NI 43-101 TECHNICAL REPORT

BOLIVAR PROJECT

ORURO STATE, BOLIVIA

EFFECTIVE DATE – 21 December 2021
REPORT DATE – 21 December 2021

PREPARED FOR

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DATE AND SIGNATURE PAGE

This report entitled NI 43-101 Technical Report for the Bolivar Project, Oruru State, Bolivia, effective as of 21 December 2021 was prepared and signed by the following authors:

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Wayne Corso *21 December 2021*
Wayne Corso, P. E. Date Signed

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NOTICE

JDS Energy & Mining, Inc. prepared this National Instrument 43-101 Technical Report, in accordance with Form 43-101F1, for Santacruz Silver Mining, Ltd. The quality of information, conclusions and estimates contained herein is based on: (i) information available at the time of preparation; (ii) data supplied by outside sources, and (iii) the assumptions, conditions, and qualifications set forth in this report.

Santacruz Silver Mining, Ltd. filed this Technical Report with the Canadian Securities Regulatory Authorities pursuant to provincial securities legislation. Except for the purposes legislated under provincial securities law, any other use of this report by any third party is at that party's sole risk.

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1 EXECUTIVE SUMMARY

1.1 Introduction

JDS Energy & Mining Inc. (JDS) was commissioned by Santacruz Silver Mining Ltd. (Santacruz) to carry out a Technical Report for the Bolivar Project, a resource development base metals project located in the state of Oruro, Bolivia.

The Bolivar Mine has been active for more than 200 years. The current mine complex consists of an underground mine, 1,100 t/d concentrator plant, maintenance workshop, shaft-winder, tailings storage facility, water treatment plants, supplies warehouse, main office, Hospital, and camp.

On October 11, 2021, Santacruz entered into a definitive share purchase agreement (the "**Definitive Agreement**") with Glencore whereby Santacruz agreed to acquire a portfolio of Bolivian silver assets (the "**Assets**") from Glencore (the "**Transaction**"). The Assets include: (a) Glencore's 45% interest in the Bolivar Mine and the Porco Mine, held through an unincorporated joint venture between Glencore's wholly-owned subsidiary Sociedad Minera Illapa C.V. ("Illapa") and Corporación Minera de Bolivia ("**COMIBOL**"), a Bolivian state-owned entity; (b) a 100% interest in the Sinchi Wayra business, which includes the producing Caballo Blanco mining complex; (c) the Soracaya exploration project; and (d) the San Lucas ore sourcing and trading business.

Pursuant to the Definitive Agreement, Santacruz will acquire all of Glencore's properties, assets and businesses related to the Assets by acquiring various Glencore subsidiaries. The consideration for the Transaction will be payable through upfront consideration of US$20 million in cash on closing (subject to customary working capital adjustments), and deferred consideration of US$90 million secured against the Assets. The deferred consideration consists of cash payments of US$22.5 million payable on each anniversary of the closing date for four years and is subject to certain accelerated payment features based on cash flows and silver and zinc prices. Glencore will also retain a 1.5% net smelter returns royalty on the Assets and will have a right to acquire 100% of the offtake from the Assets on market terms to be set forth in definitive agreements to be entered into at closing.

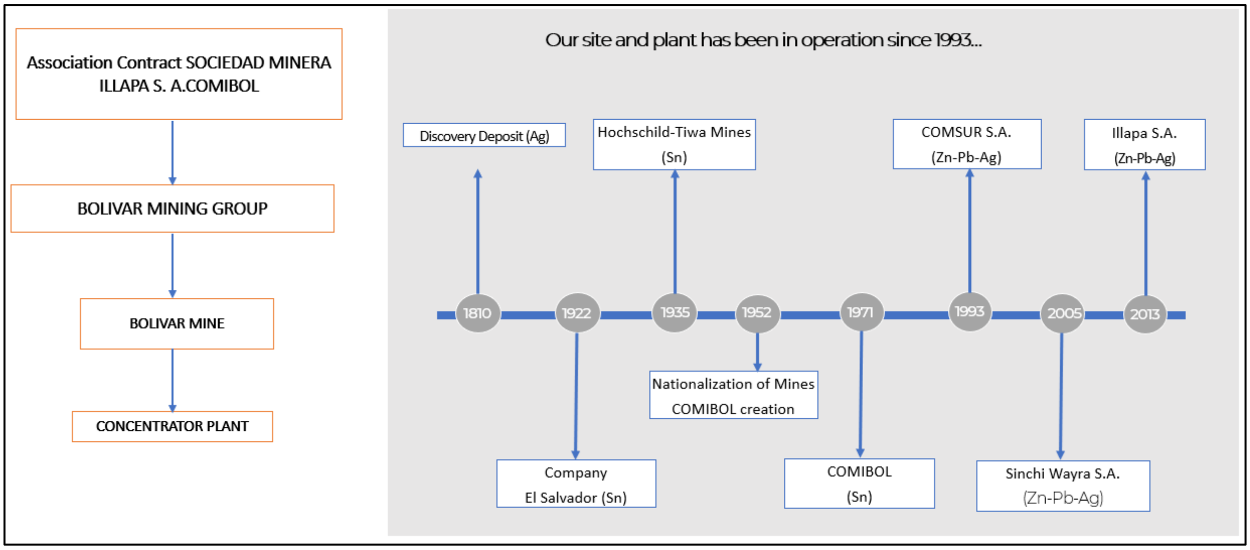
1.2 Location and Access and Ownership

Bolívar Mine is located in the state of Oruro in Bolivia, and the municipality of Antequera. The complex has UTM W-84 coordinates of 727293.087E; 7959437.617N at an elevation of 4,014 masl. Paved roads connect Bolivar to Oruro City (75 km) and the concentrate warehouse and rail station at Poopó (22 km).

Bolivar Mine is currently owned by the Bolivian government (COMIBOL) with exclusive mining rights granted to the Contrato de Asociacion Sociedad Miner Illapa S.A. which is a partnership between private owner operators (Sinchi Wayra S.A.) and the Bolivian Government (COMIBOL). Sinchi Wayra S.A. (Sinchi Wayra) is a wholly-owned subsidiary of Glencore Plc.

1.3 History

Figure 1-1: Project History



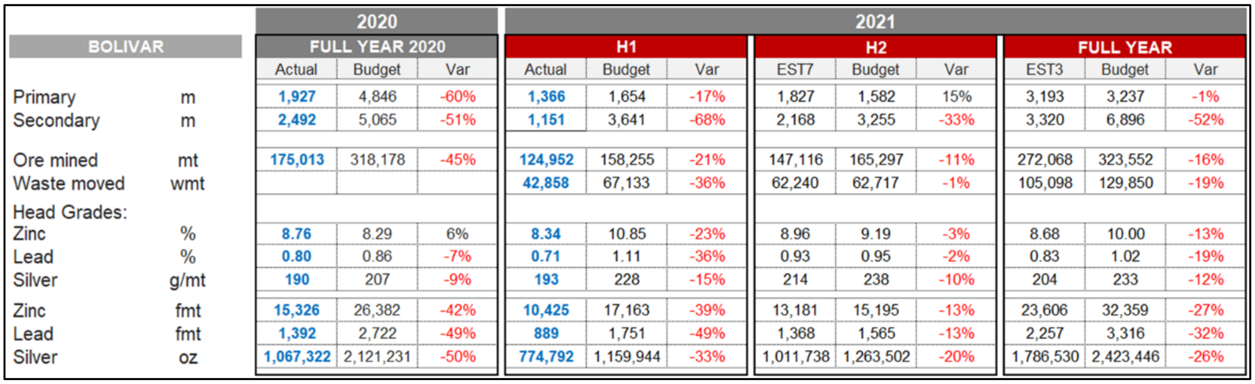
Source: Glencore (2021)

Bolivar Mine has been in operation since the early 19th century under various owners producing silver, tin, lead and zinc. After Nationalization in the 1950's tin was produced by the Bolivian State entity (COMIBOL), The current mine configuration was established in 1993. The project produces lead and zinc concentrates from a dedicated on-site process plant. Bolivar Mine is currently owned by the Bolivian government (COMIBOL) with exclusive mining held pursuant to an unincorporated joint venture (the "**Illapa JV**") between private owner operator Sociedad Minera Illapa S.A. (Illapa). Pursuant to the Illapa JV, Illapa holds a 45% interest in the Bolivar Project, and the Bolivian Government (COMIBOL) which holds a 55% interest in the Bolivar Project. Illapa is a wholly-owned indirect subsidiary of Glencore Plc.

Recent efforts over the last five years or so have been focused on improving safety and productivity standards to compare with any modern operation. Mechanization has moved the mine into less selective "bulk" methods with some increase in the flexibility and productivity of the operation.

Actual mine production for 2020 and first half 2021 along with budget targets for 2021 is presented in Table 1-1.

Table 1-1: Mine Production



BOLIVAR		2020			2021								
		FULL YEAR 2020			H1			H2			FULL YEAR		
		Actual	Budget	Var	Actual	Budget	Var	EST7	Budget	Var	EST3	Budget	Var
Primary	m	1,927	4,846	-60%	1,366	1,654	-17%	1,827	1,582	15%	3,193	3,237	-1%
Secondary	m	2,492	5,065	-51%	1,151	3,641	-68%	2,168	3,255	-33%	3,320	6,896	-52%
Ore mined	mt	175,013	318,178	-45%	124,952	158,255	-21%	147,116	165,297	-11%	272,068	323,552	-16%
Waste moved	wmt				42,858	67,133	-36%	62,240	62,717	-1%	105,098	129,850	-19%
Head Grades:													
Zinc	%	8.76	8.29	6%	8.34	10.85	-23%	8.96	9.19	-3%	8.68	10.00	-13%
Lead	%	0.80	0.86	-7%	0.71	1.11	-36%	0.93	0.95	-2%	0.83	1.02	-19%
Silver	g/mt	190	207	-9%	193	228	-15%	214	238	-10%	204	233	-12%
Zinc	fmt	15,326	26,382	-42%	10,425	17,163	-39%	13,181	15,195	-13%	23,606	32,359	-27%
Lead	fmt	1,392	2,722	-49%	889	1,751	-49%	1,368	1,565	-13%	2,257	3,316	-32%
Silver	oz	1,067,322	2,121,231	-50%	774,792	1,159,944	-33%	1,011,738	1,263,502	-20%	1,786,530	2,423,446	-26%

Source: Glencore (2021)

1.4 Geology and Mineralization

The Bolivar Mine is located in the Cordillera de los Azanaques, forming the western edge of the Cordillera Oriental, which is detached from the Cordillera de los Frailes, belonging to the group of central mountain ranges. Characterized by the essence of undulating plateaus, outstanding mountains parallel to the course of the Andes, with elevations that vary between 3,400 and 4,600 msnm. The area is part of the polymetallic belt of the altiplano and the Cordillera Occidental.

It is located in Cenozoic rocks of the middle to upper Silurian, constituted almost entirely by marine sediments of variable depth: from infraneritic, neuritic and bathyal environments.

The Bolivar system is a network epigenetic hydrothermal base metal type veins and faults filled mineralization hosted within a variety of lithologies from volcanic tuffs to sedimentary packages. The main mineral assemblages are composed of sphalerite, marmatite, galena, silver-rich galena and silver sulfosalts. The resources are usually based on multiple structures containing several veins. The typical dimensions of these structures ~500 m in length and ~450 m depth profile with mineralization continuing to be open at depth with vein widths of between 0.2 m - 4.0 m.

The occurrence of a mineral deposit is related to two primordial aspects: a hot intrusive body generating mineralizing fluids and a pre-mineral geological structure receiving mineralization.

The non-presence of an intrusive body in close proximity to the deposit, suggests that its formation is due to the influence of the Chualla Grande Stock and that the stock is the feeder. The result is higher temperature minerals such as coarse cassiterite accompanied by quartz and tourmaline in close proximity, an intermediate or transitional zone which contains Fe-Sn minerals (Buenos Aires, San Francisco, Venus veins) and an external zone where Bolívar is located with Zn-Pb-Ag-Sn minerals.

The polymetallic mineralization in the Bolivar deposit according to the mineragraphic studies concludes that it would have formed in different phases or mineralization events with a clear telescopic deposition:

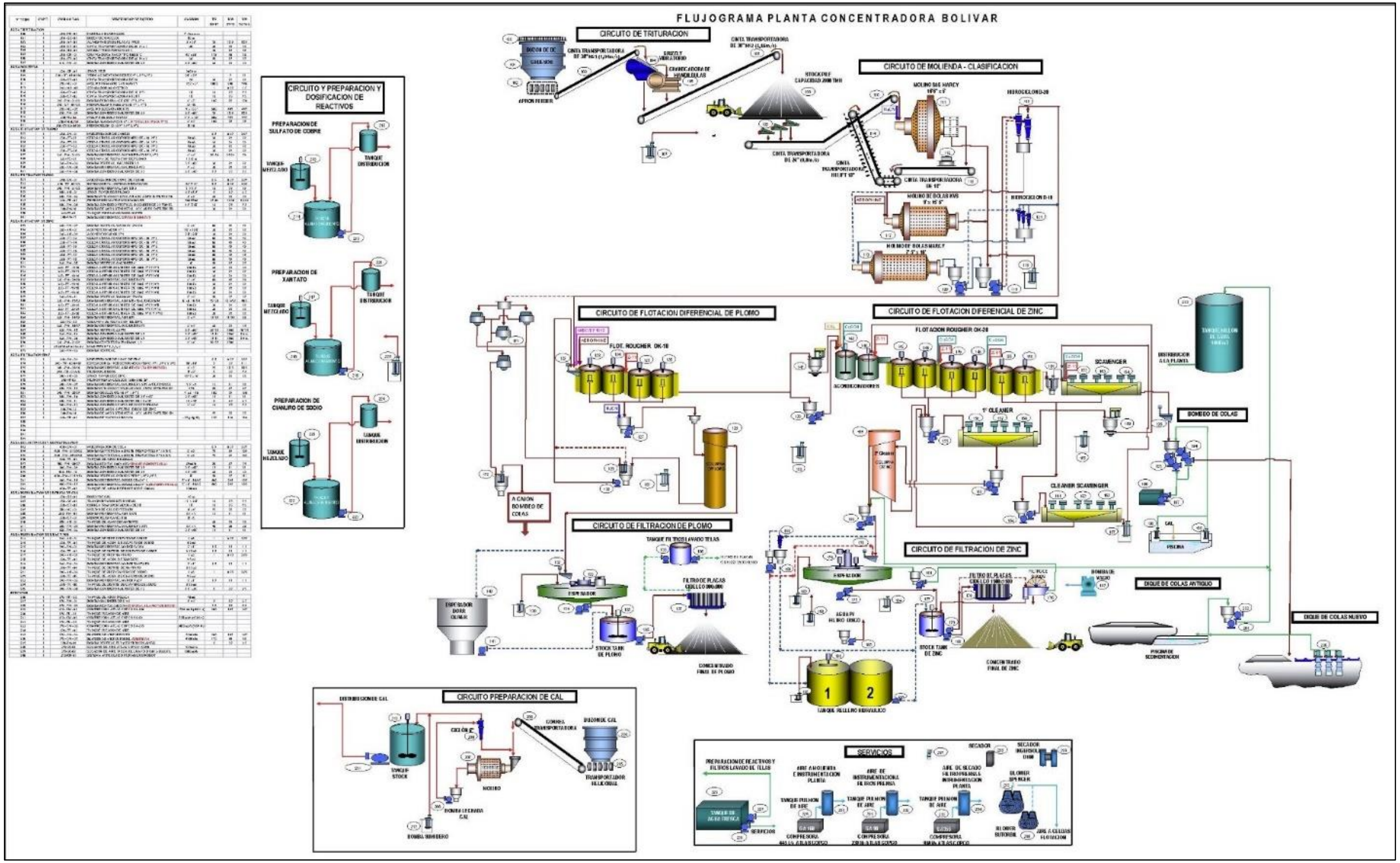
- An early phase would comprise the mineral association of quartz – pyrite – sphalerite (of the marmatite type);
- Sphalerite (brown) – jamesonite – boulangerite – cassicrite (of the needle tin type) – stannine – galena – franckeite? They would correspond to the intermediate phase of mineralization; and
- Finally, the carbonates (siderite) and quartz of the second generation would correspond to the late phase.

The composition and events of the mineralization allow us to deduce that the deposit was formed from hydrothermal solutions under intermediate temperature conditions of 250º - 300ºC, and that it classifies as a hydrothermal deposit of the meso to epithermal type.

1.5 Metallurgical Testing and Mineral Processing

The Bolivar Mine is currently operating; therefore, the metallurgical assessment is based on operational history. The recoveries and concentrate grades discussed are derived from the operational period of August 2020 to July 2021. The operating conditions have been divided into company mined feed and toll feed. The two types of feed are processed separately. The process can be seen in Figure 1-2.

Figure 1-2: Bolivar Mill Flowsheet



Source: Glencore (2021)

The feed that is treated contains lead, zinc, and silver in recoverable quantities. The process uses sequential flotation to first float off a lead concentrate, containing between 20% and 30% lead, and then a zinc concentrate that is approximately 53% zinc.

Silver is recovered to both concentrates in similar quantities, although due to the lower mass of the lead concentrate, the silver grade in the lead concentrate is much higher (approximately 6,000 g/t in the lead concentrate vs. 600 g/t Ag in the zinc concentrate).

The expected recoveries and concentrate grades can be found in Table 1-2.

Table 1-2: Estimated Metallurgical Recoveries, Concentrate Grades and Mineral Processing Factors

Parameter	Unit	Concentrates			
		Lead Concentrate		Zinc Concentrate	
		Company Feed	Toll Feed	Company Feed	Toll Feed
Zn Recovery	%	N/A	N/A	92	86.091 + 0.3218*(Zinc Feed Grade)
Pb Recovery	%	59.56 + 17.33*(Lead Feed Grade)	32.15 + 17.69*(Lead Feed Grade)	N/A	N/A
Ag Recovery	%	36.133 + 0.0604*(Silver Feed Grade)	30	57.516 - 0.0662*(Silver Feed Grade)	36
Concentrate Grade					
Zn	%	12	11	53	44
Pb	%	32	20	0.91	1.25
Ag	g/t	5900	5500	630	775

1.6 Historic Mineral Resources and Mineral Reserves

Glencore's Resources & Reserves report as of December 31, 2020 disclosed Bolivar, Porco and Caballo Blanco mineral resource statements as well as mineral reserve estimates as of December 31, 2020, which remain current for Glencore as of the date hereof. As the mineral resource and mineral reserve estimates pre-date Santacruz's agreement to acquire the Assets, Santacruz is treating them as "historical estimates" under National Instrument 43-101 - Standards of Disclosure for Mineral Projects (NI 43-101), but they remain relevant as the most recent mineral resource and reserves estimates for Bolivar, Porco and Caballo Blanco. Given the source of the estimates, Santa Cruz considers them reliable and relevant for the further development of the Project; and accordingly, they should be relied upon only as a historical resource and reserve estimate of Glencore, which pre-dates Santacruz's agreement to acquire the Assets however, the Company is not treating the historical estimates as current Mineral Resources or Mineral Reserves.

A “Qualified Person” as per NI 43-101 has not done sufficient work to classify the historical estimate as current Mineral Resources or Mineral Reserves and Santacruz is not treating the historical estimate as current Mineral Resources or Mineral Reserves. Further drilling and resource modelling would be required to upgrade or verify these historical estimates as current mineral resources or reserves for the respective assets.

The resources have been reported for Bolivar as of December 31, 2020 at a Zinc Equivalent (ZnEq) cut-off grade 2% as follows in Table 1-3.

Table 1-3: Historic Mineral Resource Estimate (2020)

Category	Tonnes	Silver	Zinc	Lead
	(Mt)	(g/t)	(%)	(%)
Measured Mineral Resources	1.4	308	12.70%	1.40%
Indicated Mineral Resources	1	283	12.20%	1.30%
Inferred Mineral Resources	5.4	350	9.00%	0.90%

Source: Glencore (2020)

Notes:

1. The Mineral Resources have been calculated in accordance with definitions in accordance with the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code), the 2016 edition of the South African Code for Reporting of Mineral Resources and Mineral Reserves (SAMREC) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves (2014).
2. The ZnEq = (Zn% + (Pb% * 0.50) + (Ag g/t * 0.0268)).
3. The Mineral Resources have been calculated in accordance with definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum on August 20, 2000. Employees of Glencore have prepared these calculations.
4. Mineral resources are not mineral reserves until they have demonstrated economic viability. Mineral resource estimates do not account for a resource’s mineability, selectivity, mining loss, or dilution.
5. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.
6. All figures are rounded to reflect the relative accuracy of the estimate and therefore numbers may not appear to add precisely.
7. Reported in-situ Mineral Resources do not consider mineral availability by underground mining methods.
8. Historical Mineral Reserves and Resources are inclusive of Mineral Reserves shown at 100% ownership

1.7 Environmental, Permitting and Social

Glencore has implemented a sophisticated management approach to sustainability consistent with their practices worldwide. From the 2019 Sustainability Report:

> *"Our commitment to responsible and sustainable mining has strengthened over the years, based on the alignment to Glencore's international policies and procedures and the major sustainability initiatives to which we subscribe. All our policies and procedures seek compliance with Bolivia's legal rules, but our goal is to go beyond them and so follow standards that exceed legislation and address all the impacts from our operations."*

This integrative approach is evident in the Bolivar operation.

Bolivar Mine has one active Tailing storage Facility (Queaqueani) and one inactive (Antiguo). Both are subject to Glencore's HSEC Catastrophic Hazards assurance program in accordance with the Dam Safety Criteria and protocols developed by Glencore HSEC. This program includes third party Verification Assessments (Dam Safety Assurance Assessment). In response to findings from these assessments, and to mitigate risks of failure, risk management tools have been developed to improve management systems for the active TSF. For the inactive facility, monitoring and maintenance have improved and follow good practice.

1.8 Conclusions and Recommendations

1.8.1 Conclusions

The current Bolivar mine complex consists of an underground mine, 1,100 t/d concentrator plant, maintenance workshop, shaft-winder, tailings storage facility, water treatment plants, supplies warehouse, main office, hospital, and camp.

On October 11, 2021, Santacruz entered into a definitive share purchase agreement (the "Definitive Agreement") with Glencore whereby Santacruz agreed to acquire a portfolio of Bolivian silver assets (the "Assets") from Glencore (the "Transaction"). The Assets include: (a) Glencore's 45% interest in the Bolivar Mine and the Porco Mine, held through an unincorporated joint venture between Glencore's wholly-owned subsidiary Sociedad Minera Illapa C.V. ("Illapa") and Corporación Minera de Bolivia ("COMIBOL"), a Bolivian state-owned entity; (b) a 100% interest in the Sinchi Wayra business, which includes the producing Caballo Blanco mining complex; (c) the Soracaya exploration project; and (d) the San Lucas ore sourcing and trading business. JDS Energy & Mining Inc. (JDS) was commissioned by Santacruz Silver Mining Ltd. (Santacruz) to prepare this Technical Report to support the disclosure of the acquisition for the Bolivar Project by Santacruz pursuant to the Transaction.

