in the down-plunge direction. Intersections grading 3.30 g/t gold over 3.56 m (drill hole MVTEX00110), 4.85 g/t gold over 8.24 m (MVTEX00111), and 3.56 g/t of gold over 3.03 m (MVTEX00122), demonstrate potential for finding additional mineral reserve down dip.

In summary, the near-mine results have demonstrated that exploration potential of Jacobina Mine is still open along strike (João Belo South, Maricota and Morro da Viúva discoveries) and in down dip (Morro do Vento extensions) directions (see Figure 9-2).

In terms of regional exploration prospects, the gold-rich stratigraphy in Jacobina has been consistently identified over an extensive strike length of approximately 150 km (as shown in Figure 9-1). Ongoing exploration initiatives have led to the discovery of numerous gold occurrences within this favourable stratigraphy, notably at the Jacobina Norte project, where a continuous 60-kilometre-long gold mineralization trend has been identified (see Figure 9-1).

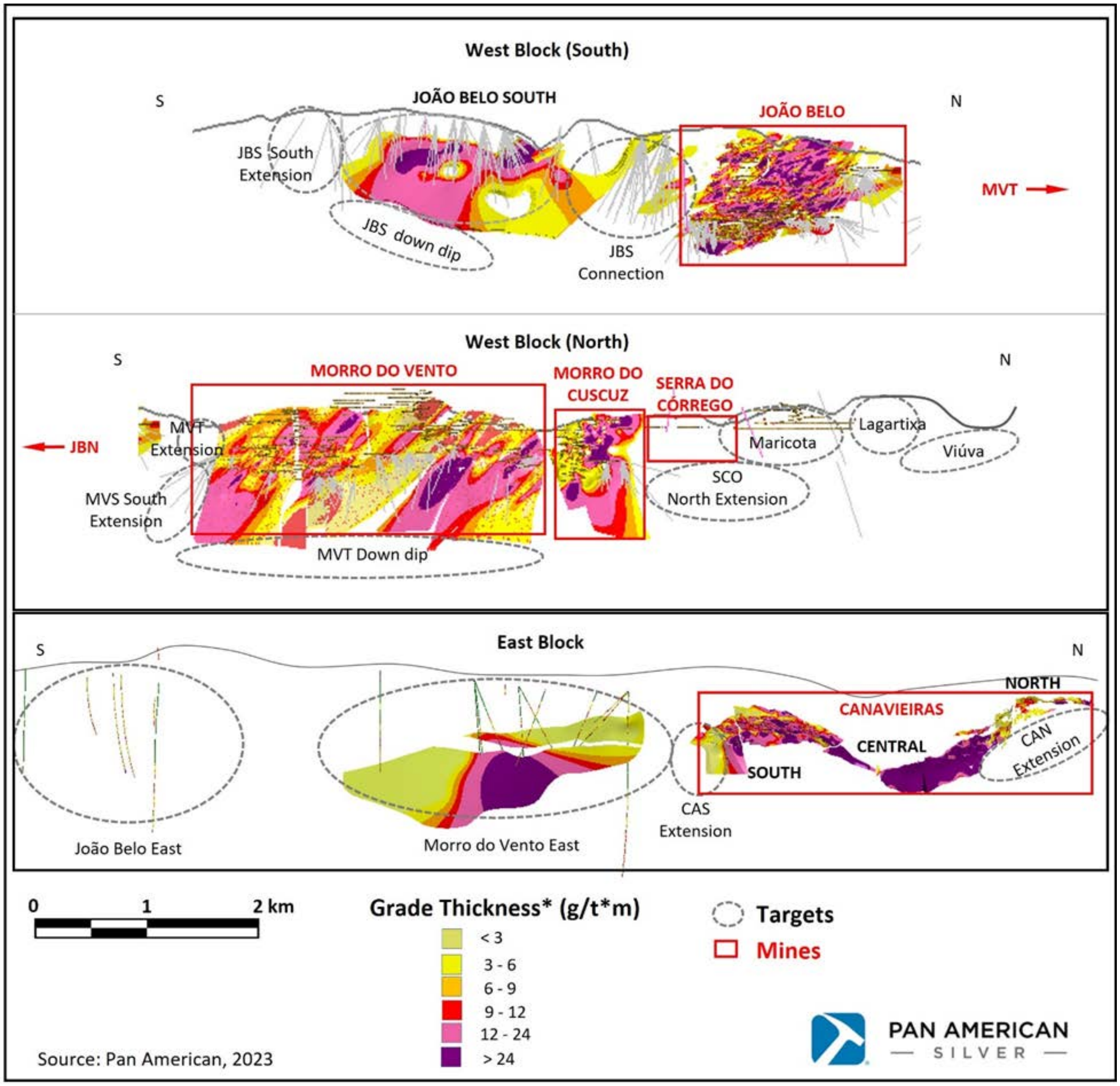


Figure 9-2: Jacobina longitudinal section showing down-plunge exploration potential

10 Drilling

From 1970 to the end of June 2023, approximately 1,175,524 m of surface and underground core drilling has been completed in the Jacobina project area (Table 10-1, Table 10-2, Figure 10-1 and Figure 10-2). Surface drilling is done using HQ-diameter (63.5 mm) and NQ-diameter (47.6 mm)-sized core; underground drilling uses LTK48-diameter core (35.3 mm) and BQ-diameter core (36.5 mm). The drill contractors used for surface drilling on the property were Geoserv Pesquisa Geológicas S.A., WFS Sondagem Ltda., Horizonte Mineiro, Geocontrole, and Geologia e Sondagens Ltda. (Geosol). Underground core drilling was completed by Jacobina personnel and Geosol. Any unsampled core is stored on site at the core storage facility.

Table 10-1: Summary of drilling history between 1970 and June 30, 2023

Company	Period	No. Drill Holes	Metres Drilled
Anglo American	1970 - 1996	886	109,697
William Multi-Tech	1996 - 1998	134	9,235
Desert Sun	2003 - 2006	429	63,426
Yamana	2006 - March 2023	7,215	969,189
Pan American Silver	April to June - 2023	132	23,977
Total		**8,796**	**1,175,524**

Table 10-2: Historical distribution of drilling by mine as of June 30, 2023

Mining Block	Type	No. Drill Holes	Total Length (m)
João Belo North	Surface	145	63,190
	Underground	42,599	230,852
João Belo South	Surface	112	46974
	Underground	—	—
Morro do Vento East	Surface	433	20,624
	Underground	4	316
Morro do Vento	Surface	250	71133
	Underground	1804	184041
Morro do Cuscuz	Surface	46	14,751
	Underground	566	58,222
Serra do Córrego	Surface	132	30,553
	Underground	531	54,977
Canavieiras South	Surface	61	33,691
	Underground	927	146,210
Canavieiras Central	Surface	55	27,137
	Underground	522	79,925
Canavieiras North	Surface	40	383
	Underground	921	81,267
Exploratory	Surface	40	19,726
	Underground	8	2,552
Sub-total	Surface	914	337,162
	Underground	7882	838,362
Total		**7,239**	**868,469**

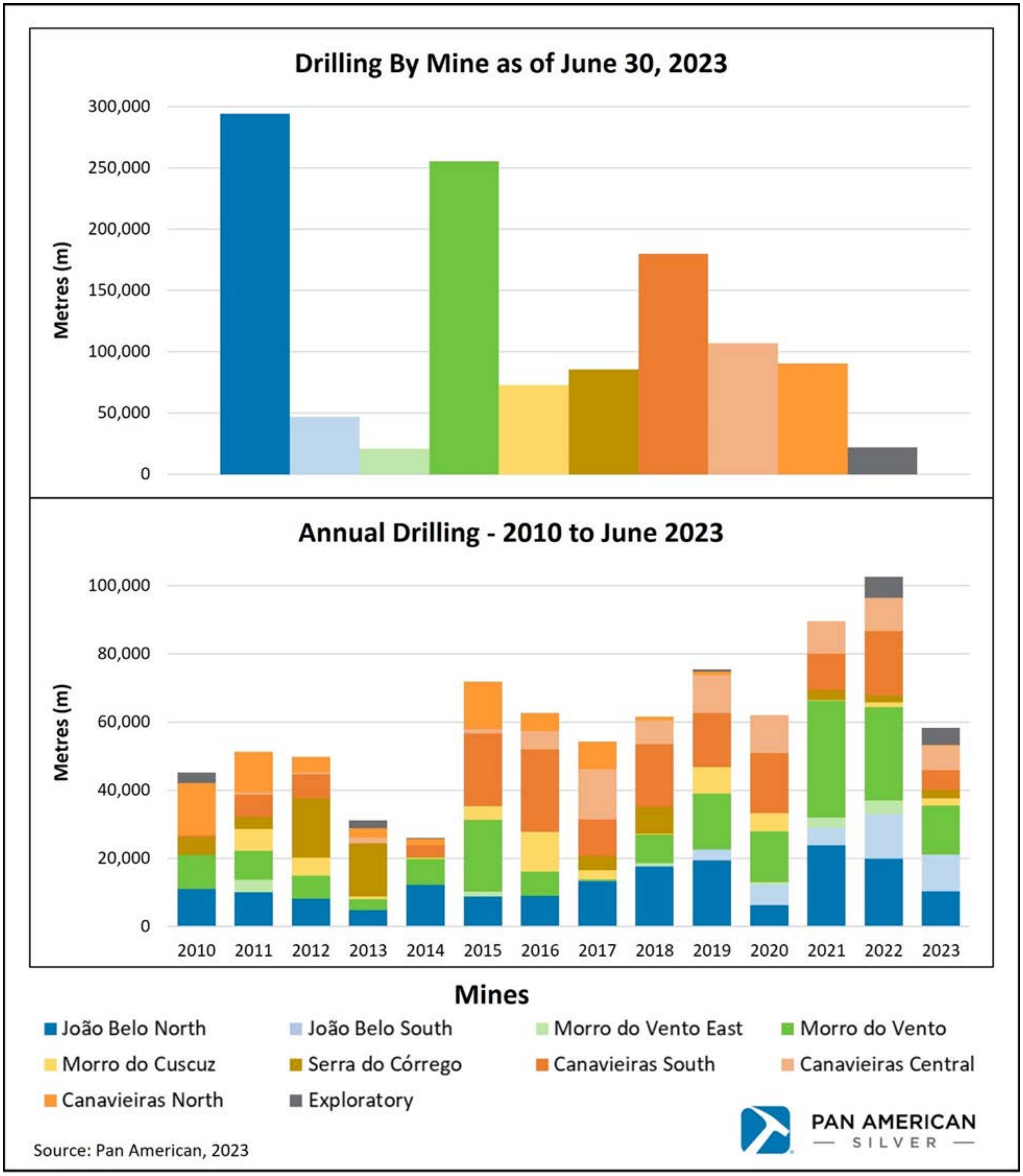


Figure 10-1: Distribution of drilling, by mine and by year, as of December 31, 2019

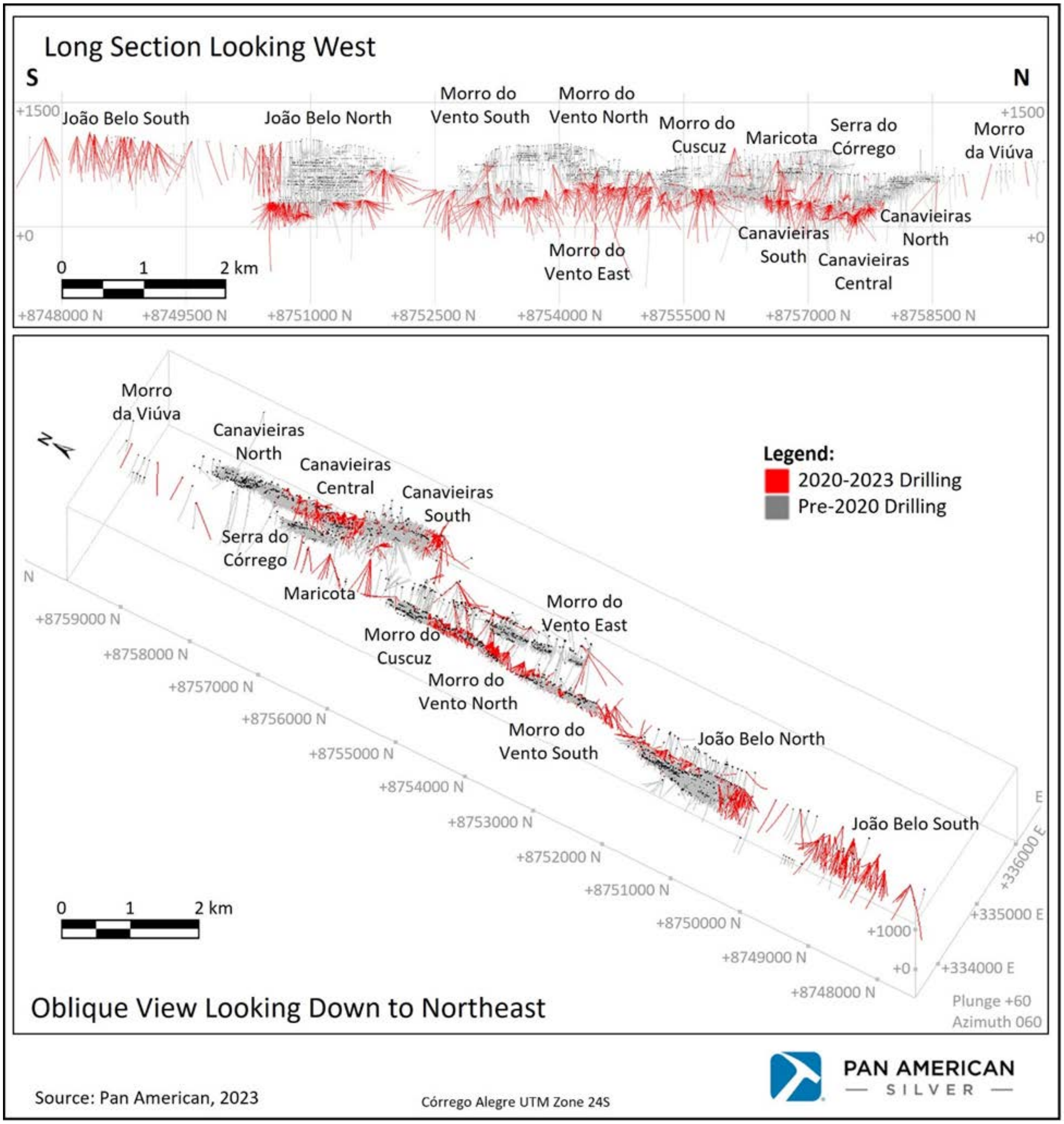


Figure 10-2: Location of drill holes

Jacobina geologists follow a series of standard operating procedures (SOPs) for the planning and execution of surface-based and underground-based core drilling programs (Table 10-3). In brief, the procedures currently used during the core drilling programs are as follows:

1. Underground, the collar locations of all drill holes are marked by Jacobina survey crews prior to drilling. On surface, the collar locations are marked by explorations technicians using a hand-held GPS prior to drilling, and the collars are then surveyed using a differential base-station GPS after the completion of the drilling.

2. A Reflex Gyro survey instrument is used to provide control information on the directional deviation (both azimuth and inclination) at three-metre intervals in each hole.

3. Core is placed in labelled boxes at the drill site and the boxes are transported by the drill contractor to the logging facility.

4. All core is photographed.

5. Company geologist conduct lithological logging of drill core and recording of geotechnical observation, describing all downhole data including assay intervals. All information is recorded on paper forms and then entered in digital format. The following features are recorded:

    - Core diameter
    - Rock quality designation measurements
    - Core recovery record
    - Downhole inclination
    - Lithological contacts
    - Description of geology
    - Recording of heavy mineral and sulphide content
    - Type and intensity of various alterations
    - Structural features, such as fractures and fault zones
    - Core angles
    - Oriented structural data
    - Sampling intervals

Table 10-3: Drilling procedures

Procedure Number	Description
Planning and Execution	
POP-04-12-3.5-227	Drill hole planning
POP-04-12-3.5-358	Diamec U6 drill rig operation
POP-04-12-3.5-213	Diamec 252 drill rig operation
POP-04-12-3.5-001	Channel sampling and underground geological mapping
POP-04-12-3.5-412	Mobilization, demobilization, and operation of drill rigs
Logging and Sampling	
POP-04-12-3.5-318	Storage and organization of geological data and responsibilities
POP-04-12-3.5-372	Drill hole deviation measurement
POP-04-12-3.5-380	Photographic record of drill cores
POP-04-12-3.5-072	Lithological description

No overall core recovery statistics were reviewed, but it is estimated that overall core recovery is greater than 95%. The sampled core should provide a reliable reflection of the mineralization in the mining operation.

Drilling activities at Jacobina have been successful at expanding the extent of known gold mineralization and in defining the plunge of the higher-grade portions of mineralized zones. The results and interpretations of this work are summarized in Sections 14 and 15.

The qualified person responsible for this section of the technical report is of the opinion that the logging and recording procedures are consistent with industry standards, and that there are no known drilling, sampling, or recovery factors that could materially affect the accuracy and reliability of the results.

11 Sample Preparation, Analyzes, and Security

Analytical samples include both drill core and channel samples. The drill core samples are generated from exploration and infill drilling programs that are conducted on surface and underground; they are used for target generation and estimation of mineral resources and mineral reserves. The channel samples come from underground grade-control channels in development drifts; they are used for short-term forecasting and grade control as well as for estimation of mineral resources and mineral reserves.

11.1 Sample Preparation and Analysis

Sample preparation and analysis at Jacobina are carried out according to a series of SOPs (Table 11-1). The current methodology of sampling drill core and underground workings at Jacobina is described below.

Table 11-1: List of sample preparation and analytical standard operating procedures

Procedure Number	Description
POP-04-12-3.5-060	Storage and disposal of cores, chips, and pulps
POP-04-12-3.5-381	Activities related to drill core sampling
POP-04-12-3.5-403	QA/QC protocol
POP-04-12-3.5-404	Rock density test
POP-04-12-3.5-380	Sample Preparation, Checking, Dispatch to Laboratory
POP-04-12-3.5-408	Sample Dispatch and Import of Geochemical Results
POP-04-11-3.5-337	Sample reception by the laboratory
POP-04-11-3.5-359	Sample preparation
POP-04-11-3.5-367	Gold analysis by fire assay (FA)
POP-04-11-3.5-370	Gold determination by atomic absorption

Sampling of Drill Core:

1. Sampled assay intervals are generally 0.5m in length in the conglomerate and 1.0m in the quartzite. Sample length can be shorter to respect the geological boundaries. The minimum length that can be considered is 0.25 m.

2. Sample numbers are assigned to the intervals. Certified reference materials (CRMs) and quartz blanks are inserted into the sample stream.

3. Core samples from the surface drilling (HQ and NQ core diameter, 63.5 mm and 47.6 mm, respectively) are cut in half by saw; one half is sent for assay and the remainder is stored on site. Underground drill core (BQ and LTK48 core diameter, 36.5 mm and 35.3 mm, respectively) is sampled in its entirety.

4. Samples from the exploration and infill drilling programs are placed in plastic bags and primarily sent to the ALS Global (ALS) laboratory and the Jacobina Mine Laboratory, with the SGS Geosol Lab Ltda (SGS Geosol) occasionally used for analysis of infill drilling. The Jacobina Mine Laboratory is owned and operated by JMC. The ALS and SGS Geosol laboratories are independent of Pan American and JMC; both are located in Vespasiano, in the state of Minas Gerais, Brazil.

Underground Channel Sampling:

1. Underground faces are washed and marked with the contacts of the mineralization.

2. Channel samples are taken at right angles to the dip across the face in both mineralization and waste, respecting the geological contacts. The normal sample length is 0.5 m, and the minimum length that can be considered is 0.25 m.

3. Samples are bagged and sent to the Jacobina Mine Laboratory for preparation and assaying. CRMs and quartz blanks are inserted into the sample stream.

The results of the underground channel samples are used for short-term forecasting and grade control as well as in the grade estimation process for resource models.

In the opinion of the qualified person responsible for this section of the technical report, the sampling methodologies at Jacobina conform to industry standards and are adequate for use in mineral resource estimation.

Preparation and Analytical Procedures

Samples from exploration and infill drilling programs are analyzed by ALS and Jacobina as the main laboratories; the SGS Geosol laboratory is occasionally used for the analysis of infill drilling samples. Samples from the grade-control channels are analyzed using the Jacobina Mine Laboratory as the main laboratory. SGS Geosol participates in inter-laboratory checks for samples previously analyzed at the ALS and Jacobina laboratories. The Jacobina Mine Laboratory is owned and operated by JMC and is not accredited. ALS and SGS Geosol laboratories are independent of Pan American and JMC and are accredited under ISO/IEC 17025:2017 and ISO 14001:2015.

Samples from grade control channels are assayed at the Jacobina Mine Laboratory as the primary laboratory; SGS Geosol is used as the secondary laboratory.

The following procedures, including the insertion rate of the QA/QC samples, are used by the Jacobina Mine Laboratory and the ALS and SGS Geosol laboratories for sample preparation and analysis:

1. A submittal form is filled out by a Jacobina technician and delivered with the samples to the ALS, SGS Geosol or Jacobina laboratories.

2. Samples are sorted, logged in, opened, and dried at 110°C.

3. The entire sample is crushed in a jaw crusher to better than 90% passing a 10 mesh. Crushers are cleaned with compressed air between every sample and with a quartz blank wash every 20^{th} sample. Every second quartz blank wash sample is placed into the analytical sequence. Granulometric checks on the crushed material are done three times per shift.

4. A 500 g subsample is taken by a rotary splitter or by Jones riffle splitter. The split is pulverized using a steel ring mill to better than 95% passing 150 mesh. Pulverizers are cleaned with compressed air after each sample and with a quartz wash after every 20^{th} sample. Every second quartz wash sample is placed into the analytical sequence. Granulometric checks on the pulverized material are done three times per shift.

5. Standard fire assay (FA) methods using a 50 g pulp sample are used to determine total gold content. Samples containing visible gold can be assayed using a screened metallic assay protocol. In this procedure, a 500 g or 1 kg split is pulverized to 95% passing 150 mesh;

screening this pulp results in a fine and coarse fraction (possibly containing coarse gold) which are assayed separately.

6. The sample, fluxes, lead oxide litharge, and silver are mixed and fired at 1,100 to 1,170°C for 50 to 60 minutes so that precious metals report to the molten lead metal phase. The samples are removed from the furnace and poured into moulds. Next, the slag is removed from the cooled lead button and the button is placed in a cupel and fired at 920°C to 960°C for one hour to oxidize all the lead and render a precious metal bead.

7. The cupels are removed from the furnace and the beads are separated by acid digestion using nitric and hydrochloric acid to dissolve the precious metals into solution. The sample solutions are analyzed by an atomic absorption spectrophotometer (AAS). For screened metallic assays, the coarse fraction is assayed in total and an aliquot of the fine fraction is analyzed. The gold concentration of the entire sample is determined by weighted average.

8. At the Jacobina Mine Laboratory, analytical batches contain 42 client samples, two pulp duplicates, two reagent blanks, and two certified reference materials. At ALS and SGS Geosol laboratories, analytical batches contain 77 client samples and seven control samples.

The qualified person responsible for this section of the technical report is of the opinion that the sample preparation, analytical, and assay procedures of drill core samples used for exploration and delineation are consistent with industry standards and adequate for use in the estimation of mineral resources.

11.2 Quality Assurance/ Quality Control Measures

JMC employs a comprehensive QA/QC program for monitoring the assay results of exploration drilling programs, infill drilling programs, and grade control channel samples.

JMC use certified reference materials (CRMs), quartz blanks, field and coarse crush duplicate samples and pulp duplicates to monitor the precision, accuracy, contamination and quality of the laboratories. These CRMs are purchased from Geostats Pty Ltd. (Geostats), ORE Pty Ltd. (OREAS), both based in Australia, and Instituto de Technologia August Kelulé Ltda (ITAK) in Brazil. Currently, JMC has protocols in place for describing the frequency and type of QA/QC submission, the regularity of analysis of QA/QC results, and failure limits. There are also set procedures to be followed in case of failure, or for flagging failures in the QA/QC database.

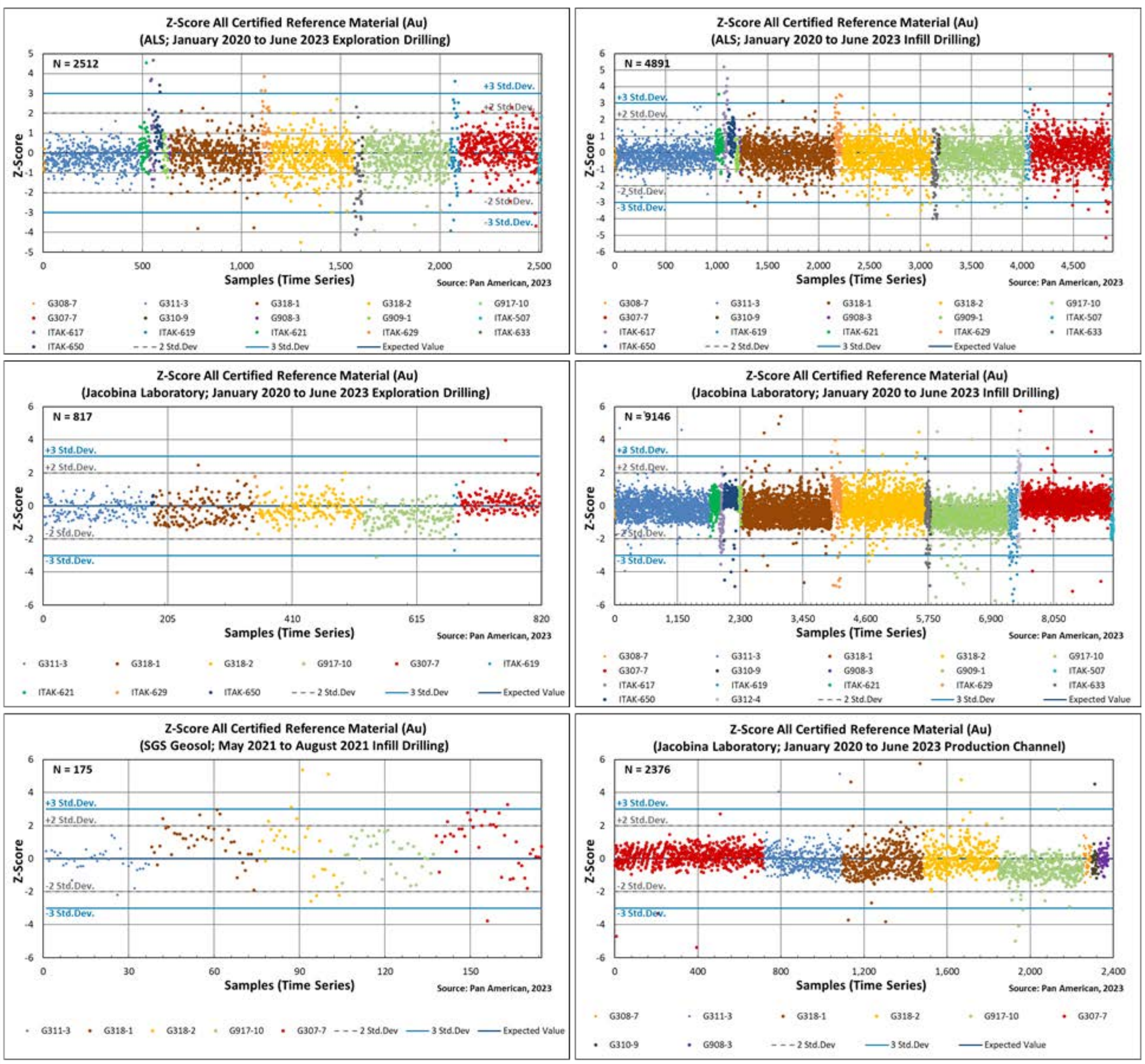
Results from the QA/QC program are reviewed and monitored by a dedicated Quality Control team who presents the results by means of detailed reports on a regular basis.

11.2.1 Certified Reference Materials

For drill core samples, JMC inserts one CRM for every 30 samples submitted to the primary laboratories (ALS, SGS Geosol or Jacobina laboratory). For channel samples, Jacobina geology staff insert one CRM for every 40 channel samples submitted to the Jacobina laboratory. CRMs of low, medium, and high gold grades are supplied in pre-packaged bags purchased from Geostats, ITAK and OREAS, who all provide JMC with certificates listing the round-robin assay results and the expected standard deviation for each CRM.

JMC submitted 17,580 CRMs with drill core samples between January 2020 and June 2023 (submission frequency of one standard per 28 samples). Between January 2020 and June 2023, Jacobina geology staff submitted 2,376 CRMs samples with channel samples (submission frequency of one standard per 29 samples).

The overall failure rates are within the target of 5% CRM failures. A failure is defined a gold analysis of a CRM that assayed greater than plus or minus three standard deviations (> ± 3SD) from the certified value. Figure 11-1 shows the performance of CRMs submitted with the exploration drill core samples, the infill drill core samples, and the underground channel samples that were assayed at ALS, SGS Geosol and Jacobina Mine Laboratory. In the opinion of the qualified person responsible for this section of the technical report, these results are considered acceptable.



Source: Pan American, 2023

Figure 11-1: Assay results of standards analyzed at ALS, Jacobina and SGS Geosol laboratories

11.2.2 Quartz Blank Samples

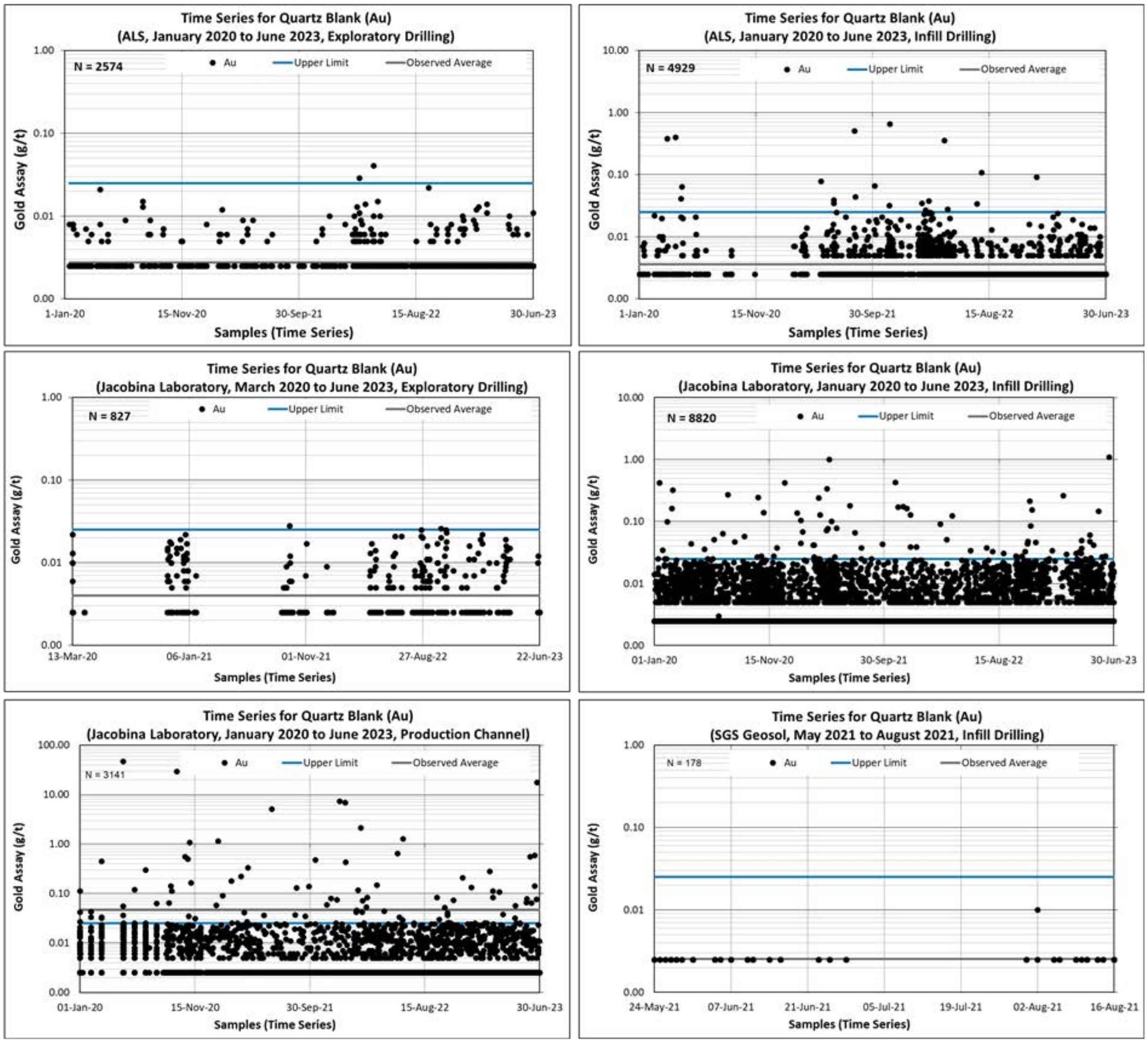
Quartz blank samples are composed of siliceous material which is known to contain gold grades that are less than the detection limit of the analytical method (< 0.005 g/t gold) as analyzed at ALS, SGS Geosol, and Jacobina Mine laboratories. JMC inserts one blank sample for every 30 drill core samples submitted to ALS, SGS Geosol, and Jacobina Mine laboratories.

Between January 2020 and June 2023, JMC submitted 17,328 quartz blank samples with drill core samples (submission frequency of one quartz blank per 29 samples) and 3,141 quartz blank samples with channel samples (submission frequency of one blank per 22 samples).

Of the 17,328 quartz blank samples submitted in the sample streams between January 2020 and June 2023, twenty-two blank samples (0.29% of the total) submitted with drill core at the ALS laboratory, eighty-one blank samples (0.84% of the total) submitted with drill core at the Jacobina Mine Laboratory, and eighty-three blank samples (2.64% of the total) submitted with channel samples at the Jacobina Mine Laboratory returned assay results exceeding the selected upper limit of 0.025 g/t gold. No samples at the SGS Geosol laboratory exceeded the acceptance limit. In the opinion of the qualified person responsible for this section of the technical report, these results are acceptable.

In cases of failure, Pan American and JMC procedures require investigation by the laboratory as well as re-analysis of six adjacent samples or of the entire batch containing a failed blank sample. Figure 11-2 illustrates the results of the analyzes of the blanks inserted into the sample stream for the drill core samples and channel samples, with the failure criteria (0.025 g/t gold).

Project	Jacobina Mine	Control Samples Statistics	ALS Exp	ALS Infill	Jacobina Exp	Jacobina Infill	Jacobina Prod	SGS Infill
Data Series	Quartz Blanks, January 2020 to June 2023	Sample Count	2,574	4,929	827	8,820	3,141	178
Data Type	Infill / Exploratory Drilling / Production	Expected Value	0.005	0.005	0.005	0.005	0.005	0.005
Commodity	Gold	Observed Average	0.003	0.004	0.004	0.005	0.047	0.003
Laboratory	ALS / Jacobina Laboratory / SGS Geosol	Standard Deviation	0.002	0.015	0.004	0.021	1.063	0.001
Analytical Method	Au Fire Assay AAS	Upper Limit (5xDL)	0.08%	0.41%	0.24%	0.90%	2.64%	0.00%
Detection Limit	0.005 (g/t)							
Source	Pan American, 2023							



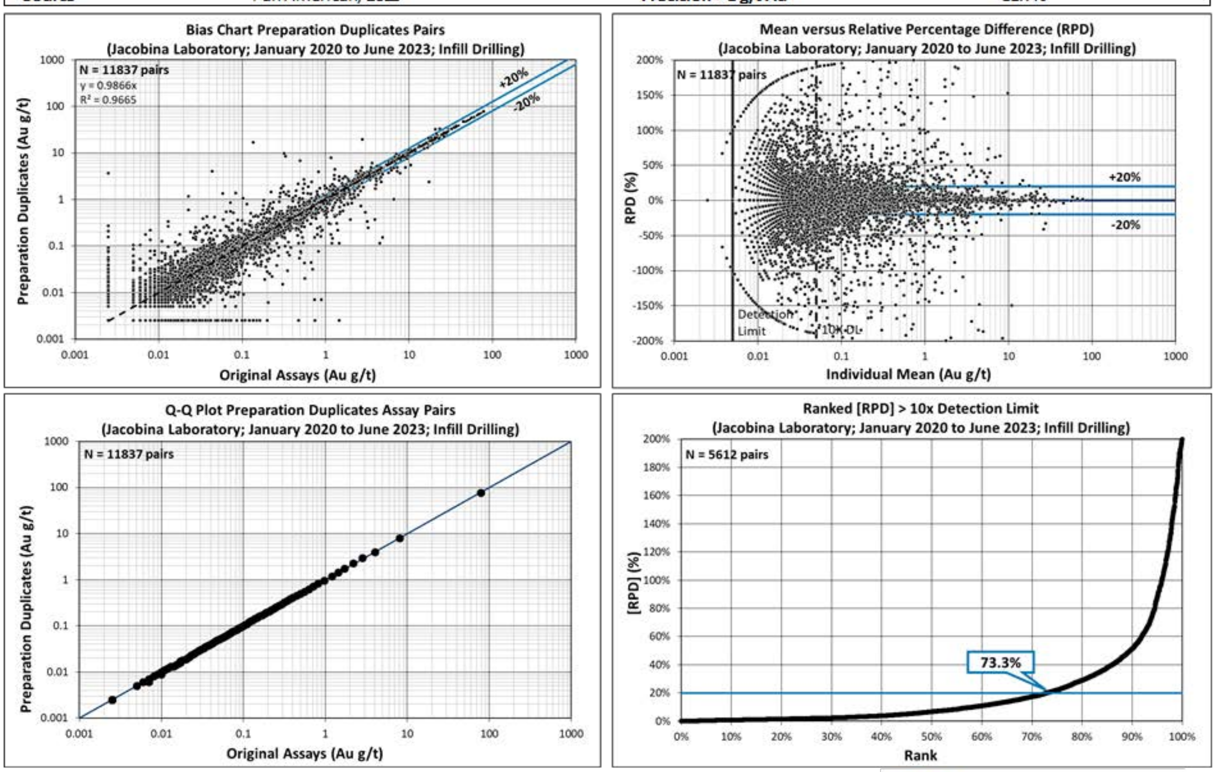
Source: Pan American, 2023

Figure 11-2: Assay results of inserted blank samples at ALS, Jacobina Mine Laboratory, and SGS Geosol

11.2.3 Coarse Crush Duplicates

JMC procedures requires the submission of one coarse crush duplicate for every 20 samples. Between January 2020 and June 2023, 23,582 drill core coarse crush duplicate samples were analyzed for gold at ALS, SGS Geosol, and Jacobina Mine laboratories. Results of the coarse crush duplicates analyzed at the Jacobina Mine Laboratory presented in Figure 11-3 show moderate dispersion, with 73% of the pairs that assayed more than ten times the detection limits returning results within ± 20% relative percent difference (RPD). The dispersion pattern for these coarse crushed duplicate samples is consistent with expectations for this type of sample material.

Project	Jacobina Mine	Statistics	Original	Duplicate
Data Series	Coarse Crush Duplicates	Sample Count	11,837	11,837
Data Type	Infill Drilling, January 2020 to June 2023	Minimum Value	0.0025	0.0025
Commodity	Au in g/t	Maximum Value	78.56	77.63
Analytical Method	FA50 at Jacobina Laboratory	Samples > 10DL	5,612	
Detection Limit	0.005 g/t Au	Pairs +/- 20% RPD if > 10DL	73.3%	
Original Dataset	Original Assays	Precision = 2xCV		
Paired Dataset	Preparation Duplicates	Precision 10DL to 0.1 g/t Au	47.4%	
		Precision 0.1 to 1 g/t Au	35.5%	
Source	Pan American, 2023	Precision > 1 g/t Au	31.7%	



Source: Pan American, 2023

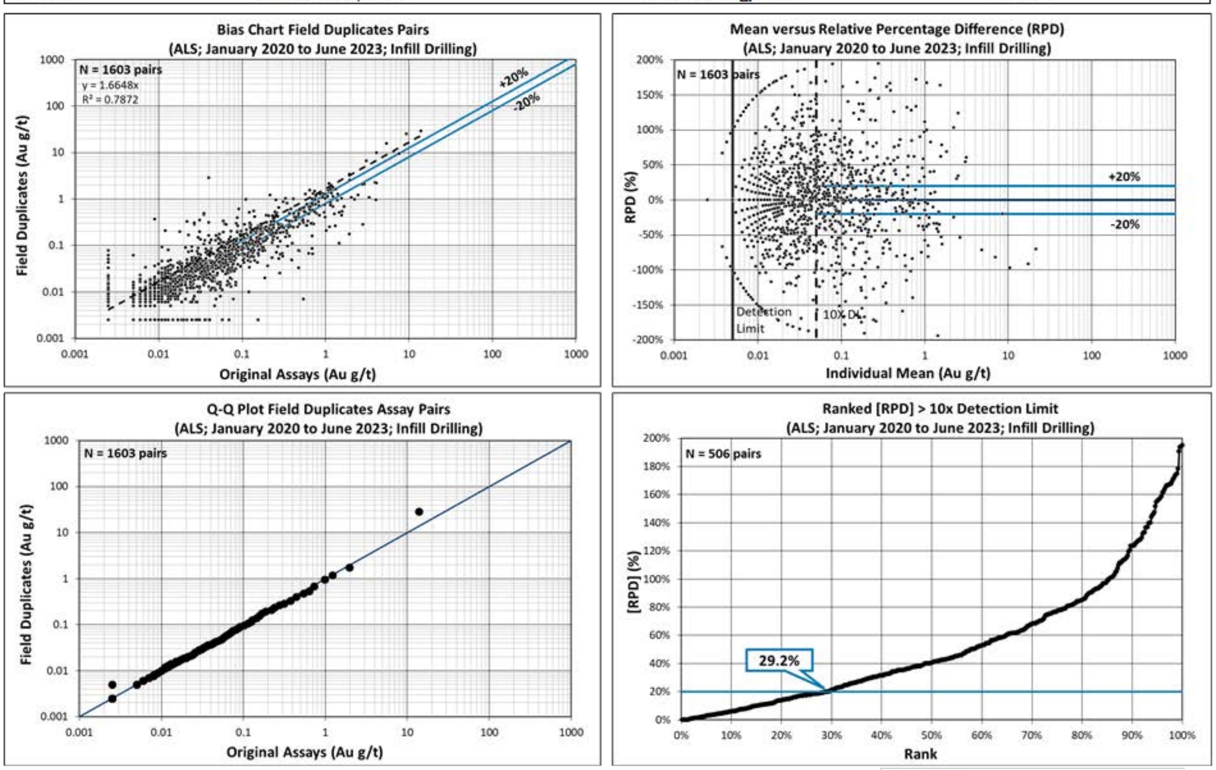
Figure 11-3: Bias charts for coarse crushed duplicates analyzed at Jacobina Mine Laboratory

11.2.4 Field Duplicates

JMC procedure requires the submission of one field duplicate for every 20 samples. Between January 2020 and June 2023, 3,076 drill core field duplicate samples (one for every 24 samples) were analyzed for gold. The procedure for sampling the drill core field duplicate is to saw the core in half, and to saw one of those halves to create two quarter-core samples. One quarter-core is sent as a regular sample and the other quarter-core is sent as the field duplicate for that same interval. The remaining half-core is stored in the box in the core shed.

Results of the field duplicates analyzed at ALS presented in Figure 11-4; they show high dispersion, with 29% of the pairs that assayed more than ten times the detection limits returning results within ± 20% RPD. In view of the deposit characteristics, with the presence of free gold and nugget effect, the qualified person responsible for this section of the technical report is of the opinion that these results are satisfactory.

Project	Jacobina Mine	Statistics	Original	Duplicate
Data Series	Field Duplicates	Sample Count	1,603	1,603
Data Type	Infill Drilling, January 2020 to June 2023	Minimum Value	0.0025	0.0025
Commodity	Au in g/t	Maximum Value	13.90	28.90
Analytical Method	Au-AA24 at ALS	Samples > 10DL	506	
Detection Limit	0.005 g/t Au	Pairs +/- 20% RPD if > 10DL	29.2%	
Original Dataset	Original Assays	Precision = 2xCV		
Paired Dataset	Field Duplicates	Precision 10DL to 0.1 g/t Au	74.7%	
		Precision 0.1 to 1 g/t Au	70.6%	
Source	Pan American, 2023	Precision > 1 g/t Au	90.4%	



Source: Pan American, 2023

Figure 11-4: Bias charts for field duplicates analyzed at ALS

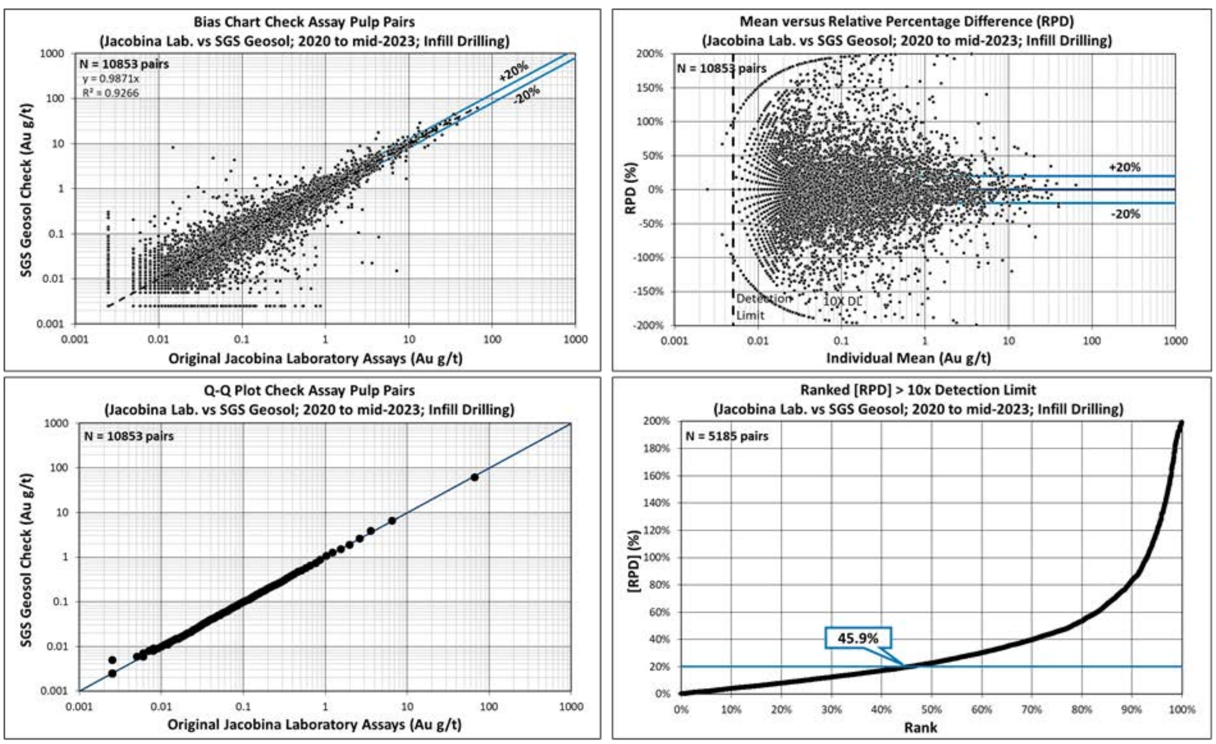
11.2.5 Inter-Laboratory Pulp Duplicates

Every month, the primary laboratories, Jacobina Mine Laboratory and ALS, send 5% of pulp samples, as selected by the Jacobina team, to the secondary SGS Geosol laboratory in Vespasiano, Brazil for check assay reanalysis. SGS Geosol is an independent ISO 9001-2015- and ISO/IEC 17025:2005- certified laboratory. Reanalyzing these pulps is useful for measuring the precision of the analytical process at the primary laboratories, assuring a better degree of accuracy and control on assays. A total of 22,856 pulp samples from drill core and 3,369 channel pulp samples were sent between January 2020 and June 2023.

Results of the pulp check assays for Jacobina Mine Laboratory vs. SGS Geosol are presented in Figure 11-5 and results for ALS vs. SGS Geosol are presented in Figure 11-6.

Project	Jacobina Mine
Data Series	Check Pulps, January 2020 to June 2023
Data Type	Infill Drilling
Commodity	Au in g/t
Analytical Method	Fire Assay AAS - GRAV
Detection Limit	0.005 g/t Au
Original Dataset	Original Jacobina Laboratory Assays
Paired Dataset	SGS Geosol Check
Source	Pan American, 2023

Statistics	Original	Duplicate
Sample Count	10,853	10,853
Minimum Value	0.0025	0.0025
Maximum Value	66.62	62.31
Samples > 10DL	5,185	
Pairs +/- 20% RPD if > 10DL	45.9%	
Precision = 2xCV		
Precision 10DL to 1 g/t Au	56.2%	
Precision 1 to 5 g/t Au	49.3%	
Precision > 5 g/t Au	38.0%	



Source: Pan American, 2023

Figure 11-5: Comparison between Jacobina Mine Laboratory and SGS Geosol inter-laboratory check assays infill drilling from January 2020 to June 2033)

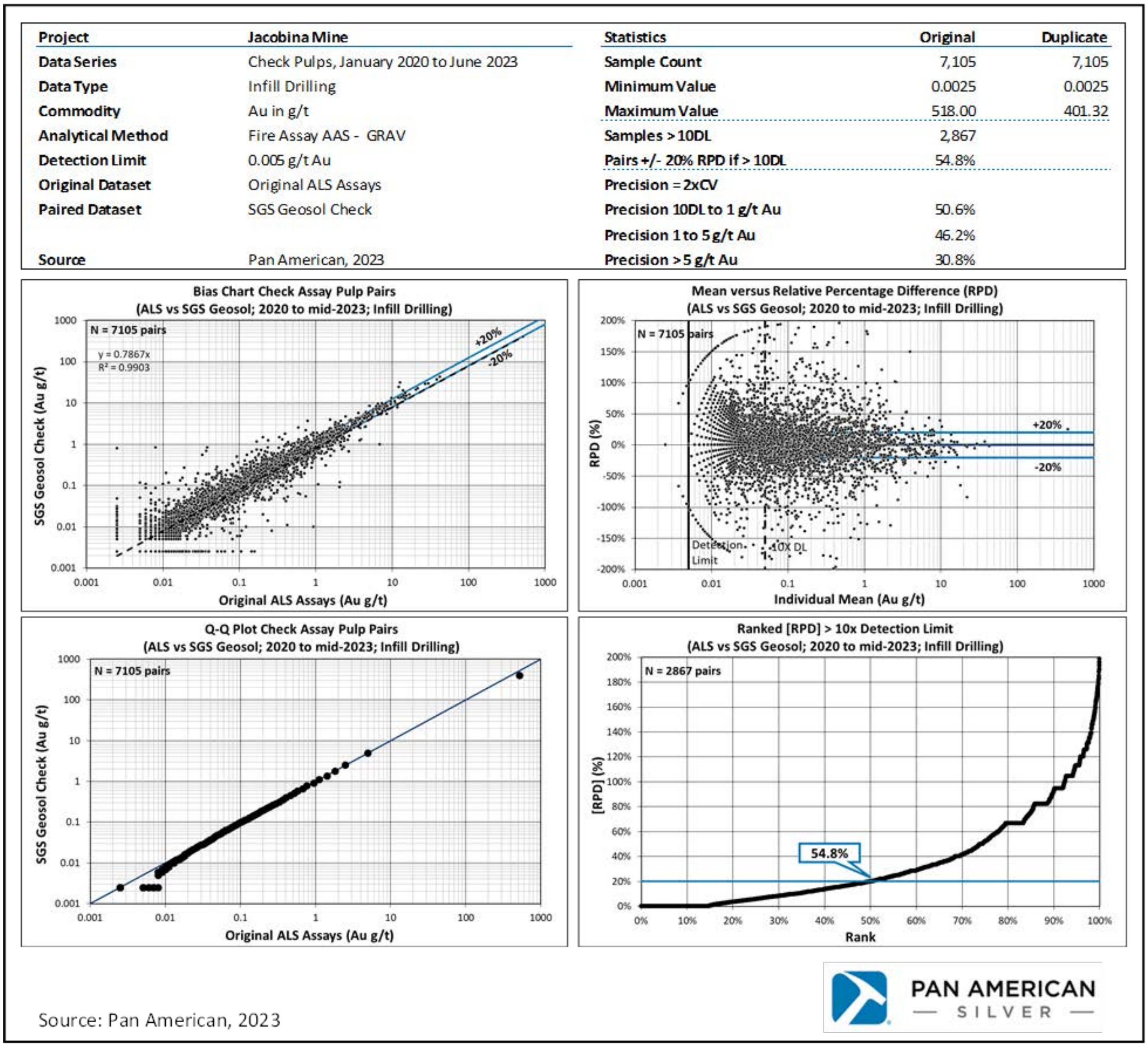


Figure 11-6: Comparison between ALS and SGS Geosol inter-laboratory check assays (infill drilling from January 2020 to June 2033)

Results of the assays analyzed at the Jacobina Mine Laboratory and SGS Geosol show no bias and moderate dispersion, with 46% of the pairs that assayed more than ten times the detection limits returning results within ± 20% RPD. Results of the assays analyzed at ALS and SGS Geosol show no bias and moderate dispersion, with 55% of the pairs that assayed more than ten times the detection limits returning results within ± 20% RPD.

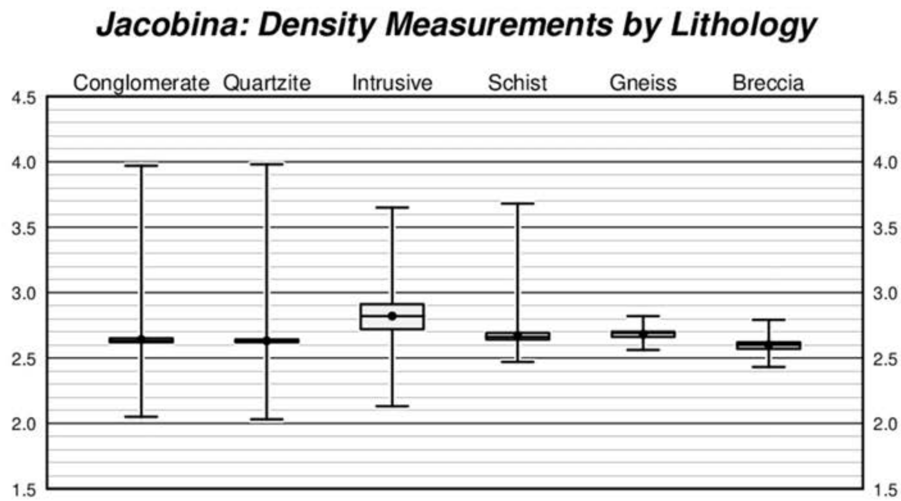
The dispersion pattern for these inter-laboratory pulp duplicate samples is consistent with expectations for this type of sample material. No material bias is detected between the primary and secondary laboratories.

There were no limitations in the ability of the qualified person to verify the data. In the opinion of the qualified person responsible for this section of the technical report, the verification of the sampling data, including the analytical quality control data produced by JMC for samples submitted to various laboratories, suggests that the analytical results delivered by the laboratories are sufficiently reliable for the purpose of mineral resource and mineral reserve estimation.

11.3 Bulk Density

Spatially and geologically representative samples have been measured for specific gravity (or bulk density) using the water displacement method and the results are used for the estimation of tonnes and contained metal in the mineral resource and mineral reserve estimates.

The total number of density measurements is greater than 38,000 with around 60% of them in the conglomerate and 37% in the quartzite; other rock types measured are divided between breccia, gneiss, intrusive, and schist (Figure 11-7).



	Conglomerate	Quartzite	Intrusive	Schist	Gneiss	Breccia	
Number of data	22989	14313	772	201	111	45	Number of data
Mean	2.64	2.63	2.82	2.67	2.68	2.6	Mean
Std. Dev.	0.05	0.05	0.14	0.09	0.04	0.06	Std. Dev.
Coef. of Var.	0.02	0.02	0.05	0.03	0.01	0.02	Coef. of Var.
Maximum	3.97	3.98	3.65	3.68	2.82	2.79	Maximum
Upper quartile	2.65	2.64	2.91	2.69	2.7	2.62	Upper quartile
Median	2.63	2.63	2.82	2.66	2.69	2.6	Median
Lower quartile	2.62	2.62	2.72	2.64	2.66	2.57	Lower quartile
Minimum	2.05	2.03	2.13	2.47	2.56	2.43	Minimum

Source: Pan American, 2023

PAN AMERICAN — SILVER —

Figure 11-7: Jacobina density measurement statistics by lithology

11.4 Sample Security

Samples are handled only by personnel authorized by JMC. Channel samples from the mining operation are delivered directly to the Jacobina Mine Laboratory each day upon completion of underground sampling. All drill core from surface and underground drill holes is taken directly by authorized exploration personnel to a drill logging and sampling area within the secured and guarded mine property. The mineralized core intervals are logged and sampled. Core samples are subsequently delivered to either the Jacobina Mine Laboratory or loaded onto an outsourced company truck and delivered to ALS laboratory in Vespasiano, Minas Gerais, Brazil.

Each sample is assigned a unique sample number that allows it to be traced through the sampling, database, and analytical procedure workflows, and is validated against the original sample site. For exploration drill holes, the remaining half of the split core is stored on-site as a control sample, available for review and resampling if required.

A photographic record is taken and kept for all drill holes.

In the opinion of the qualified person responsible for this section of the technical report, the sample preparation, sample security, and analytical procedures at Jacobina are adequate and consistent with industry standards.

12 Data Verification

This section describes the information verification procedures performed by Pan American and those reviewed by the qualified persons responsible for this technical report. There were no limitations in the ability of the qualified persons to verify the data. All qualified persons have completed site visits to verify available information and discuss with on-site personnel. It is the opinion of the qualified persons that the data used for the purposes of this technical report are adequate.

12.1 Mine Engineering Data Verification

The qualified person, Martin Wafforn, P.Eng., undertakes regular reviews of Pan American's mining fleet; mine operational and production data; grade control data including dilution and ore loss; geotechnical and hydrological studies; waste disposal requirements; environmental and community factors; processing data; development of the life of mine plan including production and recovery rates, capital and operating cost estimates for the mine and processing facilities, transportation, logistics, power and water consumption and future requirements, taxation and royalties; and the parameters and assumptions used in the mineral resource and mineral reserve estimates and economic model.

In the opinion of the qualified person, the data, assumptions, and parameters used to estimate mineral resources and mineral reserves are sufficiently reliable for those purposes.

12.2 Geology Data Verification

The qualified person, Camila Passos, P.Geo., works with Jacobina's resource geology team to create or update certain geological and resource models. They also ensure that the estimation process follows the CIM Mineral Resource and Mineral Reserves Estimation Best Practice Guidelines by joining the peer review of various models.

The exploration work carried out on the Jacobina property is conducted by JMC personnel. JMC implements a series of routine verification procedures to ensure the collection of reliable exploration data. All work is conducted by appropriately qualified personnel under the supervision of trained geologists.

The on-site database administrator, under the supervision of the Jacobina resource geology team, validates the QA/QC results when they are received from the laboratories. The qualified person has reviewed the drilling, sampling, and QA/QC results. The QA/QC database review for the 2020 to 2023 drilling and underground channel sampling results is described in Section 11.2.

In the opinion of the qualified person, the verification of the sampling data, including the data entry and verification procedures of drill hole and channel samples data, and the analytical quality control data produced by JMC for samples submitted to various laboratories, indicate that the analytical results delivered by the laboratories are sufficiently reliable for the purpose of mineral resource and mineral reserve estimation.

12.3 Metallurgy Data Verification

The qualified person, Americo Delgado, P.Eng., undertakes regular reviews of Pan American's processing plants and operational data including metallurgical results, production, reagent consumption, treatment rates, plant availabilities and utilization, pumping capacities, pond levels, solution concentrations, metallurgical and analytical lab procedures, and general business performance.

In the opinion of the qualified person, the metallurgical testing and analytical procedures are reliable for the purposes used in this technical report. The available operating results relating to the recoverability of gold show that the processing methods used at Jacobina are consistent and adequate for the mineralization of the deposit.

12.4 Tailings Data Verification

The qualified person, Carlos Iturralde, P.Eng., undertakes regular reviews of Pan American's tailings storage facilities. JMC prioritizes the management of tailings and is aligned with industry standards and best practices proposed by the Mining Association of Canada (MAC), Toward Sustainable Management (TSM) Protocol, and the Canadian Dam Association (CDA) guidelines.

In the opinion of the qualified person, plans for tailings disposal and monitoring, during design, construction, and operation are considered suitable for the project.

12.5 Environment, Social, and Permitting Data Verification

The qualified person, Matthew Andrews, FAusIMM, undertakes regular reviews of Pan American's environmental and permitting factors.

In the opinion of the qualified person, JMC's environmental studies, project permitting status, social and community involvement, and mine closure plans are considered adequate for this operation based on the information reviewed from the site.

13 Mineral Processing and Metallurgical Testing

13.1 Metallurgical Testing

Metallurgical tests programs were conducted in 2003, 2004, 2021 and 2022 on samples from Jacobina Mine. Test results consistently shows high gold recoveries with an average of 97% for the 29 tests performed by independent laboratories. The test samples were representative of the conglomerate-hosted gold deposit of Jacobina.

In 2003 and 2004, SGS Lakefield Research Limited in Lakefield, Ontario (SGS Lakefield), completed test work on six composites of various grades and ore types and on one overall master composite prepared for cyanide leaching. Samples provided a range of gold grades between 0.5 g/t up to 3.5 g/t gold and representation of oxide, mixed and sulphide mineralization.

The 2003 test program was conducted using cyanide concentrations between 250 ppm and 1,000 ppm with 48 hours leaching time; gold extractions ranged from 97.0% to 98.5% for the master composite. The 2004 test program was conducted using cyanide concentrations of 1,000 ppm with leaching times between 12 hours and 48 hours; gold extractions ranged from 90.8% for a low-grade oxides sample to 98.5% for a high-grade mixed sample, with an average of 97.6% for the master composite.

SGS Geosol in Brazil completed gravity separation test work in 2021 on five gold ore samples from Jacobina. Samples assayed from 2.7 to 4.0 g/t gold and Gravity Recoverable Gold (GRG) numbers ranged from 80% to 84%. The combined concentrate grade, combining the three gravity separation stages, ranged from 210 ppm to 255 ppm gold.

In 2022, engineering consultant Paterson & Cooke and metallurgical laboratory Hazen Research Laboratories, both based in Golden, Colorado, completed test work for gravity concentration and cyanide leaching on a mill feed sample from Jacobina. The main purpose was to evaluate leaching performance at different grind sizes. Results from bottle roll leach tests on the Jacobina mill feed material showed that overall extraction of gold is similar at 225 µm (80% passing size) and 165 µm (80% passing size), with 96.1% and 96.3% gold recovery, respectively; and that gold recovery at 125 µm (80% passing size) was 95.4%. Results therefore suggest that the ultimate leaching recovery penalty associated with changing the grind size is likely small.

13.2 Metallurgical Recovery

The processing plant operation's historical performance and throughput capacity inform the metal recovery forecast for Jacobina. In 2019, Jacobina began to raise throughput to 6,500 tpd as part of the Phase 1 plant expansion project, which involved installing an Advanced Process Control, two additional gravity concentrators, new trash screens, and some slurry pumps. Phase 2 followed with a de-bottlenecking process that increased throughput to the current 8,400 tpd, using a new intensive leaching reactor and a new electrowinning cell.

Planned upgrades for 2024 to optimize extraction capacity and support the 8,500 tpd target at 96.0% gold recovery include two new CIP tanks, upgraded leaching and CIP tank agitators, new tailings pumping station and transportation pipes, new secondary crushing screens, and new grinding trash screens.

There are no known processing factors or deleterious elements that could have a significant effect on potential economic extraction. Table 13-1 summarizes the gold recoveries and throughputs achieved in the plant in the last decade.

Table 13-1: Historical production at Jacobina mineral processing plant

Year	Production				Gold Recovery (% Au)
	Tonnes (t)	Throughput (tpd)	Gold Grade (g/t Au)	Gold (oz)	
2013	1,575,628	4,317	1.57	73,695	92.5 %
2014	1,419,032	3,888	1.78	75,650	92.9 %
2015	1,469,095	4,025	2.17	96,715	94.4 %
2016	1,802,855	4,926	2.17	120,478	95.7 %
2017	1,978,409	5,420	2.21	135,806	96.4 %
2018	2,035,457	5,577	2.30	144,695	96.2 %
2019	2,254,793	6,178	2.28	159,499	96.7 %
2020	2,425,886	6,628	2.37	177,830	96.4 %
2021	2,657,590	7,281	2.26	186,206	96.4 %
2022	3,025,361	8,289	2.10	195,427	95.5 %
2023*	1,554,655	8,589	2.05	96,658	94.4 %

**2023 results up to June 30, 2023*

14 Mineral Resource Estimates

14.1 Mineral Resource Summary

Building the mineralized wireframe models that were used to estimate the block grades began with the development of a structural model that reflected the current understanding of the location and offsets of the many post-mineralization faults present in the mining areas. Lithological wireframe models were then prepared to depict the overall location and distribution of quartz-pebble conglomerate reefs and interbedded massive quartzite beds. These lithological models were subsequently used to prepare wireframe models of the mineralized intervals. No minimum thickness was applied to the mineralized wireframes used to generate the grade estimation domains. Resource domains were modelled within the reefs using a combination of lithology and assay criteria. Domains were modelled along the stratigraphic orientation of the conglomerates, prioritizing gold grades above 0.5 g/t gold. Domains could be extended to include gold grades below 0.5 g/t where needed to avoid non-geological discontinuities in the model.

The mineral resource for Jacobina was estimated in conformity with generally accepted standards set out in CIM Mineral Resource and Mineral Reserves Estimation Best Practices Guidelines (November 2019) and were classified according to CIM Definition Standards for Mineral Resources and Mineral Reserves (May 2014) guidelines. Mineral resources are reported exclusive of mineral reserves. Mineral resources are not mineral reserves and have not demonstrated economic viability. Mineral resources are reported at a cut-off grade of 0.84 g/t gold constrained by conceptual underground mining shapes. The cut-off grade is based on a gold price of US$1,700 per troy ounce and metallurgical recovery of 96%. A minimum mining width of 1.5 m is used to construct the conceptual mining shapes. An overbreak of 0.5 m is also applied to account for dilution. Mineral resources are reported fully diluted within the conceptual shapes.

The Mineral Resource Statement of the Jacobina Gold Mine as of June 30,2023, exclusive of mineral reserves, is presented in Table 14-1.

Table 14-1: Jacobina Mineral Resource Statement, June 30, 2023

Category	Tonnage (kt)	Gold Grade (g/t Au)	Contained Gold (koz)
Measured	49,099	1.61	2,541
Indicated	45,333	1.48	2,162
Measured + Indicated	94,432	1.55	4,704
Inferred	40,128	1.56	2,015

1. *Mineral resources have been estimated by the Jacobina Resources Geology Team under the supervision of Danilo Ribeiro dos Santos, Geology Coordinator, Registered Chartered Professional Member of Australasian Institute of Mining and Metallurgy, MAusIMM CP(Geo) Number 3052712, a fulltime employee of JMC, and Camila Passos, Exploration Coordinator, PGeo. (APGO#2431), a fulltime employee of Yamana Desenvolvimento Mineral S.A. (YDM). Camila Passos is a qualified person as defined by National Instrument 43-101. The mineral resource estimate conforms to the CIM Definition Standards on Mineral Resources and Reserves (2014).*

2. *Mineral resources are reported exclusive of mineral reserves.*

3. *Mineral resources were evaluated using an ordinary kriging algorithm informed by capped composites and constrained by three-dimensional mineralization wireframes.*

4. *Individual bulk density values are used for each estimation domain according to experimental test results.*

5. *Mineral resources are not mineral reserves and have not demonstrated economic viability.*

6. *Mineral resources are reported at a cut-off grade of 0.84 g/t gold within conceptual mining shapes. The cut-off grade is based on a gold price of US$1,700 per troy ounce and a metallurgical recovery of 96%.*

7. *A minimum mining width of 1.5m is used to construct the conceptual mining shapes. An overbreak of 0.5m is also applied to account for dilution. Mineral resources are reported fully diluted within the conceptual shapes.*

8. *All figures are rounded to reflect the relative accuracy of the estimate. Numbers may not add up due to rounding.*

14.2 Resource Database and Validation

All drill core, survey, geological, and assay information used for the mineral resource and mineral reserve estimates is verified and approved by the Jacobina geological staff and maintained in an on-site database. Verification is done in part by using the Leapfrog Geo and Maptek Vulcan software data validation tools. A summary of the drilling and channel sampling databases is provided in Table 14-2.