As the Bolivar Mine has been active for more than 200 years, mining procedures and methods have been developed empirically and customized to the geologic deposit characteristics, local conditions, and available technology. Glencore has embarked on a program of modernizing the mine, taking advantage of advances in mining equipment and methods:

- Safety is of paramount importance at the mine and concerns have been successfully addressed with the establishment of training programs, systems, and the incorporation of a safety culture into mine operations;

- Mine planning is well done with trained and motivated professionals using modern hardware and software tools. Redirection of these considerable resources aligned with goals set forth by new ownership can help to identify additional opportunities for value creation in this mature mine;

- Planned future development mostly follows the current resource down dip which will incur incrementally higher haulage, ventilation, and water handling costs with depth;

- Backfill generation and transport in longhole stopes seems to be a bottleneck to production, and forces modification of the stoping sequence to maintain production goals;

- The integrated approach in place towards environmental responsibility and community relations not only ensures compliance with local regulations and permit requirements but allows Bolivar to aim their programs and achievements towards international best practice standards;

- Illegal mining (as opposed to that carried out by legal Cooperativas) remains an issue, and control of unauthorized personnel into the mine is a challenge for the owners. Unauthorized access and mining, increases the potential for safety risks as well as impact to the resource itself, mine production and productivity; and

- Historic processing at the Bolivar mill demonstrates the metallurgy of the material mined at Bolivar. The operational data is validated by the monthly reconciliation based on the concentrate shipped to the smelter and the final reconciliation between the smelter and the mine.

Many risks exist which are common to most mining projects including operating and capital cost escalation, permitting and environmental compliance, unforeseen schedule delays, changes in regulatory requirements, ability to raise financing and metal price. Many of these ever-present risks can be mitigated with adequate engineering, planning and pro-active management. The most significant risks to this project and its continued development are related socio-economic and geo-political factors:

- Areas surrounding and adjacent to Bolivar are being actively mined by mining cooperatives which are organized independent mining bodies. They are an influential population recognized by the government as a valid economic entity for local development, and conduct their activities on separate claims, in abandoned mines, or granted areas adjacent to existing operations. They are an important group with which to work for good community stability, and rogue operators within this group can pose specific risks related to ownership and safety; and

- The Bolivar Mine, along with the other Glencore operations have established mechanisms for purchase and processing of mineralized material, and strong mutually beneficial working relationships with many of the local mining cooperatives. Currently an environment of good business and good community relations exists.

Current operation of the Bolivar Mine is subject to a joint venture agreement with the Bolivian government (“COMIBOL”) which has been in effect since 2014. Continued operation under this agreement is reliant upon a stable political and socio-economic climate. Impacts of government instability are difficult to predict and preempt:

- Historic political instability in Bolivia has cost Glencore dearly in nationalized assets. The current JV structure with COMIBOL seems to be a reasonable response to minimize this risk, but not eliminate it completely.

1.8.2 Recommendations

The Bolivar complex has been in operation for decades and continued operation under new ownership is expected to continue under similar operating parameters. Therefore, the recommended work program is focused on immediate validation and verification of the historic resource in compliance with NI-43-101, followed by or concurrent with, an operational focus on technical evaluation of production planning and operation to identify areas to increase profitability.

The QPs recommend verification and delineation of the Historic Resource, which is the subject of this report, along with targeted resource expansion. Total cost of the program is estimated at US $3.4 MM (Table 1-4) and consists of:

- Plan and execute a resource expansion program including drilling and underground sampling to fully identify and upgrade resources proximal to active mining areas for inclusion in the 2-year mine plan. This is important so that existing mine development can be fully utilized, and reductions in mine development requirements and rate of vertical descent realized;
- Review and revise resource classification criteria to insure NI43-101 compliance; and
- Validate and verify the historic resource and complete a technical report in order that the resource be considered current and may be relied upon.

Table 1-4: 2022 Recommended Work Program and Budget

Description	#	Unit	$/Unit	Total $000’s
Drilling*	10,000	m	200	2,000
Underground Sampling*	12,500	#	50	625
Data Compilation, Model Update including QA/QC	120	hrs	250	30
Validate and Verify Historic Resources	120	hrs	250	30
Review and Revise Resource Classification	80	hrs	250	20
Reporting	150	hrs	250	38

Description	#	Unit	$/Unit	Total $000's
Sub total				**2,743**
G&A				250
Contingency	15	%		411
Total				**3,404**

* Estimated with contractor rates; work can potentially be done in-house.

As well, other potential areas of opportunity were observed by the QPs during the site visit and data analysis stages of this report. It is suggested that in addition to routine continuous improvement programs, project management consider focusing technical and production resources in the following areas:

- Devote attention to material and personnel transport. Mine worker productivity is low partly because of excessive travel times to and from each work area. As well, the transport of waste rock is critical to stope productivity and stability with the mining methods being used. Mine transport is central to all aspects of the operation and a comprehensive program needs to be developed and executed;

- Good work is being done to identify and quantify specific stope dilution. Analysis and incorporation of findings into mining method selection, stope planning and mine operations is an opportunity to increase project value;

- Investigate opportunities to raise Process Plant throughput and reduce downtime to improve project economics;

- Metallurgical testwork to investigate opportunities to increase recoveries through grinding, reagent dosage or newer flotation technology;

- Environmental compliance and visual remediation projects make Bolivar a valued corporate citizen and these efforts should be continued. Especially useful are programs that introduce economic evaluations of community projects; and

- Continue open communication and fair business practices with mining cooperatives and surrounding communities to minimize risk of asset subjugation.

2 INTRODUCTION

JDS Energy & Mining Inc. (JDS) was commissioned by Santacruz to prepare a Technical Report in accordance with the Canadian Securities Administrators' National Instrument 43-101 and Form 43-101F1, collectively referred to as National Instrument (NI) 43-101 for the Bolivar Project (Bolivar or the Project) located in the state of Oruro, Bolivia.

On October 11, 2021, Santacruz entered into the Definitive Agreement with Glencore whereby Santacruz agreed to acquire a portfolio of Bolivian silver assets from Glencore. The Assets include: (a) Glencore's 45% interest in the Bolivar Mine and the Porco Mine, held through an unincorporated joint venture between Glencore's wholly-owned subsidiary Illapa and COMIBOL, a Bolivian state-owned entity; (b) a 100% interest in the Sinchi Wayra business, which includes the producing Caballo Blanco mining complex; (c) the Soracaya exploration project; and (d) the San Lucas ore sourcing and trading business.

Pursuant to the Definitive Agreement, Santacruz will acquire all of Glencore's properties, assets and businesses related to the Assets by acquiring various Glencore subsidiaries including 100% of the shares of Illapa. The consideration for the Transaction will be payable through upfront consideration of US$20 million in cash on closing (subject to customary working capital adjustments), and deferred consideration of US$90 million secured against the Assets. The deferred consideration consists of cash payments of US$22.5 million payable on each anniversary of the closing date for four years and is subject to certain accelerated payment features based on cash flows and silver and zinc prices. Glencore will also retain a 1.5% net smelter returns royalty on the Assets and will have a right to acquire 100% of the offtake from the Assets on market terms to be set forth in definitive agreements to be entered into at closing.

2.1 Terms of Reference

The report was prepared to support a disclosure of the acquisition for the Bolivar Project by Santacruz pursuant to the Transaction.

2.2 Qualifications and Responsibilities

The Qualified Persons (QPs) preparing this report are specialists in the fields of geology, exploration, mineral resource estimation, metallurgy and mining.

None of the QPs or any associates employed in the preparation of this report has any beneficial interest in Santacruz and neither are any insiders, associates, or affiliates. The results of this report are not dependent upon any prior agreements concerning the conclusions to be reached, nor are there any undisclosed understandings concerning any future business dealings between Santacruz and the QPs. The QPs are being paid a fee for their work in accordance with normal professional consulting practice.

The following individuals, by virtue of their education, experience and professional association, are considered QPs as defined in the NI 43-101, and are members in good standing of appropriate professional institutions / associations. The QPs are responsible for the specific report sections as listed in Table 2-1.

Table 2-1: QP Responsibilities

Qualified Person	Company	QP Responsibility / Role	Report Section(s)
Wayne Corso, P.E.	JDS Energy & Mining Inc.	Author, Mining, Project Manager	1,2,3,4,5,6.1,6.2,12.4, 25,26,27,28,29
Garth Kirkham, P. Geo.	Kirkham Geosystems Inc.	Geology, QA/QC, Data Verification, Drilling, Resource Estimate	1,6.4,7,8,9,10,11,12.1,12.2, 25,26,27,28
Tad Crowie, P. Eng.	JDS Energy & Mining Inc.	Metallurgy	1,6.3,12.3,26,27,28

2.3 Site Visit

In accordance with National Instrument 43-101 guidelines, site visits are summarized in Table 2-2.

Table 2-2: QP Site Visits

Qualified Person	Company	Date	Description of Inspection
Wayne Corso, P.E.	JDS Energy & Mining Inc	August 10, 2021	Bolivar Project site; including process plant, select working areas of the underground mine, discussions with site personnel
Garth Kirkham, P. Geo.	Kirkham Geosystems Inc	August 10, 2021	Bolivar Project site; including select working areas and faces underground, discussions with site personnel
Tad Crowie, P. Eng.	JDS Energy & Mining Inc	August 10, 2021	Bolivar Project site; including select working areas underground, Process plant, and tailing storage facility discussions with site personnel

2.4 Units, Currency and Rounding

The units of measure used in this report are as per the International System of Units (SI) or “metric” except for Imperial units that are commonly used in industry (e.g., ounces (oz.) and pounds (lb.) for the mass of precious and base metals).

All dollar figures quoted in this report refer to United States dollars (US$ or $) unless otherwise noted.

Frequently used abbreviations and acronyms can be found in Section 29. This report includes technical information that required subsequent calculations to derive subtotals, totals and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, the QPs do not consider them to be material.

This report may include technical information that requires subsequent calculations to derive sub-totals, totals and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, JDS does not consider them to be material.

2.5 Sources of Information

This report is based on information collected by the QPs during a site visit performed on August 10, 2021 and on additional information provided by Glencore throughout the course of the QPs investigations. Other information was obtained from the public domain. The QPs conducted adequate verification of the information and take responsibility for the information provided by Santacruz.

3 RELIANCE ON OTHER EXPERTS

The QP's opinions contained herein are based on information provided by Santacruz and others throughout the course of the study. The QPs have taken reasonable measures to confirm information provided by others and take responsibility for the information.

The QPs used their experience to determine if the information from previous reports was suitable for inclusion in this Technical Report and adjusted information that required amending.

4 PROPERTY DESCRIPTION AND LOCATION

4.1 Location

Bolívar Mine is located in the state of Oruro in Bolivia, and municipality of Antequera. The complex has UTM W-84 coordinates of 727293.087E; 7959437.617N at an elevation of 4014 masl. Paved roads connect Bolivar to the capital city La Paz (298 km), Oruro City (75 km) and Poopó Rail Station (22 km) which is the concentrate warehouse and dispatch.

Figure 4-1: Project Location Map

Source: Kirkham (2021)

4.2 Property Description and Tenure

The Bolivar Mine has been active from more than 200 years. The current mine complex consists of an underground mine, 1,100 t/d concentrator plant, maintenance workshop, shaft-winder, tailings storage facility, water treatment plants, supplies warehouse, main office, hospital, and camp.

Two water treatment plants operate on mine water discharge; one potable treatment plant for the camp and surrounding community as well as a separate treatment plant for reuse of process water for industrial purposes. Electric power is purchased from the Bolivian Grid and available to the mine via overhead high-tension lines.

The mine stores tails in one active modern facility. There exists a historic storage facility on the site as well.

The Bolivar mine is owned by the Bolivian Government (COMIBOL) with exclusive mining rights held pursuant to an unincorporated joint venture (the "**Illapa JV**") between private owner operator Sociedad Minera Illapa S.A. (Illapa). Pursuant to the Illapa JV, Illapa holds a 45% interest in the Bolivar Project, and the Bolivian Government (COMIBOL) which holds a 55% interest in the Bolivar Project. Illapa is a wholly-owned indirect subsidiary of Glencore Plc.

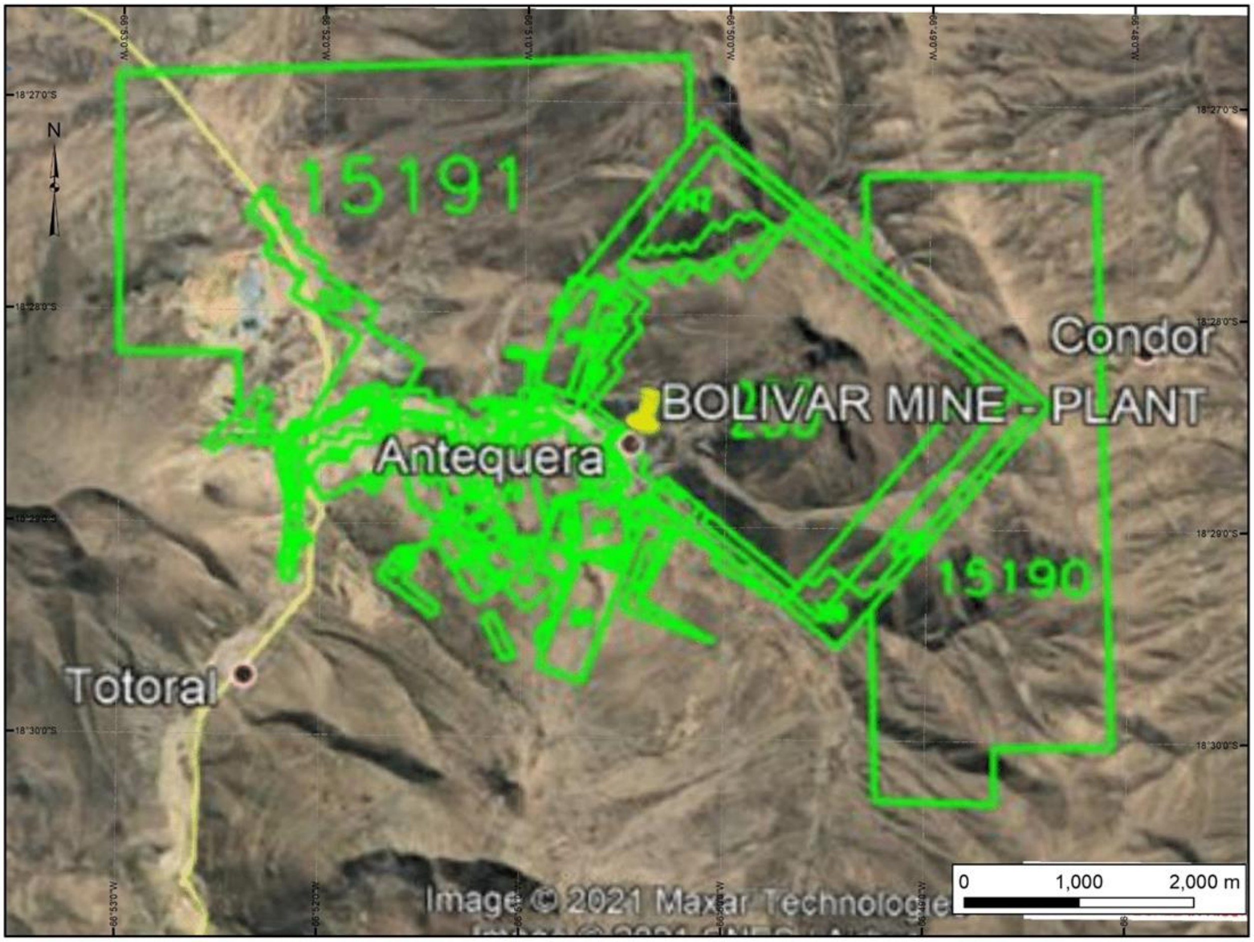
Illapa itself owns no mineral tenements in this district.

Santacruz will acquire 100% of the shares of Illapa pursuant to the Transaction, as more particularly described in Section 2. There are no royalties or encumbrances existing on the properties now as they relate to Glencore's ownership. In addition to cash payment described, a 1.5% NSR royalty forms part of the purchase price that Santacruz will pay to Glencore. The only known existing agreements that will bind Santacruz is that of the Illapa JV.

Environmental liabilities observed consist mostly of historic tailing storage facilities and mine workings. Recent audits verify environmental legal compliance and associated closure plan costing.

Figure 4-2 shows COMIBOL's tenements under the Illapa Joint Venture.

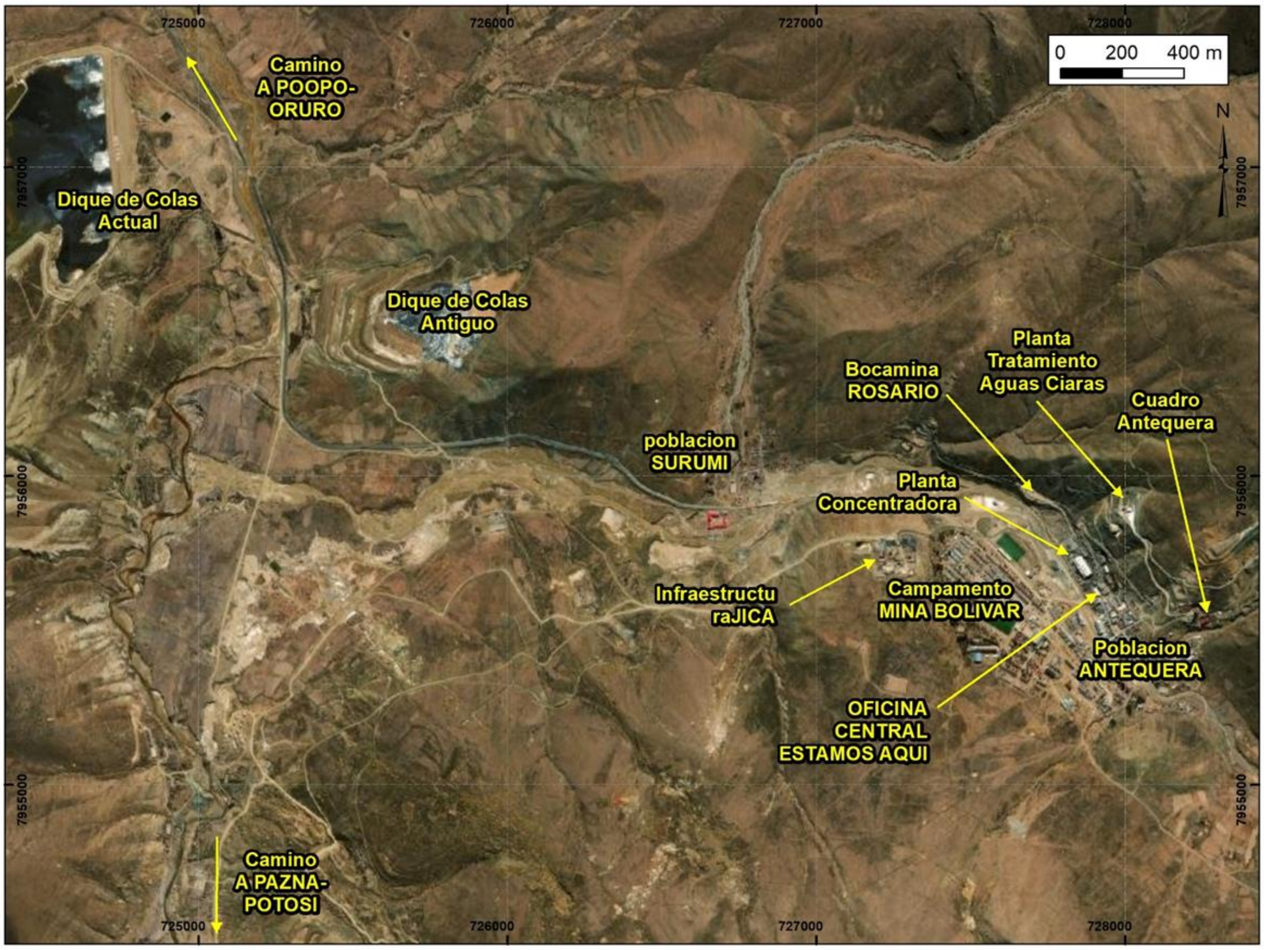
Figure 4-2: "COMIBOL" Mining Tenements Under Illapa JV



Source: Kirkham (2021)

Bolívar Mine is located in the state of Oruro in Bolivia, and municipality of Antequera. The complex has UTM W-84 coordinates of 727293.087E; 7959437.617N at an elevation of 4014 masl.

Figure 4-3: Bolivar Project Site



Source: Kirkham (2021)

4.3 Environmental, Permitting and Social Impacts

Glencore has implemented a sophisticated management approach to sustainability consistent with their practices worldwide. From the 2019 Sustainability Report:

> *"Our commitment to responsible and sustainable mining has strengthened over the years, based on the alignment to Glencore's international policies and procedures and the major sustainability initiatives to which we subscribe. All our policies and procedures seek compliance with Bolivia's legal rules, but our goal is to go beyond them and so follow standards that exceed legislation and address all the impacts from our operations."*

This integrative approach is evident in the Bolivar operation. Areas addressed and monitored include:

- Employees;
- Occupational Health & Safety;
- Governance and Compliance;
- Stakeholder Engagement;
- Contributing to Community;
- Environment; and
- Product Stewardship & Material Handling.

4.3.1 Regulatory Framework

Bolivia's central statute governing environment protection is Law 1333, of 27 April 1992; specific regulations for which are set out in Regulation of Environmental Prevention and Control, December 8, 1995. Special Decree No. 24782 of 31 July 1997 sets out specific environmental requirements related to mining. Breaching environmental obligations can result in criminal liability under the Bolivian Constitution, in addition to other administrative penalties (such as a loss of mining rights).

An Environmental Impact Assessment (EIA) would be required for a project the scale of a mining and processing operation. As well, public consultation with any potentially affected indigenous communities and local populations may also be necessary. Granting of the operating permit allows the proponent to obtain the appropriate operating licenses, which must be updated with any relevant changes during the life of the operation.

Specialized environmental authorities control compliance. As required under the license, any impact on the environment must be reported to these authorities. Remediation measures and rehabilitation projects are compulsory, and financial reserve funds are maintained annually to cover closure costs. A final closing study on the effect on the environment will also be required, and restitution met.