Table 14-2: Summary of drilling and channel databases used for resource estimation

Mining Block	Closure Date	N° of Drill Holes	N° of Channels
João Belo North	January 06, 2022	486	9263
Morro do Vento	May 05, 2022	1,856	5,360
Morro do Cuscuz	March 31, 2022	593	1,823
Serra do Córrego	August 31, 2018	681	96
Canavieiras South	December 6, 2018	470	5,647
Canavieiras Central	October 28, 2018	348	2,471
Canavieiras North	July 11, 2019	807	1,769
João Belo South	May 9, 2023	105	—
Moro do Vento East	September 09, 2022	31	—
Total		**7,206**	**23,476**

14.3 Interpretation of the Geological Structures, Lithology, and Mineralization

Given the strike length of the favourable mineralized stratigraphic units outlined to date, modelling and preparation of mineral resource estimates were undertaken only for those stratigraphic units located in the vicinity of the current mine infrastructure. To facilitate modelling activities, these were divided into nine mining blocks covering a total strike length of approximately 8,350 m (Table 14-3, Figure 7-3).

Table 14-3: Summary of modelling extents

Model Area	Minimum Northing (m)	Maximum Northing (m)	Strike Length (m)
João Belo North	8,748,500	8,752,260	3,760
Morro do Vento	8,752,200	8,755,300	3,100
Morro do Cuscuz	8,754,900	8,756,600	1,700
Serra do Córrego	8,755,000	8,757,780	2,780
Canavieiras South	8,755,050	8,756,930	1,880
Canavieiras Central	8,756,380	8,758,020	1,640
Canavieiras North	8,757,600	8,758,850	1,250
João Belo South	8,747,702	8,750,475	2,773
Morro do Vento East	8,752,950	8,755,580	2,630

The Leapfrog Geo software package was used to prepare three-dimensional (3D) models of the post-mineralization faults, the lithologies, and the zones of mineralization. The fault surfaces were created as implicit models using various sources of information from drill holes, channel samples, and geological mapping (both current and historical mapping). At Morro do Vento, a total of 17 fault planes were modelled which were used to constrain the subsequent lithological and mineralization wireframe models.

Lithological models for all major gold-bearing reefs, interbedded massive fine-grained quartzite units, and post-mineralization intrusive units were modelled using available underground mapping and drilling data (the cross-section in Figure 7-6 shows an example of lithological modelling).

Mineralization models (or resource domains) are modelled within their respective reefs using a combination of lithology and assay criteria. Domains are modelled along the stratigraphic orientation of the conglomerates, prioritizing gold grades above 0.5 g/t gold. Domains could be extended to include gold grades below 0.5 g/t where needed to avoid non-geological discontinuities in the model. Wireframes were snapped to the limit of the selected samples in each drill hole or underground channel. The mineralized wireframe domains were constrained to within the respective reef models, and were also constrained to their respective fault blocks (Table 14-4).

All structural, lithological, and mineralization models are created in accordance with the procedures described in an internal procedure POP-04-12-3.5-231.

Table 14-4: Number of mineralized wireframes by model area

Model Area	No. of Mineralization Models (Reefs)
João Belo North	11
Morro do Vento	19
Morro do Cuscuz	9
Serra do Córrego	16
Canavieiras South	22
Canavieiras Central	31
Canavieiras North	25
João Belo South	22
Morro do Vento East	22
Total	**120**

14.4 Topography and Excavation Models

The mineralization at Jacobina was extracted by means of open-pit mining methods during the early phases of its production history. Mining of the plant feed is currently achieved by means of underground mining methods from a total of seven mining blocks that access the mineralized stratigraphy along a strike length of approximately eight kilometres. All of the mineralized horizons are accessed via adits and ramps (Figure 14-1).

A topographic surface of the project area, current as of September 2022, was used to code the block models. The topographic map includes one open pit mine (João Belo) that is now depleted; open pit mine operations there have ceased. Wireframe models of the completed underground excavations as of June 30, 2023, were prepared and used to code the block models for the portions of the mineralized zones that have been mined out. For older-vintage excavations, the wireframe models for the underground accesses and stopes were reconstructed by preparing 3D-solids models from information contained on existing two-dimensional paper maps and sections. For more recent underground excavations, solids models of the mine accesses were constructed digitally from data collected using a total station surveying instrument. Digital information collected using cavity-monitoring equipment was used to create 3D excavation models for stopes.

Excavation models were used to code the block model with a single value for both development and stope volumes. The sub-blocking functions of the Maptek Vulcan software package were employed to maximize the accuracy of the block model.

A separate set of depletion solids were created by manual digitization on cross sections, to encompass the excavated stope and development volumes, any remaining intervening material residing as either ribs or sill pillars, and several metres of wall rock material in the hangingwall and footwall of the stope voids (Figure 14-2). The objective of creating this set of depletion solids was to code the block model to exclude this material from either the mineral resource or mineral reserve estimates.

An additional depletion solid was created to define a crown pillar at surface in compliance with geomechanical and environmental restrictions. This was achieved by creating a parallel surface approximately 30 m beneath the topographic surface.

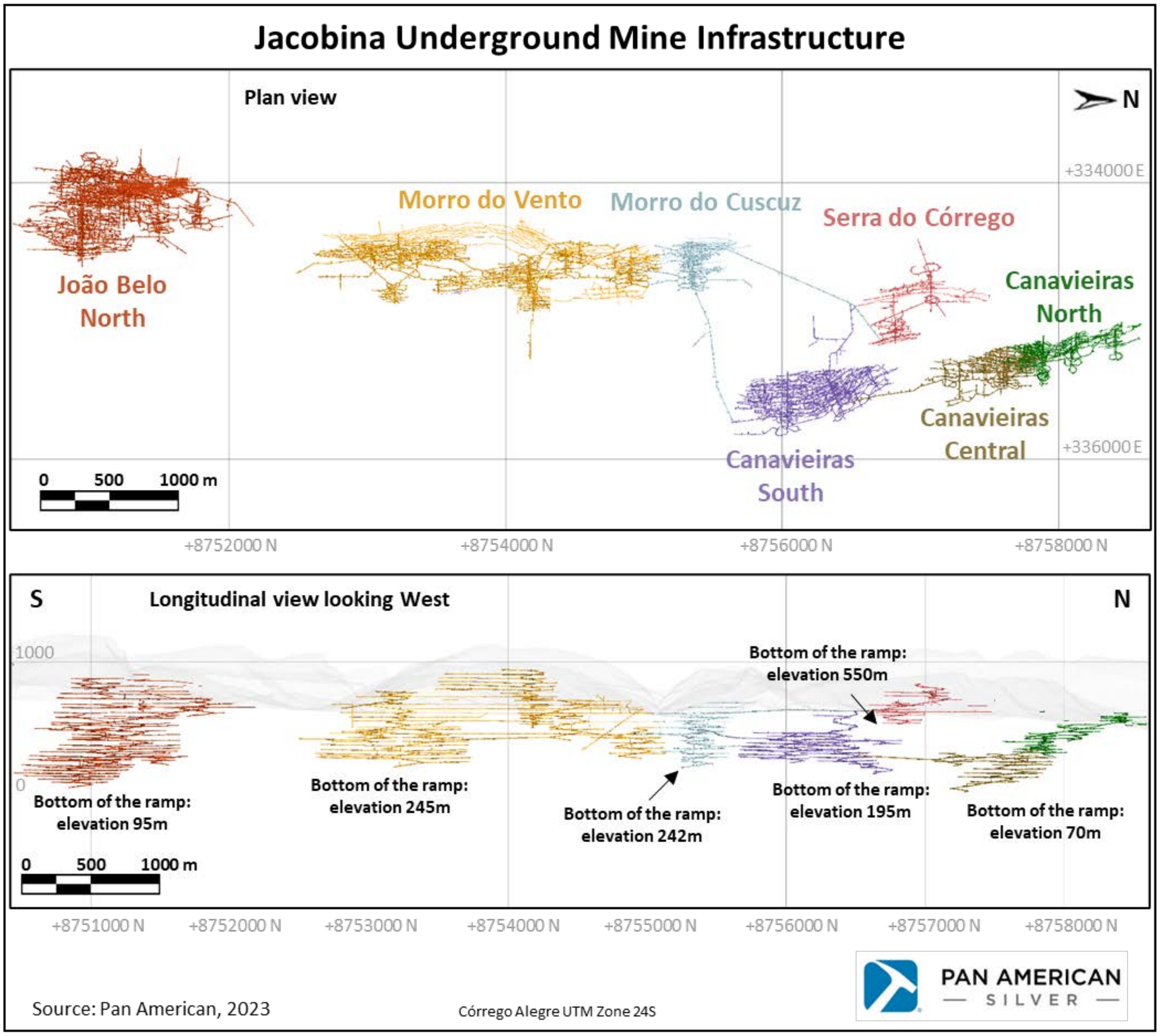


Figure 14-1: Plan (top) and longitudinal view (bottom) of the mine infrastructure

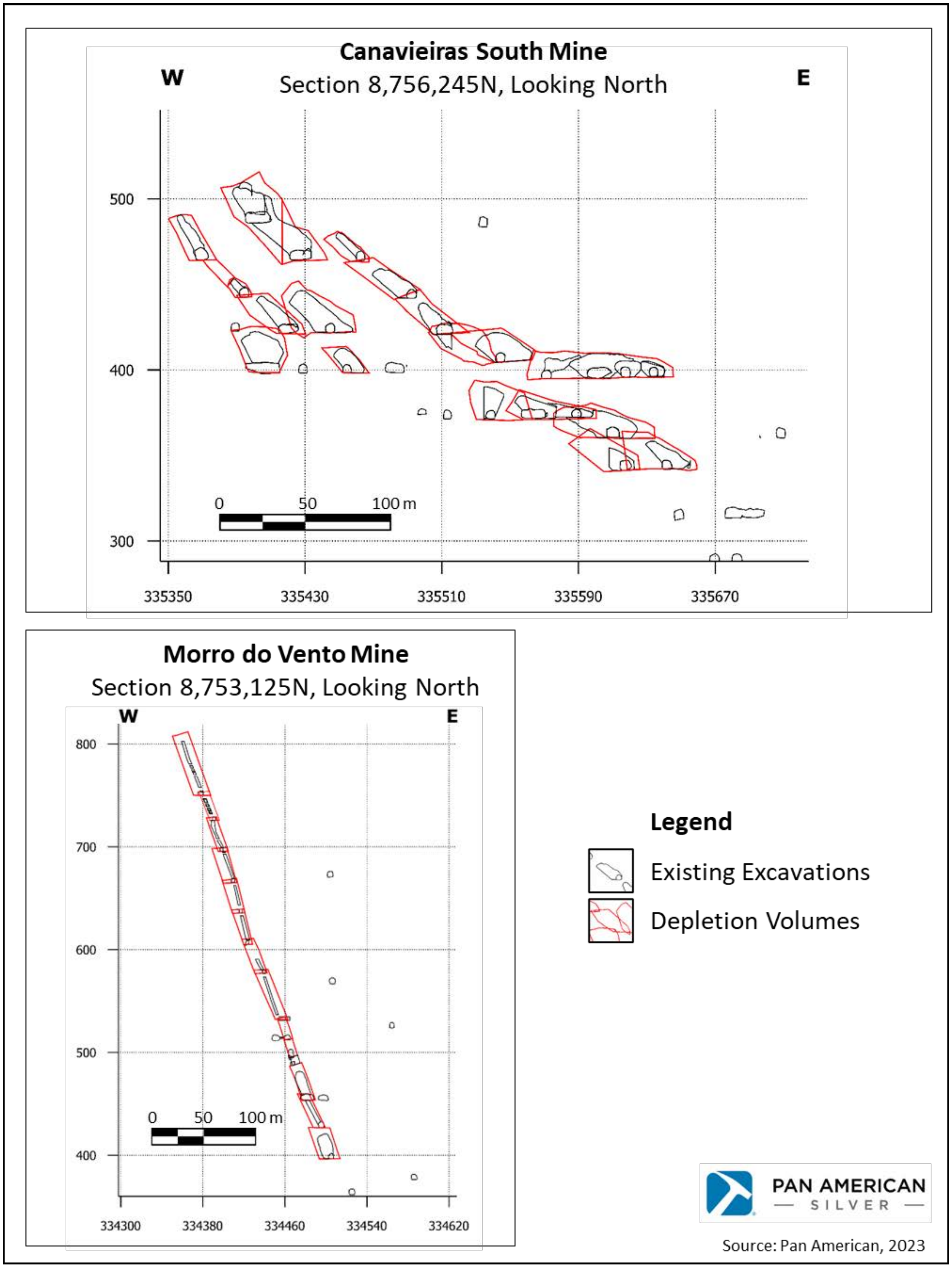
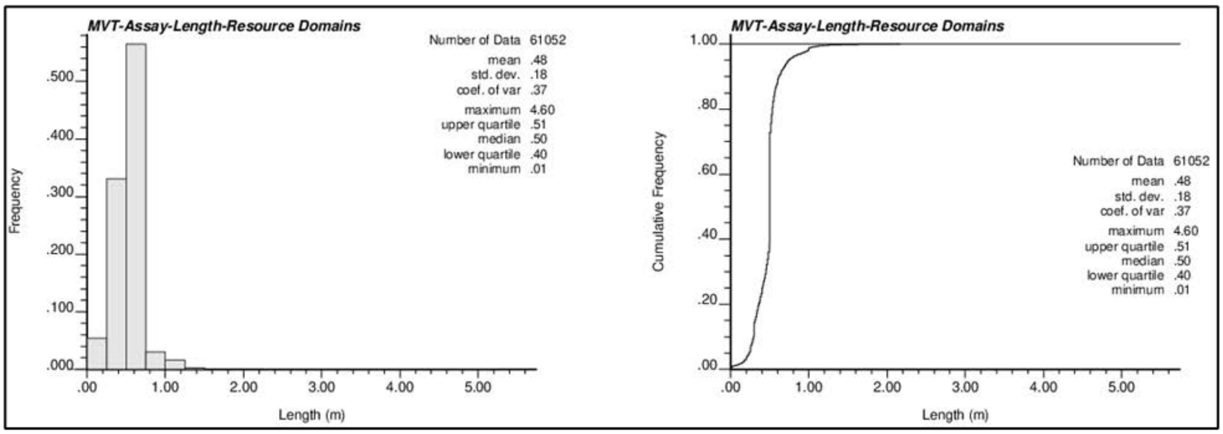


Figure 14-2: Example of excavation and depletion models at Canavieiras South and Morro do Vento mines

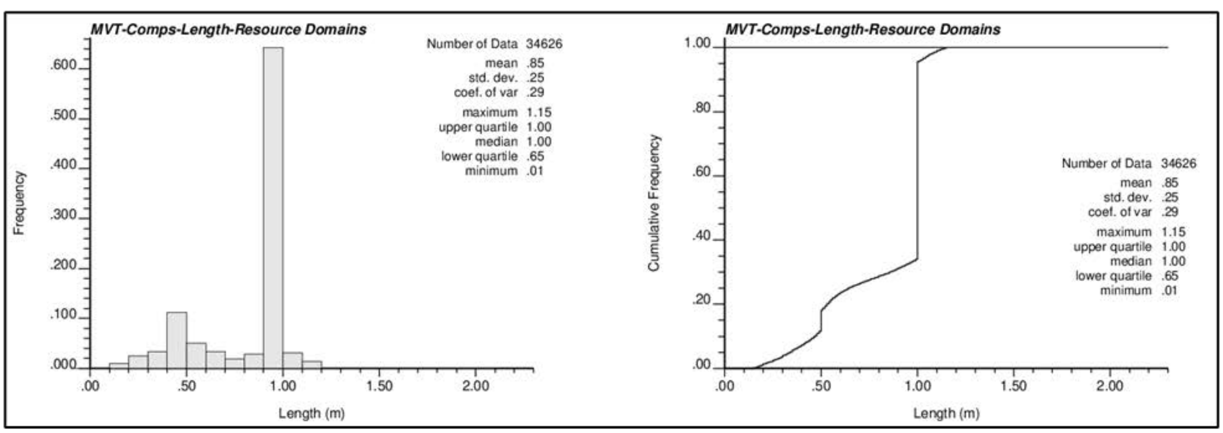
14.5 Compositing Methods

A value of 0.5 m was determined to be the most common sample length at Jacobina. (Figure 14-4 shows an example from MVT). A composite length of 1.0 m was selected for all drill holes and channel samples so that the majority of the assay intervals were not split into separate composite values. Compositing is done by resource domain, so the last composite of a drill hole or a channel can be less than 1.0 m long. If the last composite is 0.15 m or less, the composite is merged with the previous composite. When a given channel sample's length is less than 1.0 m, the average grade of the composite sample is utilized. The summary statistics and box plots of the composited length are examined by mean, minimum, and maximum values and are shown in Figure 14-5 and Figure 14-6 with an example from MVT.



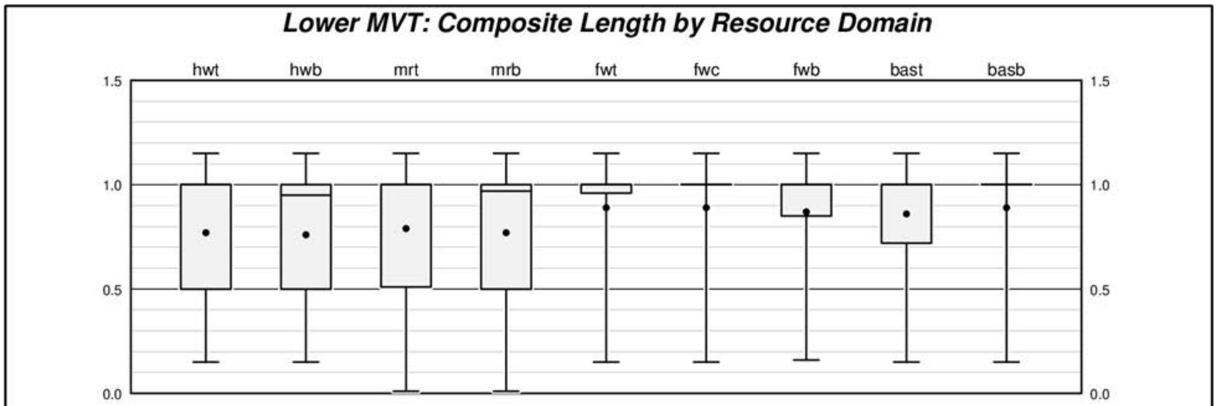
Source: Pan American, 2023

Figure 14-3: Assay lengths for resource domains at Morro do Vento Mine



Source: Pan American, 2023

Figure 14-4: Composite lengths for resource domains at Morro do Vento Mine



	hwt	hwb	mrt	mrb	fwt	fwc	fwb	bast	basb	
Number of data	1252	1618	4085	3682	4580	3868	2684	922	1238	Number of data
Mean	0.77	0.76	0.79	0.77	0.89	0.89	0.87	0.86	0.89	Mean
Std. Dev.	0.26	0.27	0.27	0.28	0.22	0.21	0.23	0.24	0.22	Std. Dev.
Coef. of Var.	0.34	0.35	0.34	0.36	0.24	0.24	0.26	0.29	0.25	Coef. of Var.
Maximum	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	1.15	Maximum
Upper quartile	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	Upper quartile
Median	1.0	0.95	1.0	0.97	1.0	1.0	1.0	1.0	1.0	Median
Lower quartile	0.5	0.5	0.51	0.5	0.96	1.0	0.85	0.72	1.0	Lower quartile
Minimum	0.15	0.15	0.01	0.01	0.15	0.15	0.16	0.15	0.15	Minimum

Source: Pan American, 2023

Figure 14-5: Box and whisker plot of composite samples from Lower Morro do Vento

14.6 Sample Statistics and Grade Capping

Descriptive statistics were computed for every mineralized layer considering raw and composited datasets; the exploratory analysis was done with histograms, probability plot and box-plots. This procedure is a check for inconsistencies in assay and length values. Declustering weights were also computed and were reviewed for statistical analysis.

The presence of local high-grade outliers could potentially affect the accuracy of the mineral resource estimate. Therefore, composite samples were statistically examined for the presence of grade outliers by using a combination of methodologies such as inspection of probability plots (calculated with and without considering declustering weights), histogram analysis, relative error analysis, parrish method, and indicator correlation plot (Figure 14-4). Once the outliers were identified, appropriate capping values were established and used. Each mineralized resource domain was examined separately (Figure 14-7). The capping values are listed in Table 14-5.

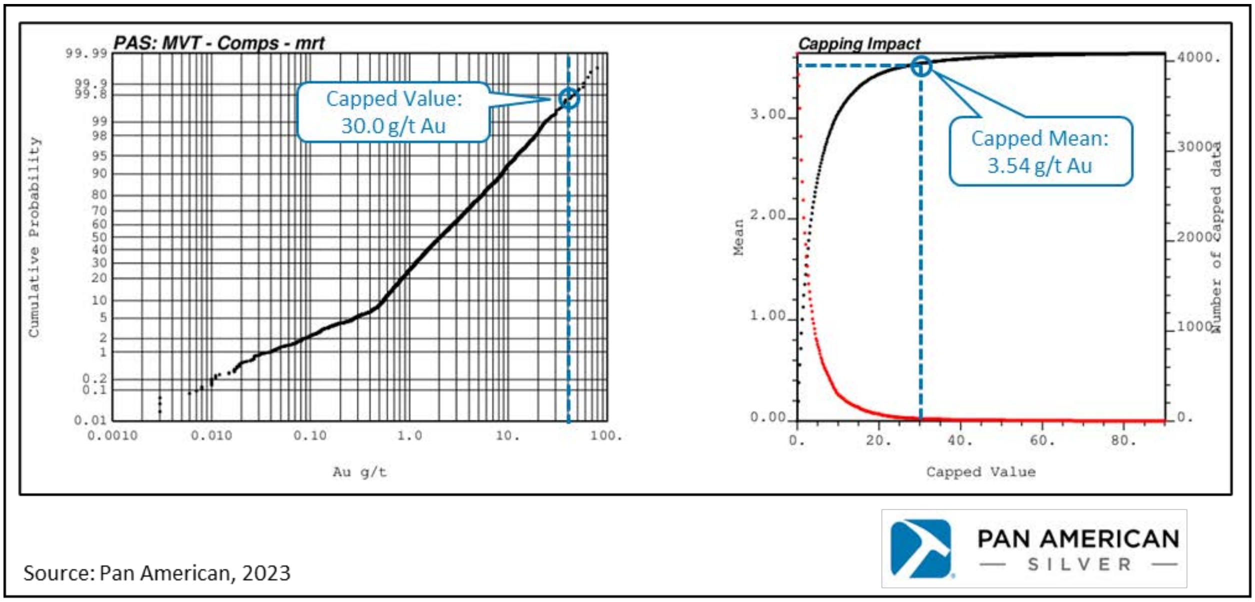


Figure 14-6: Probability plot and sensitivity analysis used for selection of capping value, Morro do Vento Mine (mrt resource domain)

Table 14-5: Summary of capping values by resource domain

CAC Domains	Capping Value (g/t Au)
manc	4.50
manc1a	12.00
manc1	6.50
manc2	4.00
manc3	3.50
manc4	—
manb1	21.00
manb	23.50
holt	5.50
holc	6.50
holc1	4.00
qtolvl	2.50
lvlt	16.00
lvlc1	24.50
lvlc2	15.50
lvlc3	8.00
lvlc4	10.50
lvlc5	5.50
lvlc6	8.00
lvlc7	5.00
lvlc8	—
lvlb	15.00
qtomu	4.50
mut	18.00
muc1	8.50
mub	15.00
qtolut	2.50
qtolbu	5.00
lut	78.00
luc	9.00
lub	21.00

CAN Domains	Capping Value (g/t Au)
mant	9.00
manc3	9.50
manc2	6.50
manc1	6.50
manb	25.00
qto_hol	5.00
holt	21.00
holc	24.50
holb	8.50
lvlt	16.50
lvlc2	7.50
lvlc1	29.00
lvlb	18.00
mut	12.50
muc	23.50
mub	10.50
qto_lu	11.00
lut	58.00
lub	15.50
qto_pir	12.50
pirt	61.50
pirb	36.50
libt	19.50
libc	18.00
libb	19.00

SCO Domains	Capping Value (g/t Au)
Manc1	22.29
Manc2	9.90
mspc	8.03
Lvlt	5.43
Lvlc	11.21
Lvlc3	7.60
Lvlc4	4.71
Lvlc5	4.71
Lvlc8	4.71
Lvlb	12.98
Mut	14.21
Muc	11.36
Mub	15.14
Lut	27.13
Luc	6.11
Lub	8.75

CAS Domains	Capping Value (g/t Au)
mant	5.50
manc	7.52
manc1	5.00
manc2	5.00
manc3	3.00
manb	5.50
holt	9.00
holc	5.00
holc1	5.00
holc2	3.50
mspc	29.50
lvlt	46.00
lvlc	21.50
lvlc1	16.50
lvlc2	11.00
lvlb	25.00
mut	40.00
muc	28.00
mub	29.50
lut	30.00
luc	24.00
lub	19.00

MCZ Domains	Capping Value (g/t Au)
hw	8.00
mrt	18.00
mrb	14.00
fwt	15.50
fwc	14.00
fwb	10.00
bast	18.50
basc	18.50
basb	26.00

JBS Domains	Capping Value (g/t Au)
mspc	—
lvlt	—
lvlc	6.00
lvlb	2.50
lmt	5.00
lmc	6.00
lmc1	5.00
lmc2	5.00
lmc3	5.50
lmb	1.50
mpct	6.00
mpcc	10.00
mpcb	3.00
spct	5.00
spcc	4.00
spcb	5.00
fwt	—
fwc	6.00
fwc1	4.00
fwc2	6.00
fwc3	—
fwb	—

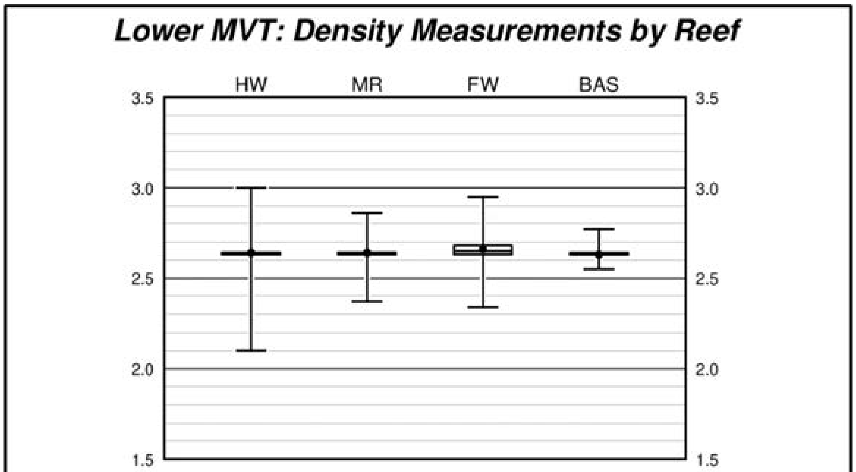
MVT Domains	Capping Value (g/t Au)
mspc	7.46
lvlt	11.41
lvlb	9.27
mut	15.14
muc	10.23
mub	8.97
flu	9.84
lut	15.30
luc	10.60
lub	5.02
hwt	13.00
hwb	17.00
mrt	30.00
mrb	30.00
Fwt	18.50
Fwc	17.00
Fwb	12.50
Bast	20.00
Basb	25.50

JBN Domains	Capping Value (g/t Au)
mspc	4.50
lvlt	11.00
lvlc	5.50
lvlb	13.50
lmt	15.00
lmc1	11.00
lmc	19.50
lmb	15.50
mpct	17.00
mpch	19.00
spc	12.50

MVE Domains	Capping Value (g/t Au)
mant	—
manb	—
holt	2.80
holc3	2.40
holc2	1.50
holc1	—
holb	—
lvlt	—
lvlc2	—
lvlc1	—
lvlb	4.10
mut	—
muc4	—
muc3	—
muc2	2.70
muc1	8.00
mub	6.00
lut	—
luc3	—
luc2	2.60
luc1	—
lub	—

14.7 Bulk Density

Several thousand density measurements were collected on drill core over the years, resulting in good understanding of the density values and variations for the different mineralized zones and wall rocks. In general terms, the variation in density values of individual reefs is low (Figure 14-8). Density values, which are dependent on pyrite content, were determined individually for each reef. These values are summarized in Table 14-6.



	HW	MR	FW	BAS	
Number of data	2394	248	1192	160	Number of data
Mean	2.64	2.64	2.66	2.63	Mean
Std. Dev.	0.04	0.04	0.05	0.02	Std. Dev.
Coef. of Var.	0.01	0.02	0.02	0.01	Coef. of Var.
Maximum	3.0	2.86	2.95	2.77	Maximum
Upper quartile	2.64	2.64	2.68	2.64	Upper quartile
Median	2.64	2.64	2.65	2.63	Median
Lower quartile	2.63	2.63	2.63	2.63	Lower quartile
Minimum	2.1	2.37	2.34	2.55	Minimum

Source: Pan American, 2023

Figure 14-7: Summary of the density values for the Lower Morro do Vento

Table 14-6: Block model bulk density values

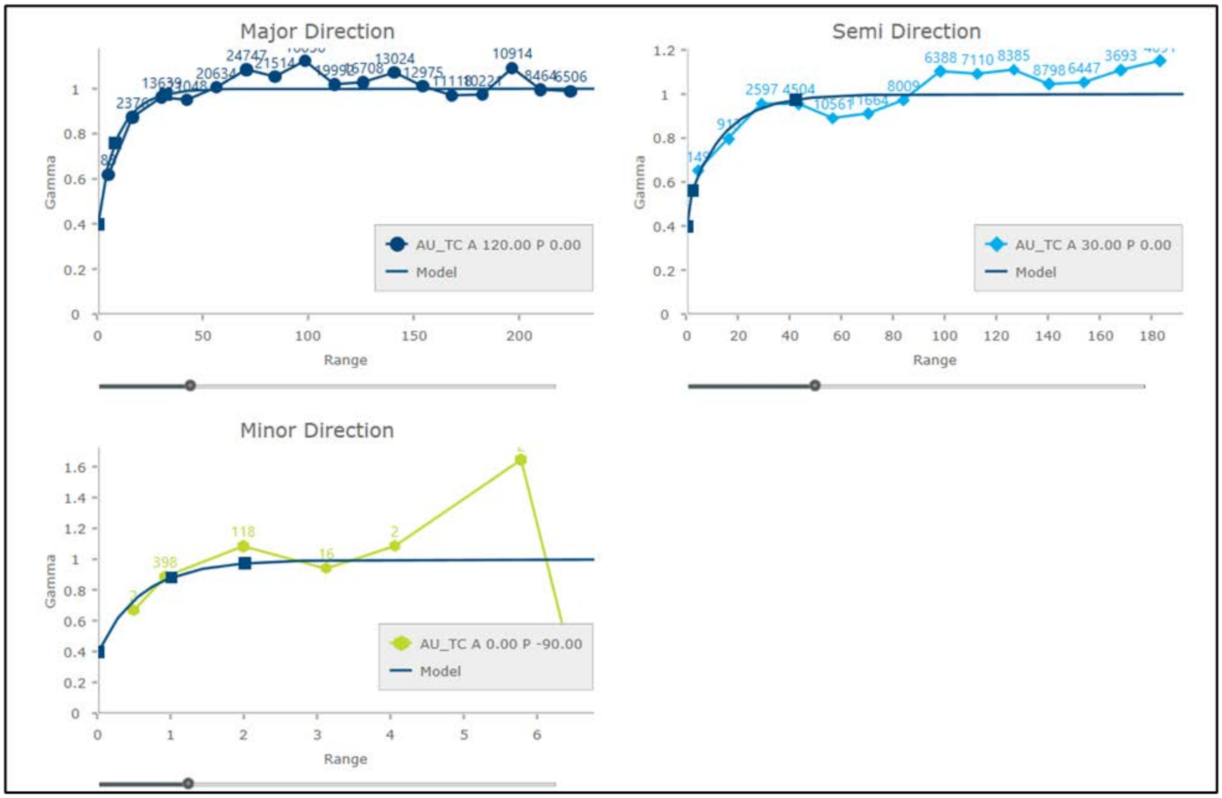
Reef	JBN	MVT	MCZ	SCO	CAS	CAC	CAN	JBS	MVE
	(t/m^3)								
MAN	—	—	—	2.63	2.63	2.64	2.63	—	2.63
QTO_HOL	—	—	—	—	—	—	2.64	—	—
HOL	—	—	—	—	2.64	2.64	2.64	—	2.63
LIB	—	—	—	—	—	—	2.63	—	—
QTO_PIR	—	—	—	—	—	—	2.63	—	—
PIR	—	—	—	—	—	—	2.63	—	—
MSPC	2.64	2.62	—	2.63	2.66	—	—	2.63	—
QTO_LVL	—	—	—	—	—	2.63	—	—	—
LVL	2.63	2.62	—	2.62	2.64	2.64	2.64	2.62	2.63
QTO_MU	—	—	—	—	—	2.64	—	—	—
MU	—	2.61		2.62	2.64	2.63	2.64	—	2.63
LMPC	2.63	—	—	—	—	—	—	2.63	—
FLU	—	2.60	—	—	—	—	—	—	—
QTO_LU	—	—	—	—	—	2.62	2.62	—	—
LU	—	2.62	—	2.62	2.64	2.64	2.63	—	2.63
MPC	2.63	—	—	—	—	—	—	2.62	—
QTO_SPC	—	—	—	—	—	—	—	—	—
SPC	2.65	—	—	—	—	—	—	2.65	—
HW	—	2.64	—	—	—	—	—	—	—
MR	—	2.64	—	—	—	—	—	—	—
FW	—	2.66	—	—	—	—	—	2.64	—
BAS	—	2.63	—	—	—	—	—	—	—
WASTE	2.63	2.64	2.62	2.62	2.63	2.63	2.66	2.62	2.63

14.8 Variography

Due to the degree of gentle undulations in the stratigraphy and the number of post-mineralization brittle faults that are observed in the mine stratigraphy, a modified workflow was adopted for the preparation of the block models in the various mining blocks. The process incorporates reconstruction and unfolding using the Isatis.neo software package by Geovariances.

The principal steps begin with the preparation of wireframe models of the structure and mineralized zones using existing drill hole and channel sample information, combined with geological information derived from detailed production mapping. The wireframe models are used to prepare block models of the mineralization. These block models are then manually restored for any structural offsets. These displacements are also applied to all drill hole and channel sample information so as to reconstruct and reflect the mineralization distribution in the original state. The next step is to carry out an unfolding step in which the reconstructed folded block models and all sample information are transformed to a flattened plane.