On February 25, 2014, a Declaration of Environmental Adequacy Certificate was issued by the Ministry of Environment and Water addressing the proper license updating procedure carried out by Sinchi Wayra S.A. during the transfer of the Bolivar Mine to Sociedad Minera Illapa S.A. In the same manner, the updating of the Porco Mine License, was addressed and approved by the Ministry of Environment and Water, on February 21, 2014, in the transfer procedure from Sinchi Wayra to Illapa.

Illapa was granted the Mining Identification Number 02-0697-04, by the SENARECOM (National Service of Control and Registration of Minerals and Metals Commercialization, for its acronym in Spanish), which expires on September 25, 2022:

a. Sinchi Wayra transferred the Bolivar Mine, which was recognized in the Declaration of Environmental Adequacy (DAA) N.° 040603-02-DAA-0324/14 dated February 25, 2014. The DAA has the nature of an environmental license; and

b. The General Direction of War Logistics and Material issued a Registration Certificate under number 0167/2021, for the use of explosives and accessories in mining activities. Expiring date: August 26, 2023.

4.3.2 Health, Safety and Economic Development

As per focus areas in the Glencore Sustainability program:

- Employees – establishing relationships based on trust and promoting a culture of prevention and safe environments. Quality employment opportunities are offered with non-discriminatory hiring. In 2019, Bolívar employed total of 379 employees and 287 contractors, 6% of whom were women. Given the labor benefits offered, Bolívar has a low turnover rate. 70% of employees at Bolívar are unionized, a decrease of 3% from the previous year. Glencore guarantees freedom of association and the right to collective bargaining;

- Occupational Health & Safety – realizing the inherent personal risks of mining and in response to a fall of ground fatality earlier that year, emphasis was made in 2019 in program development and training in proper work practices at Bolívar. As well, based on safety performance and incident analysis, 4 High Potential Risk Incidents (HPRIs) were identified for priority actions to prevent recurrence;

- Health – Medical care is provided to employees through third party health insurers at Santa Rita Hospital. Regular Occupational Health examinations are given to all workers and treatment provided when prescribed. In 2019, occupational health factors at Bolívar, were monitored led by consulting company “Servicios Ambientales Biótica”, during which lighting, ventilation, air quality, thermal stress, vibration, and occupational noise, were analyzed and found to fall within legal standards;

- Community - The neighboring communities house workers, contractors, and their families. Most of them reside in Antequera, which lies adjacent to the mine. In 2019, USD 387,865 was invested in the development of neighboring communities, benefitting approximately 1,900 families;

- One of the schools in Antequera is financed by Glencore and serves over 500 students. The program includes funding of teachers’, directors’ and supporting personnel’s wages, supplies and equipment, payment of services and school infrastructure. The school is highly competitive, ranking first inn Math and Chemistry at the national level. A scholarship program has also been established for outstanding students, who study aboard in the capital cities. These programs not only help the local communities, but they provide Bolivar with trained professionals. Public education is also supported through extracurricular sports and cultural activities;

- Economic Development - Bolívar offers a professional training workshop for women who live in the mining camp and that make up the Housewives' Committee. The purpose is to promote knitting, cooking and business management skills. One project restored land affected by the heightening of the tailings dam;

- Environment - In 2019, an employee driven plastic caps recycling campaign was organized. 50 kilograms of plastic was recycled thanks to the commitment of the offices in La Paz. Tree planting continued throughout the tailings dam area as well as a forestation and support program for the community of Quea Queani; and

- Local needs - In 2019, roads to inaccessible areas of the community were built, improved, and maintained to connect these 400 families with more populated towns. Cultural activities were sponsored as well as a series of sports activities in the communities in order to promote healthy lifestyles. Physical education, yoga and Zumba instructors, are employed to train workers and their spouses. The Company also organized a marathon in coordination with Santa Rita Hospital.

4.3.3 Environmental Management

4.3.3.1 Water Management

Bolivar produces an excess of water from the underground mine. A total of approximately 150 liters per second is pumped from the mine. This water is treated for two different uses: one for potable water at the mine and surrounding communities, the other for industrial uses in the mine and process plant. The balance of water is discharged to the Pampitas River.

4.3.3.2 Tailings Management

The stage VI lift of the Queaqueani Tailings Dam was completed in to updated design and international standards. For this project, more than 400,000 cubic meters of material were moved. A strict on-site Quality Control Management (CQC) and external Quality Assurance (CQA) was followed, and an enhanced monitoring program was put in place. Tailings from the process plant and sludge from the Water treatment plant is deposited in this facility.

4.3.3.3 Waste Management

Bolívar currently disposes of all waste rock underground; thus, surface management is not required. Domestic waste is collected by the municipal cleaning company of Antequera, whereas industrial waste is temporarily stored in authorized locations and is subsequently recycled by specialized companies.

4.3.4 Community Interaction

Glencore has assigned a dedicated Social Management superintendent for the Bolivar Mine. This position, which employs professionally trained individuals, has the most direct contact with the local community. A staff of approximately 7 support the superintendent and implementation of social programs and projects, The Company also has a Corporate Sustainability Coordinator, who oversees the economic management of the projects, the submission of Safety, Health, Environment and Communities Report to Glencore, and the corporate management with other interested parties, such as the United Nations Global Compact and Sustainable Development Goals (SDGs) Working Tables. All of them are under the purview of the Corporate Affairs and Sustainability Management. Most of the social responsibility programs are implemented jointly with the environmental team, the projects and civil works team, and the labor relations team, given that most workers are union members and reside in the communities themselves.

A due diligence policy was implemented for community investments in 2019 which applies to all of Sinchi Wayra's operations and governs the Company's contributions and investments in community projects. It establishes a process that begins with the investment requests submitted by the communities involved, through the Representatives of their Ayllu (Autonomous Indigenous Government). Then, meetings are held with the communities to discuss the feasibility of the project to be financed. The community authorities exert social control on the projects that will be conducted and are part of the process.

Bolívar has a formal agreement (known as Actas de Reunión) with the neighboring communities. These agreements are recognized and managed by their Ayllus and include different plans and projects to help the communities with their economic development, infrastructure, access to water, education, and health and assist the communities by sponsoring their traditional festivities and sports. This process is verified by the Compliance Officer, who conducts a Due Diligence Process verifying the background of the beneficiaries and ensuring that the project award process complies with HSEC and conflicts of interest policies and with our Code of Conduct. If the projects meet all the requirements and have the approval of the regional compliance officers, the relevant administrative process for the project can begin.

4.3.4.1 Mining Cooperatives

A key player of Bolivar Mine and surrounding area are the mining cooperatives which are organized independent mining entities, some quite capable and organized with their own equipment. Recognized by the government as a valid economic activity for local development, they conduct their activities in abandoned mines or expropriating active mines which can pose risks to business. The relationship is not completely one-sided as the Cooperatives utilize the Bolivar plant to process their product, thus mechanisms are in place to face possible subjugations, protect mine employees and the communities.

More importantly, proactive solutions and agreements to avoid conflict and coexist peacefully with the different cooperatives are in place. As much as possible, with cooperatives as toll processors, compliance with occupational health and safety, human rights, and good work practice is sought.

To incorporate a new supplier, an assessment is required, including:

- Submission of legal documents proving that they are up to date with regard to any rules in force;

- The mineral supplier's background is verified; for this purpose, we have access to the Thomson Reuters and Info center systems, which report their background globally. This system informs us whether the supplier has any negative local or international background; in that case, the Company does not hire the services;

- Commercial visit to the supplier’s operations, to directly verify the standards such as the 132 company’s Code of Ethics. In particular, we analyze whether child labor is employed in the operations, and any other Human Rights violations. We also observe the use of safety equipment and personal protective equipment that guarantee the safety of the workers; and

- We also assess the machinery, ensuring that they are in good condition and that they guarantee safety. Once all these steps are completed and upon the in-situ verification of legal documents, the relationship with the cooperative is authorized.

A pilot support program was launched in 2019 to supply advisors and technical assistance on environment, human rights, occupational health & safety, and administrative management. The goal being to help mineral suppliers improve their internal systems and processes to ensure sustainability and compliance with Glencore sustainability standards.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

Paved roads connect Bolivar to the capital city La Paz (298 km), Oruro City (75 km) and Poopó Rail Station (22 km). Concentrates are transported by truck from Bolivar process plant to the rail station at Poopó (concentrate warehouse and dispatch) from where it is transported to a warehouse at Portezuelo outer Harbor, located 35 km from the city of Antofagasta, Chile. Once bulk shipment is arranged, the concentrates are consolidated in air-tight containers and trucked to the port of Antofagasta. Alternate ports are also accessible including Arica, Chile and Matarani, Peru.

Bolívar Mine, located within the municipality of Antequera is important to the neighboring communities of Antequera, Charcajara, Chapana and Quea Queani. The community of Antequera is immediately adjacent to the mine site and the largest community in the area of influence. The town is inhabited mainly by mine workers. Historically, it has been an area of intensive zinc, lead and tin mining so support, and service businesses have established themselves to serve the mine and its employees.

5.2 Climate and Physiography

Geographically Bolivar is part of the Cordillera de Azanaques, which in turn is part of the Cordillera Central or Meridional, located on the slopes of Cerro El Salvador (4560 masl).

The climate is arid to semi-arid and included in the “Puna” eco-region which extends south of the 18th parallel, from which aridity increases. Precipitation averages 450 mm per year with temperatures ranging from a maximum of 24ºC to a minimum of -13ºC. The topography of the area is moderately rugged, with mountain ranges cut by the Antequera canyon, through which the Chapana River runs.

The elevation at the mine site is 4014 masl.

5.3 Infrastructure

In addition to a network of paved roads, Bolivar also has access to rail for concentrate transport. Concentrate is hauled 22 km to the Poopó railway station in a convoy of 15 dump trucks, each with approximately 14 t of cargo. The trucking service is contracted from local owners to help support the economic development of neighboring communities.

Poopó also has a warehouse and storage yards. Storage is divided into 10 compartments to separate concentrate batches, and yard area is available for drying and blending if needed. Truck and rail scales are also available at the yard.

Electric power for Bolivar is supplied by the national grid (ELFEO S.A. - Managed by ENDE) from about 2 km from the Mine at Catavi substation via a 69 kV transmission line to the Bolivar step-down substation. The Bolivar electrical distribution system consists of two main feeders: one at 25 kV for the Concentrator Plant and another at 6.6 kV for the mine and the camp. A 2.8 MW diesel backup at the mine is available for the plant thickeners and mine dewatering.

Bolivar produces an excess of water from the underground mine. A total of approximately 150 l/s is pumped from the mine and is treated in separate plants for two different uses: one for potable water at the mine and surrounding communities, the other for industrial use in the mine and process plant. The balance of water is discharged to the Pampitas River.

Bolivar Mine has access to modern communications via Internet, e-mail, and communication by broadband radio and cell phone.

Bolivar Mine has one active Tailing storage Facility (Queaqueani) and one inactive (Antiguo). Both are subject to Glencore's HSEC Catastrophic Hazards assurance program in accordance with the Dam Safety Criteria and protocols developed by Glencore HSEC. This program includes third party Verification Assessments (Dam Safety Assurance Assessment). In response to findings from these assessments, and to mitigate risks of failure, risk management tools have been developed to improve management systems for the active TSF. For the inactive facility, monitoring and maintenance have been improved and follow good practice.

The "Queaqueani" tailings storage facility started operations in April 2007. This facility was designed by Canadian engineering firm AMEC and is located 3.5 km to the north of the operation. Hydraulic tails of 25-29% solids are beached along the upstream side of the dam crest and water is reclaimed from the southwest sector of the reservoir and pumped via HDPE pipelines back to the water treatment plant.

The Quequeani Dam is a 33.5 m high, downstream-constructed dam, which contains 3.88 Mm^3 of tailings. The current crest level is El. 3994.8 m (Stage IV-A raise was completed in December 2019). The next dam raise (Stage IV-B to El. 3997.8 m) is planned for 2021-2022.

Figure 5-1: Aerial Photography of the Queaqueani TSF

Source: Glencore (2021)

6 HISTORY

6.1 Management and Ownership

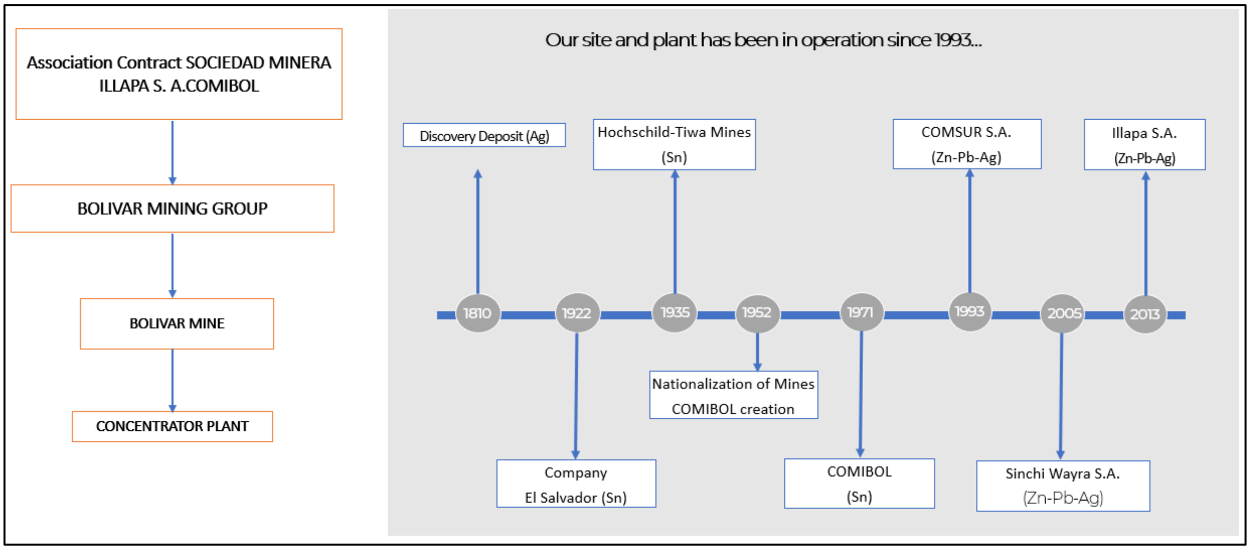
The Bolivar deposit was originally discovered in 1765 by Gonzalo de Antequera and mined primarily for silver until the late 19th century. As the world silver market began to collapse in the 1880’s and early 1890’s, a major shift to tin mining began to meet the increased demand of the industrialized world. Wealthy tin barons in Bolivia held much influence in national politics until they were marginalized by the nationalization of the three largest tin mining companies following the 1952 revolution. In March 1971, the government returned Bolívar Mine to the newly formed Bolivian Mining Corporation (COMIBOL), under whose management it operated until mid-1993. Bolivian miners played a critical part in the country's organized labor movement from the 1940s to the 1980s and continue to be an important stakeholder.

Emergency economic measures by the government in response to the international tin market crash in 1985 included massive layoffs of miners. The shift to base metal production is the space where the Bolivar Mine has been in operation since 1993 under the management of Sinchi Wayra S.A. (formerly COMSUR S.A.), and currently (since 2014) under a joint venture agreement with the Bolivian government (COMIBOL) named Illapa S.A. Sinchi Wayra S.A. (Sinchi Wayra) is a wholly-owned subsidiary of Glencore Plc, one of the most diversified, vertically integrated producers, processors and marketers of natural products in the world. Sinchi Wayra S.A. is the producing operator that is part of Glencore’s Zinc Department, operating the largest underground mines in Bolivia and producing zinc-silver and lead-silver concentrates.

Illapa and COMIBOL (Corporación Minera de Bolivia) entered a Joint Venture Agreement (the Illapa JV) on December 4, 2014, The Illapa JV is a mining contract by which Illapa is permitted to perform commercial mining activities on the mining areas of the Bolivar Mine. The duration of the Illapa JV is of 15 years, with the possibility of extending the term for the same duration. The payments and participations of the Illapa JV are of 55% for COMIBOL and 45% for Illapa from the net cash flow of the mine operations.

Sociedad Minera Illapa S.A. (Illapa) is registered as a private company under the activities of mine operations as well as exploration activities. In the event of any controversy, the Illapa JV has an arbitration clause with seat in La Paz, Bolivia, under UNCITRAL Rules.

Figure 6-1: Project History



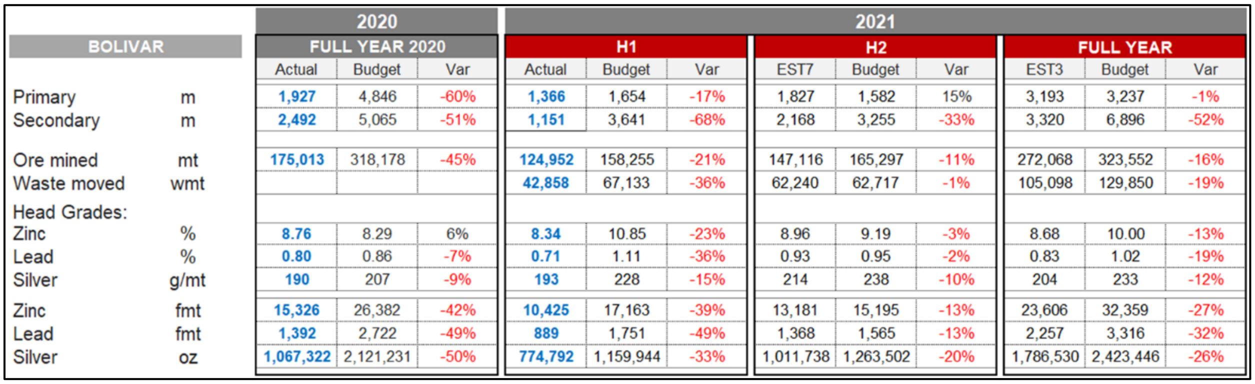
Source: Glencore (2021)

6.2 Mine Operations

The mine has been active from its discovery in 1810 until present producing silver, tin, zinc, and lead. The most modern phase of development extends from 1993 and recent efforts over the last five years or so have been focused on improving safety and productivity standards to compare with any modern operation. Mechanization had moved the mine into less selective “bulk” methods with some increase in the flexibility and productivity of the operation.

Actual mine production for 2020 and first half 2021 along with budget targets for 2021 is presented in Table 6-1.

Table 6-1: Mine Production



		2020			2021								
BOLIVAR		FULL YEAR 2020			H1			H2			FULL YEAR		
		Actual	Budget	Var	Actual	Budget	Var	EST7	Budget	Var	EST3	Budget	Var
Primary	m	1,927	4,846	-60%	1,366	1,654	-17%	1,827	1,582	15%	3,193	3,237	-1%
Secondary	m	2,492	5,065	-51%	1,151	3,641	-68%	2,168	3,255	-33%	3,320	6,896	-52%
Ore mined	mt	175,013	318,178	-45%	124,952	158,255	-21%	147,116	165,297	-11%	272,068	323,552	-16%
Waste moved	wmt				42,858	67,133	-36%	62,240	62,717	-1%	105,098	129,850	-19%
Head Grades:													
Zinc	%	8.76	8.29	6%	8.34	10.85	-23%	8.96	9.19	-3%	8.68	10.00	-13%
Lead	%	0.80	0.86	-7%	0.71	1.11	-36%	0.93	0.95	-2%	0.83	1.02	-19%
Silver	g/mt	190	207	-9%	193	228	-15%	214	238	-10%	204	233	-12%
Zinc	fmt	15,326	26,382	-42%	10,425	17,163	-39%	13,181	15,195	-13%	23,606	32,359	-27%
Lead	fmt	1,392	2,722	-49%	889	1,751	-49%	1,368	1,565	-13%	2,257	3,316	-32%
Silver	oz	1,067,322	2,121,231	-50%	774,792	1,159,944	-33%	1,011,738	1,263,502	-20%	1,786,530	2,423,446	-26%

Source: Glencore (2021)

Mine production originates from two areas in the deposit:

- "Central" is the main mining zone and provides roughly 85% of total production. It consists of three distinct production areas, each with its own ramp system: This zone is mature, and mining is relatively deep, with future planned development extensions down-dip. The mineralized material is present in thin, steeply dipping veins. These systems of veins and their groupings dictate the development of the mine into intensive working areas. Ramp systems are driven to access minable areas named after the major veins being mined. From south to north:

  - Pomabamba/Nueva veins;
  - Nané/Bolivar veins; and
  - Bolivar vein.

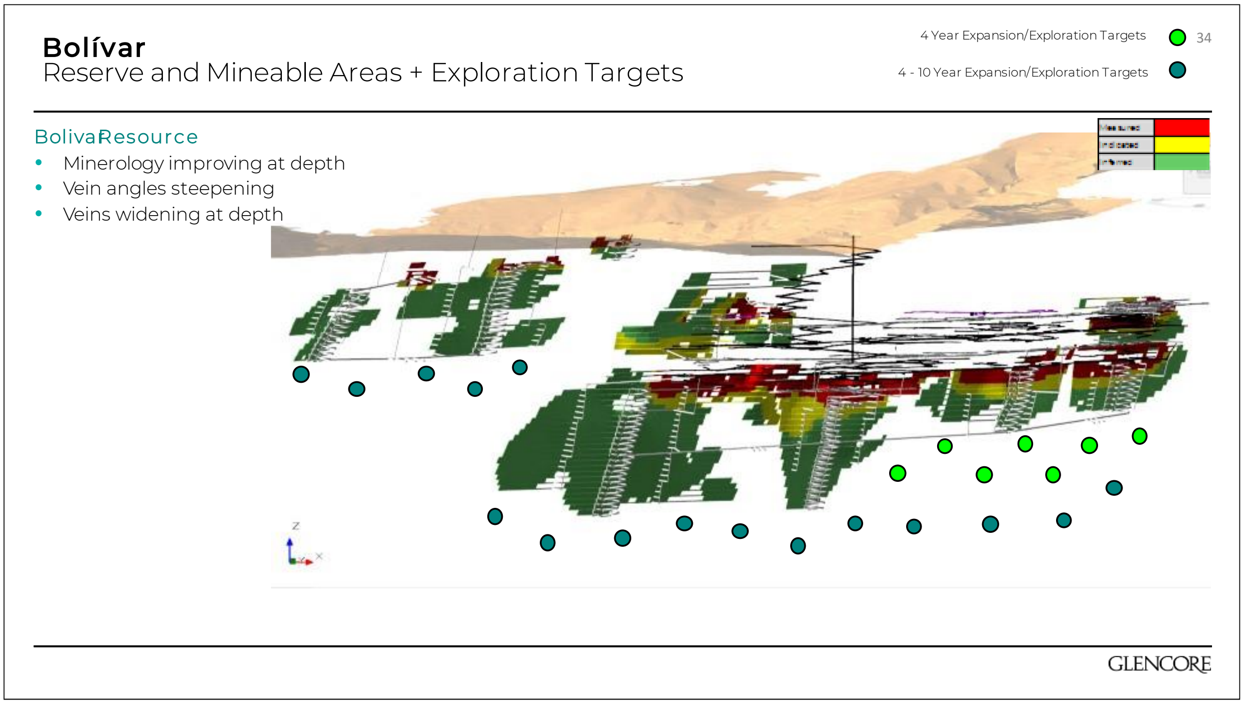
  Most of the Central Zone is mechanized using a longhole variant method called AVOCA. Mineralized material is loaded from the face with Load Haul Dump (LHD) units and trucked to a rail level where it is hauled to a shaft for hoisting to surface. About 25% of the mineralized material mined in this zone is by conventional shrinkage stoping, where mineralized material is loaded directly into rail cars and hauled to the shaft. Trackless access to the zone is via a 4.0 m x 3.6 m main ramp which extends from level zero to -380 m and grades 12%.

- Rosario is a parallel vein located about 1 km in the hanging wall and has a dedicated access decline. It is independent of the Central zone. Rosario is a relatively new development, and mining is close to surface.

  Rosario is 100% mechanized longhole mining and mineralized material is hauled from the face directly to surface via a dedicated ramp.

Figure 6-2 illustrates the general layout of the mine and the direction of future mining of identified resources in green.

Figure 6-2: Mineable Areas and Exploration Targets



Bolívar

Reserve and Mineable Areas + Exploration Targets

4 Year Expansion/Exploration Targets ●

4 - 10 Year Expansion/Exploration Targets ●

Bolivar Resource

- Minerology improving at depth
- Vein angles steepening
- Veins widening at depth

GLENCORE

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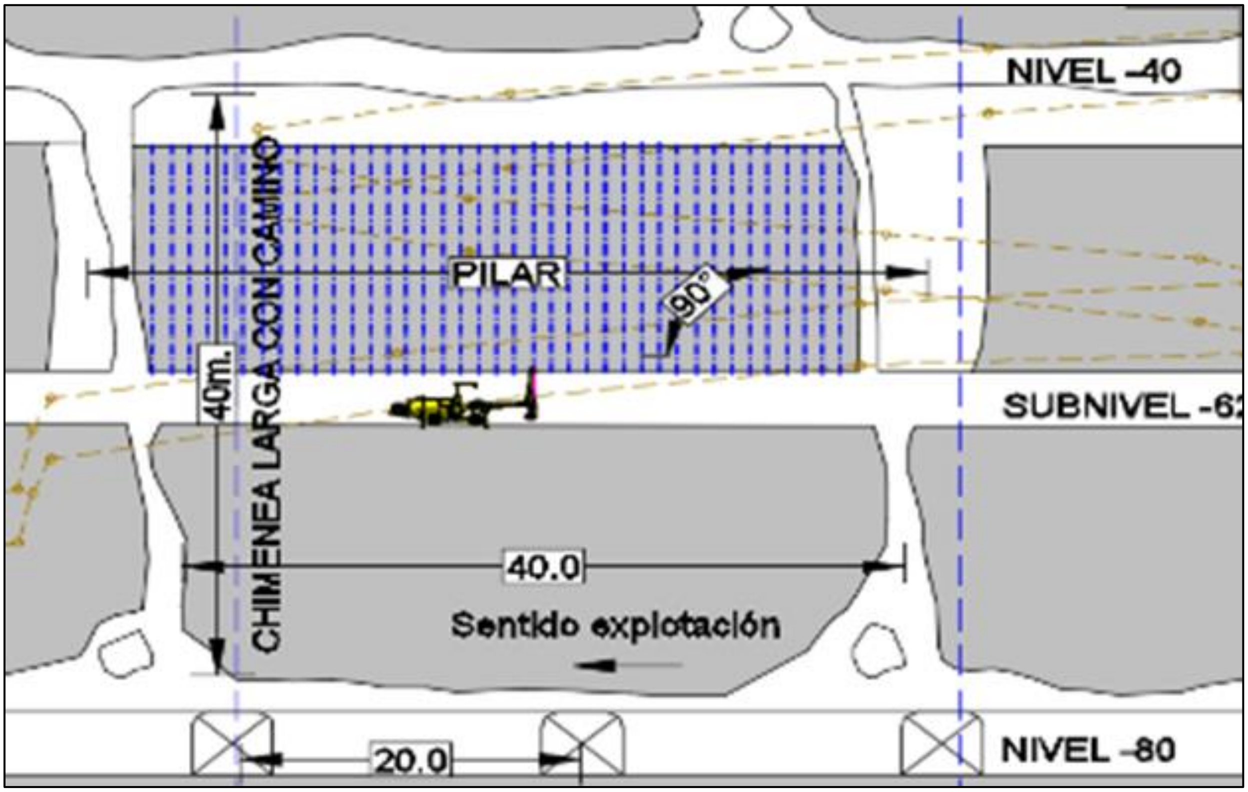
Source: Glencore (2021)

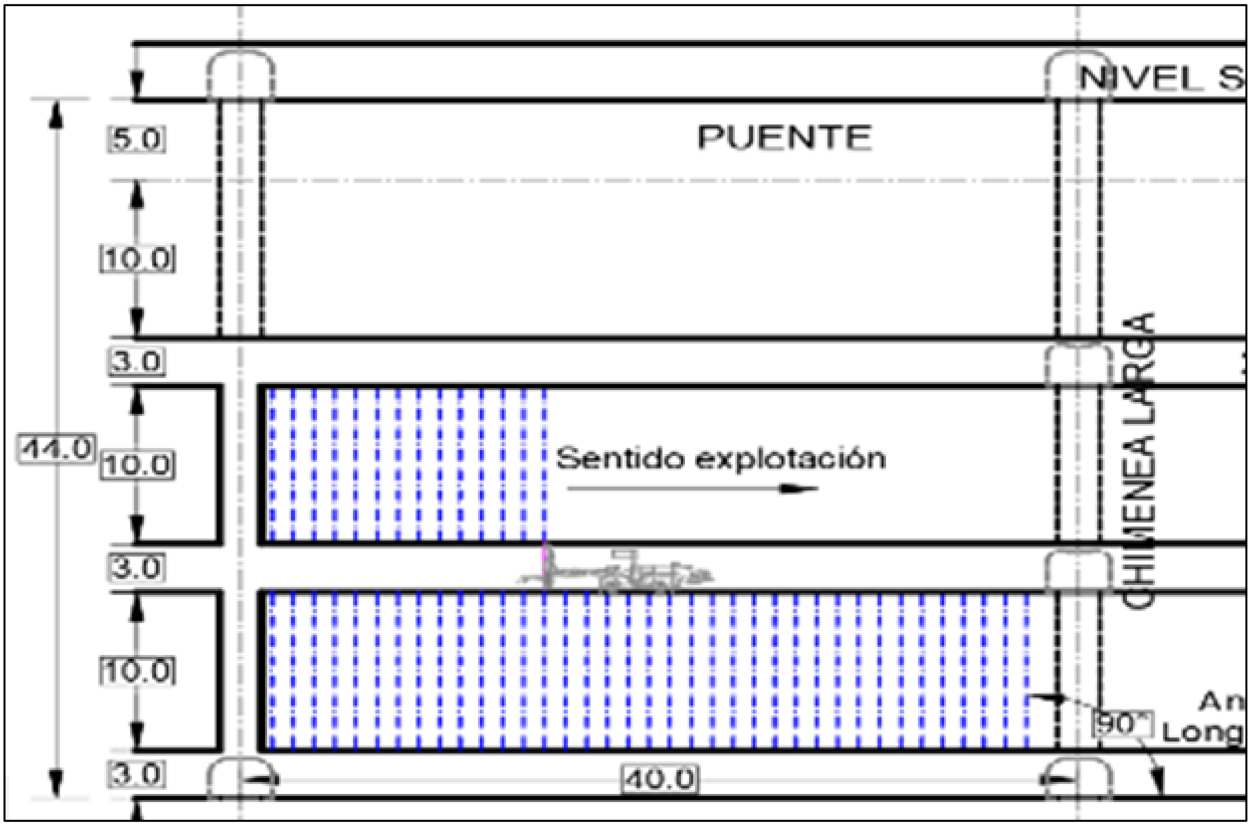
Mining methods have been slowly moving from conventional shrinkage or cut and fill, to more mechanized methods that minimize miner exposure; Primarily sublevel stoping using longholes, and its variants. Over the last 10 years, experience with longhole has prompted optimizations as illustrated in Figure 6-3 to Figure 6-5.

Figure 6-3: Longhole Stoping 2010 - 2014



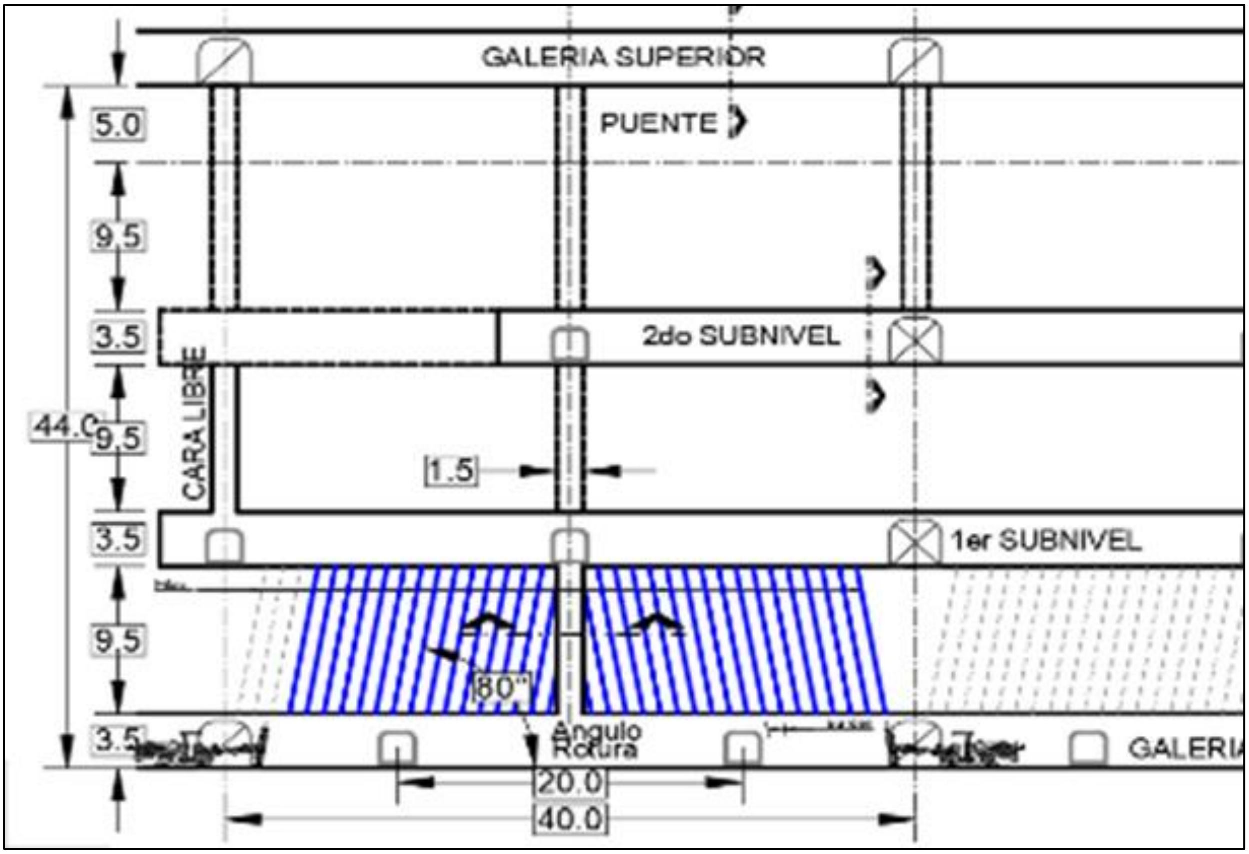
Source: Glencore (2021)

Figure 6-4: Longhole Stoping 2015 – 2016



Source: Glencore (2021)

Figure 6-5: Longhole Stoping 2017 – Present

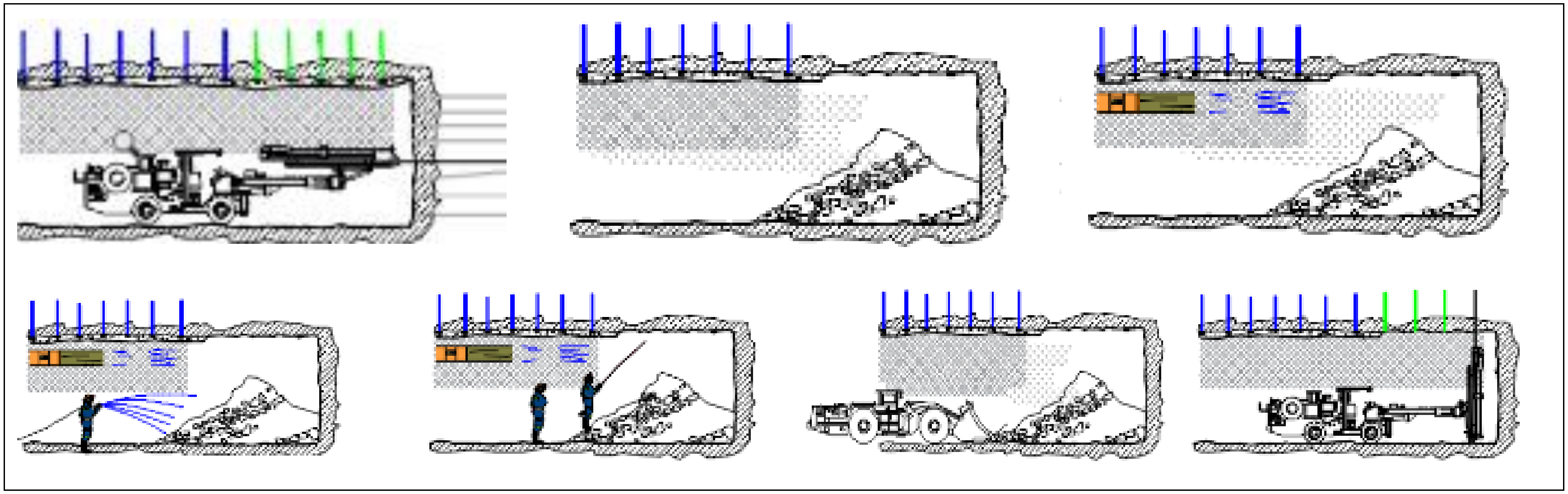


Source: Glencore (2021)

In general, the move has been to shorter sublevels, adjustments for larger development headings and smaller panels for production flexibility. Break raises are driven conventionally.

Drifting and stoping procedures have also evolved to a "no tolerance" process driven by safety concerns which keep miners from working under unsupported ground Figure 6-6.

Figure 6-6: Current Work Cycle (Development Heading)



Source: Glencore (2021)

In general, the Bolivar Mine has been in operation for many years and ground support standards have been established based both on empirical and geotechnical data. Ground support standards were observed as continually being evaluated and upgraded as part of mine safety program initiatives. Training on proper support installation was also observed. Ground support in the main drives is based on rock quality, as a minimum, with pattern bolted 2.4 m Swellex bolts with mesh, up to fully shotcreted headings. The stope sills are bolted with split sets as needed. In some areas, cable bolting was employed with variable success.

The 2021 – 2022 budgeted mine manpower is reported to be 195 employees. Average manhours per year is 2,495 for a total of 487,000 manhours. Forecast tonnage is 324,000 for 2021 giving a productivity of 0.66 tonnes per manhour or approximately 5.3 tonnes per manshift.

6.2.1 Equipment

The move to mechanization over time has resulted in a mixed fleet of mobile production equipment as listed in Table 6-2.

Table 6-2: Equipment List

Make	Model	Number
Scoop		
ATLAS COPCO	ST-2G	3
ATLAS COPCO	ST - 7	4
CATARPILLAR	R1300G	1
ATLAS COPCO	ST-1030	1
Mine Truck		
DUX	DT-22N	3
DUX	DT-12	4
ATLAS COPCO	MT-2010	1
SANDVIK	TH-315	1
Drills		
RESEMIN	RAPTOR 44 LH rig	3
RESEMIN	MUKI FF Jumbo	7
RESEMIN	TROIDON Jumbo	1
Scissor Utility Vehicle		
DUX	S1-SL5000N	5

Equipment is late model year; 85% of the fleet is less than 5 years old with an average of 5,000 operated hours. Equipment capacity should not be a limiting factor for current production rates.

Shrink stoping as practiced at Bolivar Mine does not use backfill, conversely, production from the longhole modified Avoca stopes relies on backfill and it is a logistical challenge to keep ahead of the stoping with backfill. This has two main implications:

- The stopes can be over-mucked and left unsupported for longer periods allowing for hanging wall raveling and failures which can lead to higher dilution; and
- Scheduling of stopes is affected requiring more active stoping areas to support ore production requirements.

Water is an issue at Bolivar that is recognized and addressed. Sumps and pumping systems are in place to handle the water from the stoping areas. Currently, they are handling approximately 150 l/s. As the mining goes deeper, water handling will become more critical, and development rates will have to be adjusted to account for delays and scheduling adjusted accordingly. There were no plans to dewater with wells or any other means than to handle the water in the mine openings.

Ventilation upgrades to the mine were made in 2016 to increase total volume which currently is 450,000 m^3/h and intake is via the main ramp and Antequera shaft.

The main hoisting system is via the Antequera Shaft which extends to a depth of 340 m. The shaft has two compartments, one with an eight-person cage, and the other with 3.6 t skip.

6.3 Processing

The Bolivar Mill has been in continuous production since 1993. The mill receives feed from 2 sources; the company mining operation and toll milling purchased through San Lucas. The mill processes the 2 types of feed separately which allows for an analysis of processing for both types of feed.

The mill uses a crushing, grinding, and flotation flowsheet to recover a lead concentrate and a zinc concentrate. Both concentrates are sold to the Antafagasta smelter in Chile. The mill flowsheet can be found in Figure 6-7 in Section 6.3.2.5.

The mill generally separates company and toll feed into different days, but there are a few days where the feed is processed on the same day, with a shutdown in between to separate the 2 feeds.

The company feed grades are determined on a daily basis by collecting and assaying samples of the process taken at the cyclone overflow, concentrates and final tailings. Each month, the production is reconciled to the measured feed tonnage using the concentrates sold and the final tailings to calculate the feed grade. The toll feed is received by San Lucas, often in 1-2 t lots, where it is weighed and sampled. The material is combined on a toll feed stockpile to be fed to the mill. The toll feed is reconciled in the same method as with the company feed to determine reconciled recoveries.

The mill utilizes different reagent strategies for the toll and company feed sources, primarily due to pyrrhotite which is found in the toll feed but generally not found in the company feed.

The processing plant targets 15 – 20% of the feed to be toll feed.

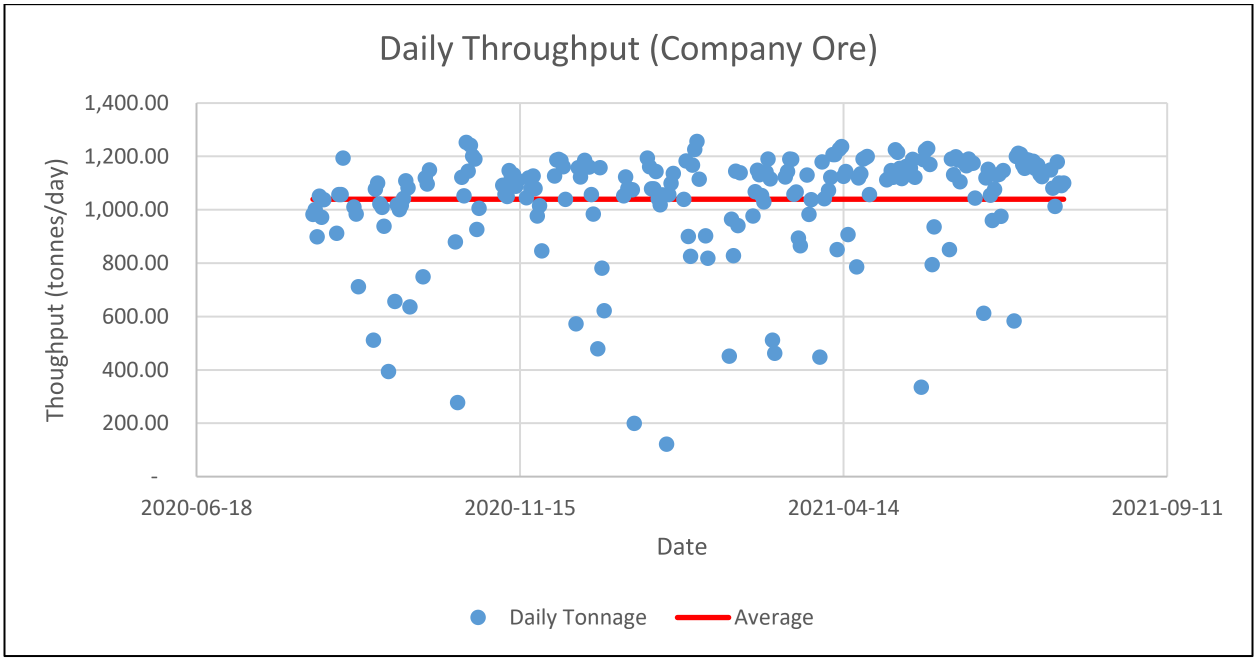
6.3.1 Company Feed Processing

Data from August 2020 to July 2021 was used to develop the expected metallurgical performance of the Bolivar mill. This data was used to determine throughput, recovery and concentrate grade relationships. The results will be discussed in the upcoming sections.

6.3.1.1 Mill Throughput

The expected availability for the mill is 93.8% and the utilization is 96.3% for an expected operating time of 90.3%. The actual throughput from August 2020 to July 2021 can be found in Figure 6-7.

Figure 6-7: Bolivar Mill Company Feed Throughput 2020/2021



The throughput of company feed through the Bolivar mill during the analyzed period was a little lower than the stated target, with the average of the days it operated being 1,040 t/d. During the analyzed period, the mill ran company feed over 219 whole or partial days and processed

227,671 t of feed. The data suggests that the feed rate is not achieving the target throughput for company feed.

The target grind for the Bolivar plant is a product size P_{80} of 100 µm.