Variography and grade estimation is completed on individual resource domains after the block model and sampling data has been transformed back to its original stratigraphic position (unfaulted and unfolded). Once all estimation passes have been completed, the flattened block model is subjected to a back-transformation step that converts the estimated block grades back to their correct location in 3D space. For JBS, the variogram analysis was performed in the original position of the resource domains and the estimates were done by fault block. The variography studies were performed in Vulcan Software for all zones. Figure 14-9 shows an example variogram built for the mrt resource domain at MVT. The GSLib (Geostatistical Software Library) software was used to calculate and model gold variograms in JBS. The variogram parameters for the main domains of each mine is presented in Table 14-7. MVE was estimated using an inverse distance to a power of two methodology so is excluded from the table.



Source: Pan American, 2023

Figure 14-8: Gold variogram for mrt resource domain at Morro do Vento Mine

Table 14-7: Variogram parameters for the main resource domains of each mine/project

Mine/ Domain	Str[1]	Contribution	Model	Major Axis	Semi-Major Axis	Minor Axis	Angles[2]			Bearing	Plunge	Dip
				m	m	m	1	2	3	1	2	3
JBN / lmc	C_0	0.37	Nugget	—	—	—	120	0	0	120	0	0
	C_1	0.52	Sph	32	20	2.8	120	0	0	120	0	0
	C_2	0.02	Sph	65	40	∞	120	0	0	120	0	0
	C_3	0.09	Sph	63	∞	∞	—	—	—	120	—	—
MVT / mrt	C_0	0.40	Nugget	—	—	—	120	0	0	120	0	0
	C_1	0.10	Exp	8	2	1	120	0	0	120	0	0
	C_2	0.50	Exp	32	42	2	120	0	0	120	0	0
	C_3	—	—	—	—	—	—	—	—	—	—	—
MCZ / bast	C_0	0.38	Nugget	—	—	—	150	0	0	150	0	0
	C_1	0.41	Sph	20	22	1.5	150	0	0	150	0	0
	C_2	0.22	Sph	1.6	42	∞	150	0	0	150	0	0
	C_3	—	—	—	—	—	—	—	—	—	—	—
SCO / lut	C_0	0.35	Nugget	—	—	—	0	0	0	0	0	0
	C_1	0.49	Sph	18.5	45	1.6	0	0	0	0	0	0
	C_2	0.16	Sph	70	50	2.1	0	0	0	0	0	0
	C_3	—	—	—	—	—	—	—	—	—	—	—
CAS / lut	C_0	0.18	Nugget	—	—	—	45	0	0	45	0	0
	C_1	0.70	Exp	15	15	0.6	45	0	0	45	0	0
	C_2	0.09	Exp	125	52	2	45	0	0	45	0	0
	C_3	0.04	Exp	138	83	∞	45	—	—	45	—	—
CAC / lut	C_0	0.42	Nugget	—	—	—	135	0	0	135	0	0
	C_1	0.23	Sph	43	30	2	135	0	0	135	0	0
	C_2	0.28	Sph	43	47	∞	135	0	0	135	0	0
	C_3	0.07	Sph	84	∞	∞	135	—	—	135	—	—
CAN / pirb	C_0	0.19	Nugget	—	—	—	0	0	0	315	0	0
	C_1	0.38	Exp	110	80	0.5	0	0	0	315	0	0
	C_2	0.43	Sph	1	50	7	0	0	0	315	0	0
	C_3	—	—	—	—	—	—	—	—	—	—	—

[1] *Structure*
[2] *The rotation angles are shown in Vulcan convention and were calculated after the unfolding process.*

Mine/ Domain	Str[1]	Contribution	Model	Major Axis	Semi-Major Axis	Minor Axis	Datamine Angles[2]		
				m	m	m	Z	X	Z
JBS[3] / lmc	C_0	0.10	Nugget	—	—	—	90	56	5
	C_1	0.24	Exp	21	15	15	90	56	5
	C_2	0.66	Sph	126	88	88	90	56	5
	C_3	—	—	—	—	—	—	—	—

[1] *Structure*
[2] *The rotation angles are shown in Vulcan convention and were calculated after the unfolding process.*
[3] *The variogram analysis and estimates were performed in the original position for JBS resource domains.*

14.9 Block Models

Block models for most of the mining areas (all mines except João Belo South (JBS) and Morro do Vento East (MVE) were created using Maptek Vulcan from their original 3D position. João Belo South and Morro do Vento East block models were created in Datamine Studio RM software package. The block models employed a variable block size strategy. For those blocks contained within a mineralized wireframe outline, the block sizes are set at 1 × 1 × 1 m. For those blocks that are located outside of the boundary of a mineralized wireframe, the parent block size was set at 10 × 10 × 10 m, with sub-blocking to 1 × 1 × 1 m. A summary of the block model parameters is provided in Table 14-8 and the block model variables are provided in Table 14-9.

Table 14-8: Generalized block model parameters

Mine	Axis	Block Size (m)		Origin*	Number of Cells	Rotation Angles[2]
		Parent	Subcell			
JBN	X	10	1	333,680	132	90
	Y	10	1	8,748,500	376	—
	Z	10	1	-590	189	—
MVT	X	10	1	334,000	250	90
	Y	10	1	8,752,200	310	—
	Z	10	1	-1000	216	—
MCZ	X	10	1	334,100	130	90
	Y	10	1	8,754,900	170	—
	Z	10	1	-200	119	—
SCO	X	10	1	334,420	114	90
	Y	10	1	8,755,000	278	—
	Z	10	1	-270	145	—
CAS	X	10	1	335,240	58	90
	Y	10	1	8,755,050	188	—
	Z	10	1	50	77	—
CAC	X	10	1	335,100	47	90
	Y	10	1	8,756,380	164	—
	Z	10	1	-320	102	—
CAN	X	10	1	334,920	62	90
	Y	10	1	8,757,600	125	—
	Z	10	1	-120	112	—
JBS	X	10	2	333,352	281	90
	Y	10	2	8,750,487	112	56
	Z	20	0.2	824	37	—
MVE	X	20	1	334,840	269	88
	Y	10	1	8,752,950	79	57
	Z	5	0.25	-500	279	—

[1] UTM grid (Datum: Córrego Alegre)
[2] JBS and MVE rotation angles are Datamine Angles (Z X Z). For all other mines, the Vulcan angles convention was used.

Table 14-9: Generalized block model variables

Attribute Name	Type	Decimals	Background	Description
ad	Float	0	-99	Average distance Block x Samples
au	Float	0	-99	Gold estimated grades
bound	Character	—	waste	Flag orebody ID
chn	Integer	—	-99	Channel sample zone for classification
class_b	Integer	—	-99	Official Resource Classification
data	Integer	—	20220831	Date in yyyymmdd
density	Float	0	2.624	Density
deplet	Integer	—	0	Geological deplete
geo	Character	—	out	Flag Reef Name
id3	Float	0	-99	Gold estimated grades with ID3
island	Integer	—	-99	Shell
ke	Float	0	-99	Kriging efficiency
kv	Float	0	-99	Kriging variance
lp	Float	0	-99	Lagrange Parameter
mine	Character	—	jbn	JBN
mined_out	Integer	—	0	Mined out
nh	Integer	—	-99	Number of holes
nn	Float	0	-99	Gold estimated grades near neighbour
ns	Integer	—	-99	Number of samples
octi	Float	0	-99	Octant information
octu	Float	0	-99	Octant used
oxi	Integer	—	-99	1 Sap 2 oxi 3 Southf
prazo	Character	—	mp	LP_Long-Term MP_Medium-Term CP_Short-Term
run	Integer	—	-99	Estimative Resource Classification
sil30	Integer	—	0	Blocks below 30 m surface
sr	Float	0	-99	Slope regression
topo	Character	—	rock	Topographic data

Block model grades were interpolated into blocks with the ordinary kriging (OK) algorithm, using the capped composite grades for each individual domain separately. Gold grades were estimated for the waste intervals located between the mineralized domains. The restricted search function of the Maptek Vulcan software package was used to limit the influence of high-grade sample values to within 3 m of the composite. Several estimation passes were applied using increasing search ellipse sizes and different estimation parameters. A summary of the general search strategies used to prepare the estimation on the flattened block models is presented in Table 14-10.

Table 14-10: Summary of the general estimation search parameters

Parameter[1]	1st Pass	2nd Pass	3rd Pass	4th Pass
Interpolation method	OK	OK	OK	OK
Search range X (relative to variogram range)	15	40	70	150
Search range Y (relative to variogram range)	6	35	65	100
Search range Z (relative to variogram range)	1	2	4	15
Minimum number of composites	4	3	2	1
Maximum number of composites	8	10	12	8
Octant search	Yes	Yes	Yes	Yes
Minimum number of octant	—	—	—	—
Minimum number of composites per octant	4	3	2	—
Maximum number of composites per octant	6	6	6	6
Maximum number of composites per boreholes	2	2	2	2

[1] *Search parameters vary for each mine and domain. The most common parameters are shown in this table.*

14.10 Block Model Validation

The block model was validated using visual comparison of block estimates and informing composites, and statistical comparisons between composites and block model distributions at zero cut-offs. Every estimated domain was visually compared against the informing composites. An example for gold in the mrt domain at MVT is provided in Figure 14-9 and another example in the lmc domain from JBS project is provided in Figure 14-10. No significant deviations between the block model and informing data were found.

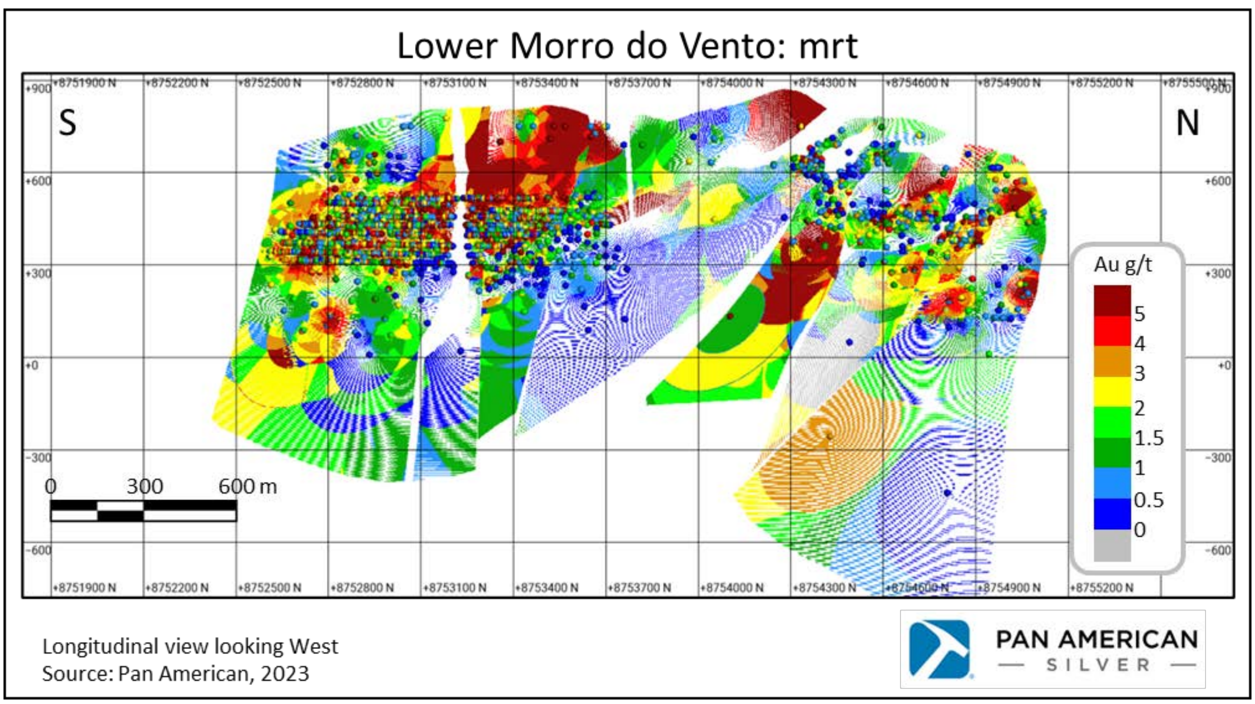


Figure 14-9: Visual validation of the block model against informing composites (Lower Morro do Vento: mrt resource domain)

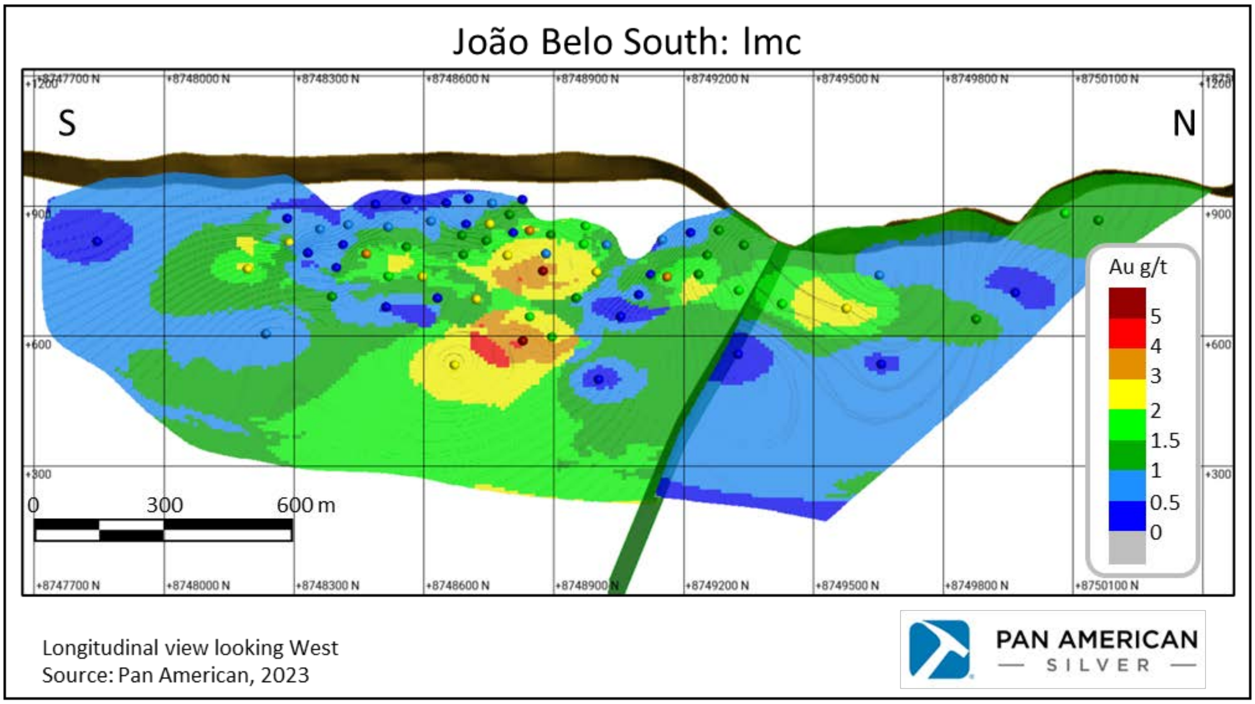


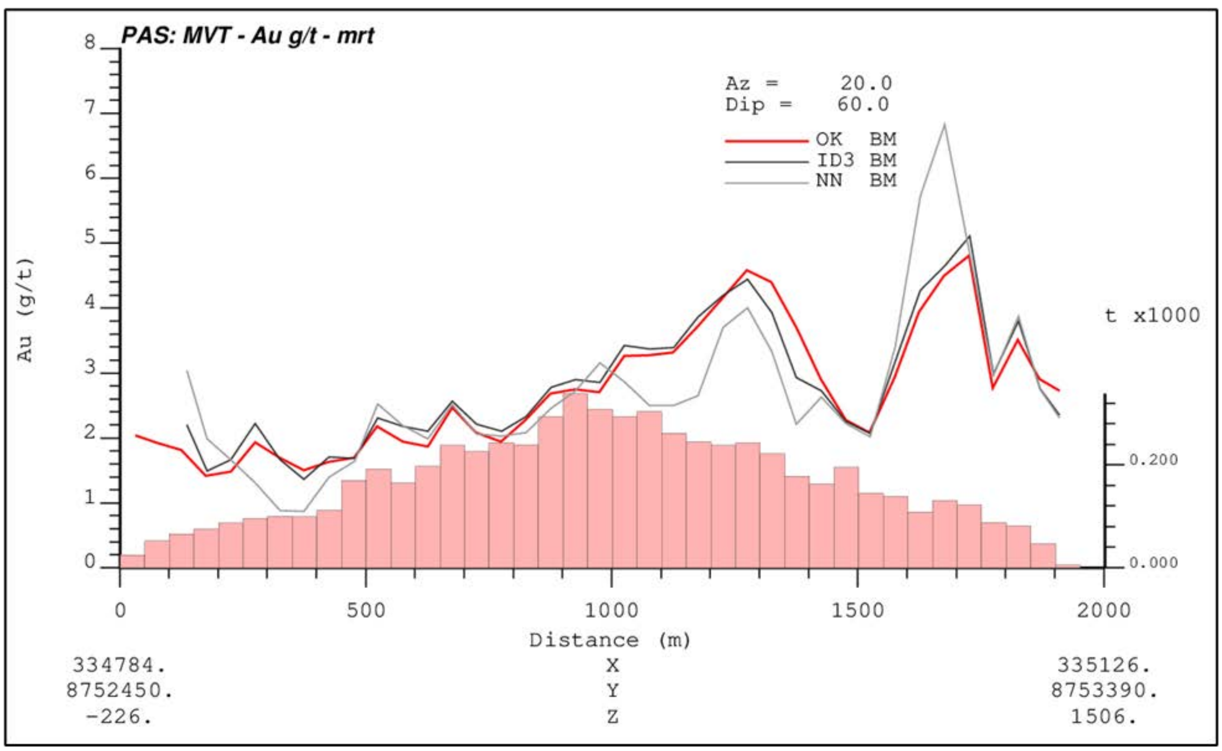
Figure 14-10: Visual validation of the block model against informing composites (João Belo South: lmc resource domain)

The block grade models from each of the interpolated resource domains were systematically validated against their corresponding composite data set (capped and declustered), nearest neighbour (NN), and inverse distance to the power of three (ID^3) models in order to validate appropriate reproduction of the input data. The ID^3 interpolations were estimated with the same parameters as the OK estimate. The average grades of the various datasets are presented in Table 14-11 with an example from Morro do Vento.

Visual inspection of the block model results against the input data is a useful tool to detect any spatial artefacts that may arise from the interpolation setup. The block model should honour the input data within reasonable limits. The composite data, block model, and geological overlays were reviewed on the computer screen on cross-sections, longitudinal sections, and plans. This inspection determined that the representation of the grade distribution, based on the drilling information, was found to be adequate and accurate. An example swath plot for mrt resource domain at MVT is presented in Figure 14-11.

Table 14-11: Statistical validation of the estimated block model (Morro do Vento - mrt domain)

	Samples (Capped and Declustered)	OK	ID3	NN
Number of blocks	—	2,432,787	2,432,787	2,432,787
Number of samples	4,085	—	—	—
Gold Statistics (g/t Au):				
Minimum	—	0.01	—	—
Q1	0.57	1.25	1.22	0.62
Median	1.28	2.36	2.17	1.29
Q3	3.06	3.90	3.80	3.04
Maximum	30.00	30.00	30.00	30.00
Mean	2.73	3.01	2.98	2.81
Standard deviation	4.17	2.58	2.76	4.51
Variance	17.42	6.67	7.64	20.34
Coefficient of variation	1.53	0.86	0.93	1.60



Source: Pan American, 2023

Figure 14-11: Swath plot for mrt resource domain, Morro do Vento

14.11 Classification of Mineral Resources

The mineral resource classification was done within each resource domain based on distance from drill holes. The block models were flagged using a distance buffer from the wireframe solids. The blocks inside a 30 m radius from a minimum of three drill holes composites were classified as measured mineral resources. The blocks inside a 30 to 80 m radius from the minimum of three drill holes composites were classified as indicated mineral resource. Finally, the blocks within a distance between 80 and 150 m from a single drill hole composite were classified as inferred mineral resource. A manual post-processing smoothing step was subsequently performed. Longitudinal sections of the mineral resource categories are shown in Figure 14-12 and Figure 14-13.

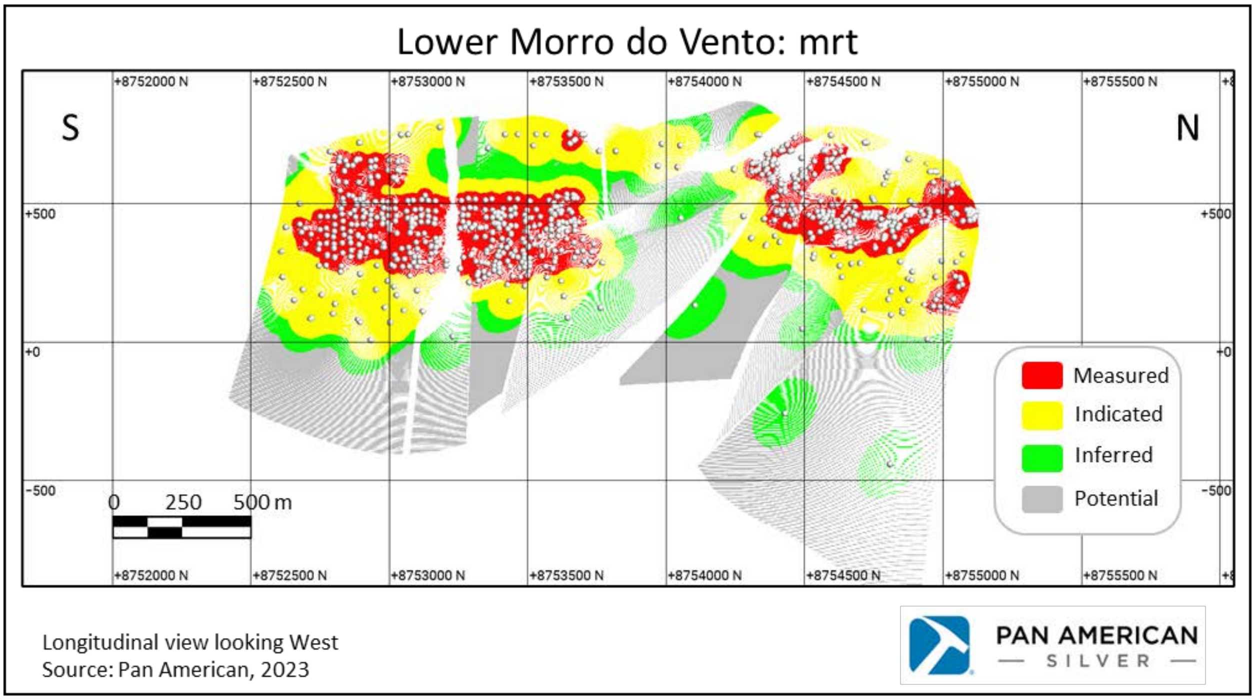


Figure 14-12: Longitudinal section of classified block models at Morro do Vento (mrt resource domain)

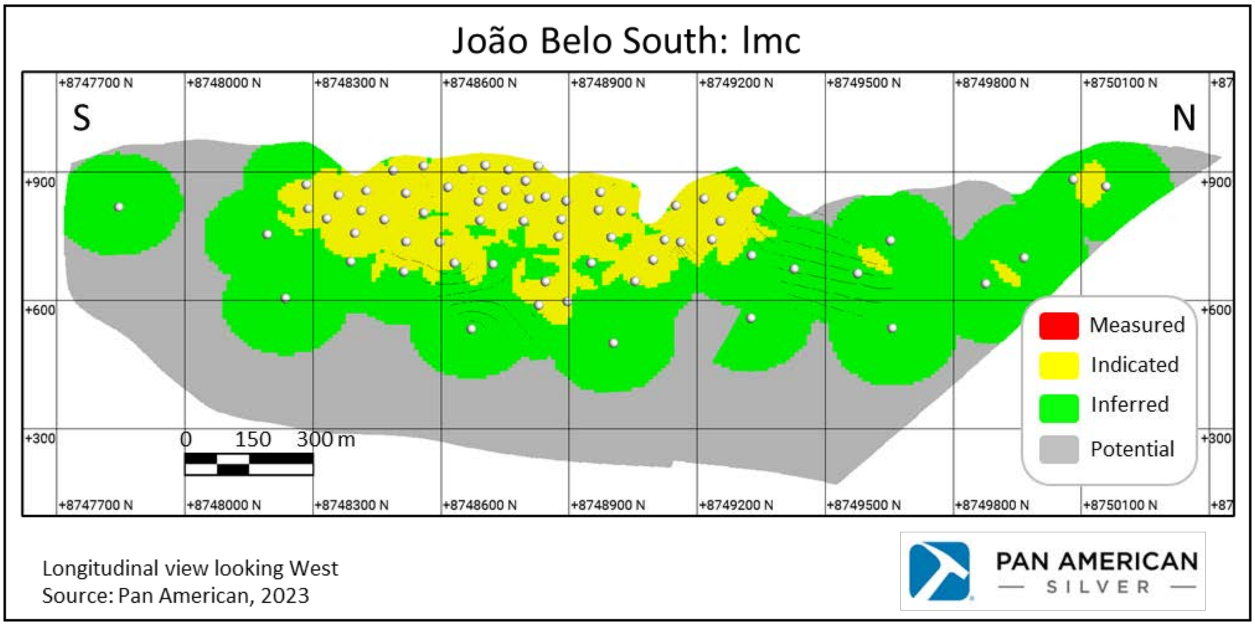


Figure 14-13: Longitudinal section of classified block models at João Belo South (lmc resource domain)

14.12 Mineral Resource Statement

The requirement for "reasonable prospect for eventual economic extraction" as defined in CIM Definition Standards for Mineral Resources and Mineral Reserves (2014) generally implies that the quantity and grade estimates meet certain economic thresholds and that the mineral resources are reported at an appropriate cut-off grade that takes into account extraction scenarios and processing recoveries. After evaluation, it was determined that underground extraction methods can be considered for mineral resource reporting at Jacobina.

The mineral resources were completed using a breakeven cut-off grade of 0.84 g/t gold. The cut-off grade was calculated using a gold price of US$1,700/oz and considering an additional operating cost of US$5/t for future filtered tailings disposal.

The mineral resources are exclusive of mineral reserves and are prepared using MSO shapes as conceptual mining stopes. The design parameters for mineral resource estimation are different than those used for mineral reserve estimation. The following parameters were selected for mineral resource estimation: the minimum mining width was set at 1.5 m, the cut-off grade at 0.84 g/t gold, the maximum mining width at 25 m, and the stope length and height at 10 m. Mineral resources are reported considering internal and external waste and dilution. The use of conceptual mining shapes as constraints in preparing mineral resource estimates demonstrate that the mineralization meets the "reasonable prospects for eventual economic extraction" requirement for mineral resources as defined in the CIM definitions.

The Mineral Resource Statement for Jacobina as of June 30, 2023, exclusive of mineral reserves, is presented at the beginning of this Section 14. A summary of the mineral resources by mining block is presented in Table 14-12.

Table 14-12: Summary of Jacobina mineral resources by mining block as of June 30, 2023

Mines	Measured			Indicated			M & I			Inferred		
	Tonnes (kt)	Gold (g/t)	Gold Ounces (koz)	Tonnes (kt)	Gold (g/t)	Gold Ounces (koz)	Tonnes (kt)	Gold (g/t)	Gold Ounces (koz)	Tonnes (kt)	Gold (g/t)	Gold Ounces (koz)
JBN	16,108	1.60	829	11,164	1.49	534	27,272	1.55	1,363	3,341	1.64	176
MVT	17,150	1.49	822	15,921	1.50	770	33,070	1.50	1,592	7,970	1.74	446
CAN	1,330	1.54	66	582	1.39	26	1,912	1.50	92	125	1.78	7
CAS	6,120	1.88	369	1,335	1.86	80	7,455	1.87	449	854	2.19	60
CAC	4,505	1.92	278	4,170	1.72	231	8,675	1.82	509	421	1.60	22
MCZ	1,697	1.43	78	680	1.43	31	2,377	1.43	109	64	1.80	4
SCO	2,189	1.40	99	3,278	1.49	157	5,467	1.46	256	1,140	1.60	59
JBS	—	—	—	8,204	1.26	333	8,204	1.26	333	14,590	1.57	737
MVE	—	—	—	—	—	—	—	—	—	11,623	1.35	504
Total	**49,099**	**1.61**	**2,541**	**45,333**	**1.48**	**2,162**	**94,432**	**1.55**	**4,704**	**40,128**	**1.56**	**2,015**

1. *Mineral resources have been estimated by the Jacobina Resources Geology Team under the supervision of Danilo Ribeiro dos Santos, Geology Coordinator, Registered Chartered Professional Member of Australasian Institute of Mining and Metallurgy, MAusIMM CP(Geo) Number 3052712, a fulltime employee of JMC and Camila Passos, Exploration Coordinator, P.Geo. (APGO#2431), a fulltime employee of Yamana Desenvolvimento Mineral S.A. (YDM). Camila Passos is a qualified person as defined by National Instrument 43-101 . The mineral resource estimate conforms to the CIM Definition Standards on Mineral Resources and Reserves (2014).*
2. *Mineral resources are reported exclusive of mineral reserves.*
3. *Mineral resources were evaluated using an ordinary kriging algorithm informed by capped composites and constrained by three-dimensional mineralization wireframes.*
4. *Individual bulk density values were used for each estimation domain according to experimental test results.*
5. *Mineral resources are not mineral reserves and have not demonstrated economic viability.*
6. *Mineral resources are reported at a cut-off grade of 0.84 g/t gold within conceptual mining shapes. The cut-off grade is based on a gold price of US$1,700 per troy ounce and a metallurgical recovery of 96%.*
7. *A minimum mining width of 1.5m is used to construct the conceptual mining shapes. An overbreak of 0.5m is also applied to account for dilution. Mineral resources are reported fully diluted within the conceptual shapes.*
8. *All figures are rounded to reflect the relative accuracy of the estimate. Numbers may not add up due to rounding.*

The qualified person responsible for this section of the technical report is not aware of any environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that could materially affect the mineral resource estimate.

15 Mineral Reserve Estimates

15.1 Mineral Reserve Summary

The Mineral Reserve Statement of Jacobina as of June 30, 2023, is presented in Table 15-1.

Table 15-1: Jacobina Mineral Reserve Statement, June 30, 2023

Category	Tonnes (kt)	Gold Grade (g/t Au)	Contained Gold (koz)
Proven	26,990	2.00	1,738
Probable	21,252	2.06	1,405
Total Reserves	**48,242**	**2.03**	**3,143**

1. *Mineral reserves have been estimated by the Jacobina long-term mine planning team and reviewed by Martin Wafforn P.Eng., Senior Vice President, Technical Services and Process Optimization at Pan American, and a qualified person as defined by National Instrument 43-101. The mineral reserve estimate conforms to the CIM Standards for Mineral Resources and Mineral Reserves (2014).*

2. *Mineral reserves are reported by zone at variable cut-off grades ranging from of 0.83 to 0.95 g/t gold. The cut-off grade is based on metal price assumptions of US$1,500/oz for gold, a gold processing recovery assumption of 96%, operating cost assumptions ranging from US$34.68 to 40.19/t processed and sustaining capital cost assumption of US$3.16/t processed. Mine development cost assumptions average US$ 12.40/t and are excluded from the cut-off grade calculation. Development costs are considered during the economic evaluation stage before conversion of mineral resources to mineral reserves, considering the specific development requirements of each mining panel.*

3. *Mineral reserves are stated at a mill feed reference point and account for minimum mining widths, diluting material, and mining losses.*

4. *All stope shapes contain a majority of measured and indicated mineral resources and may include minority portions of inferred mineral resources and unclassified material.*

5. *Numbers may not add up due to rounding.*

15.2 Conversion Methodology

The methodology used at Jacobina to convert mineral resources to mineral reserves is summarized as follows:

- Verify geometries for the block model and resource domains.
- Confirm accurate block model depletion with current excavated development and stope solids up to the effective reporting date.
- Discard any mineral resources within 30 m of the surface topography (crown pillar).
- Using the MSO (mineable shape optimizer) planning tool in Datamine software, create automated stope shapes using variable break-even cut-off grades by zone. Stopes planned to be mined in the first two years of the LOM are manually re-designed in Maptek Vulcan, software using stope polygons at a section spacing of 5 to 10 m and using the continuity of the mineralization and the MSO stope shapes as guide for design.

- Complete both manual and automatic stopes design using specific stability graphs for each mine. Stope spans are adjusted to sizes assuming 15% additional dilution, which is included in the design.
- Design secondary development shapes and cut them from stope shapes.
- Evaluate all stope and secondary development shapes against the block model and report ore tonnes and grade by classification. Exclude stope shapes and associated development below the cut-off grades outlined in Table 15-2.
- Exclude all shapes that contain a majority proportion of inferred mineral resources.
- Design primary development, including ramps, ventilation, escape ways, dewatering, materials handling, access, and other infrastructure.
- In addition to the evaluation against the cut-off grade, the designed zones, levels and individual shapes are subject to an economic analysis to ensure the operational cash-flow expected to be obtained by mining them affords the required development and infrastructure. As a result, isolated zones, levels or shapes with grades higher than the cut-off grade that do not pay for the necessary development are excluded from the mineral reserves.
- Complete a geotechnical analysis of each sector and adjust the design where required.
- List designed stopes as “approved” or “not approved” based on cut-off grade, economic and geotechnical analyzes.
- Apply the mining recovery factor on "approved" stopes prior to conversion to mineral reserves.
- Convert “approved” stopes and development shapes containing a majority proportion of measured or indicated blocks to proven or probable mineral reserves, respectively.

15.3 Cut-Off Grade and Economic Evaluation

Cut-off grades used for the mineral reserve estimate were based on average actual 2022 operating costs at Jacobina. Development costs were excluded since development requirements for each mining zone are evaluated in a subsequent step of the mineral reserve estimation process. The operating mining costs vary on a zone-by-zone basis due to factors including mining width and variable hauling distances. Selected cut-off grades range from 0.83 g/t to 0.95 g/t gold. The main parameters used to complete the cut-off grade calculation for each zone are summarized in Table 15-2.