6.3.1.2 Feed Grades

For the period examined, the unreconciled feed grades for the company feed were 7.86% zinc, 0.74% lead, and 201 g/t silver. The feed was somewhat variable with standard deviations of 1.52, 0.22, and 61.85 for zinc, lead, and silver respectively. These values fall within the expected ranges for Bolivar feed. The unreconciled feed grades can be seen in Figure 6-8, Figure 6-9, and Figure 6-10.

Figure 6-8: Zinc Feed Grade 2020/2021

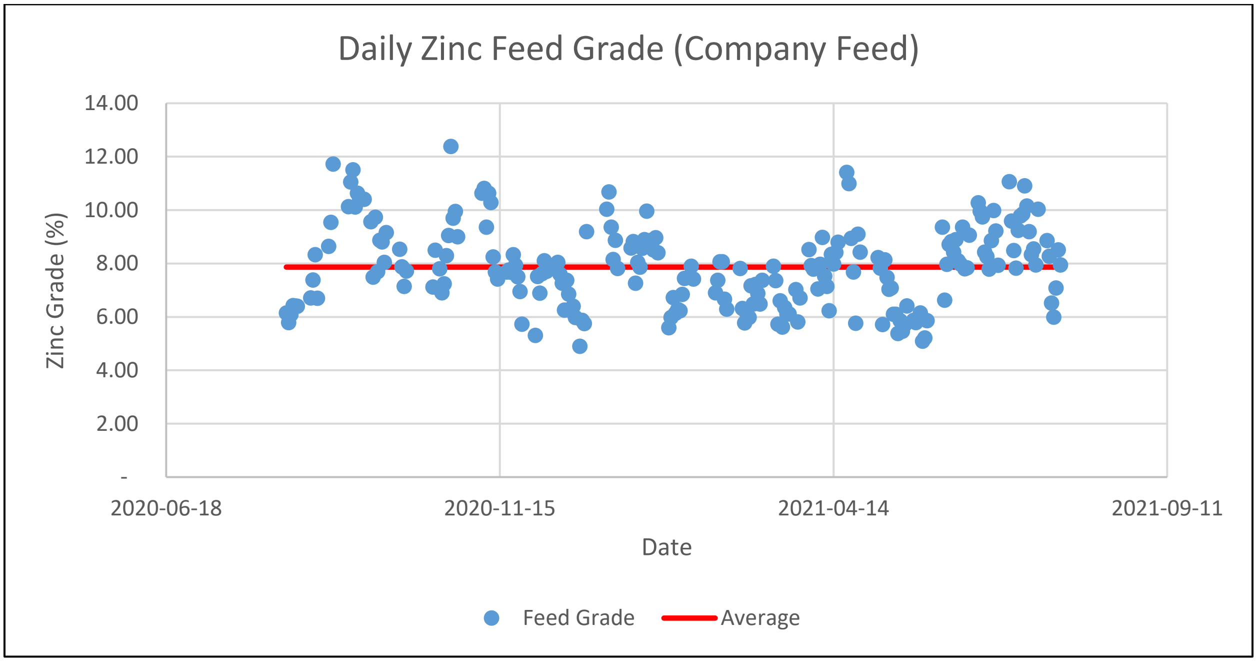


Figure 6-9: Lead Feed Grade 2020/2021

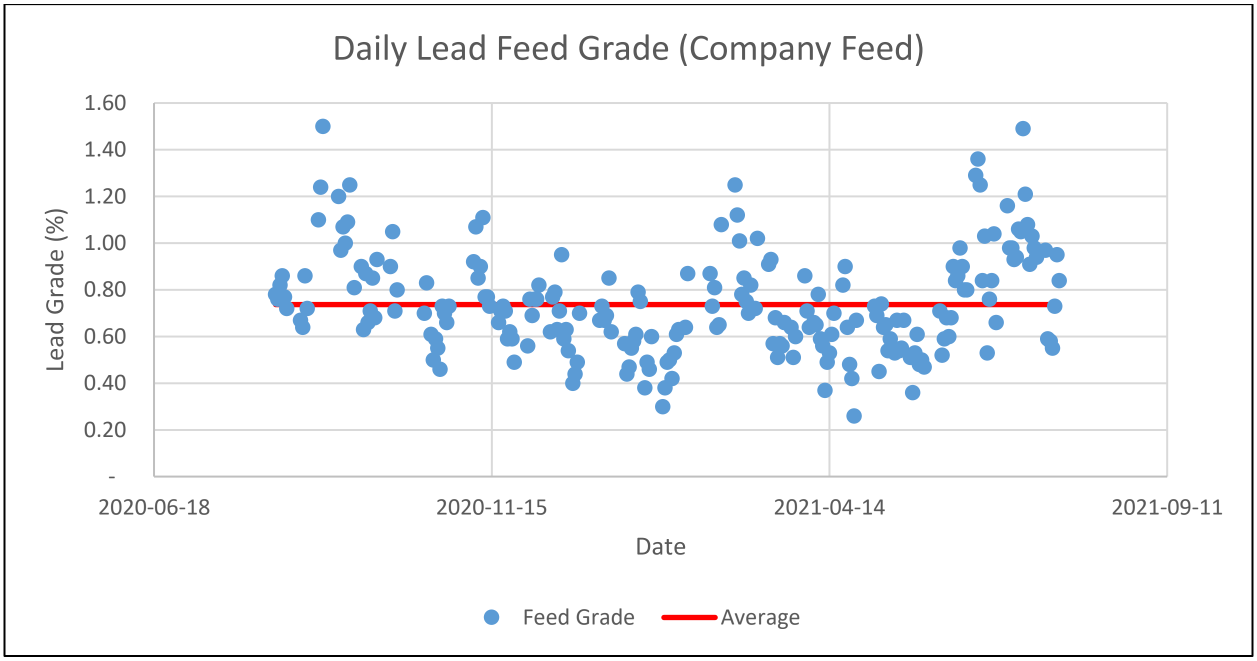
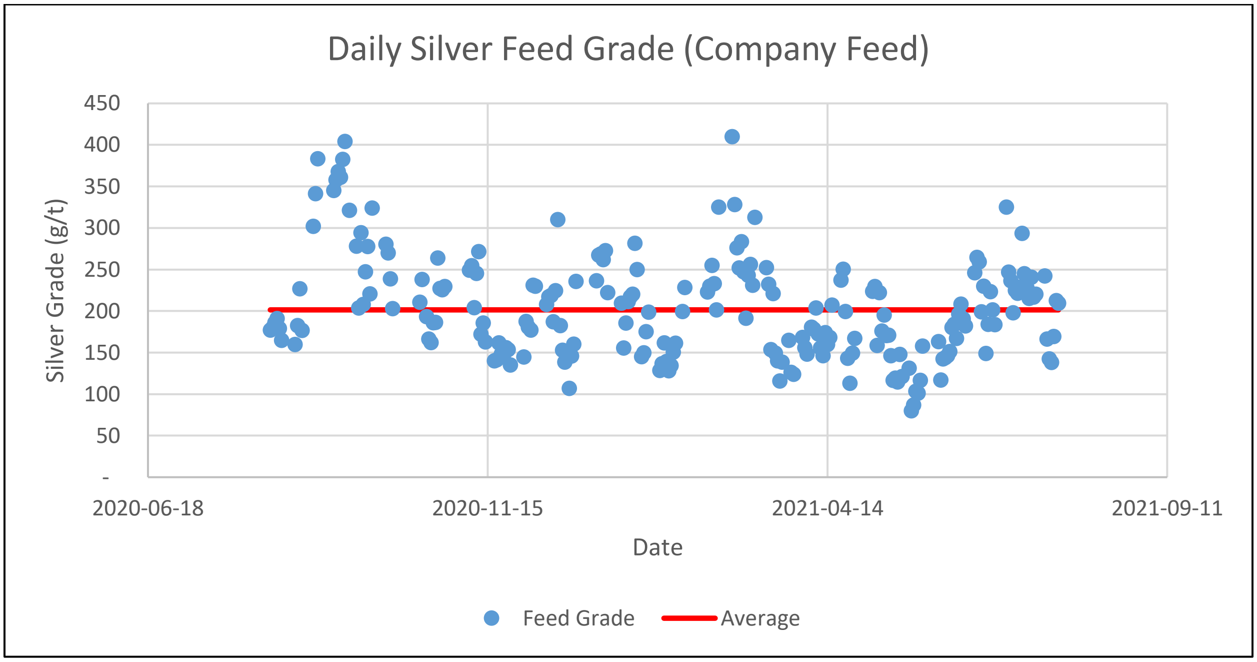


Figure 6-10: Silver Feed Grade 2020/2021



The mill feed grades are measured at the lead circuit flotation feed.

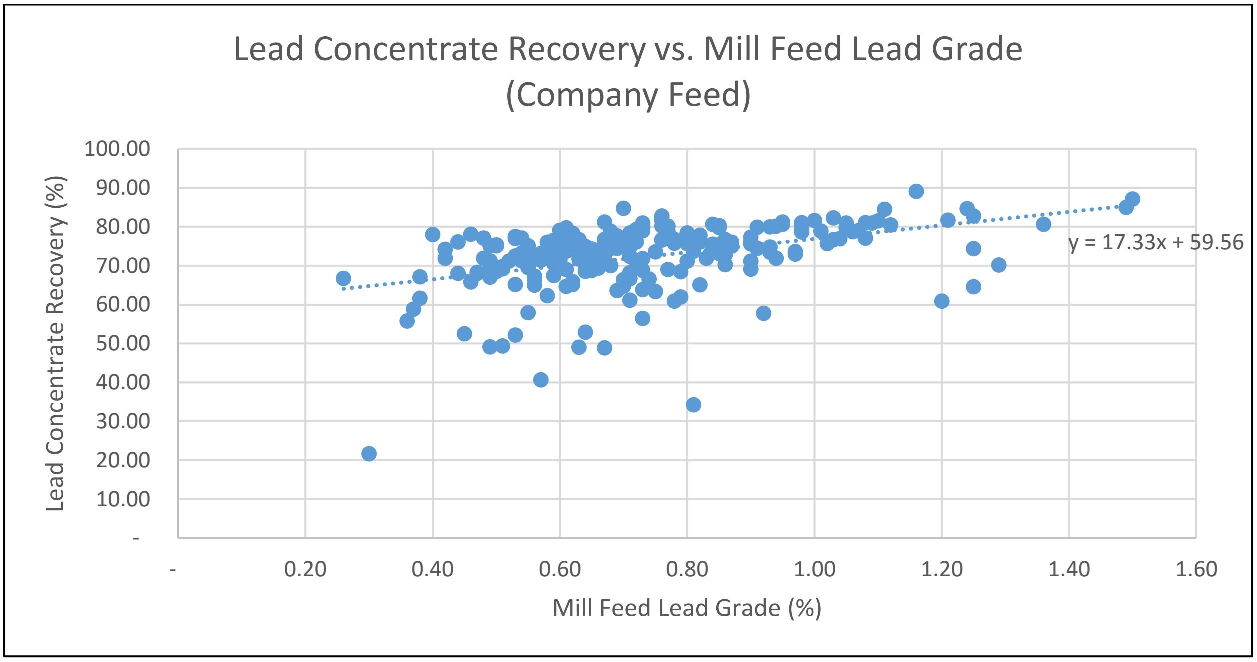
6.3.1.3 Lead Production

The grinding circuit product reports to the lead flotation circuit where Aerophene 3418A and a frother are added to float the lead and associated silver. In this circuit, cyanide is used as a zinc depressant. The lead concentrate produced during evaluated period measured 3,850 t which represents 1.69% of the feed to the plant.

The average grade of the lead concentrate was 32.16% lead, 12.18% zinc, and 5,912 g/t silver. The recoveries to the lead concentrate were 72.68%, 48.43%, and 2.59% for lead, silver, and zinc respectively.

The relationship between the lead feed grade and the lead recovery to the lead concentrate can be seen in Figure 6-11. While there is some variability, especially in the lower lead feed grades, a clear relationship can be seen between lead feed grade and recovery to the lead concentrate.

Figure 6-11: Mill Lead Concentrate Recovery vs. Lead Feed Grade

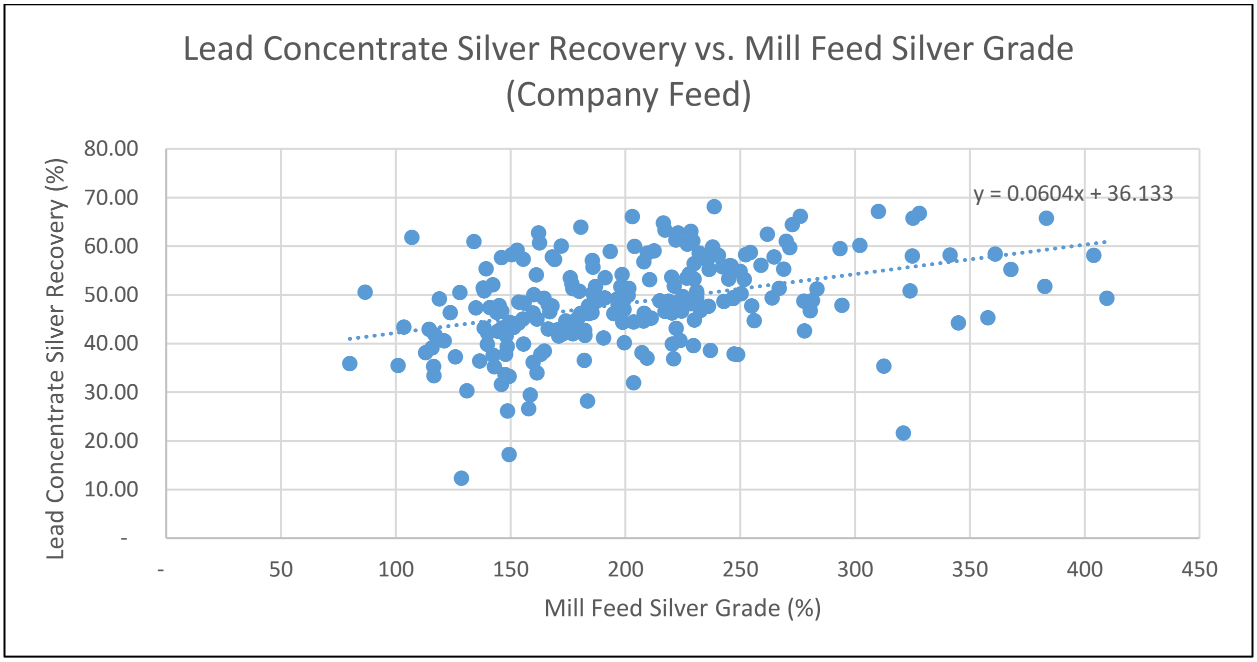


From the above analysis, the recovery relationship for lead to the lead concentrate will be considered: 17.33*(Lead feed grade %) + 59.56.

The silver recovery to both the lead and zinc concentrates is a byproduct of the flotation process; the silver is associated with the lead and zinc minerals and follows them into the concentrates.

The recovery of silver to the lead concentrate can be seen in Figure 6-12. In this case, the silver recovery appears to follow a reasonable trend to the silver grade in the feed and, therefore, the relationship of 0.0604*(Silver feed grade %) + 36.133 will be used for this report.

Figure 6-12: Silver Recovery to the Lead Concentrate vs. Mill Feed Silver Grade



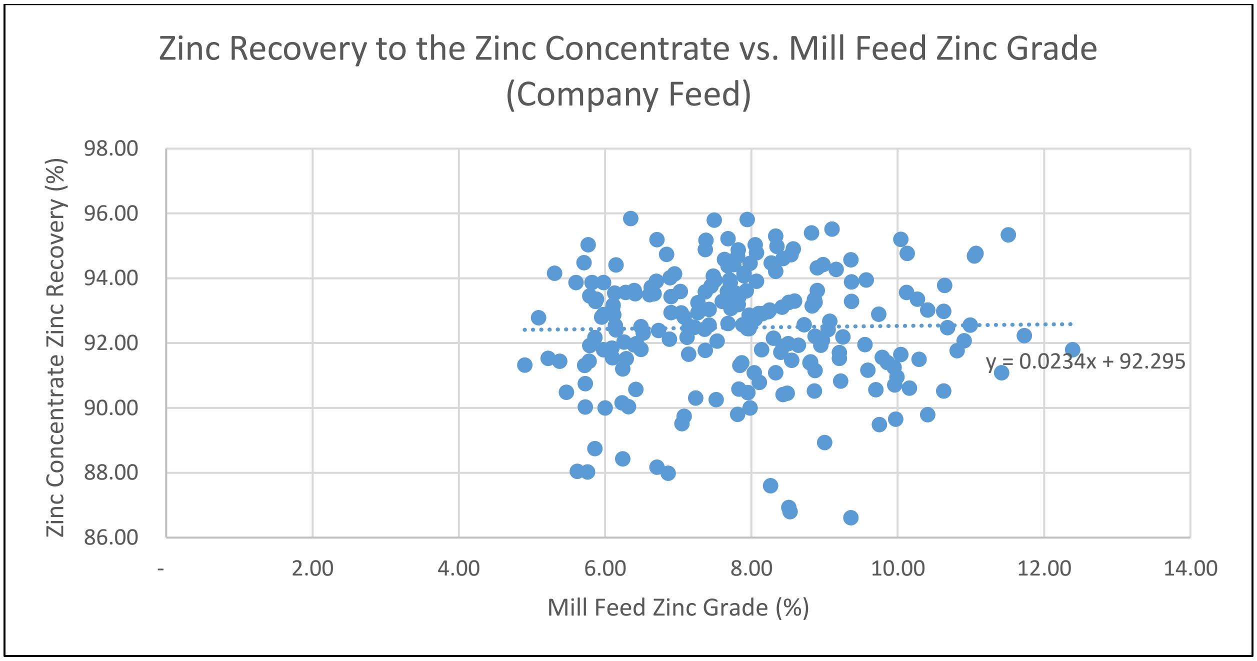
6.3.1.4 Zinc Production

The lead rougher and cleaner tailings report to the zinc circuit conditioning tanks where copper sulphate and additional collector and frother are added to float a zinc concentrate, with silver. The zinc concentrate accounts for approximately 13.7% of the feed mass.

Over the period analyzed, the unreconciled zinc concentrate production was 31,207 t with average grades of 53.06% zinc, 0.91% lead, and 626 g/t silver. The recoveries to the zinc concentrate were 92.48, 43.89, and 17.61 for zinc, silver, and lead respectively.

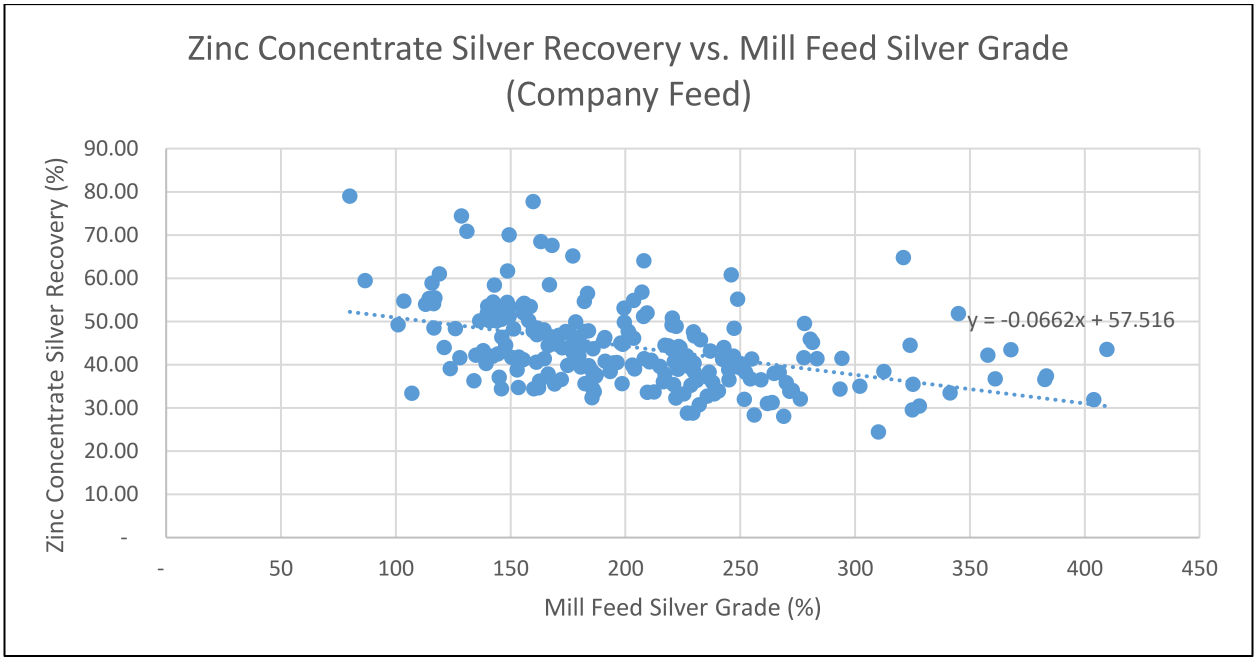
The zinc recovery as a function of the feed grade was examined and found to be a poor relationship (as is indicated by the R^2 value of 0.0004) for determining expected zinc recovery to the zinc concentrate as can be seen in Figure 6-13. It was determined in this case that the best option was to assign a zinc recovery to the zinc concentrate of 92%, which is the average value over the period examined.

Figure 6-13: Zinc Recovery to the Zinc Concentrate vs. Mill Feed Zinc Grade



The silver recovery to the zinc concentrate can be seen in Figure 6-14. In this case, the recovery has a negative relationship to the feed grade, presumably due to the positive relationship that the silver grade has with the silver recovery to the lead concentrate. The relationship for the silver recovery to the zinc concentrate will be taken as -0.0662 x (Silver Feed Grade) + 57.516.

Figure 6-14: Silver Concentrate to the Zinc Recovery vs. Mill Feed Silver Grade



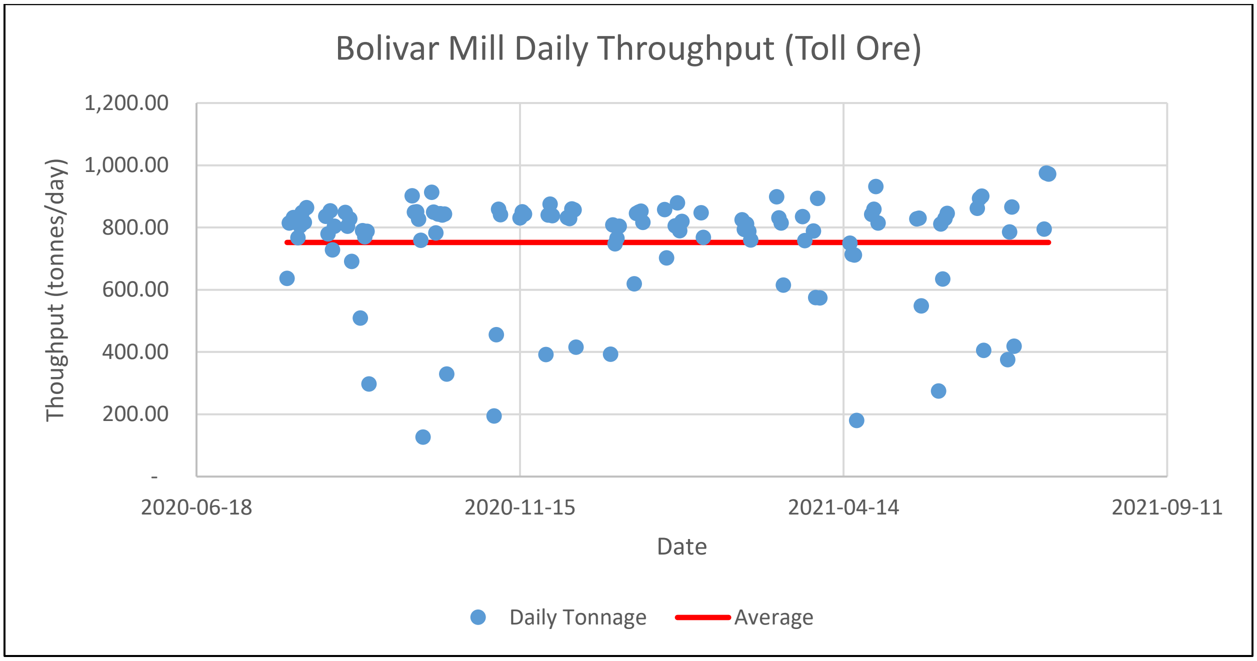
6.3.2 Toll Feed Processing

Data from the same time period, August 2020 to July 2021, was used to develop the expected metallurgical performance of the Bolivar mill on toll feed. As was the case for the company feed, the data was used to determine throughput, recovery and concentrate grade relationships.

6.3.2.1 Mill Throughput

As with the company feed, the expected availability for the mill is 93.8% and the utilization is 96.3% for an expected operating time of 90.3% for the toll feed. A summary of the throughput from August 2020 to July 2021 can be found in Figure 6-15.

Figure 6-15: Bolivar Mill Toll Feed Throughput 2020/2021



The throughput of company feed through the Bolivar mill during the analyzed period was a little higher than the stated target, with the average of the days it operated being 752 t/d. During the analyzed period, the mill ran company feed over 114 whole or partial days and processed 85,738 t of feed. The data suggests that the feed rate is not achieving the target throughput for company feed.

The target grind for the Bolivar plant toll feed is 100 µm.

6.3.2.2 Feed Grades

For the period examined, the unreconciled feed grades for the company feed were 7.70% zinc, 0.76% lead, and 306 g/t silver. The feed was somewhat variable with standard deviations of 1.45, 0.32, and 111.32 for zinc, lead, and silver respectively. These values fall within the expected ranges for Bolivar toll feed. The unreconciled feed grades can be seen in Figure 6-16, Figure 6-17, and Figure 6-18.

Figure 6-16: Toll Feed Zinc Grade 2020/2021

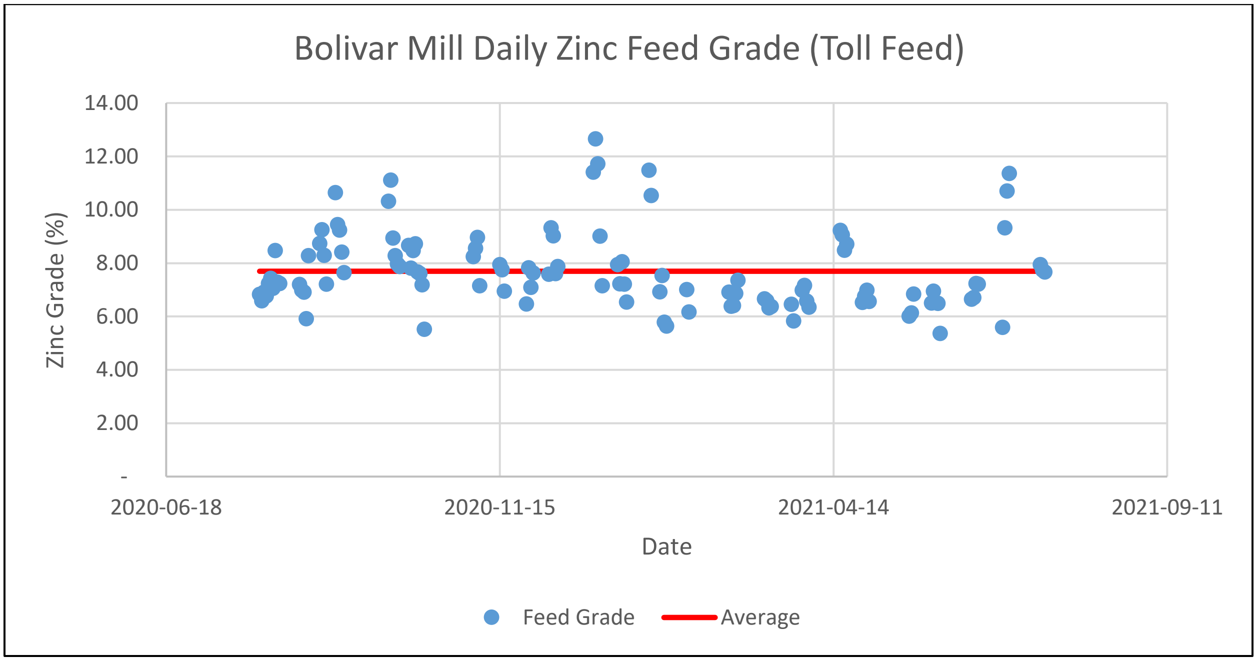


Figure 6-17: Toll Feed Lead Grade 2020/2021

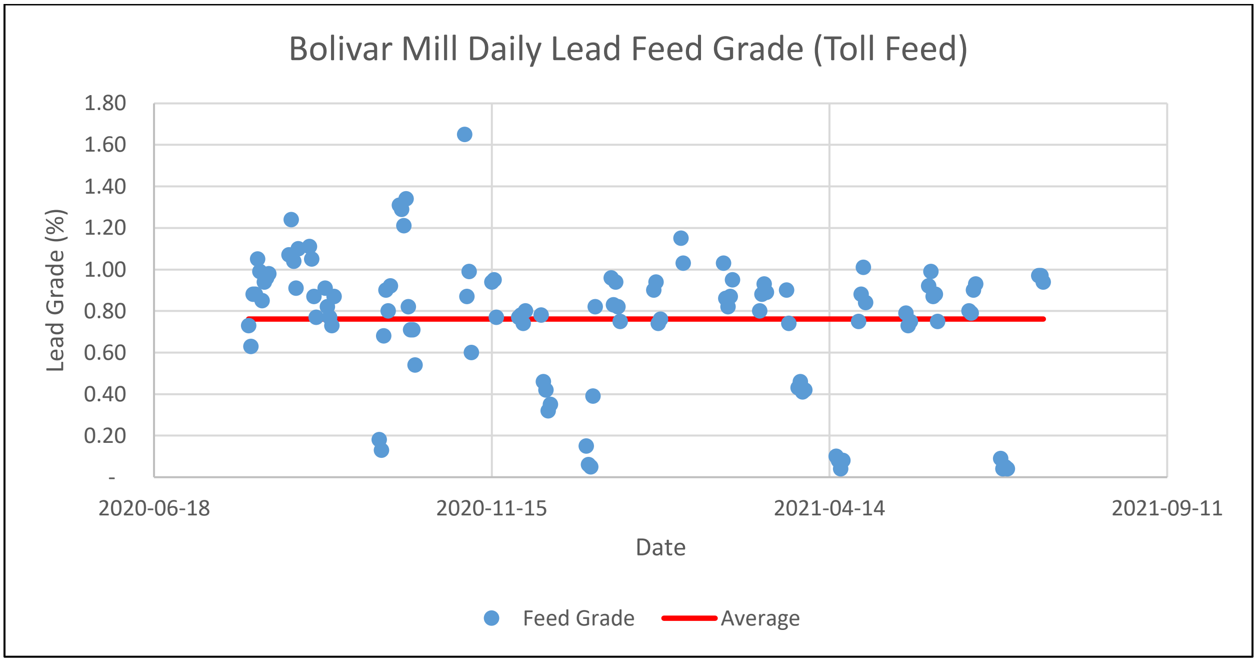
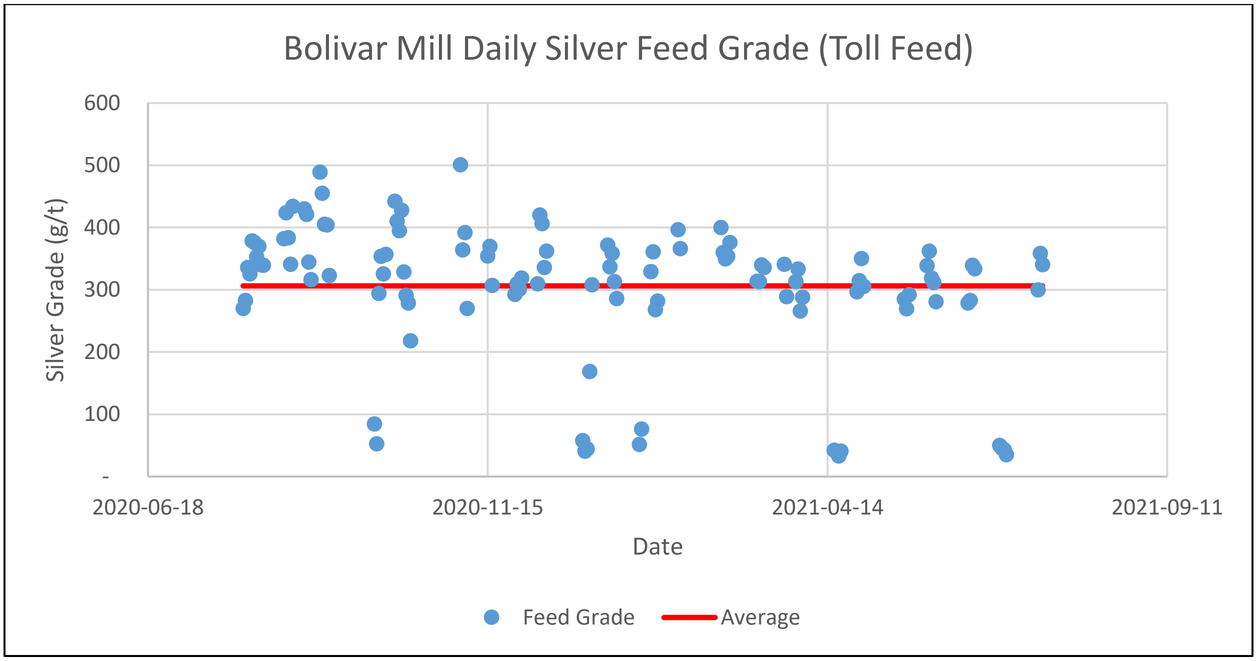


Figure 6-18: Toll Feed Silver Grade 2020/2021



The toll feed head grades were measured in the same location as the company feed.

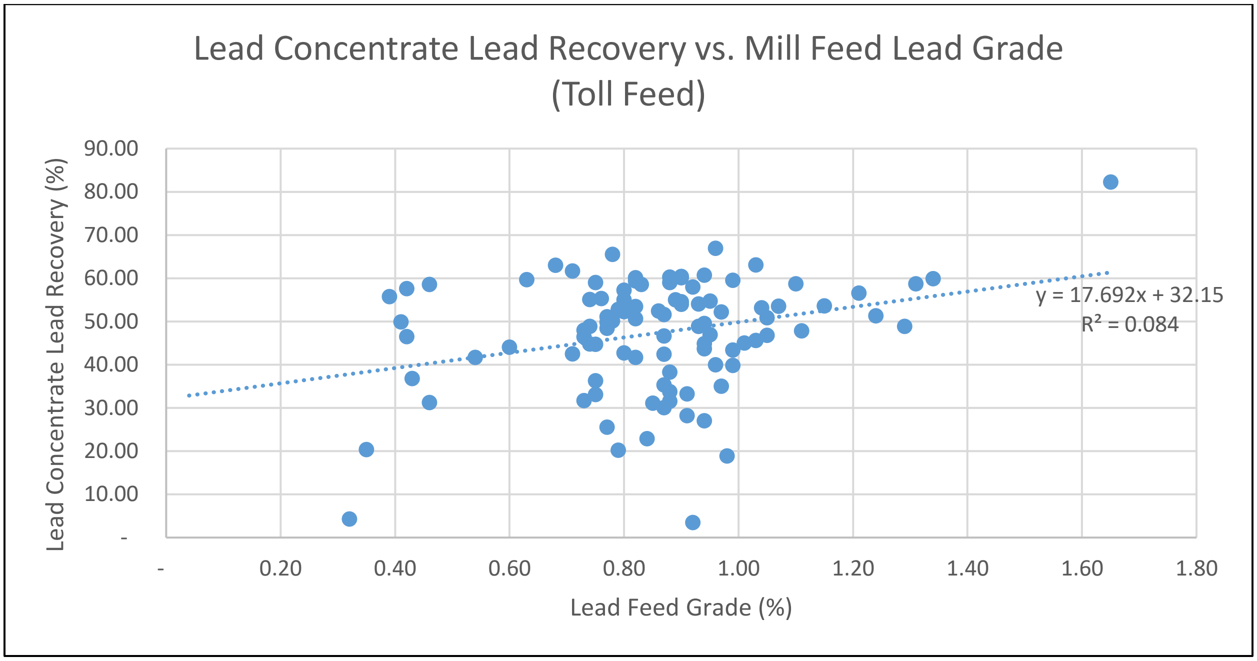
6.3.2.3 Lead Production

The toll feed utilizes the same reagents as the company feed, but in different dosages due to the pyrrhotite that is present in the toll feed but not the company feed. The lead concentrate produced during evaluated period measured 1,569 t which represents 1.83% of the feed to the plant.

The average grade of the lead concentrate was 19.80% lead, 11.07% zinc, and 5,472 g/t silver. Due to the low lead grades, the lead concentrate from the toll feed must be blended with the concentrate from the company feed to produce a concentrate which will be accepted by the smelter The recoveries to the lead concentrate were 41.84%, 29.42%, and 2.78% for lead, silver, and zinc respectively.

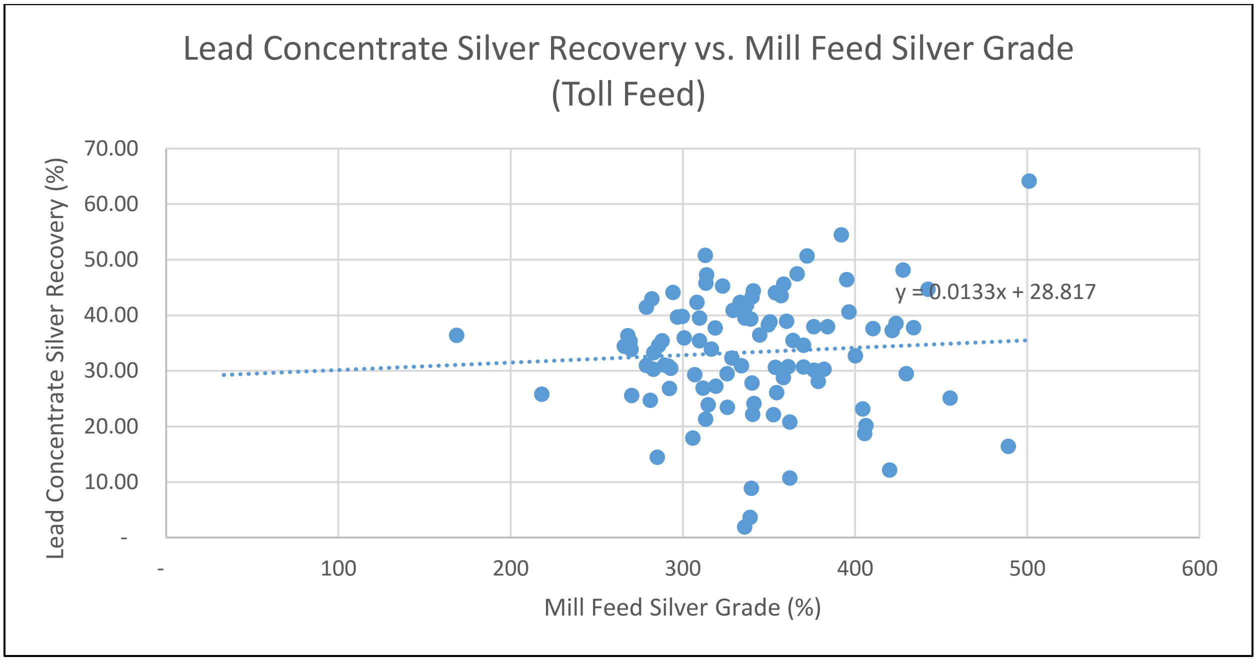
The relationship between the lead feed grade and the lead recovery to the lead concentrate can be seen in Figure 6-19. Although the relationship between lead feed grade and lead recovered to the lead concentrate does not have a high R2 value, the graph does demonstrate that there is a relationship that can be used to loosely predict recovery. The recovery relationship for lead to the lead concentrate was determined to be: 17.69 x (Lead feed grade %) + 32.15.

Figure 6-19: Mill Lead Concentrate Recovery vs. Lead Feed Grade



The silver recovery to both the lead and zinc concentrates is a byproduct of the flotation process; the silver is associated with the lead and zinc minerals and follows them into the concentrates. The recovery of silver to the lead concentrate can be seen in Figure 6-20, In this case the silver recovery appears to be uncorrelated to the silver grade in the toll feed and therefore a silver recovery of 30, which is the average of the toll feed silver recovery to the lead concentrate, will be used.

Figure 6-20: Silver Recovery to the Lead Concentrate vs. Mill Feed Silver Grade

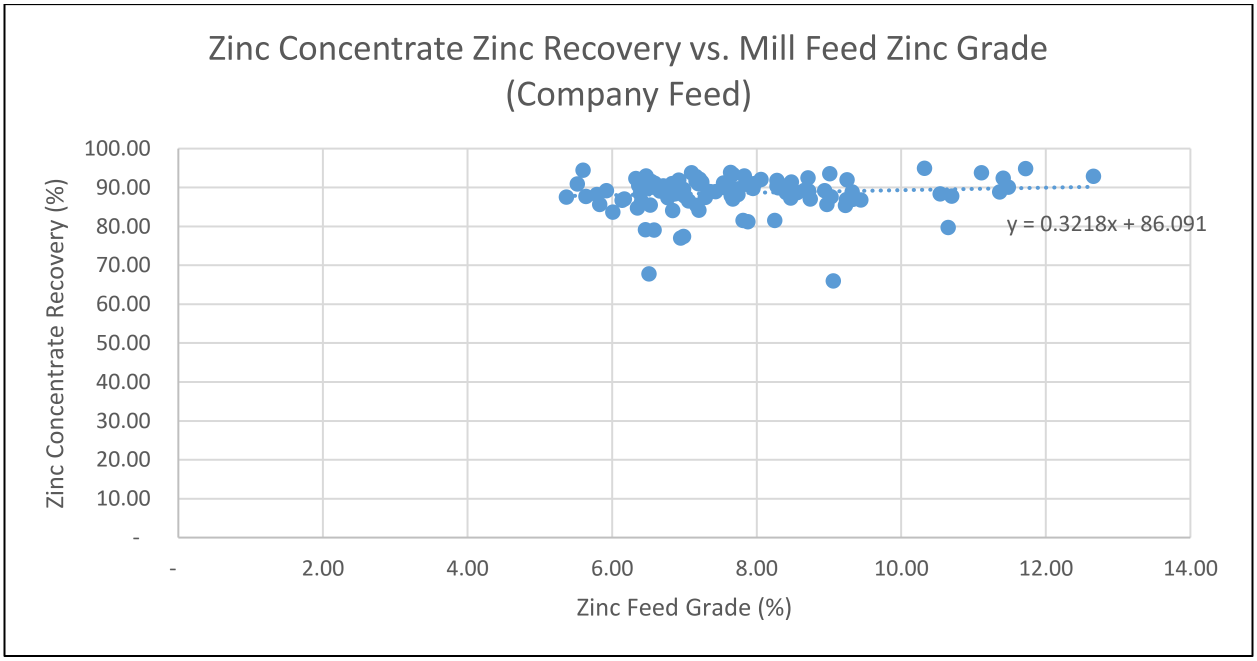


6.3.2.4 Zinc Production

Over the period analyzed, the unreconciled zinc concentrate production was 13,434 t with average grades of 43.63% zinc, 1.25% lead, and 773 g/t silver. The recoveries to the zinc concentrate were 88.74%, 36.23%, and 31.27% for zinc, silver, and lead respectively. The higher lead in the zinc concentrate is due to the low recovery of lead to the lead concentrate.

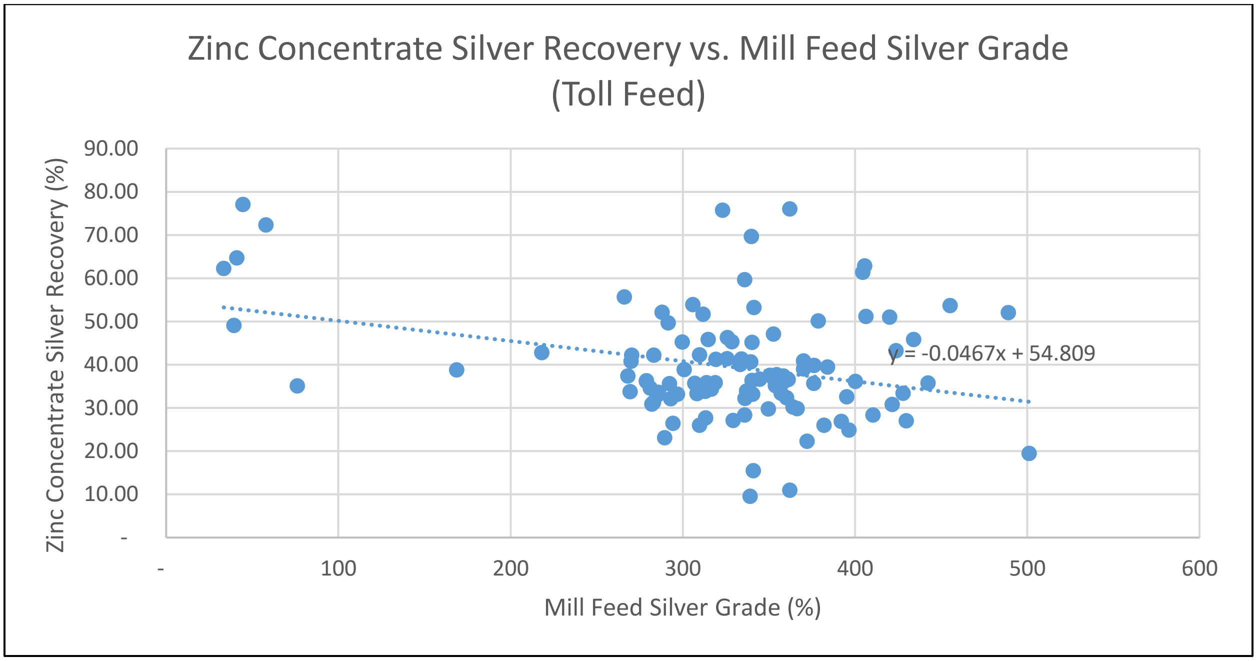
The zinc recovery as a function of the feed grade was examined and found to be a much better relationship for determining expected zinc recovery to the zinc concentrate than for the company feed. This relationship can be seen in Figure 6-21. The relationship used for the purposes of this report for the zinc recovery to the zinc concentrate is 0.3218 x (toll feed zinc grade) + 86.091.