Table 15-2: Cut-off grades

Description	Units	JBS	JBN	MVS	MVC	MCZ	SCO	CAS	CAC	CAN
Metallurgical Recovery	%	96 %	96 %	96 %	96 %	96 %	96 %	96 %	96 %	96 %
Taxes – CFEM	%	1.50 %	1.50 %	1.50 %	1.50 %	1.50 %	1.50 %	1.50 %	1.50 %	1.50 %
Gold Price	US$/oz	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Mining Cost*	US$/t ore mined	37.23	32.23	32.30	35.11	35.11	31.71	31.71	34.32	34.32
Stope production	US$/t ore mined	24.83	19.83	19.90	22.71	22.71	19.31	19.31	21.92	21.92
Secondary Development*	US$/t ore mined	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21
Primary Development*	US$/t ore mined	6.19	6.19	6.19	6.19	6.19	6.19	6.19	6.19	6.19
Plant Cost	US$/t processed	10.69	10.69	10.69	10.69	10.69	10.69	10.69	10.69	10.69
G&A + Overhead	US$/t processed	4.68	4.68	4.68	4.68	4.68	4.68	4.68	4.68	4.68
Operating Cost for COG Calculation	**US$/t processed**	40.19	35.19	35.27	38.08	38.08	34.68	34.68	37.29	37.29
Sustaining Capital	US$/t processed	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16	3.16
Total Cost for COG Calculation	**US$/t processed**	43.36	38.36	38.43	41.24	41.24	37.84	37.84	40.45	40.45
Cut-Off Grade	**g/t Au**	0.95	0.84	0.84	0.90	0.90	0.83	0.83	0.89	0.89

**Mining development costs are excluded from the cut-off grade calculation and considered during the economic evaluation stage before conversion to mineral reserves*

The cut-off grades were used to determine if the ore contained in designed stope and secondary development shapes can be mined and processed economically. Stope and development design parameters are summarized in Table 15-3 and Table 15-4. A typical layout of a mining panel is shown in Figure 15-1.

Before conversion to mineral reserves, an economic evaluation was carried out to determine if the operating margin of each shape, level and zone of the mine is enough to pay for the required development and infrastructure. Therefore, mine development costs are excluded from the cut-off grade calculation and considered during the economic evaluation stage. The unitary development and infrastructure costs considered for the mineral reserves estimate presented in this technical report are based on actual 2022 costs and are summarized in Table 15-5.

Table 15-3: Stope design parameters

Zone	Minimum Mining Width (m)	Overbreak Additional Dilution (%)	Stope Length (m)	Stope Height* (m)	Sill Pillar Width (m)	Rib Pillar Length (m)	Rib Pillar Length at Crosscut (m)
JBS	3	15%	30	25 to 28	6 to 8	5	15
JBN	3	15%	30	25 to 28	7 to 12	5	15
MVT	3	15%	30	25 to 28	6 to 10	5	15
MCZ	3	15%	30	25 to 28	6 to 8	5	15
SCO	3	15%	30 to 40	25 to 28	6 to 8	5	15
CAS	3	15%	30	25 to 28	6 to 12	5	15
CAC	3	15%	30	25 to 28	7 to 12	5	15
CAN	3	15%	30 to 40	25 to 28	6 to 8	5	15

**Stope height measured from floor of bottom drift to back of stope (inclined distance)*

Table 15-4: Development design parameters

Item	Dimensions W(m) x H(m) x L(m)	Gradient (%)	Comment
Ramp decline	4.5 x 5.5	± 15%	Designed with turning radius of 20 to 30m
Load point	4.5 x 5.5 x 15.0	2%	Every 100m in the ore drives / Half-way between levels
Crosscut	4.5 x 5.5	2%	All levels, gradient can vary depending on layout
Access	4.5 x 5.5	2%	Gallery to connect parallel ore drives
Electrical substation	6.0 x 5.0 x 15.0	2%	Between levels / every 400m
Refuge chamber	4.0 x 4.8 x 25.0	2%	Every 2 levels, developed in the opposite direction to crosscut
Escape way drift	4.0 x 4.8	2%	Every 2 levels
Escape way raise	1.8	2%	To connect escape way drifts every 2 level
Ventilation drift	4.0 x 4.8	2%	On every level
Ventilation drop raise	3.0 x 3.0	2%	On every level
Mud drying sump	5.0 x 5.0 x 25.0	0.02	Located in front of pumping stations
Sump	5.0 x 5.0 x 12.0	-15%	At every crosscut
Pumping station	5.0 x 5.0	2%	Every 80 vertical meters
Pumping station sump	5.0 x 5.0	-15%	At every pumping station
Ore drive	4.0 x 4.8	2%	Developed along reef strike
Exploration drift	4.0 x 4.8	2%	Depending on exploration requirements

Table 15-5: Development and infrastructure cost

Item	Development Cost (US$/m)
Primary development	2,139
Secondary development	2,063
Escape way	1,478
Ventilation drop raise	1,200
Ventilation raise borer	3,776

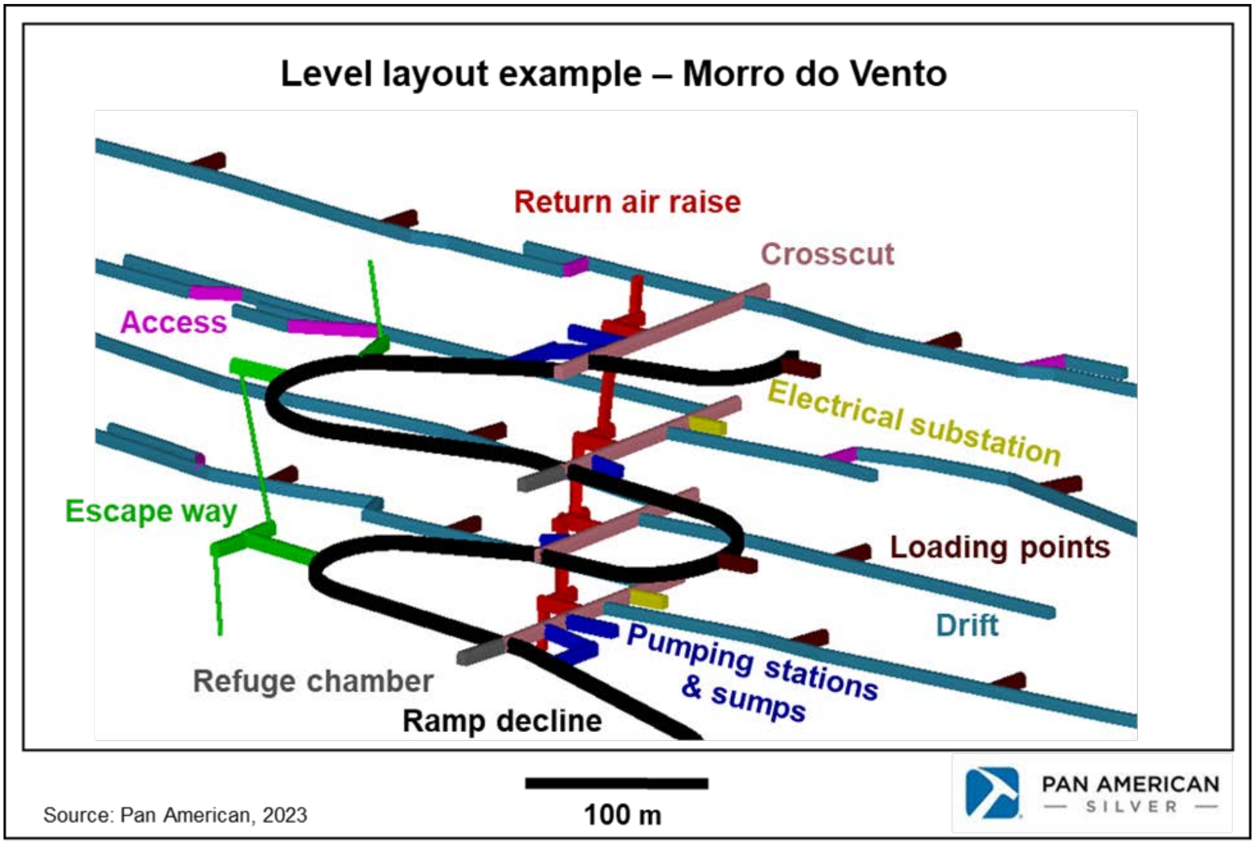


Figure 15-1: Level layout example

15.4 Dilution and Mining Recovery

Dilution of sublevel long hole stopes is modelled by applying an overbreak skin to the hanging walls of stopes based on stope spans, this overbreak averages 15%. A mining recovery factor of 92% is then applied to the resulting diluted tonnes of ore contained in stope shapes. No mining recovery factor is applied on ore contained in development shapes. The average operational dilution and mining recovery for the first 6 months of 2023 was of 12% and 92%, respectively, according to stope reconciliation results shown in Table 15-6.

Table 15-6: Stope reconciliation results – January to June 2023

Parameter	Jan	Feb	Mar	Apr	May	Jun	H1-2023
Mining Recovery (%)	90%	91%	90%	92%	93%	94%	92%
Stope dilution (%)	13%	15%	9%	12%	10%	12%	12%

15.5 Reconciliation

Reconciliation results for the period comprised between January and June 2023 are presented in Table 15-7. The table shows monthly ore tonnes, grades, and contained gold delivered to the processing plant (directly from the underground mines or from the stockpiles). These values are based on grade-control information and the actual process-feed information reported by the processing plant, which is based on the tonnes processed and the gold grades recalculated from the physical gold produced and the gold contained in tailings.

The table shows monthly ore tonnes, grades, and contained gold delivered to the processing plant (directly from the underground mines or from the stockpiles). These values are based on grade-control information and the actual process-feed information reported by the processing plant, which is based on the tonnes processed and the gold grades recalculated from the physical gold produced and the gold contained in tailings.

Table 15-7: 2019 Reconciliation results - January to June 2023

	Item	Units	Jan	Feb	Mar	Apr	May	Jun	H1-2023
Ore mined	Tonnes	t	260,921	252,046	280,489	268,375	258,958	245,132	1,565,921
	Gold Grade	g/t	2.12	2.34	2.06	2.21	2.19	2.16	2.18
	Gold	oz	17,751	18,977	18,600	19,061	18,245	16,993	109,627
Ore stockpiled	Tonnes	t	—	1,757	14,801	13,852	—	—	30,409
	Gold Grade	g/t	—	4.60	2.13	2.38	—	—	2.39
	Gold	oz	—	260	1,013	1,061	—	—	2,333
Ore reclaimed from stockpiles	Tonnes	t	2,369	—	—	—	15,685	1,089	19,143
	Gold Grade	g/t	0.76	—	—	—	1.29	3.53	1.35
	Gold	oz	58	—	—	—	649	123	830
Ore processed	Tonnes	t	263,290	250,289	265,688	254,523	274,643	246,221	1,554,655
	Gold Grade	g/t	2.10	2.33	2.06	2.20	2.14	2.16	2.16
	Gold	oz	17,809	18,717	17,587	18,000	18,894	17,116	108,124
Ore processed – Recalculated grades based on gold contained in doré and in tailings	Tonnes	t	263,290	250,289	265,688	254,523	274,643	246,221	1,554,655
	Gold Grade	g/t	2.05	2.17	2.05	1.97	1.95	2.15	2.06
	Gold	oz	17,338	17,487	17,520	16,146	17,245	16,983	102,718
Differences	Tonnes	t	0%	0%	0%	0%	0%	0%	0%
	Gold Grade	g/t	-2.6%	-6.6%	-0.4%	-10.3%	-8.7%	-0.8%	-5.0%
	Gold	oz	-2.6%	-6.6%	-0.4%	-10.3%	-8.7%	-0.8%	-5.0%

15.6 Mineral Reserve Statement

The Mineral Reserve Statement for Jacobina as of June 30, 2023 is presented in Figure 15-1 at the beginning of this Section 15. A summary of the mineral resources by mining block is presented in Table 15-8.

Table 15-8: Summary of Jacobina mineral reserves by mining block as of June 30, 2023

Mines	Proven			Probable			Total Reserves		
	Tonnes (kt)	Gold Grade (g/t Au)	Contained Gold (koz)	Tonnes (kt)	Gold Grade (g/t Au)	Contained Gold (koz)	Tonnes (kt)	Gold Grade (g/t Au)	Contained Gold (koz)
JBS	—	—	—	4,914	1.79	283	4,914	1.79	283
JBN	8,746	1.63	459	5,579	1.78	319	14,325	1.69	778
MVT	5,729	1.93	355	5,924	2.21	421	11,653	2.07	776
MCZ	1,034	1.53	51	76	1.51	4	1,110	1.53	55
SCO	924	1.89	56	1,405	2.17	98	2,329	2.06	154
CAS	4,910	2.30	362	404	2.60	34	5,314	2.32	396
CAC	4,126	2.60	345	2,690	2.65	229	6,816	2.62	573
CAN	1,311	2.35	99	260	2.11	18	1,571	2.31	117
Stock	210	1.62	11	—	—	—	210	1.62	11
Total	**26,990**	**2.00**	**1,738**	**21,252**	**2.06**	**1,405**	**48,242**	**2.03**	**3,143**

1. *Mineral reserves have been estimated by the Jacobina long-term mine planning team and reviewed by Martin Wafforn P.Eng., Senior Vice President, Technical Services and Process Optimization at Pan American, and a qualified person as defined by National Instrument 43-101. The mineral reserve estimate conforms to the CIM Standards for Mineral Resources and Mineral Reserves (2014).*

2. *Mineral reserves are reported by zone at variable cut-off grades ranging from of 0.83 to 0.95 g/t gold. The cut-off grade is based on metal price assumptions of US$1,500/oz for gold, a gold processing recovery assumption of 96%, operating cost assumptions ranging from US$34.68 to 40.19/t processed and sustaining capital cost assumption of US$3.16/t processed. Mine development cost assumptions average US$ 12.40/t and are excluded from the cut-off grade calculation. Development costs are considered during the economic evaluation stage before conversion of mineral resources to mineral reserves, considering the specific development requirements of each mining panel.*

3. *Mineral reserves are stated at a mill feed reference point and account for minimum mining widths, diluting material, and mining losses.*

4. *All stope shapes contain a majority of measured and indicated mineral resources and may include minority portions of inferred mineral resources and unclassified material.*

5. *Numbers may not add up due to rounding.*

The qualified person responsible for this section of the technical report is not aware of any mining, metallurgical, infrastructure, permitting or other relevant factors that could materially affect the mineral reserve estimate.

16 Mining Methods

16.1 Mine Design

Jacobina utilizes the sublevel long-hole open stoping (SLOS) method without backfill to achieve an average production rate of approximately 8,500 tpd from the ramp-accessed underground mines; these include João Belo, Morro do Vento, Morro do Cuscuz, Serra do Córrego and Canavieiras.

Access to the different mining zones is achieved via ascending or descending spiral declines, which, depending on the ground conditions, can be developed in the hanging-wall or foot-wall of the reefs, a maximum gradient of 15%, and with section profiles measuring 4.5 m wide x 5.5 m high. The ramp access to the mineralized zones allows for a high degree of flexibility to access the reefs at different elevations. In general, level spacing is designed to keep blast hole length at (or below) 25 to 28 m to help manage drilling deviation.

Mining generally progresses by applying the longitudinal retreat variant of SLOS. The method considers the development of one single ore drive per stope, which is used for up-hole drilling and ore extraction using remotely operated LHD equipment after blasting. Ore drive sections measure 4.0 m wide x 4.8 m high. Ore drives are developed at a gradient of 2% for dewatering purposes.

Production drill holes vary from 76 to 112.5 mm in diameter and are typically drilled in fan patterns. Backfill is not required for the SLOS mining method since rib pillars are left in place to provide ground support and control dilution. However, the deposition of development waste in underground voids occurs more frequently as this reduces both the waste haulage distances and the footprint required on the surface for waste dumps.

Typically, production panels have a vertical extension of 2 to 3 levels and are separated by 6 to 12 m thick sill pillars. Stope lengths as wells as rib and barrier pillar widths are described in Table 15-3.

16.2 Mining Sequence

The mining sequence starts with the development of the declines towards the target level elevations. Once the target elevation is reached a crosscut face is opened and developed towards the mineralized reefs. At each production level, during the development of the crosscut, infrastructure development for ore handling, dewatering, ventilation, electrical services and second mean of egress is completed. Details of the typical infrastructure requirements are summarized in Table 15-4.

Once services are available at the crosscut, a single ore drive is developed along the strike of each mineralized reef and loading points are developed as required along the ore drive length to reduce loading distances. The number of mineralized reefs varies depending on the mine and level. To reduce development requirements and/or provide mining sequence flexibility, accesses can be developed at variable spacings to connect parallel ore drives. A typical level layout is shown in Figure 15-1.

Stope production begins with the opening of an up-hole slot raise at the far end of the stope. Once the slot is completed, production blasting retreats towards the crosscut until the maximum stope length is reached. The blasted ore is extracted using remotely operated LHDs to access the open stopes, loaded on trucks at the closest loading point, and hauled directly to the ROM pad or to a stockpile at surface. Once a stope is completely mined out, a rib pillar is left in place and a new up-hole slot raise is opened beside the pillar at the far end of the next stope.

Production within a panel follows a top to bottom sequence. Within a mining panel, stope voids between levels connect with the stope voids of the previously mined-out level already above, while, to ensure stability, up-hole stopes between panels only reach the floor of the sill pillar of the panel located above.

The mining sequence described above is shown in a schematic longitudinal section in Figure 16-1. Figure 16-2 to Figure 16-4 show longitudinal sections of the mined-out areas and mineral reserves for the south (João Belo), central (Morro do Vento) and north (Morro do Cuscuz, Serra do Córrego, and Canavieiras) portions of the Jacobina mining complex.

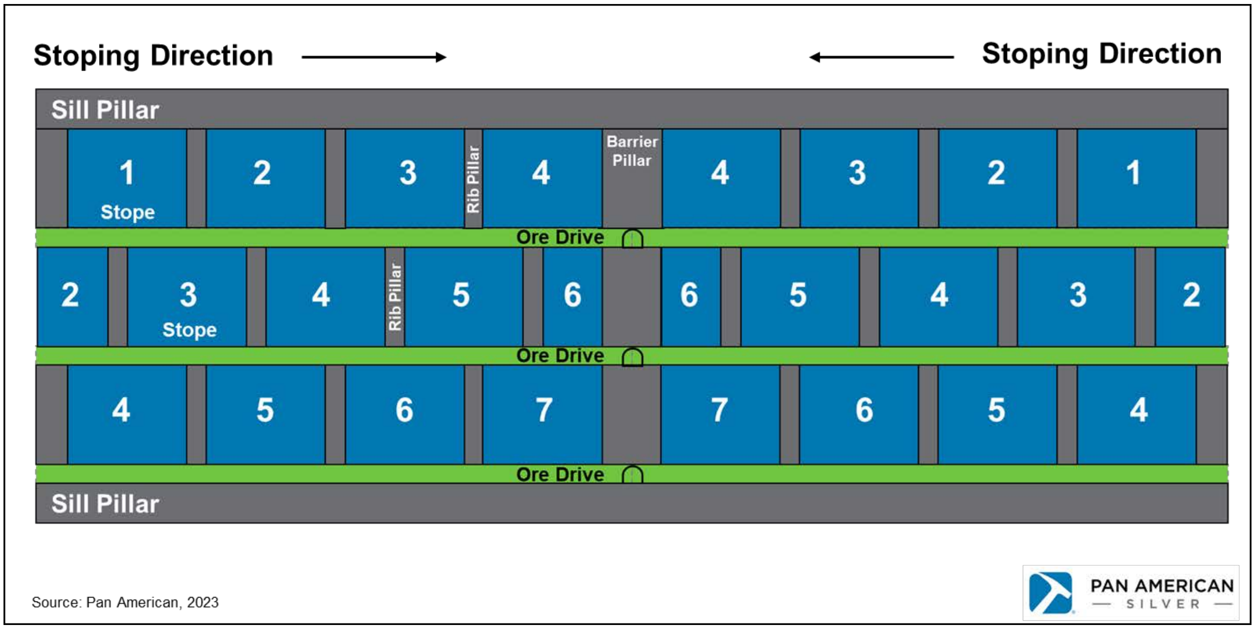


Figure 16-1: Example of typical mining sequence

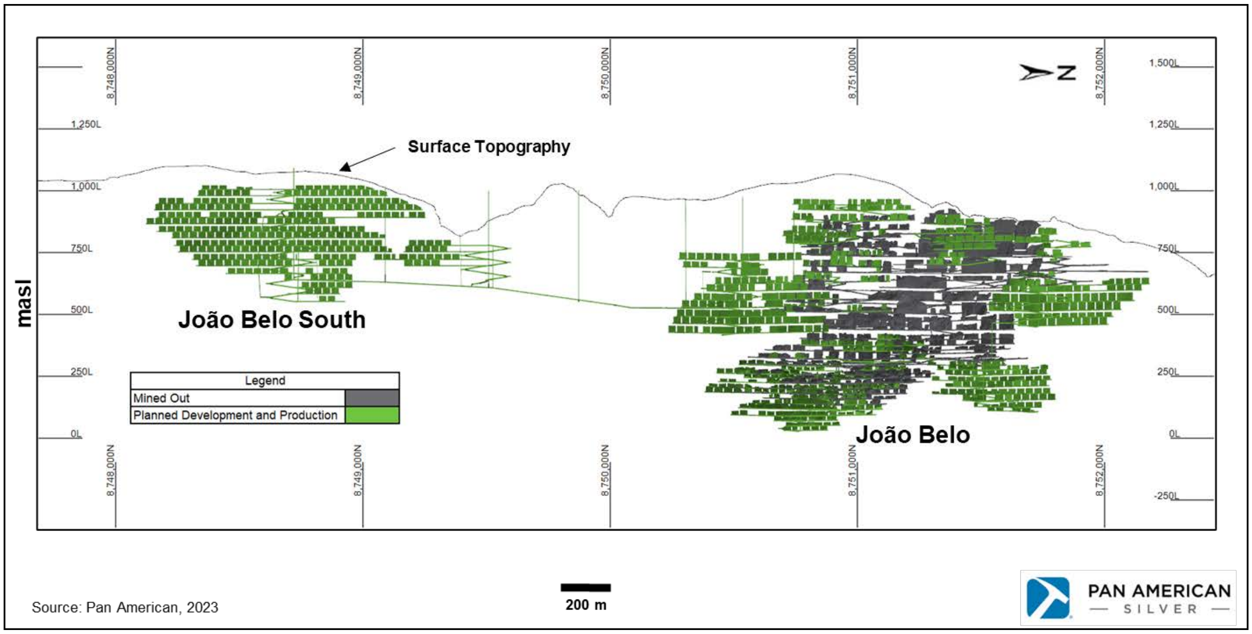


Figure 16-2: Mineral reserves - João Belo South

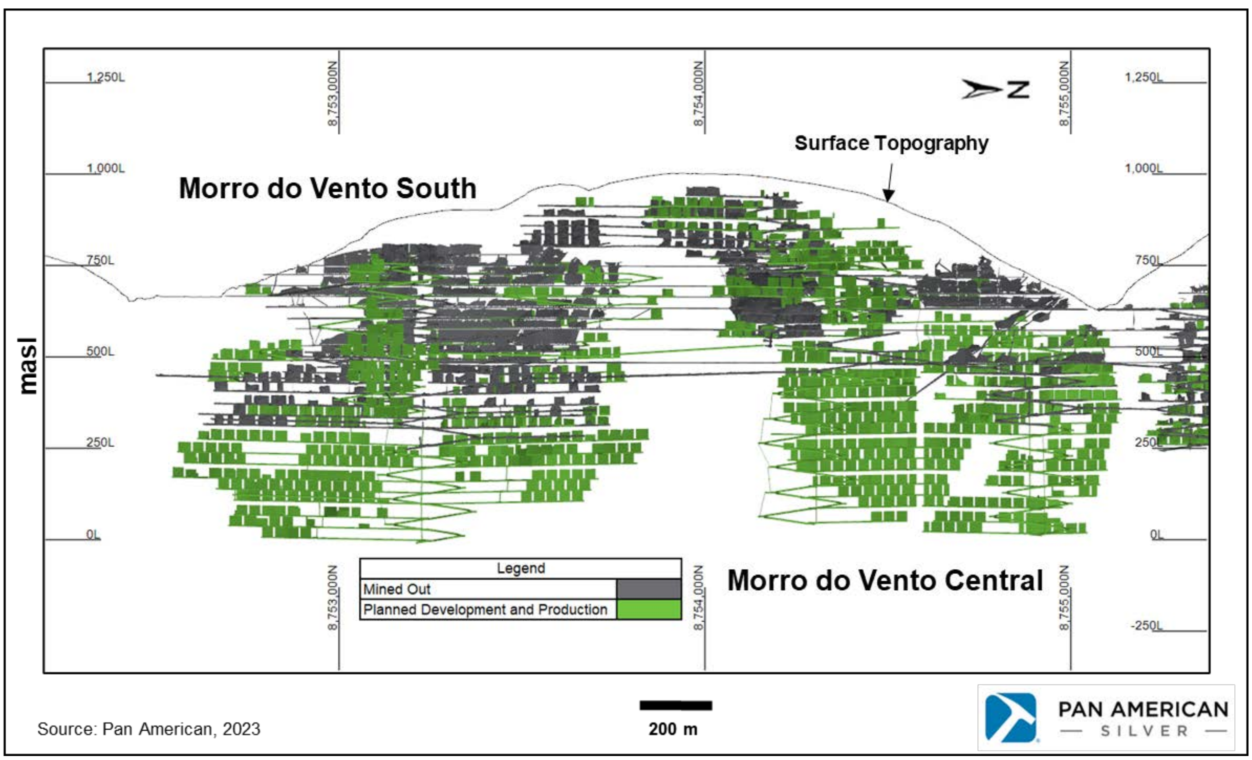


Figure 16-3: Mineral reserves - Morro do Vento South and Central

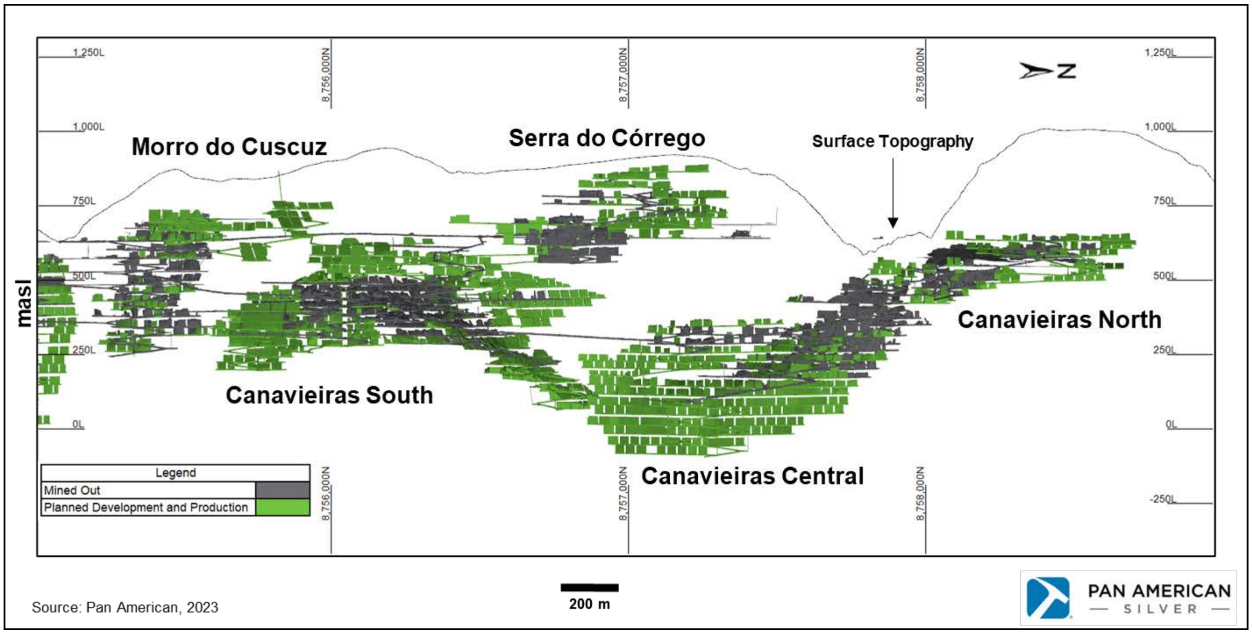
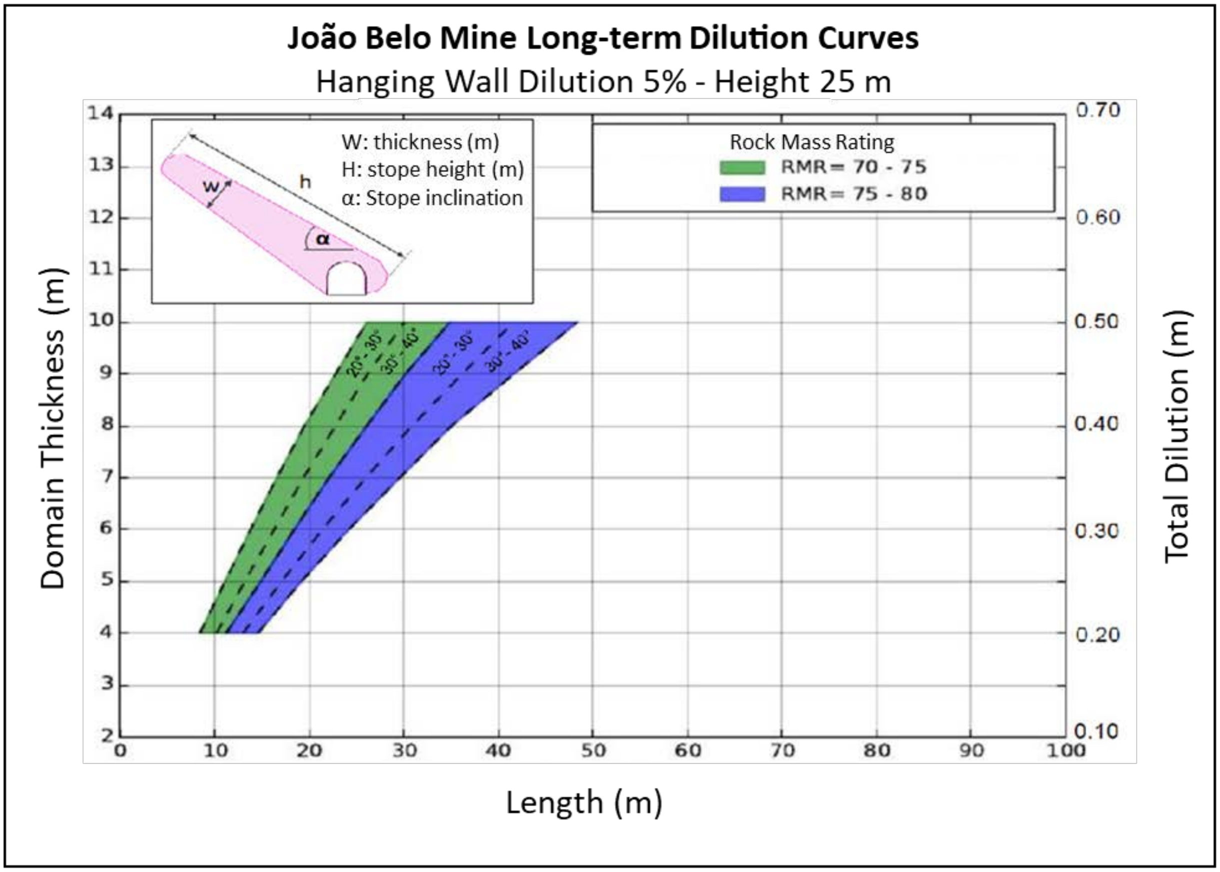


Figure 16-4: Mineral reserves - Morro do Cuscuz, Serra do Córrego and Canavieiras

16.3 Geomechanics

Stope design for short- and long-term mine planning is calculated using the empirical Mathews Stability Graph. Dilution predictions for the short term mine plan are estimated from local reconciled stope shapes, whereas study results from E-Mining Technology S.A. (2016) proposed a long-term dilution range of 10–20%. Figure 16-5 is an example using the long-term dilution curves for the João Belo mine as a function of Bieniawski's Rock Mass Rating (RMR) and stope geometry.

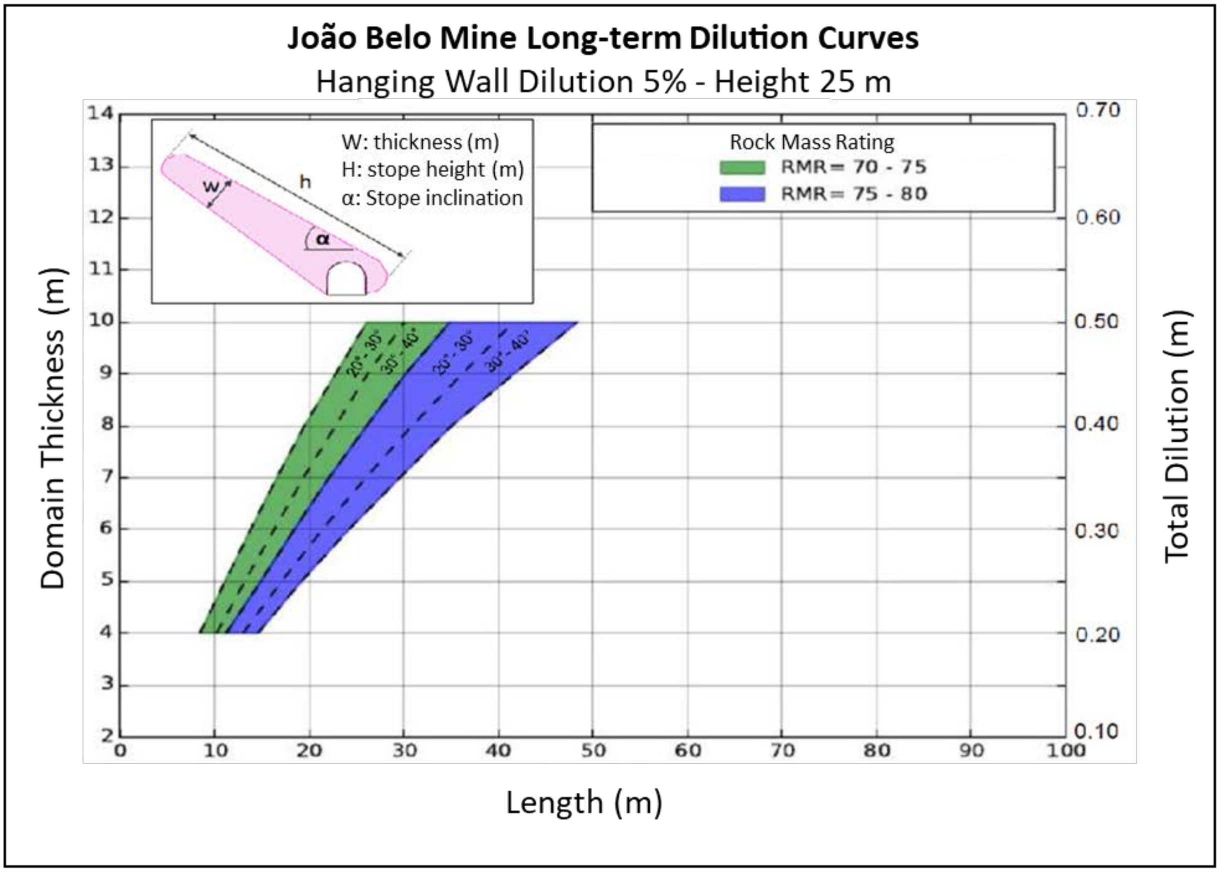


Source: modified from E-MINING, 2016

Figure 16-5: Stability chart with dilution curves

The stability of rib and sill pillars is evaluated using the Lunder and Pakalnis (1997) empirical method and numerical analysis (Map3D). Typical rib pillars are 5 m wide (but can vary up to 10 m). Barrier pillars, used to protect main travel ways or accesses to levels, are typically 15 m wide. Typical sill pillar widths range from 6 m to 12 m. The pillar widths follow recommendations stemming from a study conducted by Itasca in 2007 and 2008. Since these pillars dimensions have been adopted, no pillar instabilities have been recorded.