Figure 6-21: Zinc Recovery to the Zinc Concentrate vs. Mill Feed Zinc Grade



The unreconciled silver recoveries to the zinc concentrate, for the toll feed, as reported had a few instances of values that were impossible (>100%). In order to determine a silver recovery to the zinc concentrate, any values that were greater than 80% were removed to produce the average recovery of 36.23%. The recovery of silver to the zinc concentrate, with the stated adjustments, can be seen in Figure 6-22, As with the lead concentrate, the silver recovery to the zinc concentrate appears to have a poor correlation to the silver grade in the toll feed. A silver recovery of 36% to the zinc concentrate, which was the average for the data, was chosen for this report.

Figure 6-22: Silver Recovery to the Zinc Concentrate vs. Mill Feed Silver Grade



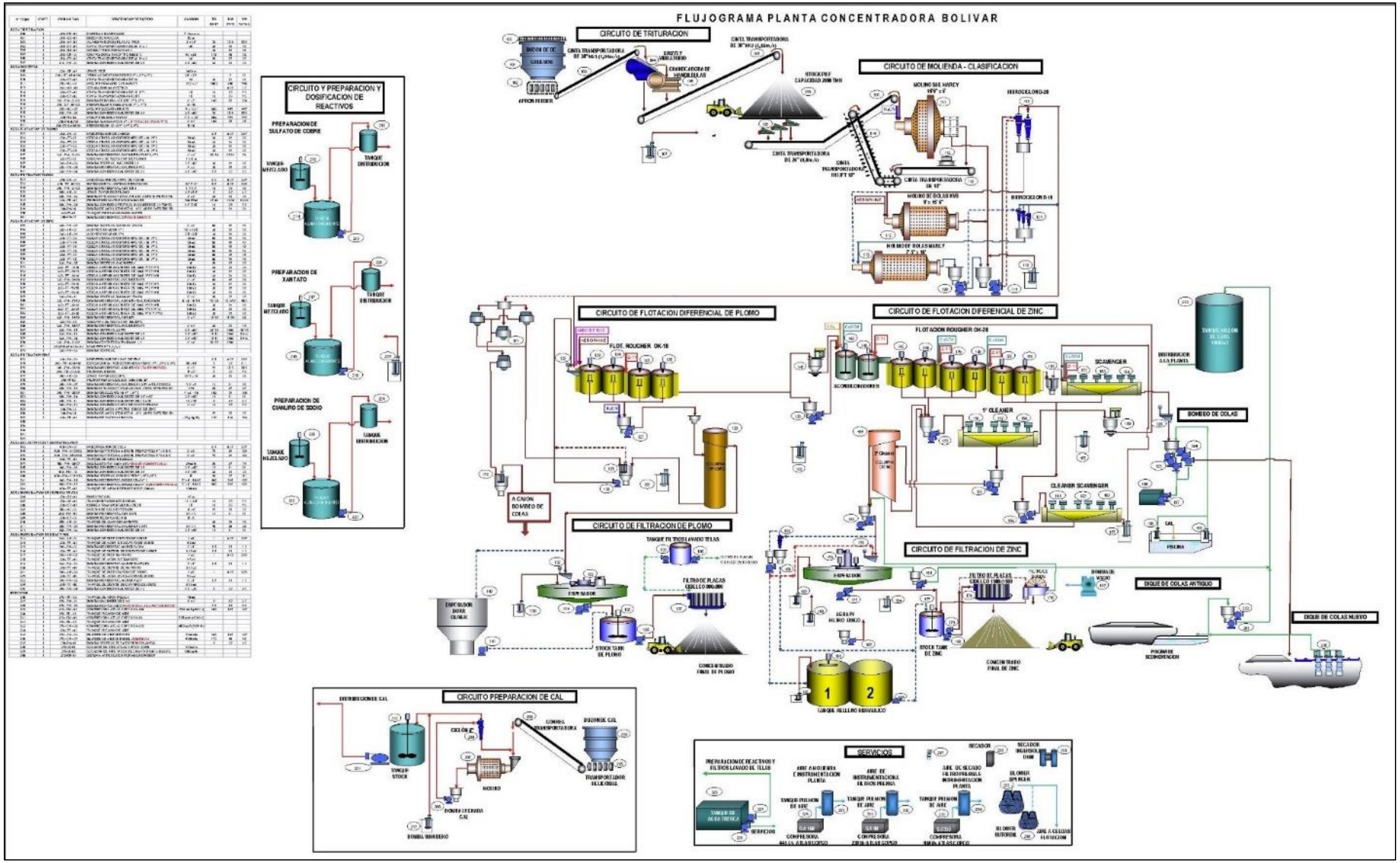
6.3.2.5 Plant Flowsheet

The plant flowsheet for the Bolivar mill is a typical sequential flotation circuit for lead and zinc; it can be seen in Figure 6-23. The ore is crushed in preparation for feed to the grinding circuit. The grinding circuit utilizes a SAG/Ball mill combination to produce a product size of 100 µm for the flotation circuit.

The flotation circuit starts with the lead recovery circuit. In this circuit a rougher concentrate is produced, which is then cleaned without regrinding, in a column flotation cell. The lead rougher and cleaner tails are combined and fed to the zinc circuit. The zinc circuit consists of rougher flotation and 3 stages of cleaning to produce a zinc concentrate. The zinc circuit tailings are deposited in the tailings pond. Both of the concentrates are filtered for shipping to the smelter. The lead concentrate is bagged for shipping, while the zinc concentrate is shipped bulk in trucks. The concentrates produced at the Bolivar Mine are sold to the Glencore refinery in Antafagasta, Chile. The zinc concentrate is shipped as a bulk product. The lead concentrate, due to local laws, is bagged prior to shipping. The products are transported by truck to the train loading facility that is approximately 10 km from the mine.

There are 2 tailings storage facilities at the Bolivar Mine. The original tailings storage has been decommissioned. The operational tailings dam is currently undergoing a lift to extend the capacity to 2024. Both tailings dams are inspected regularly and maintained to the standards set out by the Canadian Dam Association guidelines. Both dams are under the supervision of engineers from AMEC (now Wood Engineering) and recently an external audit was conducted by Knight Piésold Consulting.

Figure 6-23: Bolivar Mill Flowsheet



Source: Glencore (2021)

6.3.3 Metallurgical Assumptions

The metallurgical assumptions for recoveries and concentrate grades can be found in Table 6-3.

Table 6-3: Recovery and Concentrate Grade Estimates

Parameter	Unit	Concentrates			
		Lead Concentrate		Zinc Concentrate	
		Company Feed	Toll Feed	Company Feed	Toll Feed
Zn Recovery	%	N/A	N/A	92	86.091 + 0.3218*(Zinc Feed Grade)
Pb Recovery	%	59.56 + 17.33*(Lead Feed Grade)	32.15 + 17.69*(Lead Feed Grade)	N/A	N/A
Ag Recovery	%	36.133 + 0.0604*(Silver Feed Grade)	30	57.516 - 0.0662*(Silver Feed Grade)	36
Concentrate Grade					
Zn	%	12	11	53	44
Pb	%	32	20	0.91	1.25
Ag	g/t	5900	5500	630	775

6.4 Historical Resource Estimates

Glencore's Resources & Reserves report as of December 31, 2020 disclosed Bolivar, Porco and Caballo Blanco mineral resource statements as well as mineral reserve estimates as of December 31, 2020, which remain current for Glencore as of the date hereof. As the mineral resource and mineral reserve estimates pre-date Santacruz's agreement to acquire the Assets, Santacruz is treating them as "historical estimates" under National Instrument 43-101 - Standards of Disclosure for Mineral Projects (NI 43-101), but they remain relevant as the most recent mineral resource and reserves estimates for Bolivar, Porco and Caballo Blanco. Given the source of the estimates, Santa Cruz considers them reliable and relevant for the further development of the Project; and accordingly, they should be relied upon only as a historical resource and reserve estimate of Glencore, which pre-dates Santacruz's agreement to acquire the Assets however, the Company is not treating the historical estimates as current Mineral Resources or Mineral Reserves.

A "Qualified Person" as per NI 43-101 has not done sufficient work to classify the historical estimate as current Mineral Resources or Mineral Reserves and Santacruz is not treating the historical estimate as current Mineral Resources or Mineral Reserves. Further drilling and resource modelling would be required to upgrade or verify these historical estimates as current mineral resources or reserves for the respective assets.

The resources have been reported for Bolivar as of December 31, 2020 at a Zinc Equivalent (ZnEq) cut-off grade 2% as follows in Table 6-4.

Table 6-4: Historic Mineral Resource Estimate (2020)

Category	Tonnes	Silver	Zinc	Lead
	(Mt)	(g/t)	(%)	(%)
Measured Mineral Resources	1.4	308	12.70%	1.40%
Indicated Mineral Resources	1	283	12.20%	1.30%
Inferred Mineral Resources	5.4	350	9.00%	0.90%

Source: Glencore (2020)

Notes:

1. The Mineral Resources have been calculated in accordance with definitions in accordance with the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code), the 2016 edition of the South African Code for Reporting of Mineral Resources and Mineral Reserves (SAMREC) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves (2014).
2. The ZnEq = (Zn% + (Pb% * 0.50) + (Ag g/t * 0.0268)).
3. The Mineral Resources have been calculated in accordance with definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum on August 20, 2000. Employees of Glencore have prepared these calculations.
4. Mineral resources are not mineral reserves until they have demonstrated economic viability. Mineral resource estimates do not account for a resource's mineability, selectivity, mining loss, or dilution.
5. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.
6. All figures are rounded to reflect the relative accuracy of the estimate and therefore numbers may not appear to add precisely.
7. Reported in-situ Mineral Resources do not consider mineral availability by underground mining methods.
8. Historical Mineral Reserves and Resources are inclusive of Mineral Reserves shown at 100% ownership

For comparison, Table 6-5 shows the Measured and Indicated Resources for 2018 and 2019, respectively which reflects mining depletion and changes in classification due to additional drilling and sampling during operations. The Indicated and Inferred Resources are reported at a 2% ZnEq cut-off grade.

Table 6-5: Historic Mineral Resource Estimate for 2018 and 2019

	Measured		Indicated		Total	
	2019	2018	2019	2018	2019	2018
Ore (Mt)	1.6	1.5	1.1	1.3	2.6	2.8
Zinc (%)	13.2	14	13	13.7	13.1	13.9
Lead (%)	1.4	1.6	1.3	1.3	1.4	1.5

	Measured		Indicated		Total	
	2019	2018	2019	2018	2019	2018
Silver (g/t)	326	343	293	336	313	340

Source: Glencore (2020)

The mineral reserves have been reported for Bolivar as of December 31, 2020 at a Zinc Equivalent cut-off grade 2% as follows in Table 6-6.

Table 6-6: Historic Reserve Estimate (2020)

Category	Tonnes	Silver	Zinc	Lead
	(Mt)	(g/t)	(%)	(%)
Proved Reserves	0.8	251	9.40%	1.10%
Probable Reserves	0.7	215	8.60%	0.90%

Source: Glencore (2020)

Notes:

1. The Mineral Resources have been calculated in accordance with definitions in accordance with the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code), the 2016 edition of the South African Code for Reporting of Mineral Resources and Mineral Reserves (SAMREC) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves (2014).
2. The ZnEq = (Zn% + (Pb% * 0.50) + (Ag g/t * 0.0268)).
3. The Mineral Resources have been calculated in accordance with definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum on August 20, 2000. Employees of Glencore have prepared these calculations.
4. All figures are rounded to reflect the relative accuracy of the estimate and therefore numbers may not appear to add precisely.
5. Historical Mineral Reserves are shown at 100% ownership.

Glencore reports resources and reserves in accordance with the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code), the 2016 edition of the South African Code for Reporting of Mineral Resources and Mineral Reserves (SAMREC) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves (2014 edition). The term ‘Ore Reserves’, as defined in Clause 28 of the JORC Code, has the same meaning as ‘Mineral Reserves’ as defined in the CIM Definition Standards for Mineral Resources and Mineral Reserves. All tonnage information has been rounded to reflect the relative uncertainty in the estimates; there may therefore be small differences in the totals. The Measured and Indicated resources are reported inclusive of those resources modified to produce reserves, unless otherwise noted. Commodity prices and exchange rates used to establish the economic viability of reserves are based on long-term forecasts applied at the time the reserve was estimated.

The reserve, encompassing all measured and indicated resources for Bolivar, was produced using Stope Optimizer (SO) by Deswik and is based on the geological resource models. The resource and reserve figures quoted in this report refer to the in-situ resource as of December 31, 2020.

The parameters and methodology for each step of the resource estimation and manipulation were reviewed by the Qualified Person and are detailed as follows:

- Eighteen separate veins were modelled in the resource estimate, from sets of sub-parallel, northwest-trending and steeply dipping mineralized zones which are traced for over 2,500 m at a strike of 30º for the Rosario, while the combined veins excluding Rosario is 2,800 m at a strike of 45º is greater than 600 m in depth and still open;

- A total of 137 drillholes and 20,547 channel samples were used in the estimations into 6,123,000 m^3 of vein domain solids;

- The estimate was carried out using separate block models for each of the veins constrained by 3D wireframes of the individual mineralized zones. The block model is comprised of an array of blocks measuring 5 m x 5 m x 5 m rotated 47 º from North, which are sub-blocked to 5 m x 1.25 m x 1.25 m, with grades for Ag, Pb and Zn interpolated using either Inverse Distance Weighting or Ordinary Kriging depending on the data density within each of the veins. Zinc equivalent values were subsequently calculated from the interpolated block grades;

- Bulk densities at Bolivar were based on a total of XXX sample interval measurements taken by Glencore while SG estimates are based on a multilinear regression formula as follows:

  If Iron analysis is available:

  - Density = 2.524312797+0.017933782*ZN+0.055421308*PB+0.043407958*FE

  If Iron analysis is unavailable:

  - Density = 2.821*EXP(0.0077*(PB+ZN))

- Silver, zinc and lead composite values have been capped in order to remove the effects of potential overestimation due to statistical outliers. The threshold chosen was dependent upon the individual vein as shown in Table 6-7:

Table 6-7: Proven and Probable Reserve Estimate (2020)

#Code	Code	Vein Name	Method	Comp	CAP_ZN%	CAP_AG g/t	CAP_PB%
3000	PBA	Pomabamba	OK	0.9	49.7	5800	15.4
3010	NAN	Nané	OK	0.9	49.7	5800	15.4
3020	BOL	Bolivar	OK	0.9	49.7	5800	15.4

#Code	Code	Vein Name	Method	Comp	CAP_ZN%	CAP_AG g/t	CAP_PB%
3030	RBO	Ramo Bolivar	OK	1	45.3	5323	15.3
3031	RBC	Ramo Bolivar Central	OK	0.6	39.3	780	7.7
3032	RMA	Ramo A	OK	0.5	27.5	1400	4.2
3033	REG	Regina	OK	0.9	44.85	3750	14.5
3034	RBU	Ramo Uno	IDW	0.6	27.99	290	2.5
3040	BSW - RNA	Bolivar SW - Ramo Nané	OK	0.8	49.5	5069	18.4
3050	NUE	Nueva	OK	0.8	47.4	2567	16
3060	NSW	Nané SW	OK	0.5	21.5	5363	12.45
3070	EXN	Extension Nané	OK	0.35	40.19	2500	6.81
3090	ROS	Rosario	OK	1.5	20	1429	25.54
3091	RRO	Ramo Rosario	IDW	1.5	16.5	480	11.14
3092	PAM	Pamela	IDW	0.6	16.2	550	7.5
3101	SR3	Santa Rosa 3	OK	0.55	44.75	1447	10.2
3102	SR4	Santa Rosa 4	IDW	0.5	46.97	3200	9.06
3230	NEG	Negrita	OK	0.3	48.74	1199	10.3
3240	ALK	Alimak	OK	0.3	38.7	1344	4.26
3250	RBE	Ramo Bolivar Este	IDW	0.95	40.3	1300	5

Source: Glencore (2020)

- The interpolation was carried out in a single pass using the orientations and ellipse ranges as described in Table 6-8:

Table 6-8: Estimation Parameters

CODEG	VEIN	METHOD	ROT_ANGLES			VG_RANGES		
			ANG1	ANG2	ANG3	X	Y	Z
3000	PBA	OK	140	110	-120	90	55	6
3010	NAN	OK	140	110	-120	90	55	6
3020	BOL	OK	140	110	-120	90	55	6
3030	RBO	OK	120	100	30	25	55	3
3031	RBC	OK	150	100	170	16	108	10

CODEG	VEIN	METHOD	ROT_ANGLES			VG_RANGES		
			ANG1	ANG2	ANG3	X	Y	Z
3032	RMA	OK	130	120	10	37	71	20
3033	REG	OK	130	110	160	10	15	20
3034	RBU	IDW	130	110	160	11.6	11.6	11.6
3040	BSW - RNA	OK	150	100	100	73	94	20
3050	NUE	OK	150	120	-150	47	50	7
3060	NSW	OK	130	110	160	60	40	20
3070	EXN	OK	130	110	160	42	20.6	20
3090	ROS	OK	130	130	150	55	55	50
3091	RRO	IDW	130	110	160	44	39	20
3092	PAM	IDW	120	130	160	120	139	40
3101	SR3	OK	130	110	160	70	35	20
3102	SR4	IDW	130	110	160	32	21	20
3230	NEG	OK	130	110	160	36.7	92.4	20
3240	ALK	OK	130	110	160	41.3	27.5	20
3250	RBE	IDW	130	110	160	22.5	18.7	20

Source: Glencore (2020)

- The mineralized wire frames were defined using a combination of geological constraints and grade boundaries with no minimum mining thickness applied;
- For all veins, the resource classification criteria are determined according to the variography and it has been established using the methodology as follows:
  - Measured Resources: variogram range of 2/3 of the variogram range with a minimum of 5 samples being informed per block;
  - Indicated resources: to the full variogram range with a minimum of 4 samples being informed per block;
  - Inferred resources: extended to twice the variogram range with a minimum of 2 samples being informed per block; and
  - However, an interpreted boundary is the final determination of indicated and inferred resources in order to remove outlier blocks and the “spotted dog” effect.

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Inferred Resources are considered too speculative geologically to have economic considerations applied to them that would enable them to be classified as Mineral Reserves. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

7 GEOLOGICAL SETTING AND MINERALIZATION

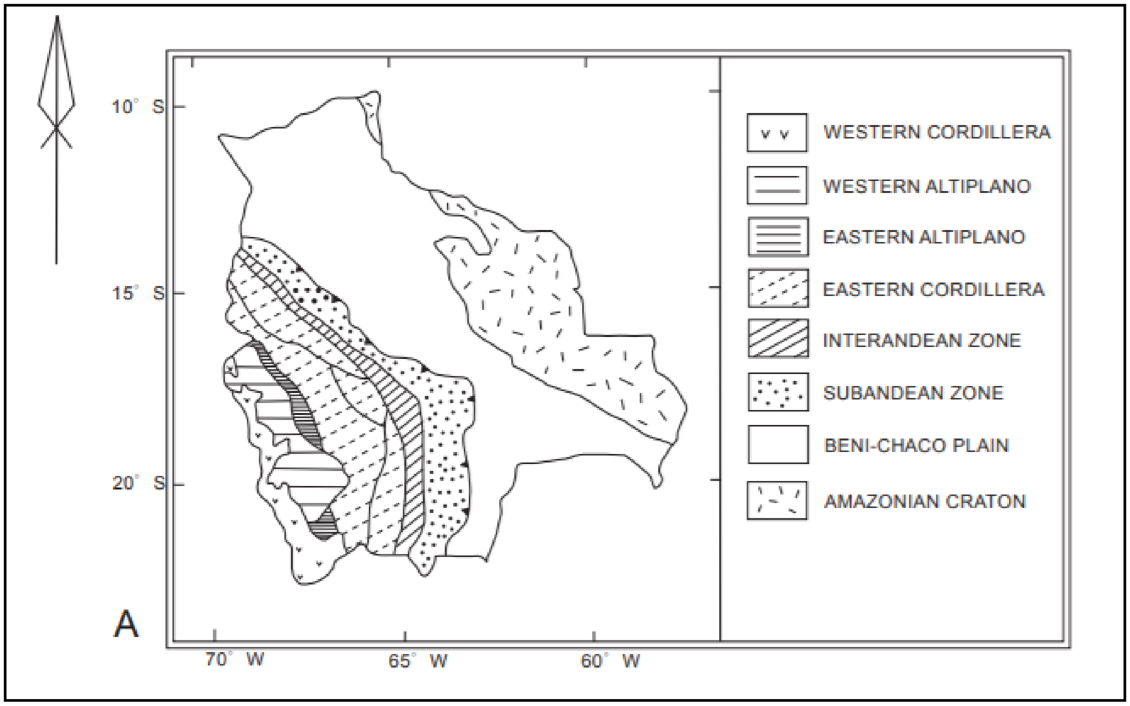
7.1 Introduction

The geological setting, framework and mineralization detailed herein, is derived from and is based on published definitive references such as Redwood (2021) and Arce-Burgoa (2009).