Ground support standards applied to underground excavations are selected according to Barton's Q system and rock mass rating (RMR) classification systems. Available ground support elements include resin or cement rebar bolts, mesh, and shotcrete; these are used in different combinations based on the service life of the excavation and rock mass quality. Typical ground support standards by excavation type and quality of the rock mass are summarized in Table 16-1.



Source: modified from E-MINING, 2016

Table 16-1: Jacobina ground support standards

Class	Bolt Length	Bolt Spacing (m)	Start Bolting Height (m)	Mesh Type	Shotcrete Thickness (mm)
Ramps and Permanent Development – 4.5 m x 5.5 m					
II	2.4 m Rebar	1.50 x 1.50	1.3	Welded	—
III	2.4 m Rebar	1.50 x 1.50	1.3	Welded	—
IV	2.4 m Rebar	1.25 x 1.25	1.3	Welded	60 to 90
V	2.4 m Rebar	1.10 x 1.10	1.0	Welded	60 to 90
Temporary Development – 4.0 m x 4.8 m					
II	2.4 m Rebar	1.50 x 1.50	1.3	Welded	—
III	2.4 m Rebar	1.50 x 1.50	1.3	Welded	—
IV	2.4 m Rebar	1.25 x 1.25	1.3	Welded	60 to 90
V	2.4 m Rebar	1.10 x 1.10	1.0	Welded	60 to 90

Jacobina installed a seismic monitoring system covering the Canavieiras South and João Belo zones to record mining-induced and regional seismological events. Most of the mining-induced events are crush-type events from rockmass stress fracturing and bulking from remnant pillars. Routine seismic monitoring will continue with the future development and consideration will be given to the mine sequence, structure, and ground-support requirements as needed.

16.4 Life of Mine Plan

The LOM plan was developed based on the mineral reserves inventory of Jacobina as of June 30, 2023. The LOM plan consists of an integrated operation of different underground mines feeding the processing plant at an average throughput of 8,450 tpd, resulting in a mine life of 15.5 years at target production rates and including a ramp-down period thereafter.

At the target throughput and expected metallurgical recovery of 96%, gold production averages 200,000 oz per year over the first 10.5 years of the LOM, as mining of lower grade reserves is deferred until late in the mine life where possible. As a result, production decreases to an average of 153,000 oz per year in the last 5 years of the life of mine plan, at full production. Lateral development requirements to achieve the LOM plan are of approximately 113,000 m of primary development (ramp declines, crosscuts, infrastructure) and 165,000 m of secondary development.

The strategy is to maintain a lateral development rate of approximately 18,500 m per year to keep operational flexibility and several mining zones available at any given time. During the first half of 2023, Jacobina has been on track to achieve the required yearly lateral development.

No additional mineral resources or exploration potential are considered in this mine plan. There is a significant inferred mineral resource that may potentially be converted to measured and indicated mineral resources in the future with the required infill drilling, which can further extend the mineral reserve LOM plan, considering that, since 2017, Jacobina has successfully replaced reserves net of depletion.

Pan American Silver has initiated mining, mineral processing and tailings management optimization studies, reviewing alternative mining methods, mine designs, material handling, mineral processing, waste and tailings disposal options to determine the optimum production rate and evaluate a plan to eventually expand the production capacity of Jacobina. The suitability of the Jacobina tailings for paste backfill has been confirmed by test work carried out between 2019 and 2021. Alternative mining methods and the use of paste backfill has potential to enable an increase in mining extraction and increase conversion of mineral resources to mineral reserves.

Figure 16-6 to Figure 16-8 show longitudinal sections of the current LOM plan for the south (João Belo), central (Morro do Vento) and north (Morro do Cuscuz, Serra do Córrego and Canavieiras) portions of the Jacobina mining complex.

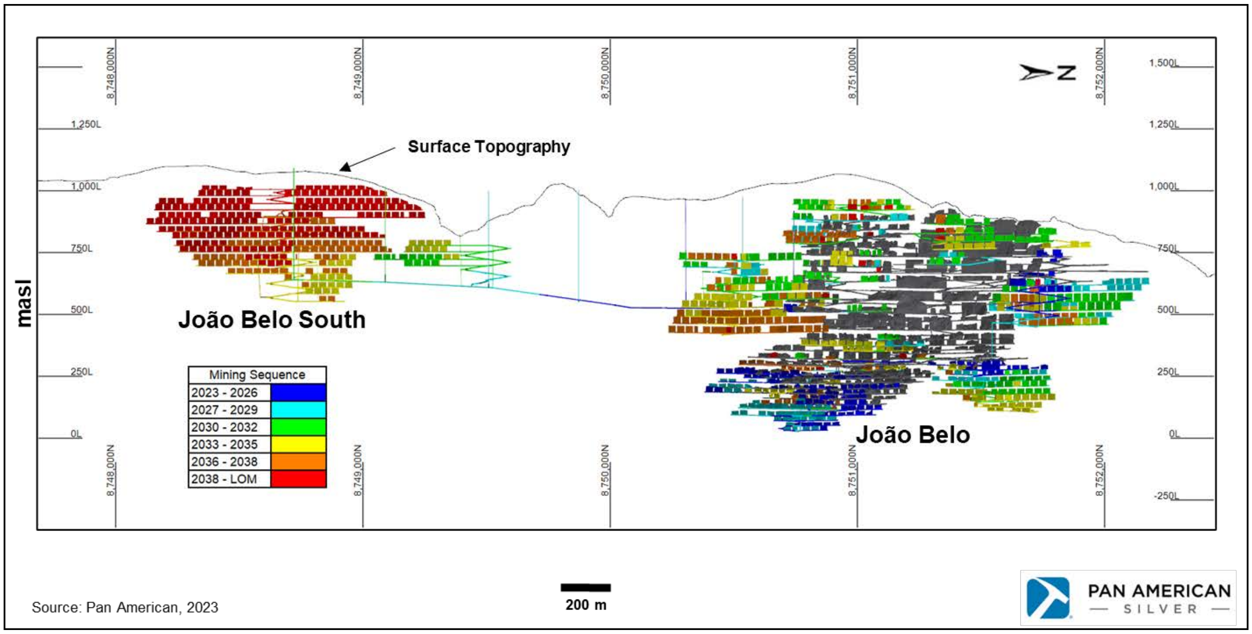


Figure 16-6: Mining sequence - João Belo and João Belo South

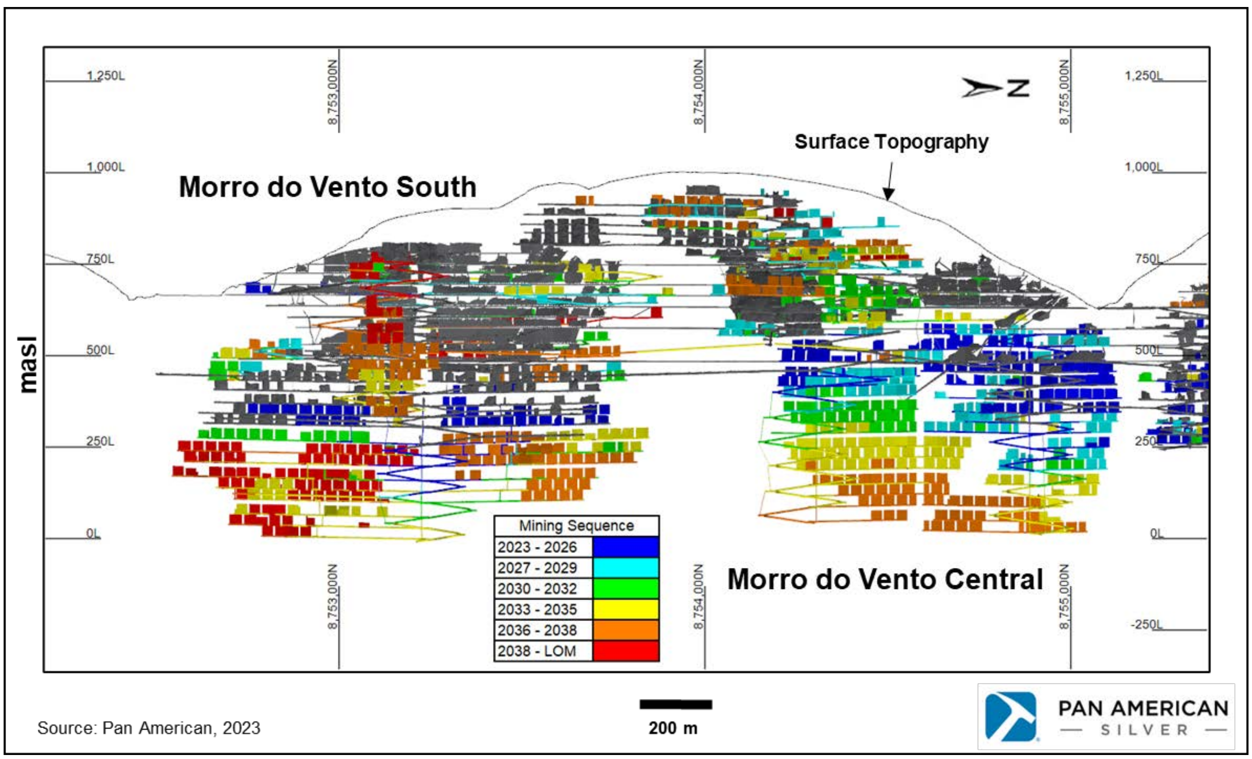


Figure 16-7: Mining sequence – Morro do Vento South and Central

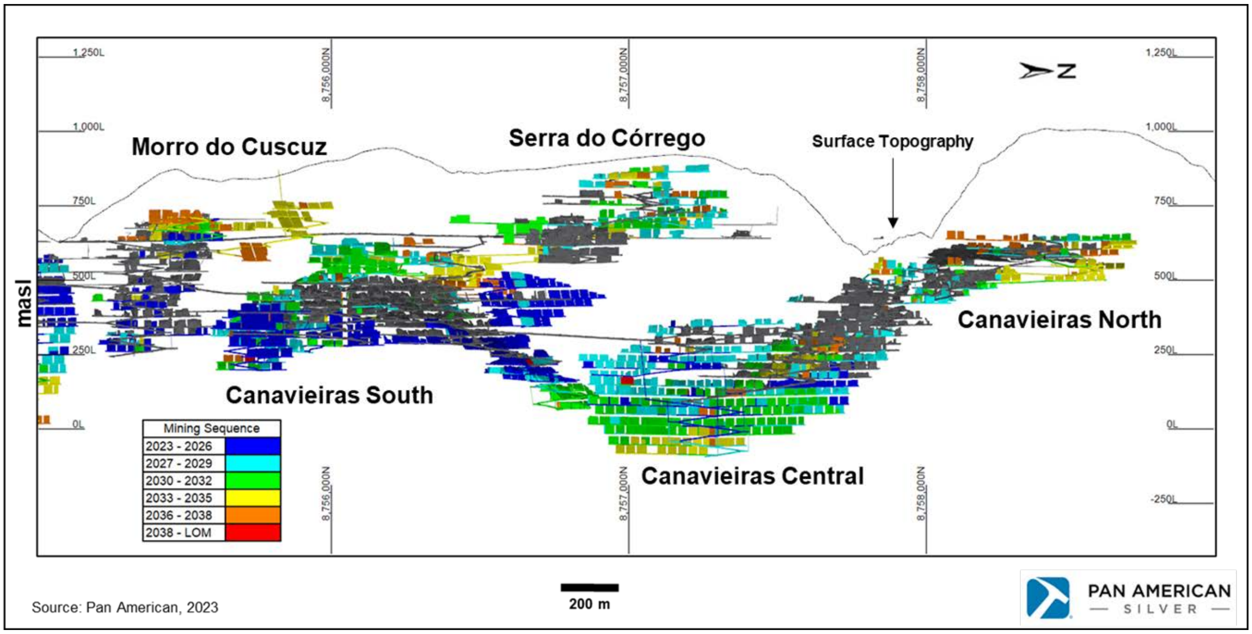


Figure 16-8: Mining sequence – Morro do Cuscuz, Serra do Córrego and Canavieiras

16.5 Mine Equipment

A list of the active mine equipment at Jacobina is shown in Table 16-2. The age of equipment age varies as most of the equipment was acquired between 2018 and 2022. Haulage trucks are contractor-owned and operated and are therefore not included in the table below.

Table 16-2: List of current mobile mining equipment

Equipment	Total
Backhoes	4
Bolters	2
Excavators	1
Fan drills	9
Forklifts	9
Front-end loaders	10
Graders	3
Jumbos	9
LHDs	10
Mobile concrete mixers	2
Scalers	9
Scissor lifts	8
Shotcreters	5
Telehandlers	14

16.6 Ventilation

Primary ventilation of the underground mines at Jacobina is provided through an exhaust/pull ventilation system. Return air is exhausted through the return air raises to surface by main exhaust fans, generating a negative pressure that allows fresh air to enter the mine through the different portals and intake raises. The main return air raises are constructed using the raise-boring method with a diameter of 3.1m. Ventilation circuit connections between levels are constructed using vertical crater retreat (VCR) drop-raising method. Drop-raises sections generally measure 3m x 3m.

Fresh air that enters the mine is forced from the main ramp declines to the working faces via auxiliary fans and 1,000 or 1,200 mm diameter flexible ventilation ducting. Return air then flows back from the stoping areas to the return air raise connection located at the crosscut, from where it flows back to the surface.

A schematic ventilation circuit for the Morro do Vento Central Mine is shown in Figure 16-9. The underground ventilation fans utilized at the various underground mining sectors are shown in Table 16-3. Primary fan air flow rates range from 95 to 100 m^3/s, while secondary fan air flow rates range from 19 to 30 m^3/s.

Table 16-3: Ventilation fans – Number of units

Mine	Auxiliary Fans (unit)					Main Exhaust Fans (unit)		
	75 hp / 56 kW	100 hp / 75 kW	125 hp / 93 kW	150 hp / 112 kW	Total	250 hp / 186 kW	550 hp / 410 kW	Total
JBN	4	12	—	3	19	2	2	4
MVS	5	5	1	—	11	—	1	2
MVC	—	9	2	—	11	2	—	1
CAS	3	15	—	6	24	—	4	4
CAC	—	11	1	2	14	—	2	2
SPARE	—	5	—	1	6	1	3	4
Total	**12**	**57**	**4**	**12**	**85**	**5**	**12**	**17**

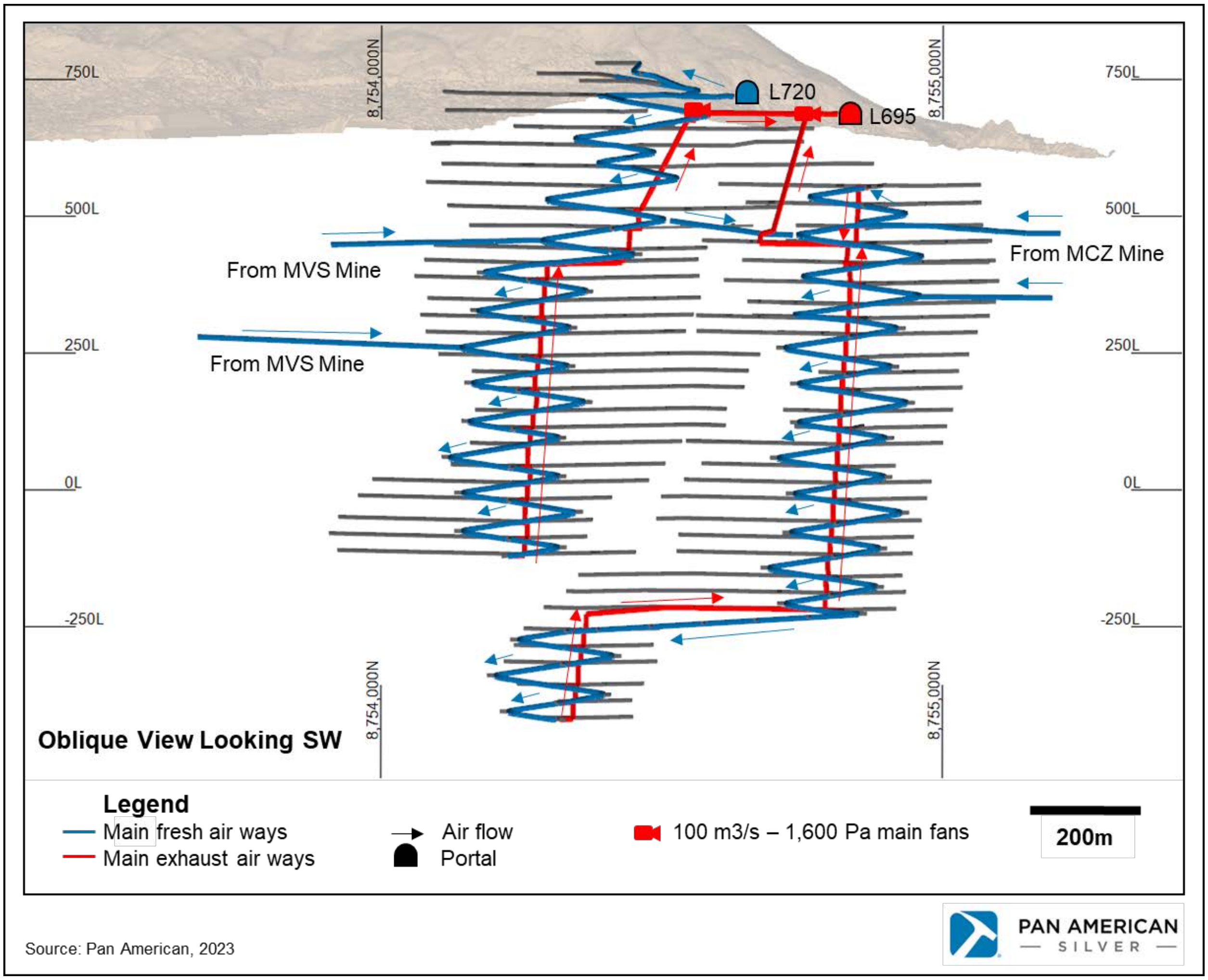


Figure 16-9: Schematic view of ventilation circuit - Morro do Vento Central Mine

16.7 Dewatering

The mine dewatering and water supply system at Jacobina operates a closed system. Water pumped from the underground mines by submersible pumps and pumping stations is treated and re-circulated to be used in processing and underground mining operations.

Dewatering of the development and production faces to level sumps is carried out using 10 kW Grindex submersible pumps. Level sumps are equipped with 22 kW centrifuge pumps that deliver the water to pumping stations located close to crosscut and main ramps intersections, and are generally placed every 80 vertical metres. These pumping stations are equipped with 3x2 or 4x3 size Weir 37 kW, 74 kW or 110 kW centrifuge pumps. Water is pumped from the last pumping station of each mine to treatment basins where the pH is adjusted using caustic soda and where any excess sediment is removed by decantation. After treatment, clean water is pumped back to the mines using 74 kW KSB/Imbil centrifuge pumps.

The pipe sizes used for dewatering are 110 mm diameter for submersible pumps and 160 mm diameter for centrifuge pumps. Figure 16-10 shows a schematic drawing of the dewatering system at the João Belo Mine.

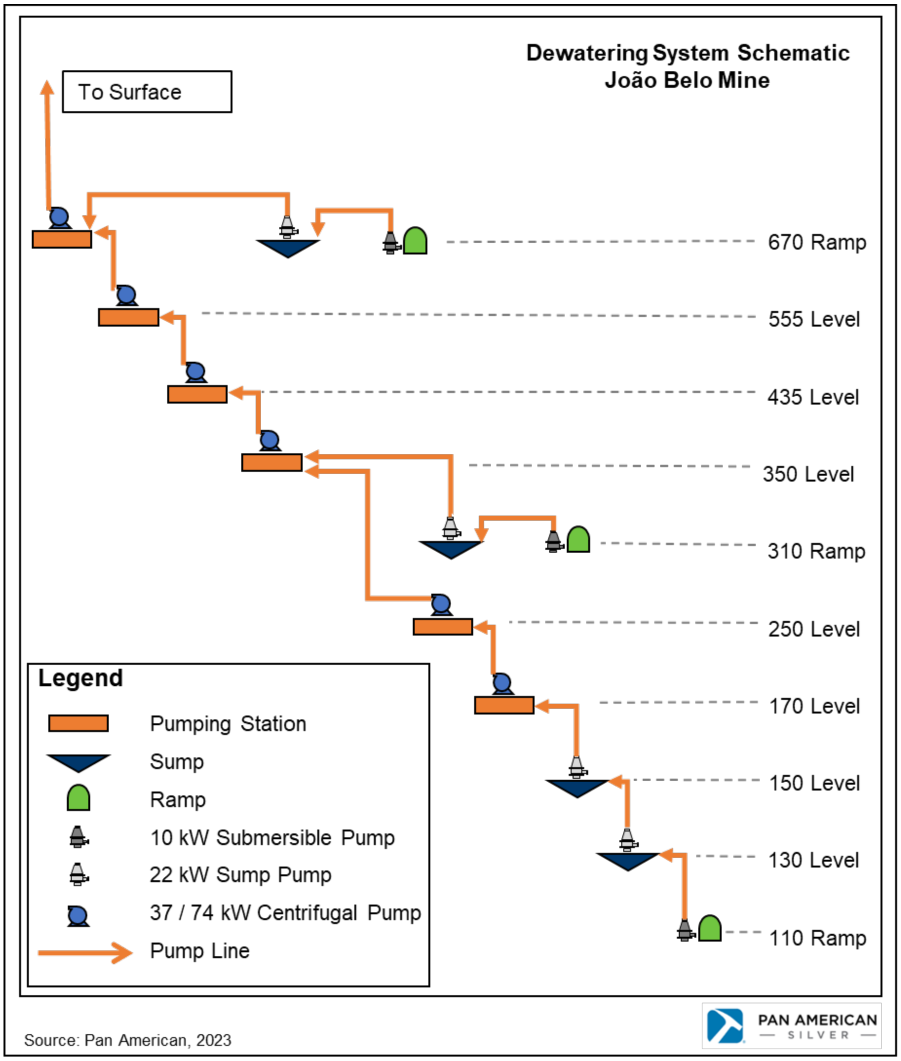


Figure 16-10: Schematic drawing of dewatering system at João Belo Mine

16.8 Compressed Air

Compressed air infrastructure is no longer used for underground mining operations at Jacobina. Development jumbos and production fan drills are equipped with autonomous compressed air systems. Compressed air is currently only used for mobile equipment maintenance and at the concrete plant on surface; it is distributed through 110 mm and 63 mm diameter pipes.

16.9 Power

The power supply and distribution at Jacobina is described in detail in Section 18 of this technical report.

16.10 Communications

Underground communications are carried out with the use of a Leaky Feeder 2-way radio system, which permits continuous contact between mine supervisors and operating and service crews in various locations throughout the mine complex.

Additional systems are used for better communication between the operators and the information center on the surface. The Newtrax system is a technology project implemented in 2018 and 2019 for controlling secondary fans, tracking underground personnel, and monitoring gas emissions. The system reduces energy consumption by stopping secondary fans during shift changes; improves logistics in times of emergency by tracking the location of personnel in the underground mines; and monitors gas levels in the underground working areas, which allows supervisors to anticipate ventilation problems and minimize re-entry times after blasting.

17 Recovery Methods

17.1 Introduction

The Jacobina mineral processing plant uses conventional gold processing methodologies to treat run-of-mine (ROM) material from the underground mines. Comminution comprises three stages of crushing followed by wet grinding. Within the grinding circuit, gravity concentration of gold is performed on a bleed stream of classification cyclone feed. Rejects from the gravity circuit are returned to the grinding circuit; the cyclone overflow is sent to leaching in a conventional cyanide leaching process, and gold extraction follows in carbon-in-pulp (CIP) tanks. Gold is stripped in an elution circuit and final gold recovery is performed in an electrowinning circuit. The sludge and solids from electrowinning are dried and smelted in an induction furnace to produce doré bars. The current process flow sheet is depicted in Figure 17-1.

17.2 Crushing Circuit

The ROM material is trucked to the crushing facilities located adjacent to the processing plant. The broken ore is passed through a grizzly and fed into a jaw crusher with a capacity of 920 t/h. The coarsely crushed material is then passed through secondary and tertiary cone crushers. The secondary crusher reduces the size of the feed to 80% passing 40 mm, and the tertiary crusher further reduces the feed to 80% passing 8 mm.

17.3 Grinding Circuit

The crushed ore feeds the grinding circuit where ball mill/cyclone combinations are used to grind and classify the ore to prepare the feed for the leach circuit. The product of the crushing circuit is fed to storage silos and then conveyed to the ball milling circuit where ore is ground to 80% passing 170 µm. Ball mill product is classified in cyclones, with the cyclone underflow being returned to the ball mills, and with the overflow forming the feed to the leach circuit. A portion of the circulating load is processed through Knelson gravity concentrators, and the concentrate is pumped to the intensive leaching reactors. It is estimated that 50% of the gold in the plant is recovered by the concentrator/reactor combination.

17.4 Thickening, Leaching, and Adsorption

Cyclone overflow from the grinding circuit is pumped to the pre-leach thickener and then to the leach tanks. A Falcon gravity concentrator, part of the dewatering process, provides an additional opportunity to extract fine Gravity Recoverable Gold (GRG) before the leaching stage. The leaching circuit consists of seven leaching tanks with a total capacity of 5,450 m3. The pulp from the leaching circuit is delivered to the CIP adsorption circuit. The activated carbon is pumped to a single screen per adsorption line. The loaded carbon from the CIP circuit is delivered to the elution circuit.

17.5 Elution Circuit

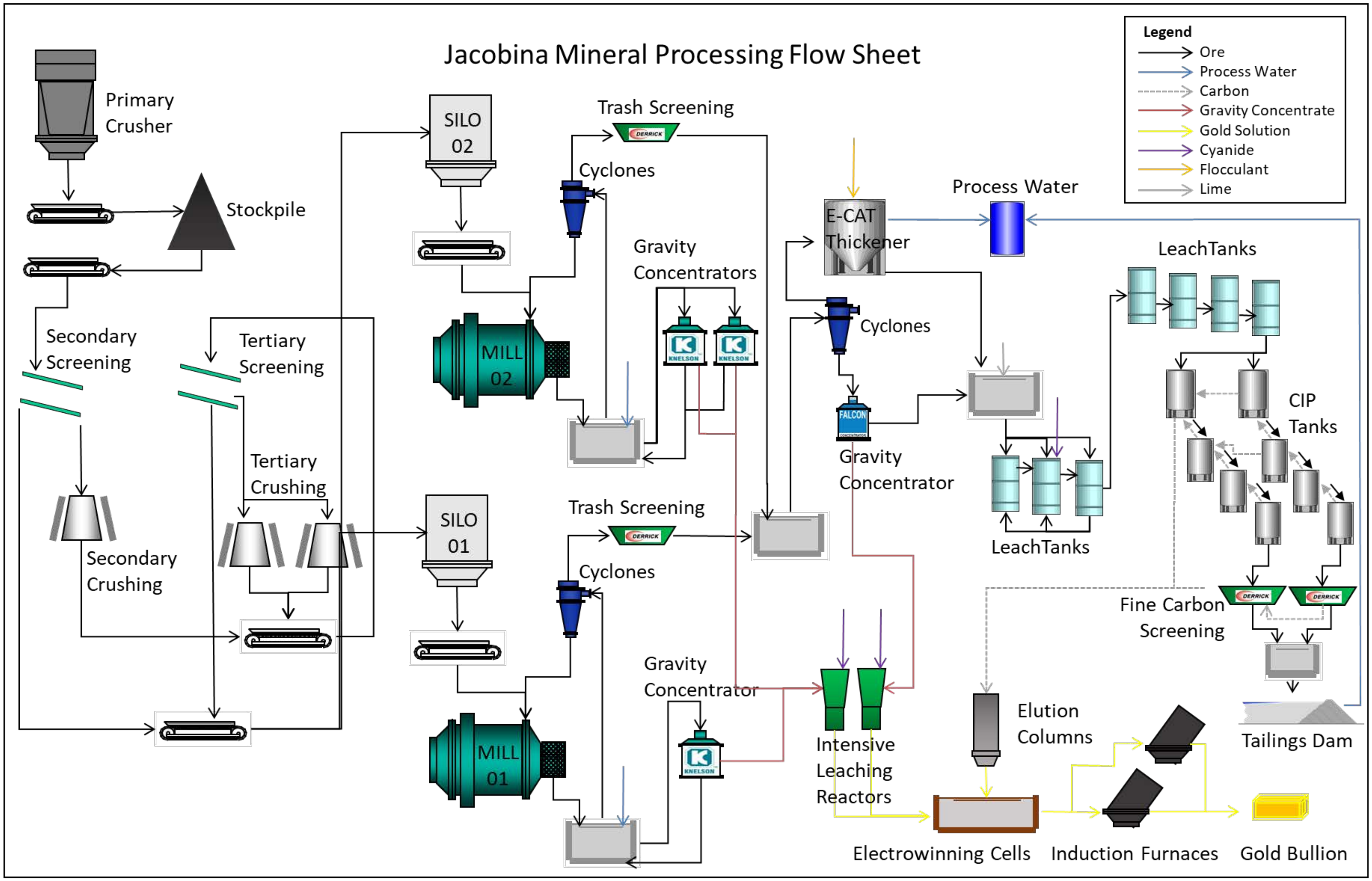
The loaded carbon from the CIP circuit reports to the acid wash column where concentrated hydrochloric acid is circulated through the bed of carbon to remove inorganic foulants such as scale and other salts. The acid-washed carbon is then transported to a separate elution column. The elution column is filled with NaCN and NaOH where the acid-washed carbon is stripped to produce a high-grade solution which reports to the pregnant eluate tank.

17.6 Electrowinning Circuit and Smelting

The pregnant solution from the carbon elution circuit and from the intensive leaching reactor is circulated through electrolytic cells. Both gold rich streams are pumped to two plating cells in parallel where the gold is deposited in the cathode cell and the solution returned to the storage tank. Doré bars are produced from the resulting sludge; they have a nominal composition of 96.5% gold, 3% silver, and 0.5% other metals.

17.7 Power, Water, and Material Requirements

Power requirement is around 61.629 MW-hr per year, water is recirculated from the tailing's storage facilities, and the main material requirements for processing the ore are 1.6 kg/t of grinding media, 0.5 kg per tonne of lime and 0.3 kg per tonne of sodium cyanide.



Source: Pan American, December 2023

Figure 17-1: Current process flow sheet

18 Project Infrastructure

Jacobina currently operates five mine sectors and has the following infrastructure necessary for a mining complex:

- Five underground mine sectors: Canavieiras, Morro do Cuscuz, and Serra do Córrego (North Mining Complex); João Belo and Morro de Vento (South Mining Complex).
- A conventional processing plant - with crushers, ball mills, leach tanks and CIP tanks - which produces gold doré.
- Mine and processing plant infrastructure, including office buildings, shops, and equipment.
- A fully lined tailings storage facility (TSF B2), consisting of a cyclone sand dam, constructed following the downstream construction method, and associated tailings and reclaim water pumping systems. The current completed phase (Phase V Stage 2A) has a dam height of 106.5 m at its highest point, at an elevation of 616.5 masl. At the final phase, Phase VII, TSF B2 will have an ultimate dam crest elevation of 640 masl. The current TSF design has an ultimate capacity of 27.8 M m^3 of slurry tailings and 14 M m^3 of cyclone sand used for construction of the main dam (DAM, 2020a).
- Water for the processing plant, pumped from the mine and collected in the tailings impoundment (95% recirculation).
- Electric power from the national grid.
- Mine ventilation fans and ventilation systems.
- Haulage roads from the mines to the plant.
- Stockpile areas.
- Warehouse, maintenance workshop and facilities.
- Administrative office facilities.
- Core storage and exploration offices.
- Canteen.
- Security gates and manned security posts at mine entries.
- Access road network connecting the mine infrastructure to the town site and to public roads.

JMC requires an expansion of its tailings storage capacity to support the current LOM. JMC is conceptualizing building and running a filtration plant to handle the tailing that exceeds the current B2 Dam capacity over the LOM and to store it in a filtered tailings TSF. The project spans an approximate strike length of eight kilometres, which will extend to approximately ten once the João Belo South Mine is developed. The mine and processing plant infrastructure are illustrated in Figure 18-1. The TSF designs and management are described in sections 18.2 and 20.2.2.

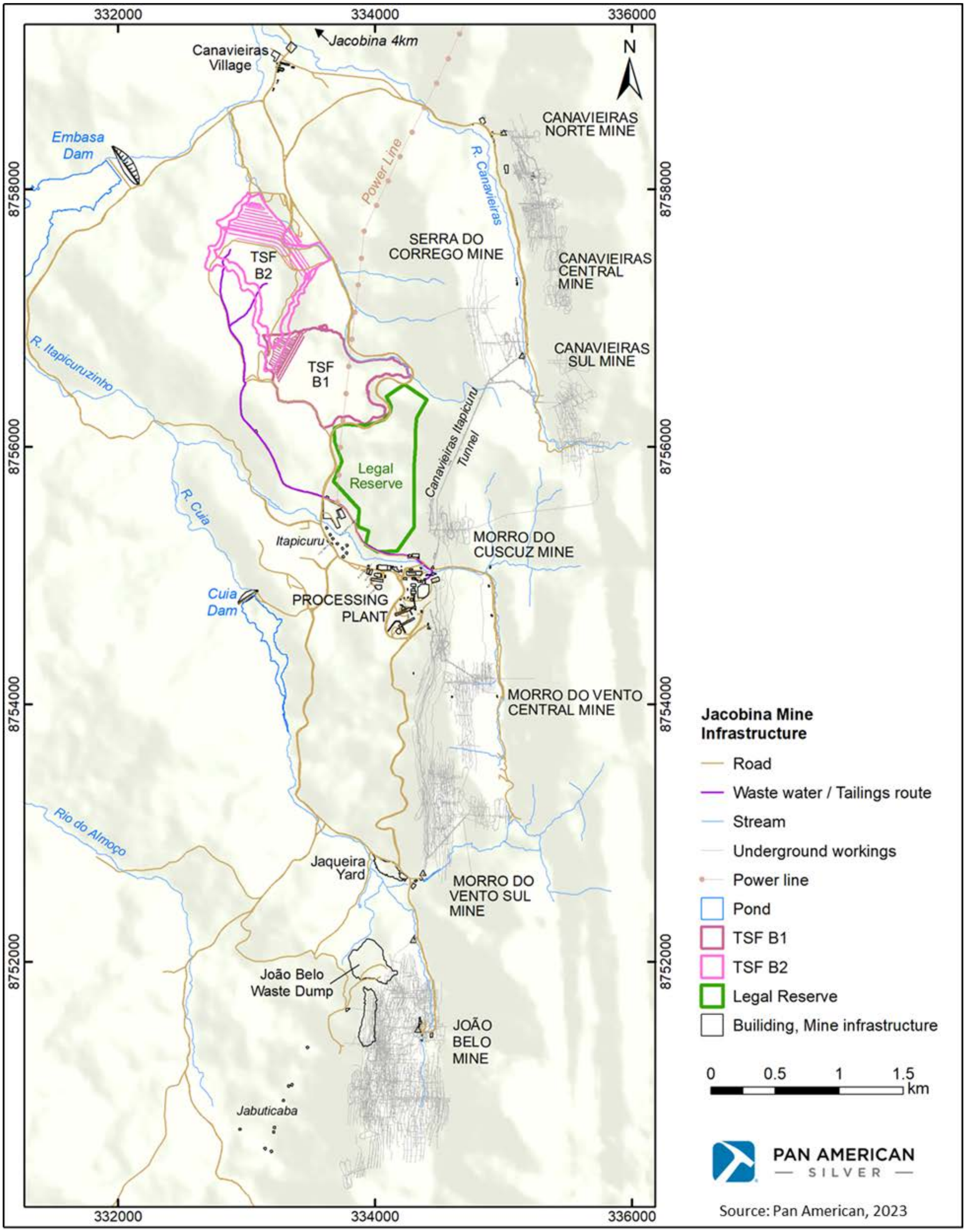


Figure 18-1: Site layout of mine infrastructure

Production at Jacobina has continuously increased since 2015, the result of the implementation of several optimization projects developed internally and with the support of external consultants. This increase in production was spurred by Jacobina's long mine life and by increased mineral reserves replacing and exceeding depletion.

Jacobina is currently targeting a production rate of 8,500 tpd and keeping metallurgical recoveries close to 96%. To achieve this several projects are currently ongoing:

- Repowering of secondary crushing screening to increase process reliability and prepare for eventual increase of production rates.
- Installation of new metal extractors in the crushing area to reduce process downtime.
- Installation of high-frequency sieves at the grinding area to improve efficiency in down-stream processes.
- Re-powering of tailing discharge pumps to ensure process stability.

Since the mineral reserve inventory has increased over depletion and the current inventory exceeds the capacity of the B2 tailings dam, alternatives are being evaluated for future tailings disposal. Pan American is currently working with external consultants on the conceptual engineering of a filtration plant for filtered tailings disposal. The project includes preliminary installation of filter presses. The location of the filtered tailings disposal area is planned downstream of the current B2 dam, supporting long-term stability and closure of the TSF area.

18.1 Power

Jacobina Mine is connected to the National Electric Grid through a 138 kV transmission line connected to the Jacobina II electric substation in the City of Jacobina. Power is supplied by COELBA, an energy distribution company, with a contracted demand of 16.8 MW at-peak and 18.0 MW off-peak at 138 kV. The contracted demand can be exceeded by up to 5%, but power demand in excess of that value incurs additional charges.

The existing power distribution system at Jacobina consists of a main substation (SE-880) which receives power at 138 kV through a distribution line from COELBA. The main substation has 2 similar 138 kV/13.8 kV step-down transformers designed at 20/25 MVA. Installation of a third 138 kV/13.8 kV step-down transformer is planned at the main substation to support future electrical load increases at the mine and processing facilities.

From the main substation, power is supplied to three distribution substations, which supply electrical power to the processing plant and the underground mines. Distribution substation SE-830-01 supplies power to the ball mills and has two 13.8 kV/4.16 kV transformers, designed at 10/12.5 MVA and 7.5/10 MVA. Electrical transformers, at 4.16 kV/0.44 kV, feed the plant auxiliary loads.

Power distribution to the underground mines is divided into two areas. Substation SE-850-QF-01 supplies power to the crushing area of the processing plant and the South Mining Complex, which consists of the João Belo and Morro do Vento mines. Substation SE-850-QF-02 supplies power to the North Mining Complex, which consists of the Canavieiras, Morro do Cuscuz, and Serra do Córrego mines. Power is supplied to the production faces through fixed and portable substations distributed throughout the underground mines; the substations are rated at 13.8 kV/440 V and designed at 750, 1000 or 1500 kVA. There are currently 42 underground substations located in the South Mining Complex and 34 in the North Mining Complex.

18.2 Tailings Dam Design and Construction

The tailings produced at the Jacobina mill are presently stored in a fully lined tailings storage facility, TSF B2, located 2.5 km north of the mineral processing plant. TSF B2 consists of a cyclone sand dam built following a downstream construction method. TSF B1 is a legacy tailings facility that has not been in operation since 2012. Figure 18-1 shows the location of both TSFs, B1 and B2.

The operation of TSF B2 contemplates seven construction phases. Phase V Stage 2A construction was completed in 2023 to an elevation of 616.5 masl and it is currently in operation. Phase V Stage 2A impoundment capacity is approximately 7 M m^3, assuming a 3 m freeboard. Construction of phase V Stage 2B is planned to start in the second half of 2024. Phase V has a final dam elevation of 620 masl. The final phase, Phase VII, has an ultimate dam elevation of 640 masl, as shown in Figure 18-2. The TSF designs for phases IV and V are summarized in design reports by DAM Projectos de Engenharia (DAM) (2017, 2020a, and 2023). The following paragraphs describe some of the key design characteristics for TSF B2.

The mine's Phase 2 expansion design assumes a processing rate of 8,500 tpd. TSF B2's ultimate capacity is of approximately 41.8 M m3 of tailings, including 27.8 M m3 of slurry fine tailings and 14 M m3 of cyclone sand material used for construction of the embankment dam. The final storage capacity for TSF B2 will be sufficient to manage the mineral reserves until the year 2032 as well as approximately 7 M additional tonnes of slurry fine tailings, assuming a density of 1.35 t/m3. In 2021 and 2022, a trade-off study was completed along with preliminary conceptual designs to allow for additional tailings storage capacity and considering implementation of new technologies such as filtered tailings. Expansion TSF designs were furthered advanced in 2023 and feasibility designs are expected by the end of 2024. A filtered tailing stack is currently under design to accommodate the tailings generated by the remaining of the estimated mineral reserves past 2032.

The TSF B2 dam has an overall downstream slope of approximately 2.5H:1V and upstream slope of 1.8H:1V. The following features improve the drainage and stability of the dam:

- A rockfill initial embankment dam (compacted to a 95% standard proctor density)
- Coarse-grained underdrain system
- Coarse-grained material for erosion protection
- Construction of a tailings beach extending from the crest of the dam

In addition, the total surface area of TSF B2 is lined using a 1.5 mm-thick low-density geomembrane on top of 9 m thick fine-grained low permeability bedding layer underlying the geomembrane liner along the upstream phase of the dam to limit potential seepage from the impoundment into the environment. Unsuitable materials and overburden soils were removed and stockpiled for use during closure and remediation activities.

Monitoring instruments installed for performance monitoring of the cyclone-sand dam and tailings impoundment area include piezometers and survey monuments. Section 20.3 provides more information on monitoring instrumentation and activities in the tailings area.

The Canadian Dam Association (CDA) ranks dams as structures of low, significant, high, very high, and extreme consequence based on the potential social, environmental, and economic damage that a dam failure may cause to the floodplain area located immediately downstream of the facility. Based on the CDA's consequence classification guidelines (CDA, 2007) and recent dam breach and inundation studies completed for TSF B2 in 2022, the TSF B2 dam is considered of extreme consequence, as permanent populations are located in the downstream area of the dam.

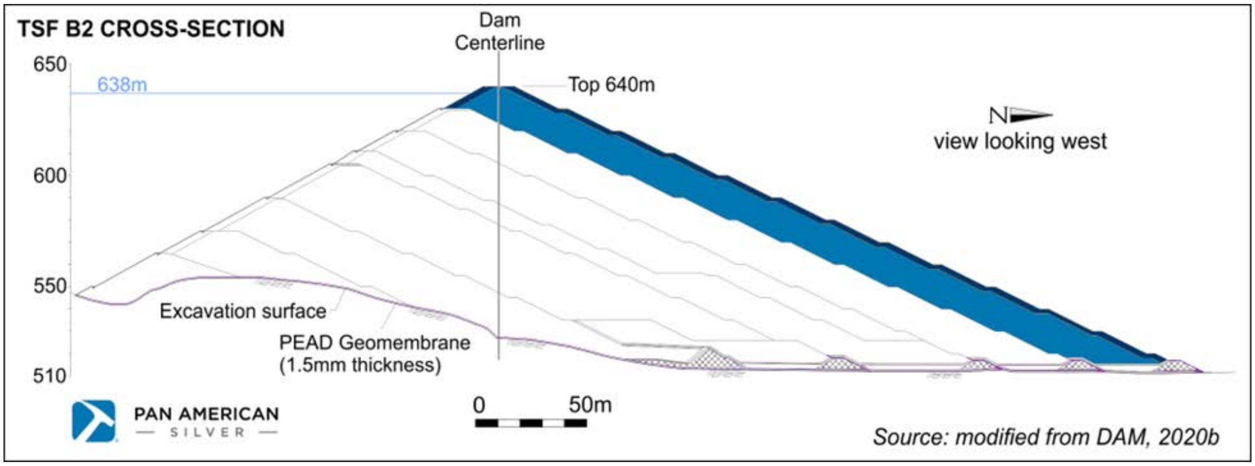


Figure 18-2: Cross-section of TSF B2 dam at final elevation

The precipitation event considered in the TSF B2 design is the PMP 24-hr storm event estimated at 405.7 mm (DAM, 2023). The design considers a minimum of 3 m freeboard above the maximum supernatant pond level for Phase V up to Phase VII. In addition, an emergency spillway with a flow capacity of 3 m^3 per second is installed for each dam raise.

TSF B2 was designed assuming a peak ground acceleration (PGA) of 0.05 g. Such a low PGA value is typical of seismically inactive areas.

Foundations conditions in TSF B2 dam area generally consist of dense residual soils on top of bedrock. All alluvial material encountered at the bottom of the basin was removed during construction of the initial TSF phases.

Ancillary infrastructures include a service road and diversion water channels around the entire perimeter of the TSF. These were built as part of the initial construction activities for TSF B2.

18.2.1 Tailings Deposition and Reclaim Water System

Tailings enter a tailings thickener prior to being pumped into the system of cyclones located in the TSF area. Coarse tailings from the underflow of the cyclones are used for construction of the tailings dam while fine tailings are deposited in the TSF impoundment area. Process water from slurry tailings discharged in the TSF impoundment contribute to the creation of a supernatant pond. Water accumulated in the TSF pond that is not lost to evaporation is reclaimed into the process plant. On average, water available from the TSF pond represents a significant percentage (over 90%) of the overall water needs of the mineral processing plant. The remainder of process water supplied to the process plant is pumped from the mine dewatering operations and wells. Tailings deposition and water reclaim lines to and from the TSF are located within a secondary containment. There is no discharge of tailings or process water into the environment at Jacobina.

Precipitation and surface water run-off represent a significant additional volume that needs to be managed in the TSF impoundment area. The region has a net positive precipitation rate (evaporation < precipitation). To limit the supernatant pond size, the mine installed a system of water canons in 2018 and 2021 that spray water to increase the evaporation rates.

19 Market Studies and Contracts

19.1 Markets

The principal commodity produced at Jacobina, 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$1,500/oz was used for mineral reserve estimation as well as for completing the economic analysis, which ensures the project is cash-flow-positive and therefore supports the mineral reserve estimate.

19.2 Contracts

JMC currently has a collective agreement with the workers union "Sindicato dos Trabalhadores na Indústria da Extração de Ouro e Metais Preciosos, Ferro, Metais Básicos, Pedras Preciosas, Semipreciosas, Mármore, Calcário, Pedras e Minerais Não Metálicos de Jacobina- Bahia e Região."

JMC also has existing contracts for equipment leasing, equipment operating, ore and waste haulage, material transport, and water trucks.

JMC has contracts for mine and plant consumables including drilling products and explosives.

Average prices for consumables during 2022 were as follows:

- Power: US$68.10/MWh
- Diesel fuel: US$1.10/L
- Steel balls: US$1.21/kg
- Caustic Soda: US$0.15/kg
- Lime: US$0.14/kg

The qualified person responsible for this section of the technical report has reviewed the market and contracts; the results of the review support the assumptions in the technical report. The terms, rates, or charges for material contracts are within industry norms.

20 Environmental Studies, Permitting, and Social or Community Impact

20.1 Project Permitting and Authorizations

The operation activities at Jacobina are regulated and inspected by the Environmental and Water Resources Institute (INEMA INSTITUTO DO MEIO AMBIENTE E RECURSOS HÍDRICOS), the environmental agency for the state of Bahia. All environmental issues related to Jacobina activities, both internal (environmental management, execution of environmental controls, attendance to environmental monitoring), and external (relationship with public agencies, environmental agency, renewal of licences), are supervised by the Technical Environmental Guarantee Commission (Comissão Técnica de Garantia Ambiental – CTGA) and through the Enterprise Monitoring Committee (Comissão de Acompanhamento do Empreendimento - CAE), an advisory committee comprising of government, non-governmental, and private sector members, to monitor compliance again the conditions established in the operating license through quarterly meetings, according to the requirements of the State Environmental Council of Bahia (Conselho Estadual de Meio Ambiente da Bahia – CEPRAM).

Licences required by various government agencies covering the operation of the mines, mill, and TSF B2 have been obtained and applications for renewals have been filed. The information on operational licences and water permits presented below was taken from the PFS by Ausenco (2020).

Jacobina has two operational licences and one modification license, one for underground mining (Operational License (L.O 1791/11), one for the processing plant and TSF (Operational License (L.O. 14.100/11) and one for expanding the production capacity of the plant and underground mining (Modification License (L.A.24.731/21). JMC is working to unify all those licenses for the entire site. The quantities and rates permitted by these licences are summarized in Table 20-1.

Table 20-1: Summary of environmental operational licences

Operational Licence	Activity	Permitted Quantity/ Rate	Date of Issue	Valid Until*
L.O. 14.100/11	Processing plant	7,500 tpd	January 30, 2011	January 30, 2016
	Stockpile area	15,000 t		
	TSF	23,938,000 m^3		
L.O. 1791/11	Underground mining	2,500,000 tpy	December 28, 2011	December 28, 2016
L.A.24.731/21	Processing plant	10.000 tpd	December 02, 2021	December 02, 2024
	Stockpile area	82.000 t		
	Underground mining	3.650.000 tpy		

** Because the requests for revalidations were submitted more than 120 days before the expiration dates, both of the licences remain valid until the process is analyzed and completed by INEMA.*

JMC has commenced a process to renew and change these operational licences through the INEMA. JMC met with INEMA in Salvador at the end of 2019 to present the Phase 2 Expansion. INEMA recommended that Jacobina should apply for a change licence for the Operational Licence (L.O. 14.100/11) (i.e., Change Licence (L.O. 14.100/11)) because the renewal of the Operational Licence (L.O.14.100/11) is still in progress. On the week of March 9, 2020, INEMA visited the Jacobina mine site. Presentations were given on the processing plant, TSF, and environment, highlighting the changes to the operation that had occurred between 2015 and 2019. In December 2021, INEMA granted the modification license for the requested capacity changes, as per the application and the issued decree.

Changes since 2015 are being reviewed by INEMA and include the following:

- Installation of a new gravimetric concentrator and hydrocylones
- Renovation of the gold refinery
- Installation of a concrete batching plant
- Operation of the hydraulic barrier downstream of TSF B2
- Closure of João Belo waste dump

JMC is applying for the following inclusions in Change Licence (L.O 14.100/11) (Process number 2020.001.001035/ INEMA/LIC-01035):

- Decrease of the environmental free board of TSF B2 from 3 m to 2 m.

The renewal process of the mining Operational Licence (L.O. 1791/11) and a reinvasion of the Operational License (L.O. 14.100/11) will be processed in parallel and is currently under review by the local authorities.

A summary of water permits under renewal at INEMA is provided in Table 20-2.

Table 20-2: Summary of water permits

Ordinance Granting Water Use	Description	Authorized Flow Rate (m^3/day)	Issue Date	Expiry Date*
15.752/2018 Freshwater withdrawal	Authorizes freshwater withdrawal in the Itapicuru River watershed, from an existing dam, (Cuia) authorized through Ordinance No. 219/04	2,125	March 14, 2018	March 14, 2022
18.678/2018 Mine water discharge	Authorizes the discharge of effluent into the Itapicuru River watershed, on the “Sem Nome” River	7,200	July 16, 2019	July 16, 2023

**Permit renewal is under review by the local authority. The current permits are still valid until the local authority provides a final decision about it.*

20.2 Environmental Management

20.2.1 Environmental Management System

JMC has implemented an integrated management system covering health, safety, environment, and community through internationally accredited systems, including the ISO 14001 Environmental Management System, the ISO 45001 Occupational Health and Safety Management System, TSM - Towards Sustainable Mining, and the International Cyanide Management Code. JMC is also certified on ESG - Environmental, Social, and Governance by the Brazilian Association of Technical Standards ABNT (Associacao Brasileira de Normas Tecnicas).

Jacobina has implemented the JMC Management System (SYG, in Portuguese) to establish the organization's policies and objectives. This system supports the management of environmental and occupational health and safety policies, social responsibility, and community relations; it also helps manage proposed objectives and meet the needs, expectations, and requirements of stakeholders. A risk assessment matrix was developed for the Jacobina mine operation by integrating risk matrices for ISO 14001:2015 and ISO 45001:2018. A hazardous and non-hazardous solid waste management plan was developed and implemented (POP-04-02-3.5-039).

JMC's Integrated Health, Safety and Environment Framework reflects the operation's approach to health and safety, and environmental management. Its purpose is to help develop a robust management system that allows the operation to have systematic approach to its operational challenges.

20.2.2 Tailings Management and Monitoring

JMC prioritizes the management of tailings and is aligned with best practices of the Mining Association of Canada (MAC), Towards Sustainable Management (TSM) Protocol, and the Canadian Dam Association (CDA) guideline. Pan American currently has a dedicated Corporate Tailings Team including a Corporate Director and Sr. Tailings Engineer whose sole responsibility is the governance of the tailings management system and to provide technical guidance and support to ensure compliance.

Since 2017, JMC has implemented a tailings management system known as SYGBAR. The system is built on a six-point management system that focuses on the following protocols:

- Standards for design and construction, and the use of design reviews
- Constant TSF monitoring and site-specific key performance indicators for development and performance management
- Periodic safety inspection
- Documentation and monthly reporting
- Training and continuous improvement
- Emergency response plans with dam failure analysis

As a member of the MAC, Pan American will be assessing its current tailings management systems with respect to the tailings framework proposed in MAC (2022) and TSM Protocol (2022). Previously, MAC (2019) and TSM Protocol (2019) were used for assessing the site's tailings management systems. MAC's tailings management systems and guidelines have been formally adopted by mining associations in Canada, Argentina, Brazil, Mexico and Guatemala since 2019. The MAC systems include the completion of a Dam Safety Review (DSR) that follows the guidelines and recommendations provided in CDA dam safety guidelines (CDA, 2007) and its corresponding mining bulletin.

The tailings produced at the Jacobina mill are presently stored in a fully-lined facility, TSF B2. TSF B1 is a legacy tailings facility that has not been in operation since 2012. TSF B1 has been rehabilitated according to the Recovery Plan Report (PRAD) and INEMA standards, which include the installation of closure cover in the impoundment area and the placement of a revegetation layer. TSF B1 is moving forward with a de-characterization design initiated in Q3 2023 following Brazilian regulations.

Both TSF B1 and TSF B2 are monitored on an ongoing basis for seepage and physical stability conditions. Monitoring includes collecting data on phreatic surface levels in the dams and potential signs of deformation or other physical instabilities. Monitoring instrumentation includes a network of piezometers, tiltmeters and survey monuments installed in the B1 and B2 dams. Volumes of deposited tailings, grain size distribution and density of the tailings, and impoundment water levels and volumes are also recorded for TSF B2 on a regular basis.

In addition, the Jacobina tailings area is covered by an extensive environmental monitoring program; this consists of 21 surface water stations, 60 groundwater monitoring points, as well as the monitoring of effluent, sediment, air quality (dust fallout), noise, and weather. Also, INEMA approved a project proposed to collect sulphate emanating from the old TSF B1. The project was fully implemented by November 2017; it consists of a system of groundwater interception wells installed downstream of TSF B2, immediately upstream of the Itapicuru River, designed to intercept the sulphate plume from TSF B1. Monitoring in 2018 has shown a reduction in sulphate at downstream locations. In addition, metals potentially associated with TSF B1's water quality, such as lead, copper, and zinc, are now also being intercepted (MDGEO, 2018). Recommendations from MDGEO Servicos de Hidrogeologia Ltda. (MDGEO) included the installation of additional monitoring wells to better assess the system's performance.

As part of the mine's tailings management system, Jacobina has an Independent Review Board (ITRB) and completed several independent expert reviews for TSF B2 in recent years; these include annual reviews by the renowned international and local experts. The review process includes an assessment of the design, stability, construction, and operation of the tailings facility. The November 2022 and April and October 2023 ITRB session in Jacobina concluded that there were no significant weaknesses nor discrepancies from international best practices.

More recent dam inspections of TSF B2 were completed by local engineering experts, including Fonntes Geotécnica in 2023, SRK in 2022, GeoHydroTech in 2019 and DAM Projetos de Engenharia (DAM) annually since 2020. DAM is the design firm responsible for the design of TSF B2. Dam Safety Inspections of TSF B2 concluded that the facility is in good condition, the instrumentation system in place is adequate, and the dam is stable and meets the recommended safety standards.

Inspections by the various experts typically provided recommendations on maintenance and potential improvements to the design so that the mine works in an organized fashion based on an agreed upon prioritization.

Finally, the current closure plan for TSF B2 is presently at a conceptual level. The existing closure plan needs to be further developed, including preparation of more detailed closure design to confirm the feasibility of the existing conceptual closure plan approved by the regional authority (ANM), including budgets, and implementation schedules. The mine closure plan needs to also consider a plan for the long-term management of sulphate/metals in water collected from TSF B1. TSF B1 dam closure activities have been concluded in 2023 as per initial agreement with the environmental agency. TSF B1 will have decharacterization designs advanced in 2024 and 2025 to meet the requirements set by the mining agency for this type of structure, including mechanism to allow long-term stable conditions and phreatic levels.

20.2.3 Water Management

Water management is a primary focus at Jacobina and has two main goals: (i) to minimize freshwater use in industrial processes, especially during drought conditions, and (ii) to intercept and treat contact water and site effluent. Water management also includes the interception and management of a sulphate/metals plume emanating from TSF B1 to minimize downstream effects from the Jacobina mine operation on the Itapicuru-Mirim River.

The waste rock extracted from underground mining is used for underground backfill and for dam construction when required. ARD - acid rock drainage / metal leaching - ML management is required for legacy mine facilities located at the Jacobina mine site. Contact water is collected from the TSF B1 and the João Belo waste rock dump, both inactive facilities.

The main water used for ore processing is water recirculated from TSF B2, equivalent to a rate of 95% for the entire site. On the other hand, the freshwater intake is collected in the Cuia dam reservoir located in the river of the same name, approximately 1.5 km from the industrial area. This water is clarified prior to being used in the process plan (gold elution process) and a portion of it is conveyed to a potable water treatment plant for domestic use and drinking water supply.

The water used in underground mine operations is first pumped into sumps and from there to a water treatment plant where the pH is adjusted to the desired level using caustic soda. Most of the mine water is pumped back and used in the underground operations.

In 2021, after technical analysis by INEMA of the waste pile projects of the Caldeirão, an opinion was issued requesting further details regarding the hydrogeological studies of the requested area and verification of compliance with regulatory reference from the Brazilian Association of Technical Standards (Associação Brasileira de Normas Técnicas - ABNT) NBR 13029 “disposition of waste rock in a pile”. Therefore, new studies and evaluations will be carried out to continue preparations for the implementation of the PDE (waste rock disposal pile), if authorized by the local environmental agency.

TSF B1, no longer in operation, has been rehabilitated. TSF B2 is lined with a geomembrane which reduces water infiltration to the groundwater environment. Diversion channels around the TSFs minimize the catchment area that contributes surface runoff from precipitation. A total of four evaporators reduces the water inventory in the tailings pond, minimizing the need to discharge excess water to the environment. The percolated solution of TSF B1 and seepage from TSF B2 are pumped back to the tailings pond of the active TSF. Water collected in this tailings pond is recirculated and reused in the industrial process.

TSF B2 is equipped with an emergency overflow structure designed to safely convey the PMP 24-hour storm runoff event while maintaining a minimum freeboard from the dam crest to prevent dam overtopping. Operation requirements of the TSF B2 tailings pond include maintaining the storage availability between the maximum operating water level elevation and the invert elevation of the emergency overflow structure. The purpose of this storage allowance is to manage runoff resulting from extreme storm events without activating the emergency overflow.

The water management system of Jacobina has been designed as a closed circuit, where water collected in the tailings pond is either used in the industrial process (or other activities such as dust suppression) without discharge of water to the environment. Besides the four evaporators in TSF B2 to help dealing with excess water, there is an effluent treatment system (ETAC) located in the North Mining Complex (Canavieiras) that uses caustic soda and coagulants to adjust the quality of the mine water and then pump it back to the mine operation circuit.

The TSF B1, built in the 1980s, is not lined with geomembrane to reduce water infiltration. In November 2017, with approval from INEMA, a system of groundwater interception wells was put into operation downstream of TSF B2 and upstream of the Itapicuru-Mirim River; with the purpose of intercepting the sulphate plume from TSF B1 to reduce sulphate concentrations downstream of the TSF B2. The intercepted water is pumped back to the TSF B2 tailings pond. In addition to the sulphate, other metals such as lead, copper, and zinc, potentially associated with the tailings, are being intercepted. Monitoring in 2018 showed a reduction in sulphate at downstream locations after the system was implemented (RPA, 2019). Following a performance assessment in 2018, recommendations were made to include additional monitoring wells to improve the assessment, and to carry out a study to evaluate the installation of additional interception wells in some areas of the current system to improve collection of the plume (RPA, 2019). Since 2020, 17 new wells were constructed at TSF B1 to reduce its water level and 6 new wells were constructed downstream from TSF B2 to improve the monitoring of the sulphate plume.

During operations, the collected water is recirculated and used for mine operation activities; however, another plan for sulphate/metals management will be required post-closure. It is anticipated that during the closure and post-closure phases the water collected in the TSF B2 tailings pond will have to be treated prior to discharge to the environment to comply with national environmental legislation on water quality (SETE, 2018).

The sewage treatment plant receives and treats the sanitary effluent from the plant area and the support facilities. Currently, the treated effluent is pumped to TSF B2 pond, but improvements in the plant are being planned to reuse this water for irrigation purposes at TSF B1.Currently, the treated effluent is pumped to TSF B2 pond, but improvements in the plant are being planned to reuse this water for irrigation purposes at TSF B1.

Seepage water from the João Belo waste rock dump is acidic. In 2019, a water collection pond was built downstream of the stockpile to collect runoff from the dump and prevent impacts to the Cuia River. The water is now pumped to the recirculation circuit for use in the process. Furthermore, pilot-scale studies have been carried out for effluent water treatment of the João Belo stockpile at closure (SETE, 2018). The bench/pilot-scale studies conclude that the best alternative for full-scale treatment will be a passive treatment system.

A site-wide water balance has been developed to mitigate the risk to water supply due to drought as well as the risk of excess water to the operation. In response to drought conditions, Jacobina has been successful at reducing freshwater consumption. In 2018, the Green Belt Operational Excellence project “Reduction of Freshwater Consumption”, carried out in 2017, received an award from the mining magazine Minérios & Minerales. The main result of this project was the reduction in the water withdrawal, by promoting an increase in the reuse of process water. Today JMC recirculates 95% of process water.

In 2019, an Operational Excellence project was carried out to automate water balance tracking. The main objective was to integrate the automation systems of the mine and plant in the PI software, a database program used by the environmental team for online monitoring of the main flows between the different areas of the operation.

20.3 Environmental Monitoring

To comply with environmental legislation and applicable standards, the Jacobina Mine carries out environmental monitoring in the areas influenced by the operation. The monitoring is carried out by an internal technical team, trained and qualified for execution and evaluation of the monitoring program, as well as externally by third parties contracted for each type of monitoring. Where applicable, accreditation of methods according to INMETRO/ABNT NBR ISO/IEC 17025 is requested for the external companies.

The environmental monitoring program at Jacobina is extensive; it relies on the following number of quality sampling points: 38 for surface water, 136 for groundwater, 8 for sediments, 27 for effluents (including industrial, mine and sanitary), 66 for TS B2 pond, 4 for solid waste, hazardous and non-hazardous, classification, and 28 for drinking water. There is also monitoring of air quality (dust fallout), noise, vibration, river flows, groundwater levels and climate. In 2021, two fixed vibration monitoring stations were installed in the Jaboticaba and Itapicuru communities; while mobile equipment is used for vibration monitoring in other areas, as required.

Ongoing monitoring of fauna and flora has not been a condition to current and previous operational licences, but it might occur in subsequent ones. In a proactive approach, Jacobina initiated a monitoring program for both fauna and flora with the completion of an initial inventory in March 2020.

An operational process standard has been developed for surface water, groundwater, and liquid effluent monitoring (POP-04-02-4.1-170), which is reviewed every year.

Water quality samples are analyzed in the Jacobina Mine Laboratory for a suite of parameters that include alkalinity, pH, free cyanide, WAD cyanide, total cyanide, chloride, free residual chlorine, total coliforms (P/A), conductivity, colour, biochemical oxygen demand (BOD), chemical oxygen demand (COD), hardness, Escherichia coli (P/A), dissolved iron, ammoniacal nitrogen, oils and greases, dissolved oxygen (DO), total cadmium, total lead, total zinc, total dissolved solids (TDS), total suspended solids (TSS), sedimentable solids (SS), sulphate, temperature, and turbidity. Since October 2019, Corplab Environmental Analytical Services, an accredited external laboratory affiliated with ALS Global, is responsible to analyze samples for an expanded suite of water quality parameters.

Determining the background groundwater quality concentrations that can serve as a reference to identify environmental impacts for the area is a complex task. Many parameters, such as antimony, arsenic, iron, lead, and manganese can occur naturally in concentrations above reference thresholds adopted for groundwater in mineralized areas. Historical high concentrations of anionic compounds and metals in the area downstream of TSF B1 are indicative of its influence on groundwater. Likewise, the influence of mining activities on groundwater is noticed in the processing area and João Belo area, where the water quality samples can present higher concentrations of some parameters than in areas located upstream. PH is slightly acidic in the region, even in upstream areas.

In compliance with conditions established in the operating licences, annual environmental assurance technical reports are submitted to INEMA in March of every year, in addition to other submissions of monitoring results that take place throughout the year. The latest Environmental Assurance Technical Report from 2022 summarizes the compliance of conditions and monitoring activities.

No non-compliance issues have been raised by INEMA about the 2022 report and there were no non-compliances for the last ISO 14001 audit completed in April 2023.

Regarding the water quality of water bodies located in the JMC and surrounding areas, it was found that most of the parameters that were outside the limits established by CONAMA 357/2005 are related to the characteristics of the region or similar to baseline conditions, such as pH and dissolved aluminum, observed- if also BOD above the limit recommended by CONAMA, possibly resulting from domestic discharge and/or the presence of animals rom activities carried out in the region, not related to JMC since all effluent is directed for treatment and recirculated.

20.4 Environmental Status

The main programs undertaken by Jacobina to cover various environmental aspects in and around the mine complex are as follows:

- **Environmental Complex Project.** Aims to integrate environmental practices and sustainability concepts through reactivation of the sewage treatment station plant, implementation of temporary residue deposit program, implementation of composting unit, construction of tree nursery, and construction of environmental education center.

- **Solid Waste Management Program.** Aims at managing solid waste by the identification, collection, and disposal of selected waste to licensed recipients and by conducting experimental research and analytical work. Includes identification of requirements, and of licensed recipients as well as periodic revisions.

- **Degraded Areas Recovery Plan.** Mapping of the degraded areas, studies of fauna and flora interaction, definition of recovery methodology, chronogram of activities, and presentation to environmental authorities.

- **Water Balance and Water Use Program.** A comprehensive site-wide water balance has been developed with support of external consultants to mitigate the risk of both drought and excess water to the operation, in response to drought conditions, Jacobina has been successful at reducing freshwater consumption.

- **Environmental Control and Monitoring Plan.** Monitoring of the TSFs and acid rock drainage. Establishment of methods to monitor the impact and frequency of operation activities on surface water, groundwater, ambient noise, and air emissions (dust, gases, “black smoke”). Monitoring of flora and fauna was initiated in the first quarter of 2020.

- Other environmental initiatives such as environmental education and environmental emergency brigade.

20.5 Community Relations

20.5.1 General Context

The Jacobina Mine is located in the Serra de Jacobina, where gold mining has occurred since the end of the 17th century.

- The direct area of influence comprises the communities of Itapicuru, Jaboticaba, Pontilhão and Canavieiras, with approximately 2,000 inhabitants.

- The indirect area of influence covers the entire municipality of Jacobina, BA, where the operation is located. According to IBGE (2010), the municipality of Jacobina has five districts and 22 (twenty-two) villages, including Canavieiras, Itapicuru, Jaboticaba and Pontilhão, with approximately 82,600 inhabitants.

Jacobina municipality is the central economic hub of Piemonte da Diamantina region, known for its diverse economic activities. The mineral sector is a prominent contributor, with gold and sandstone extraction being the main activities. Additionally, livestock farming of cattle, goats, and pigs, along with the industrial sector, which includes clothing and footwear factories, and the commercial sector, play significant roles in the region's economic growth. In Jacobina, ecotourism stands out due to its mountainous terrain, abundant waterfalls, rivers, and lakes and its rich cultural heritage.

This section presents the results of the social review based on documentation for JMC's operations and compared with the relevant International Finance Corporation (IFC) Performance Standards (PS). This social assessment does not represent a detailed audit of JMC's compliance with IFC Performance Standards. JMC's social performance in Jacobina is compared with the following IFC 2012 PS:

PS1: Socio-environmental Assessment and Management Systems requires companies to identify, evaluate, and mitigate the social and environmental impacts and risks they generate throughout the life cycle of their projects and operations. From a social perspective, the requirement includes: a comprehensive social assessment, identification of critical social impacts and risks, community consultation and engagement, dissemination of information, mitigation plans to address impacts and risks, and development of an organizational structure with qualified personnel and budgets to manage the global social management system.

PS2: Work and Working Conditions incorporates International Labour Organization conventions that seek to protect the basic rights of workers and promote effective relationships between workers and managers.

PS4: Community Health and Safety declares the project's duty to avoid or minimize risks and impacts to the health and safety of the community and addresses priorities and measures to avoid and mitigate project-related impacts and risks that may generate community exposure to accident and disease risks.

PS5: Land Acquisition and Involuntary Resettlement considers the need for land acquisition or involuntary resettlement of any individual, family or group; including the potential for economic displacement.

PS7: Indigenous Peoples considers the presence of groups, communities or indigenous lands in the area that may be directly or indirectly affected by projects or operations.

PS8: Cultural Heritage. This standard is based on the Convention on the Protection of the World Cultural and Natural Heritage. The objectives are to preserve and protect irreplaceable cultural heritage during the operations of a project, whether it is legally protected or previously disturbed, and to promote equitable sharing of the benefits of using cultural heritage in business activities.

PS3 Resource Efficiency and Pollution Prevention and **PS6 Biodiversity Conservation** are not included in this list for social performance as they correspond to environmental performance standards.

20.5.2 PS1: Socio-environmental Assessment and Management Systems

A strategic stakeholder management approach, assessment and management of social risks are part of JMC's operating strategies. The social risk management elements are shown in Table 20-3.

Table 20-3: Social risk management

Category	Management Elements
Stakeholder Engagement	Stakeholder identification and analysis (mapping)
	Stakeholder engagement
	Social risk management
	Grievances mechanism
Impact Management	Impact identification
	Impact management
	Community Baseline Information Tracking
Benefits Management	Local employment and procurement
	Community investment
	Community development

The framework above guides JMC and its operations to gather information about relevant stakeholders, assess potential impacts, and develop mitigation measures.

Under these guidance documents, JMC has been monitoring stakeholder issues and risks related to Jacobina and has aimed to continually communicate project activities and other programs to stakeholders and the general public. Jacobina has several environmental certifications relevant to the social environment including:

- ISO 14001:2015, a tool to help companies identify, prioritize, and manage environmental risks.
- ISO 45001:2018 consists of an Occupational Health and Safety Management Certification System.

Regular audits and reports on social performance are carried out for Jacobina, and recommendations are made to improve communication and performance based on the audit findings.

20.5.3 PS2: Work and Working Conditions

Workers at Jacobina are registered and covered by a collective bargaining agreement renewed in 2023. Some examples of labour benefits include (but are not limited to):

- Overtime pay
- Compensation for dangerous activities
- Retirement Bonus
- Profit sharing
- Food and meal cards
- Educational supplements for employees and families
- Health insurance
- Dental plan
- Life insurance

- Childcare Benefits
- Vacation Benefits

Jacobina employs 90% of workers from the local community, with 3% from elsewhere in the country.

The HSEC team guides JMC and its operations to inform the development of site-specific health and safety procedures and how to improve operations based on health and safety monitoring performance.

Regular audits and reports on worker health and safety are carried out for Jacobina, and recommendations are made to improve performance based on the audit findings.

JMC has once again been certified by Great Place to Work, recognizing it as one of the best companies to work for globally. JMC retained its certification for the fourth consecutive year in 2023 after conducting extensive quantitative research involving more than a thousand employees. The certification validates the organizational culture of JMC, which is focused on the development and well-being of its people.

20.5.4 PS4: Community Health and Safety

JMC has made a series of commitments to the well-being, health and safety of the community in Jacobina, including the following:

- Corporate programs with direct investments in the community such as community developments, the “Open Doors” Program to improve community communications, and the “Integration Program” that aims to improve the community's quality of life.
- Arts and education programs.
- Community Development Programs.

The JMC provides updates on these programs to community members through presentations and ongoing discussions with stakeholders. Some of these recent and specific programs are listed below:

- Regular meetings with stakeholders
- Seminar for women entrepreneurs
- Awareness program on Family, Community, Environment and Health
- Cultural events
- Actions to combat sexual exploitation of children and adolescents
- Participation in the Itapicuru Hydrographic Basin Committee

This list is just a part of the social, cultural, educational, and economic programs developed and supported by JMC in Jacobina.

20.5.5 PS5: Land Acquisition and Involuntary Resettlement

At the time of preparing this technical report, there are no new activities proposed outside of the existing project footprint, there is no new land acquisition or involuntary resettlement.

20.5.6 PS7: Indigenous Peoples

Based on available information, no Indigenous Peoples reside or use the lands in the project area. Therefore, this standard is not relevant to this review.

20.5.7 PS8: Cultural Heritage

The area around the Jacobina Mine is not known for archaeological resources and no related studies have been completed to date.

20.6 Mine Closure

The Jacobina operation involves mining and processing of gold ore. The mining unit consists of five underground mine sectors (Canavieiras, Morro do Cuscuz, Serra do Córrego, João Belo, and Morro de Vento) with respective openings for galleries and ventilation shafts, a metallurgical plant with ore processing facilities, the Cuia dam and reservoir (freshwater), TSF B1 and TSF B2, administrative and operational support facilities, and haul and access roads. Two additional inactive facilities, an open pit and a waste rock stockpile from the former João Belo Mine are located at the Jacobina mine site.

The mine closure plan for Jacobina will be developed in three stages: conceptual plan, basic plan and executive plan, with increased level of detail as the operation approaches the end of the mine life. The current mine closure plan (SETE, 2018), which corresponds to the conceptual stage, considers the beginning of mine closure in 2032. It was prepared based on JMC's standard procedure PCS-00-00-3.5-015 – Closing of Mining Activities; these activities are in line with the recommendations of the International Council on Mining and Metals (ICMM, 2008) according to SETE (2018).

The mining regulatory norm NRM No. 20/2001 establishes administrative and operational procedures in case of mine closure (definitive cessation), suspension (temporary cessation), and resumption of mining operations. NRM No. 20/2001 also outlines the content requirements of the mine closure plan.

The mining regulatory norm NRM No. 21/2001 establishes administrative and operational procedures in case of rehabilitation of mined and impacted areas. According to this norm, rehabilitation projects must be prepared by legally qualified technicians and submitted to the National Mining Agency (ANM for its acronym in Portuguese) for evaluation.

The main objective of the conceptual mine closure plan for Jacobina is to present solutions to be implemented before, during, and after mine closure in order to avoid, eliminate, or minimize occurrences of long-term environmental liabilities and eventual future obligations for JMC. The conceptual mine closure plan for Jacobina considers the following three phases:

- Pre-closure phase: encompasses a period of 2 years prior to commencement of decommissioning activities and execution of closure works. Final closure studies will be developed during this phase.

- Closure phase: encompasses decommissioning activities and execution of closure works for rehabilitation of the mine site area.
- Post-closure phase: expected minimum duration of 5 years encompassing environmental stabilization, post-closure monitoring and verification of physical, biological and socioeconomic stability, including maintenance activities. Post-closure monitoring of the tailings dams is expected to be required for a longer period, estimated to be 10 years.

A summary of the main proposed closure activities is presented in Table 20-4.

Table 20-4: Summary of main closure activities

	Mine Component	Closure Activities
Mine	Open pit mine (João Belo)	Removal of equipment and auxiliary infrastructure
		Construction of perimeter fencing
		Signage
	Underground mines	Dismantling and removal of mobile equipment for reuse or sale
		Dismantling and removal of water management, ventilation, and communication infrastructure
		De-energization and contaminant removal
		Installation of reinforced concrete at access points to block access
Waste Disposal Facilities	Waste rock stockpiles	Recontouring of slope, if needed, for physical stability
		Installation of low-permeability cover to limit infiltration and promote storage and evaporation of surface water runoff
		Construction of surface drainage system with erosion-protection lining for management of clean surface runoff
		Revegetation where possible
	Tailings storage facility	Consolidation and treatment of tailings by removing impounded water
		Levelling, slope stabilization, and recontouring
		Installation of low-permeability cover to limit infiltration, induce chemical stabilization, and promote storage and evaporation of surface water runoff
		Construction of drainage system as part of the cover
		Reconfiguration of non-contact water diversion channels
		Removal of equipment and auxiliary infrastructure
		Revegetation where possible
Other Infrastructure	Process plant Water management infrastructure Workshops Warehouse & auxiliary buildings Electrical substations Access and hauling roads Fuel station Gallery 7 Environmental complex	Disassembly of electrical, mechanical, and hydraulic systems
		Topographic regularization for revegetation, in compliance with the Degraded Areas Recovery Plan
		Adequate disposal of chemical substances, contaminated materials, non-contaminated materials, hazardous waste and non-hazardous waste
		Dismantling, demolition, salvaging, and disposal of structures; including buried structures when necessary
		Demolition of masonry building facilities
		General sanitation and cleaning
		Removal of equipment
		Verification of soil quality and removal of contaminated soils if required
		Scarification of access roads
		Transportation to authorized disposal or collection areas
		Maintenance of Gallery 7 for visitors in partnership with the Ouro Vivo Museum and in association with the Environmental Education Center
		Keep the environmental Education Center area operational. Seedling Nursery repurposed for cultivation of ornamental plants. Disposable Materials Center repurposed for commercialization of ornamental plants to be produced by the community.
Staff Facilities	Administrative buildings Potable water and sewage systems	Dismantling and removal of structures and equipment to authorized disposal areas
		Removal of prefabricated elements
		Demolition of concrete slabs
		Recontouring of surface topography for revegetation, in compliance to the PRAD
		Implementation of natural drainage

Physical, chemical, hydrological, and biological stability conditions following closure will be verified through implementation of a post-closure maintenance and monitoring program. Monitoring should also support the evaluation and verification of compliance with closure activities and targets, and the identification of deviations leading to the adoption of corrective measures.

The closure and post-closure initiatives and monitoring programs designed to achieve physical, chemical, biological, and social stability consist of both engineering measures, land revegetation, as well as socioeconomic measures. The closure initiatives and monitoring programs identified in the conceptual mine closure plan are as follows:

- Geochemical monitoring program
- Geotechnical monitoring program for open pit, waste rock piles, and dam slopes
- Air emissions and ambient noise control program
- Solid waste management program
- Erosive and settlement process control program
- Degraded areas recovery plan
- Flora and fauna monitoring program in rehabilitation areas
- Social communication program
- Program to promote the creation of an Association of Ornamental Plant Growers
- Program to promote creation of an Association of Productors and Collectors
- Labourers demobilization program
- Social and environmental closure performance monitoring program

Surface water and groundwater monitoring locations have not yet been proposed in the current mine closure plan. In the next iterations of the closure plan, preliminary closure and postclosure water monitoring program that identifies the future location of stations, the suite of water quality parameters to be sampled and analyzed, and the reporting procedures and their frequency, will be defined and incorporated.

As noted in RPA (2019), the 2018 mine closure plan does not provide details on the potential requirement for long-term water management and treatment, particularly in regard to the sulphate/metals plume from TSF B1, which is currently intercepted downstream of TSF B2. Due to the potential for environmental impacts to downstream water from the existing sulphate/metals plume, long-term closure costs could potentially extend beyond the post-closure period. The next iteration of the closure plan will consider further detail on the costs for management of water and for monitoring and maintenance of dams during the post-closure period.

Table 20-5 lists the current estimate for closure costs as presented in the 2018 mine closure plan (SETE, 2018), using an exchange rate of 4.00 BRL:USD (Brazilian real to US dollar).

Table 20-5: Total estimated costs for mining reclamation and closure (from 2018 mine closure plan)

Activity	Cost (R$)	Cost (US$)
Future closure planning studies	969,000	242,250
Monitor, pump and treat groundwater - 60 months	2,162,000	540,500
Demolition, waste management, underground mine	44,302,000	11,075,500
Air and noise monitoring	544,000	136,000
Geotechnical monitoring	3,451,000	862,750
Revegetation, contaminated soil, contouring, fencing	76,508,000	19,127,000
Fauna monitoring	920,000	230,000
Environmental programs	10,200,000	2,550,000
20% contingency	27,811,000	6,952,750
Total	**166,867,000**	**41,716,750**

21 Capital and Operating Costs

The capital and operating costs outlined in this section of the technical report are based on the LOM plan presented in Section 16.4 of this technical report. The capital and operating cost estimates were prepared based on recent operating performance and on the current budget forecast. All costs in this section are in US dollars and are based on an exchange rate of 5.15 BRL:USD.

21.1 Capital Costs

The total LOM capital costs estimate is approximately US$440 M and is assumed to support sustaining and project capital requirements for the mining and processing of mineral reserves over the project's 15.5-year LOM. A summary of the LOM capital costs for the project is shown in Table 21-1.

Table 21-1: Life of mine capital costs

Category	Total LOM Capital Costs (M US$)
Sustaining Capital Cost	195.0
Mine Equipment	95.4
Mine Infrastructure	64.6
Plant Upgrades	18.9
Tailings Dams	14.8
Site Infrastructure	1.4
IFRS16 Adjustment	160.7
Project Capital	84.5
Total Capital Cost	**440.2**

Capital costs do not include project financing and interest charges, working capital, sunk costs and closure costs. No exploration capital has been considered, since the LOM plan is based on mineral reserves only. Capital costs include the required capital to complete the processing plant upgrades to stabilize throughput and metallurgical recovery. A preliminary project capital estimate for the future installation of a tailings filtration plant is also included.

Mine closure costs are listed in Section 20.6 of this technical report and cover rehabilitation, dismantling, tailings, closure of mine accesses, as well as five years of post-closure monitoring.

21.2 Operating Costs

Operating costs are defined as the direct operating costs; these include mining, processing, tailings storage, water treatment, general and administrative, and refining costs.

The production plan drove the calculation of the mining and processing costs as the mobile mining equipment fleet, manpower, contractors, power, and consumables requirements were calculated based on specific consumption rates.

The operating cost estimates rely on the following assumptions:

- The specific consumption for all consumables for mining and processing were analyzed based on historical usage over the last 12 months and defined based on the continuous improvement projects, assuring alignment with the mine production and cost plan.

- Power cost was calculated based on power capacity load of each equipment and area, considering the availability, utilization, and power factor. The prices were based on the contract for demand and supply.

- Labour cost was calculated based on the estimated headcount requirements, including salaries, benefits, workload, and personal protective equipment (PPE).

- The maintenance costs were calculated at a task level for each equipment for both mining and processing areas. The drivers for those costs were equipment working hours, preventive maintenance plan, and useful life for spare parts and components.

- Contractor costs are based on existing contracts, where the most expensive costs are the mine hauling contract and light vehicles rental. The costs for the hauling contract were calculated considering contract rates, truck productivity, and necessary working hours to support the mine plan. The fixed costs of this contract were also considered.

- General and administrative (G&A) costs consider the supporting areas, such as human resources, accounting, HSEC, IT, general services, security, and procurement. The main costs are labour and contracts like surveillance, catering, environmental monitoring, and consulting.

Operating costs are forecasted to average US$59.30/t over the LOM period, as set out in Table 21-2. Processing costs include a preliminary estimate for the future operation of tailings filtration plant and filtered tailings storage facility.

Table 21-2: LOM Average unit operating costs

Category	Operating Cost (US$/t processed)
Mining	35.38
Stope Production	21.67
Secondary Development	7.7
Primary Development	6.01
Processing	18.06
G&A	5.86
Operating Cost	**59.30**

22 Economic Analysis

Financial information has been excluded from this technical report as Pan American is a producing issuer and the Jacobina Mine is currently in production. Pan American has performed an economic analysis of the current project using a gold price of US$1,500/oz at the planned production rates, metal recoveries, and capital and operating cost estimated in this technical report. Pan American confirms that the outcome is a positive cash flow that supports the mineral reserve estimate. Due to the nature of the mining business, these conditions can change significantly over relatively short periods of time. Consequently, actual results may be significantly more or less favourable.

23 Adjacent Properties

There are no adjacent properties that are relevant to this technical report.

24 Other Relevant Data and Information

There is no other relevant data or information regarding Jacobina.

25 Interpretation and Conclusions

Since modern mining commenced in 1983, Jacobina has produced more than 2.8 Moz of gold. Through increases in plant throughput and gold feed grade, annual gold production has risen year-over-year from 74 koz in 2013 to over 195 koz in 2022.

The plunge of the higher-grade portions of the mineralized zones has been defined successfully in previous years through drilling activities, which have also led to the discovery of new mineralized zones, such as João Belo South and Morro do Vento East. Good potential for discovering new mineralized zones and/or the strike and dip extents of the known mineralized horizons exists in the proximity of the current mine infrastructure, based on the exploration successes and production history Jacobina.

The favourable stratigraphy hosting the gold mineralization at Jacobina has been traced along a strike length of approximately 150 km, with many gold occurrences discovered along this favourable stratigraphy through regional exploration programs. The Jacobina Norte project is one such occurrence, where gold mineralization has been discovered along a continuous 15 km-long trend. As of the end of June 30, 2023, 8,796 drill holes were drilled in the project area, for a total of 1,175,524 m. Almost all of this drilling has been within the 11 km-long main mining area, with the majority of the 58,000 ha of exploration concessions still yet to be drilled.

Jacobina mineral resources and mineral reserves have been estimated in conformity with generally accepted CIM Estimation of Mineral Resources and Mineral Reserves Best Practice Guidelines (November 2019) and are reported in accordance with CIM (2014) Standards. The total proven and probable mineral reserve at Jacobina as of June 30, 2023, is 48.2 Mt averaging 2.03 g/t gold, for approximately 3.1 Moz of contained gold. In addition, measured and indicated mineral resources total 94.4 Mt grading 1.55 g/t gold (4.7 Moz gold) and inferred mineral resources of 40.1 Mt grading 1.56 g/t gold (2.0 Moz gold).

Jacobina started to improve the plant's performance in 2019, aiming to reach a steady output of 6,500 tpd. This goal was met earlier than expected in the first quarter of 2020. The plant continued to undergo enhancements in 2020, 2021 and 2022, with new equipment such as high frequency screens, Knelson and Falcon gravimetric concentrators, an additional electrowinning cell, and more. Other support infrastructure upgrades included a new cyanide warehouse and a larger diameter tailings pipeline. These changes, along with a new permit to process up to 10,000 tpd, enabled Jacobina to increase its processing capacity further, surpassing 8,500 tpd in the first half of 2023.

The mineral reserves inventory of Jacobina informs a LOM plan that accounts for the increases and improvements in the processing capacity. The LOM plan models an integrated operation from various underground mines that supply the processing plant with an average throughput of 8,450 tpd. This leads to a mine life of 15.5 years at the target throughput rates and a subsequent ramp-down period. Assuming a 96% metallurgical recovery, the LOM plan projects an average gold production of 200,000 oz per year for the first 10.5 years, while mining of lower-grade mineral reserves is deferred until later in the mine life where feasible.

The LOM plan does not include any inferred mineral resources or exploration potential. However, there is a significant amount of inferred mineral resources that could be upgraded to indicated and measured mineral resources with the necessary infill drilling, which could increase the LOM plan, given that Jacobina has consistently replenished reserves after depletion since 2017, even with growing production rates.

The mine budget data and operating experience provide the basis for the capital and operating cost estimates, which reflect the known mining methods and production schedule. The capital cost estimates also include appropriate sustaining capital cost estimates. The costs for building and running a filtration plant to handle the tailing that exceeds the current B2 Dam capacity over the LOM and to store it in a filtered tailings TSF are also accounted for. These costs are estimated at a conceptual level, pending the completion of feasibility studies by the end of 2024. The mineral reserve estimate is supported by the positive project economics of Jacobina until the end of the mine life, under the assumptions stated in this technical report. The LOM average unit operating costs are estimated to be US$59.30/t over the LOM.

Pan American is conducting studies to optimize its operations in mining, mineral processing and tailings management. The studies aim to explore alternative mining methods, mine designs, material handling, mineral processing, waste and tailings disposal options to find the best production rate and plan for a possible expansion of Jacobina. Using alternative mining methods and paste backfill could help increase the mining extraction, convert more mineral resources to mineral reserves and offer more options for tailings management.

Jacobina has all the operational licences required for operation according to the national legislation. The approved licences address the authority’s requirements for mining extraction and operation activities. JMC is already permitted for throughput of up to 10,000 tpd.

JMC's commitment to sustainability and responsible mining practices is evident through the implementation of an integrated management system. The certification of Jacobina under ISO 14001, ISO 45001, and the International Cyanide Management Code, along with the endorsement from the Brazilian Association of Technical Standards for ESG, underscores the company's pursuit of excellence in Environmental, Social, and Governance aspects, addressing the main risks associated with the mining activities.

Pan American's operations at Jacobina are a positive contribution to hosting communities. Jacobina has also demonstrated a commitment to employee health, safety, and well-being; community programs; and ongoing outreach and data collection to support issues management and mitigation. JMC and Pan American have established and continue to implement their various policies, procedures, and practices in a manner broadly consistent with relevant IFC Performance Standards.

The results of this technical report are subject to variations in operational conditions including, but not limited to the following:

- Assumptions related to commodity and foreign exchange (in particular, the relative movement of gold and the Brazilian real/US dollar exchange rate)
- Unanticipated inflation of capital or operating costs
- Significant changes in equipment productivities
- Geological continuity of the mineralized structures
- Geotechnical assumptions in underground designs
- Ore dilution or loss
- Throughput and recovery rate assumptions
- Changes in political and regulatory requirements that may affect the operation or future closure plans
- Changes in closure plan costs
- Availability of financing and changes in modelled taxes

Pan American’s business involves many risks and uncertainties, both known and unknown, that affect its ability to operate successfully and accurately estimate mineral reserves and mineral resources. The qualified persons and

Pan American do not expect any significant negative impact from external factors such as environmental, permitting, title, access, legal, taxation, availability of resources, and other similar factors, but these factors may change and are unpredictable in the mining industry and may have a material impact on Pan American's business and performance. The political, economic, regulatory, judicial and social risks of doing business in foreign jurisdictions, and changes in metal and commodity prices, are especially challenging and uncertain for Pan American. In addition to external factors and risks, the accuracy of any mineral reserve and mineral resource estimate is, among other things, the function of the quality and quantity of available data and of engineering and geological interpretation and judgment. Drilling, testing, production, metal prices, mining method, or operating factors may change after the date of the estimate and may require revision of the estimate and may differ significantly from what is currently expected. Readers are cautioned against attributing undue certainty to estimates of mineral reserves and mineral resources.

26 Recommendations

Based on the information presented in this technical report, the qualified persons recommend the following action items.

Based on success in extending known mineral resources, Pan American should continue exploration at the mining operations. Due to the quantity of material in the mineral reserve category and its impact on mine life, Pan American's focus is to continue infill drilling programs in support of converting mineral resources to mineral reserves. An additional focus will be to carry out exploration programs in the vicinity of the current mines to search for the strike extensions of known mineralization.

Drilling programs should continue to be carried out with the following objectives:

- Replacing the mined-out mineral reserves through conversion of inferred mineral resources to indicated and measured mineral resources. The focus of the drilling programs should be on the higher-grade sectors of the known mineralized zones.
- Increasing the inferred mineral resources through conversion of material that has been identified by exploration drilling located in close proximity to the current mining infrastructure into the inferred mineral resource category. The focus of this activity will be on those areas which have higher gold grades, with the goal of building a higher-grade inventory of inferred mineral resources.
- Develop a long-term pipeline of brownfields exploration discoveries through testing of exploration targets.
- Evaluate the known gold mineralization at the Jacobina Norte project with the goal of developing a greenfield mineral resource target of over 1 Moz gold.

Jacobina has been able to replace and increase its mineral reserves net of depletion since 2017, despite higher production rates. Meanwhile, engineering studies should continue to find the optimum and sustainable production rate for Jacobina, considering not only mining and processing capacities, but also a long-term tailings management strategy. This strategy may involve different tailings disposal methods, such as filtered tailings on surface and paste backfill underground. This would prolong the current tailings storage facility and reduce the environmental footprint. The use of alternative mining methods with paste backfill should also aim to increase mining recovery, which will help convert more mineral resources to mineral reserves and lower the lateral development needs compared to the current mining method. As the engineering studies progress, cost optimization alternatives should be explored, such as evaluating different materials handling strategies.

Pan American should initiate the application of permits for the installation of additional infrastructure as soon as the initial engineering studies are completed. Jacobina already has a permit to produce 10,000 tpd, so it will need to obtain new permits if it wants to increase its production capacity beyond that level.

Regarding environmental and social management, it is recommended to:

- Conduct geochemical sampling and characterization of waste rock before developing a new waste rock stockpile.
- Examine the water management plan with a focus on identifying key studies to be conducted, ensuring timely updates to the water balance, and pinpointing opportunities for infrastructure enhancements.

- Maintain a robust water quality monitoring program to verify compliance with applicable environmental standards and evaluate the appropriateness of the water management strategies that are in place.
- Continue to implement the environmental monitoring program, which monitors and manages potential environmental impacts resulting from the mine operations, to inform future permit applications and mine closure plan updates.
- Maintain a noise- and vibrations-monitoring program, consistent with local procedures and regulations.
- Consider establishing an energy and emissions strategy/plan to determine, on a defined frequency, sources of energy consumption and associated greenhouse gas (GHG) emissions, consistent with internal standards.
- The existing sulphate/metals plume originating from the decommissioned TSF B1 may potentially cause ongoing effects on water. This could result in long-term closure costs extending beyond the five-year post-closure treatment period that is currently outlined in the conceptual 2018 mine closure plan. It’s recommended to evaluate necessary studies to understand exactly the behaviour of the underground water and evaluate potential solutions for treating the water.
- Review closure cost estimate as needed. Costs for long-term monitoring and maintenance of dams should also be reviewed.
- Incorporate a strategy for closure of the inactive open pit into the mine closure plan.

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28 Certificates of Qualified Persons

Certificate of Qualified Person – Martin Wafforn

I, Martin Wafforn, P.Eng., as an author of this report entitled "NI 43-101 Technical Report for the Jacobina Gold Mine, Bahia State, Brazil" prepared for Pan American Silver Corp. (the Issuer) and dated effective as of June 30, 2023 (the Technical Report), do hereby certify the following:

1. I am Senior Vice President, Technical Services and Process Optimization at the Issuer, with an office at 1500-625 Howe St, Vancouver, BC, V6C 2T6, Canada.

2. I graduated with a Bachelor of Science in Mining degree from Camborne School of Mines, England, in 1980. I am a Professional Engineer in good standing with Engineers and Geoscientists British Columbia. I am also a Chartered Engineer in good standing in the United Kingdom. I have worked as an engineer in the mining industry since my graduation from Camborne School of Mines.

3. I have read the definition of "qualified person" set out in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (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.

4. I visited Jacobina on four previous occasions including most recently between October 12 and 14, 2023.

5. I am responsible for Sections 15, 16, 18 (excluding 18.2), 19, 21, 22, 24, and share responsibility for related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 of the Technical Report.

6. I am not independent of the Issuer. I am a full-time employee of the Issuer.

7. I have had prior involvement with the property that is the subject of the Technical Report in my role as Senior Vice President, Technical Services and Process Optimization of the Issuer.

8. I have read NI 43-101, and the sections of Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

9. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 15, 16, 18 (excluding 18.2), 19, 21, 22, 24, and related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 in the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed"

Martin Wafforn, P.Eng. Dated this 22nd day of December, 2023

Certificate of Qualified Person – Camila Passos

I, Camila Passos, P.Geo., as an author of this report entitled "NI 43-101 Technical Report for the Jacobina Gold Mine, Bahia State, Brazil" prepared for Pan American Silver Corp. (the Issuer) and dated effective as of June 30, 2023 (the Technical Report), do hereby certify the following:

1. I am Exploration Coordinator at Yamana Desenvolvimento Mineral S.A., a subsidiary of the Issuer, with an office at Fazenda Itapicuru, S/N, Jacobina, Bahia, 44700-000, Brazil.

2. I graduated from the University of São Paulo, São Paulo, Brazil in 2003 with a B.Sc. and I obtained a M.Sc. degree from the same university in 2005. I am a Professional Geoscientist registered with the Association of Professional Geoscientists of the Province of Ontario (APGO #2431). I have practiced my profession continuously since 2005. My relevant experience for the purpose of the Technical Report includes the following:

    - Reviewing and reporting as a consultant and employee 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.

    - Execution of numerous assignments in a variety of deposit types and a variety of geological environments; commodities include gold, phosphate, iron ore, base metals and coal. Senior position with major multinational mining companies in South America, focusing on geostatistical studies, geological modelling, and resource modelling.

3. I have read the definition of "qualified person" set out in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (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.

4. I visit Jacobina regularly, most recently between December 4 and 7, 2023.

5. I am responsible for Sections 4 to 11, 14, and 23, and share responsibility for related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 of the Technical Report.

6. I am not independent of the Issuer. I am a full-time employee of Yamana Desenvolvimento Mineral S.A., a subsidiary of the Issuer.

7. I have had prior involvement with the property that is the subject of the Technical Report in my role as Exploration Coordinator at Yamana Desenvolvimento Mineral S.A., a subsidiary of the Issuer.

8. I have read NI 43-101, and the sections of Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

9. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 4 to 11, 14, and 23, and related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 in the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed"

Camila Passos, P.Geo.

Dated this 22nd day of December, 2023

Certificate of Qualified Person – Americo Delgado

I, Americo Delgado, P.Eng., as an author of this report entitled "NI 43-101 Technical Report for the Jacobina Gold Mine, Bahia State, Brazil" prepared for Pan American Silver Corp. (the Issuer) and dated effective as of June 30, 2023 (the Technical Report), do hereby certify the following:

1. I am Vice President, Mineral Processing, Tailings, and Dams at the Issuer, with an office at 1500-625 Howe St, Vancouver, BC, V6C 2T6, Canada.

2. I graduated with a Master of Science in Metallurgical and Material Engineering from the Colorado School of Mines in Golden, Colorado, in 2007, and with a Bachelor of Science in Metallurgical Engineering degree from the Universidad Nacional de Ingenieria, Lima, Peru, in 2000. I am a Professional Engineer in good standing with the Association of Professional Engineers and Geoscientists of the Province of British Columbia. I have worked as a metallurgist and in mineral processing management in the mining industry for a total of 23 years since my graduation from the Universidad Nacional de Ingenieria.

3. I have read the definition of "qualified person" set out in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (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.

4. I visited Jacobina between March 26 and 29, 2023.

5. I am responsible for Sections 13 and 17, and share responsibility for related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 of the Technical Report.

6. I am not independent of the Issuer. I am a full-time employee of the Issuer.

7. I have had prior involvement with the property in my role with the Issuer.

8. I have read NI 43-101, and the sections of Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.

9. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 13 and 17, and related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 in the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed"

Americo Delgado, P.Eng. Dated this 22nd day of December, 2023

Certificate of Qualified Person – Carlos Iturralde

I, Carlos Iturralde, P.Eng., as an author of this report entitled "NI 43-101 Technical Report for the Jacobina Gold Mine, Bahia State, Brazil" prepared for Pan American Silver Corp. (the Issuer) and dated effective as of June 30, 2023 (the Technical Report), do hereby certify the following:

1. I am Director, Tailings at the Issuer, with an office at 1500-625 Howe St, Vancouver, BC, V6C 2T6, Canada.
2. I graduated from the University of Kansas with a dual major in Civil Engineering and Mathematics in 2002. I received a MSc. from the University of Tübingen in Applied Environmental Geosciences in 2007. I am a professional engineer registered with Engineers and Geoscientist British Columbia since 2010 (License # 40153). I have over 20 years of professional experience in the mining industry focused on tailings management and related infrastructure. The following aspects of my experience are relevant for the purpose of the Technical Report:
    - Completion of design and engineering studies and dam safety reviews of tailings facilities
    - Best management practices following the Mining Association of Canada (MAC) and Canadian Dam Association (CDA) proposed framework and dam safety criteria.
    - Implementation of risk management and quality management strategies, including QA/QC programs and risk evaluation and mitigation through identification of critical controls.
    - Since 2015, I have been an active member of MAC's tailings working group (TWG) and participated in the development of the 3rd edition of MAC's tailings management guidelines.
3. I have read the definition of "qualified person" set out in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (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.
4. I visited Jacobina on numerous occasions including most recently between August 8 and 9, 2023.
5. I am responsible for Sections 18.2 and 20.2.2, and share responsibility for related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 of the Technical Report.
6. I am not independent of the Issuer. I am a full-time employee of the Issuer.
7. I have had prior involvement with the property that is the subject of the Technical Report in my role as Director, Tailings at the Issuer.
8. I have read NI 43-101, and the sections of Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
9. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Sections 18.2 and 20.2.2, and related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 in the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed"

Carlos Iturralde, P.Eng.

Dated this 22nd day of December, 2023

Certificate of Qualified Person – Matthew Andrews

I, Matthew Andrews, FAusIMM, as an author of this report entitled "NI 43-101 Technical Report for the Jacobina Gold Mine, Bahia State, Brazil" prepared for Pan American Silver Corp. (the Issuer) and dated effective as of June 30, 2023 (the Technical Report), do hereby certify the following:

1. I am Vice President, Environment at the Issuer, with an office at 1500-625 Howe St, Vancouver, BC, V6C 2T6, Canada.
2. I graduated with a Bachelor of Chemical Engineering (Hons) from the University of New South Wales, Sydney, Australia, in 1993. I received a Master of Environmental Management from the University of New South Wales in 2005. I am a Fellow in good standing with the Australasian Institute of Mining and Metallurgy (AusIMM). I have 25 years experience in environmental management in the mining and resource industry.
3. I have read the definition of "qualified person" set out in National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* (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.
4. I visited Jacobina on three occasions since November 2022 and most recently between October 10 and 12, 2023.
5. I am responsible for Section 20 (excluding 20.2.2) and share responsibility for related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 of the Technical Report.
6. I am not independent of the Issuer. I am a full-time employee of the Issuer.
7. I have had prior involvement with the property that is the subject of the Technical Report in my role as Vice President, Environment at the Issuer.
8. I have read NI 43-101, and the sections of Technical Report for which I am responsible have been prepared in compliance with NI 43-101 and Form 43-101F1.
9. At the effective date of the Technical Report, to the best of my knowledge, information, and belief, Section 20 (excluding 20.2.2) and related disclosure in Sections 1, 2, 3, 12, 25, 26, and 27 in the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

"Signed"

Matthew Andrews, FAusIMM

Dated this 22nd day of December, 2023