7.2 Geological Tectonic Framework

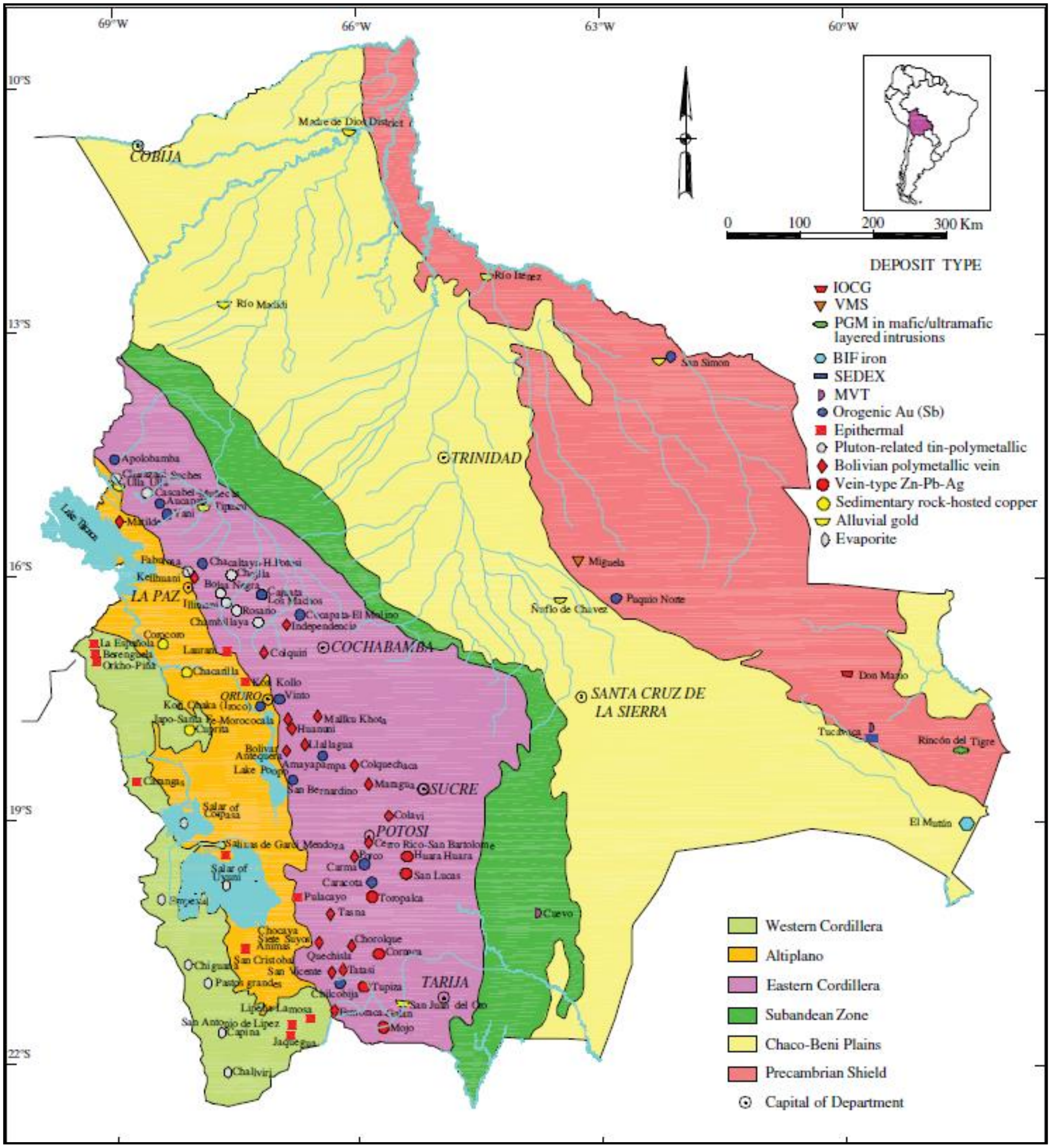
The geologic-tectonic framework of Bolivia can be divided into six physiographic provinces. From east to west (Figure 7-1), these are the Precambrian Shield, the Chaco-Beni Plains, the Sub Andean zone, the Eastern Cordillera (or Cordillera Oriental), the Altiplano, and the Western Cordillera (or Cordillera Occidental). The latter four provinces make up the Mesozoic-Cenozoic Andean orogen in Bolivia (Arce-Burgoa, 2002, 2007), which hosts an abundance of mineral deposits (Figure 7-2), many of which have been mined for centuries. The landward Precambrian Shield, exposed far to the east of the Andes, represents an area of great mineral potential, but has had limited exploration.

Figure 7-1: Regional Geology Setting



Source: Arce-Burgoa (2009)

Figure 7-2: Regional Geology Setting with Deposit Types



Source: Arce-Burgoa (2009)

Rocks of the Precambrian Shield in easternmost Bolivia have commonly been suggested as defining the southwestern part of the Amazon craton and cover an area of approximately 200,000 km^2, or 18% of Bolivia. The units are mainly Mesoproterozoic medium and high-grade metasedimentary and meta-igneous rocks, which are widely covered by Tertiary laterites and Quaternary alluvial basin deposits. Previous studies have referred to this as the Guaporé craton, but Santos et al. (2008) suggested that these may not be basement rocks of the craton; rather, they could be 1.45–1.10 Ga Sunsas orogen, formed along the craton margin. Major tectonic events in the orogen are dated at 1465– 1420, 1370–1320, and 1180–1110 Ma.

Subsequent Brazilian tectonism (ca. 600–500 Ma) had only minor effects on the orogen (Litherland et al., 1986, 1989).

The Chaco-Beni plains are located in the central part of the country and cover 40% of Bolivia. The topography is dominated by the southwestern Amazon basin wetlands, which lie below 250 m elevation, with little relief or outcrop. These extensive plains are part of the foreland basin of the Central Andes and include 1 to 3 km of Cenozoic foreland alluvial sediment in the west and much thinner accumulations atop a broad forebulge to the east (Horton and DeCelles, 1997). These overlie Tertiary red-bed sediments that are >6 km thick and cover the Precambrian crystalline basement to the east and Paleozoic and Mesozoic sedimentary rocks to the west.

These alluvial accumulations are products of several Neogene to Holocene episodes of post-kinematic and epeirogenetic isostatic adjustment in the Eastern Andes and its piedmont.

Rocks of the Bolivian Andean orogen underlie approximately 42% of Bolivia and include those of the Subandean zone, Eastern Cordillera, Altiplano, and the Western Cordillera. These physiographic provinces form a series of mountain chains, isolated mountain ranges, and plains, with a north-to-south trend (Ahlfeld and Schneider-Scherbina, 1964). This part of the orogen has a length of 1,100 km, a maximum width of 700 km, and an average crustal thickness of 70 km; the orogen includes a distinct oroclinal bend at the Arica Elbow (18°–19°S).

The Subandean zone is the thin-skinned, inland margin of an orogen-parallel fold-and-thrust belt, which is partly covered by sediments of the western side of the active foreland basin. It is characterized by north- south- trending, narrow mountain ranges with elevations between 500 and 2,000 m. Rock types in this province include Paleozoic siliciclastic marine and Mesozoic and Tertiary continental sedimentary rocks.

The Eastern Cordillera, the uplifted interior of the Andean thrust belt, includes poly deformed Ordovician to Recent shale, siltstone, limestone, sandstone, slate, and quartzite sequences. These mainly Paleozoic clastic and metamorphic rocks have an approximate area of 280,000 km^2 and represent flysch basin sediments that were deposited along the ancient Gondwana margin and first deformed in the middle to late Paleozoic. After Permian to Jurassic rifting, they were uplifted to high elevation and folded and thrusted again during Andean compression, which may have begun as early as Late Cretaceous (McQuarrie et al., 2005).

The Altiplano is a series of intermontane, continental basins, which have a combined length of approximately 850 km, an average width of 130 km, and an area of approximately 110,000 km^2. They form a high plateau at elevations between 3,600 and 4,100 m.

Geomorphologically, the province consists of an extensive flat plain that is interrupted by isolated mountain ranges. Crustal shortening, rapid subsidence, and, simultaneously, as much as 15 km of sedimentation took place during the Andean orogeny (Richter et al., in USGS and GEOBOL, 1992). Basin fill was dominated by erosion of the Western Cordillera during Late Eocene-Oligocene, but Neogene shortening in the Eastern Cordillera and Subandean zone led to a subsequent dominance of younger sediments derived from the east (Horton et al., 2002).

The Western Cordillera consists of a volcanic mountain chain that is 750 km in length and 40 km in average width, with an area of about 30,000 km^2. Late Jurassic and Early Cretaceous flows and pyroclastic rocks and marine sandstone and siltstone sequences dominate the Cordillera in Peru and Chile. Lesser Late Cretaceous continental sediment was deposited above the marine rocks and, simultaneously, large granitoid plutons, many of which are associated with large porphyry orebodies, were emplaced along the coasts of adjacent Peru and Chile. In Bolivia, this province is dominated by high andesitic to dacitic strata volcanoes, formed since ca. 28 Ma, that define the narrow, main Central Andes modern magmatic arc.

7.3 Regional Geology

7.3.1 Eastern Cordillera

The Bolivar, Porco and Caballo Blanco deposits are located in the central part of the Eastern Cordillera, a thick sequence of Paleozoic marine siliciclastic and argillaceous sedimentary rocks deposited on the western margin of Gondwana and deformed in a fold-thrust belt. There were two major tectonic cycles in the Paleozoic: The Lower Paleozoic Famatinian cycle (the Tacsarian and Cordilleran cycles of Bolivia), and the Upper Paleozoic Gondwana cycle (Subandean cycle of Bolivia).

The late Precambrian supercontinent broke up with the opening of the southern Iapetus Ocean and the spreading of Laurentia away from Gondwana in the latest Precambrian or early Cambrian (Figure 7-3, Figure 7-4 and Figure 7-5). Ocean closure and collision of Laurentia and the South American segment of Gondwana during the Ordovician formed the Famatinian orogenic belt of NW Argentina (Dalla Salda et al., 1992a) which has been correlated with its probable Laurentian equivalent, the Taconic event of the Appalachian orogen (Dalla Salda et al., 1992b). The Famatinian belt records extension in the latest Precambrian with establishment of subduction during the Cambrian and closure of the ocean basin and continent-continent collision in the Ordovician (480-460 Ma) (Figure 7-6). The Pre-Cordillera Terrane carbonate platform of western Argentina, which has faunal similarities with eastern North America, may be a sliver of eastern Laurentia detached in the late Ordovician when Laurentia separated from Gondwana again (Dalla Salda et al., 1992a; b) (Figure 7-7 and Figure 7-8).

Figure 7-3: Plate Tectonic Reconstructions of the Neoproterozoic Subcontinent and the Late Precambrian Supercontinent after the Opening of the Southern Iapetus Ocean

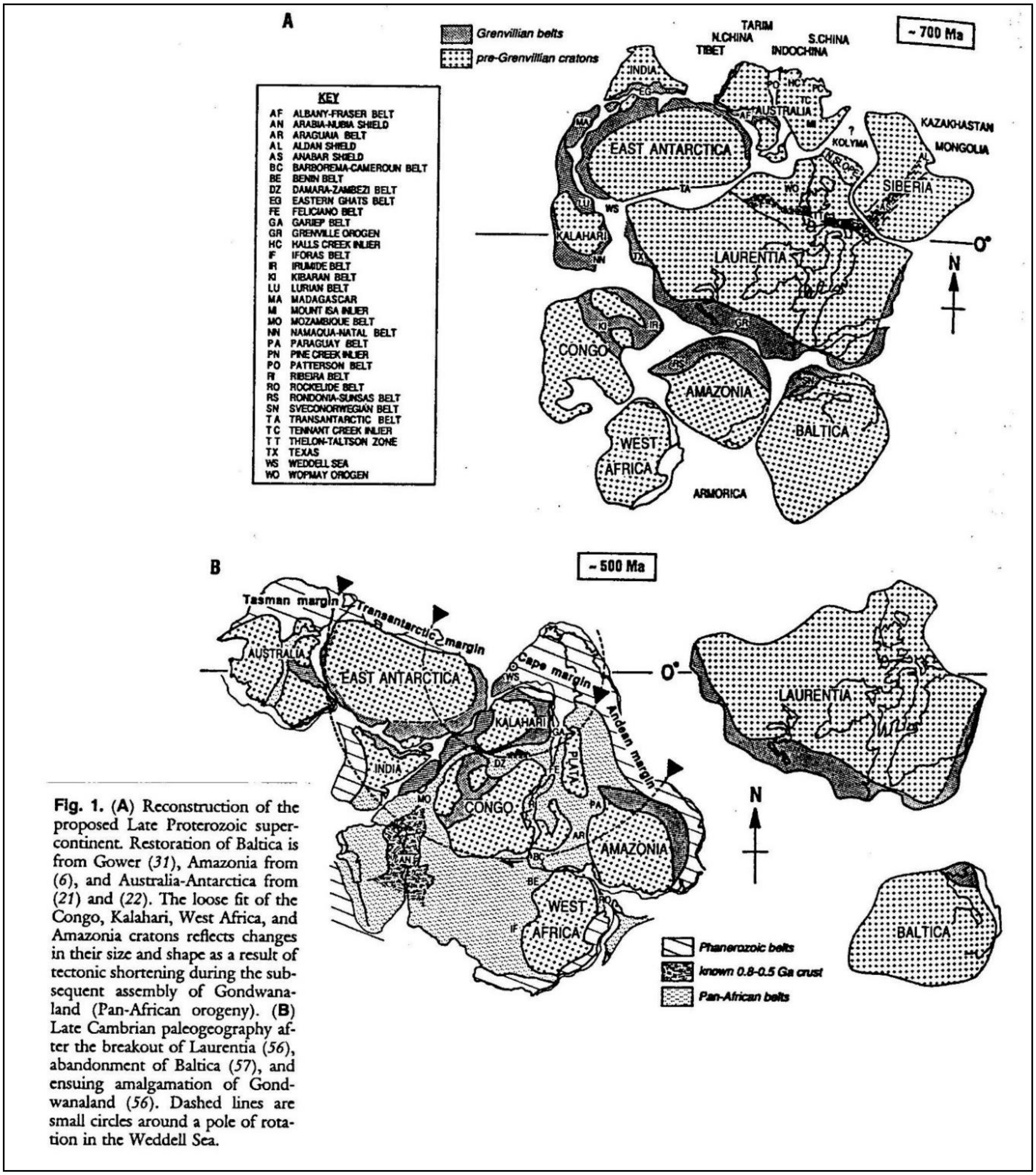


Fig. 1. (**A**) Reconstruction of the proposed Late Proterozoic supercontinent. Restoration of Baltica is from Gower (*31*), Amazonia from (*6*), and Australia-Antarctica from (*21*) and (*22*). The loose fit of the Congo, Kalahari, West Africa, and Amazonia cratons reflects changes in their size and shape as a result of tectonic shortening during the subsequent assembly of Gondwanaland (Pan-African orogeny). (**B**) Late Cambrian paleogeography after the breakout of Laurentia (*56*), abandonment of Baltica (*57*), and ensuing amalgamation of Gondwanaland (*56*). Dashed lines are small circles around a pole of rotation in the Weddell Sea.

Source: Hoffman (1991)

Figure 7-4: Plate Tectonic Reconstructions of the Neoproterozoic and Late Precambrian Subcontinents

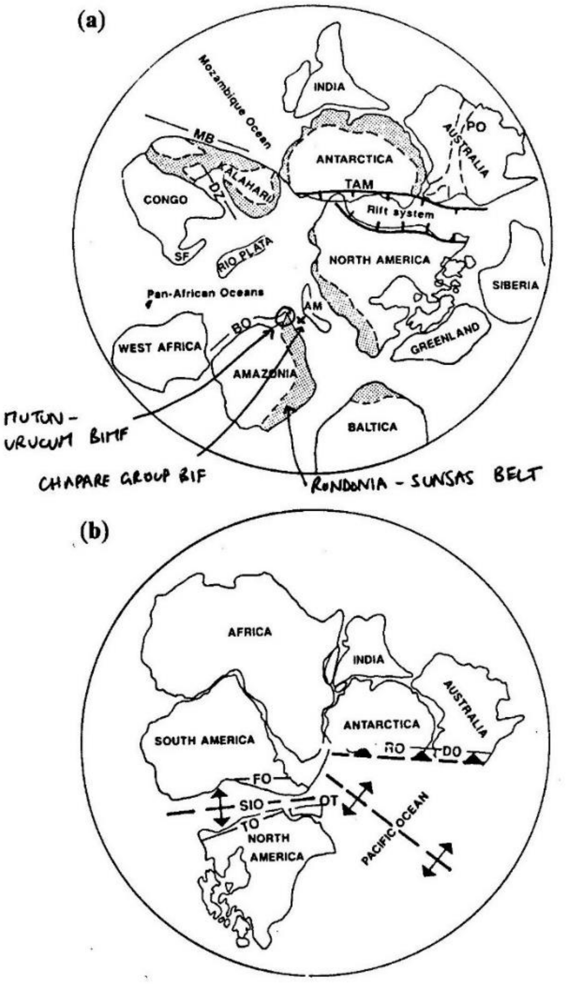
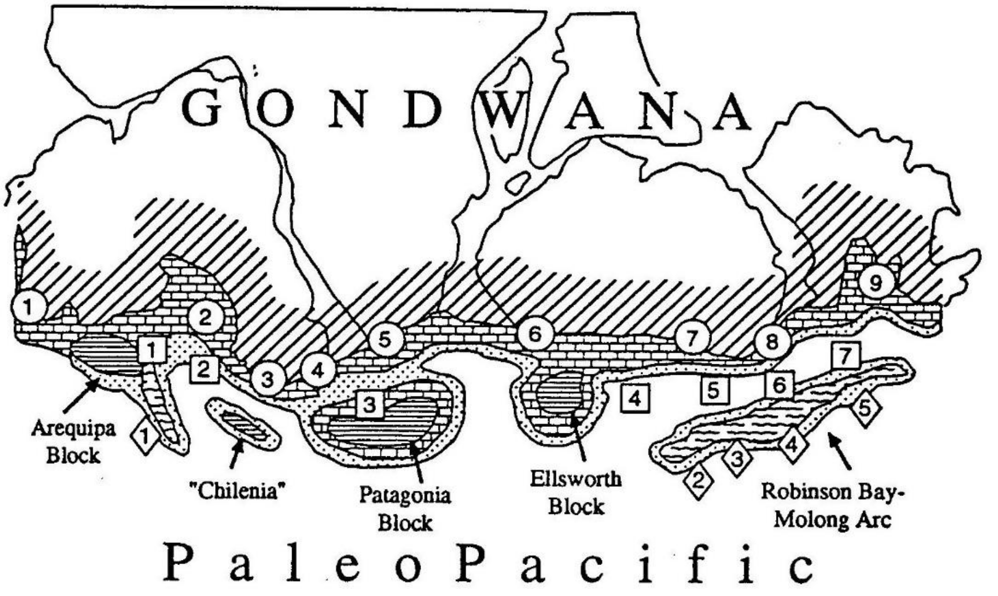


Fig. 3. (**a**) A Neoproterozoic reconstruction (*c*.750 Ma) based on the ideas of Moores (1991), Dalziel (1991, 1992*a*, *b*) and Hoffman (1991). It illustrates a single Neoproterozoic supercontinent just prior to rifting and a loose collage of African and South American cratonic blocks separated by oceanic crust. Variations in the position of the cratonic blocks can be seen in Hoffman (1991) and Dalziel (1992*a*, *b*). The supercontinent incorporates the SWEAT hypothesis of Moores (1991) linking the Transantarctic Mountains margin of East Antarctica to the western Cordilleran margin of Laurentia. The Grenville belt is shown as a stipple. AM, Arequipa Massif: BO, Brasiliano orogen; DZ, Damara -Zambezi belt; MB, Mozambique belt; PO, Patterson orogen; SF, São Francisco craton; TAM, Transantarctic Mountains. (**b**) Reconstruction of a late Precambrian to early Cambrian supercontinent following opening of the Pacific Ocean and amalgamation of Gondwana during Pan-African collisional events (Dalziel 1992), and at the time of opening of the southern Iapetus ocean (SIO) between North and South America. DO, Delamerian orogen; FO, Famatinian orogen; OT, Occidentalia terrane; RO, Ross orogen; TO, Taconic orogen.

Source: Story (1993)

Figure 7-5: Paleogeography of SW Gondwana Margin in the Early Ordovician



TECTONOSTRATIGRAPHIC UNITS

Continental Shelf	Slope/Marginal Sea	Volcanic Arc
① Fm. Hidago-Cord. Central Columbia (1)	1 Ord. Mar Clastics SE Peru/Bolivia (8)	1 S. Almeida calc-alk. suite N. Chile (13)
② Meson Group/NW Arg. (2)	2 Ord. A. de Perdiz Strata/N. Chile (9)	2 Devils River Volcanics N.W. Nelson (11)
③ C.-O. Carbonates/Precordillera Argentina (3)	3 Port Stevens Fm. Malvinas/Fauklands (10)	3 Bowers Group/North Victoria Land (14)
④ La Tinta Group/Buenos Aires Prov. Arg. (4)	4 Swanson Fm. & Fosdick Cx./M.B.L. (11)	4 Stavely volcanics (11)
⑤ Table Mt. Gp./Cape Fold Belt (5)	5 Camb. Berg Gp/North Victoria Land (11)	5 Molong Volcanics (15)
⑥ Camb. Strata Pensacola Mt. (6)	6 Dundas "Trough" (11)	
⑦ Camb. Strata/S. Victoria Land Antarctica (6)	7 Wagga-Monaro "Trough" (12)	
⑧ C.-O. Strata/Adelaide "Geosyncline" Tasman Fold Belt (7)		
⑨ C.-O. Strata/Amadeus Basin (7)		

Fig. 12. Paleogeographic model for the SW margin in Gondwana in the Early Ordovician. Brick pattern outlines the marginal shelves and the stable Proterozoic platforms of Gondwana, in stipple are slope and outer basin floor clastic deposits, in horizontal ruling, possible platform and/or microplate regions of discontinous lower Paleozoic deposition, and in v symbols, theallocthonous volcanic arc components. References are: (1) Mojica et al. [1988], (2) Turner [1970, 1972], (3) Borrello [1969], Baldis and Bordonaro [1985], (4) Baldis et al. [1985], (5) Rust [1973], Tankard and Hobday [1979], (6) Laird and Bradshaw [1982], (7) Veevers et al. [1982], (8) Martinez [1980], Acenolaza [1976], Dalmayrac et al. [1980], (9) Garcia [1976], (10) Borrello [1972], (11) Findley [1987], (12) Pachman [1987], (13) Mpodozis et al. [1983], (14) Gibson and Wright [1985], and (15) Leitch and Scheibner [1987].

Source: Forsythe et al, (1993)

Figure 7-6: The Famatinian – Taconic Orogen in the Middle Ordovician

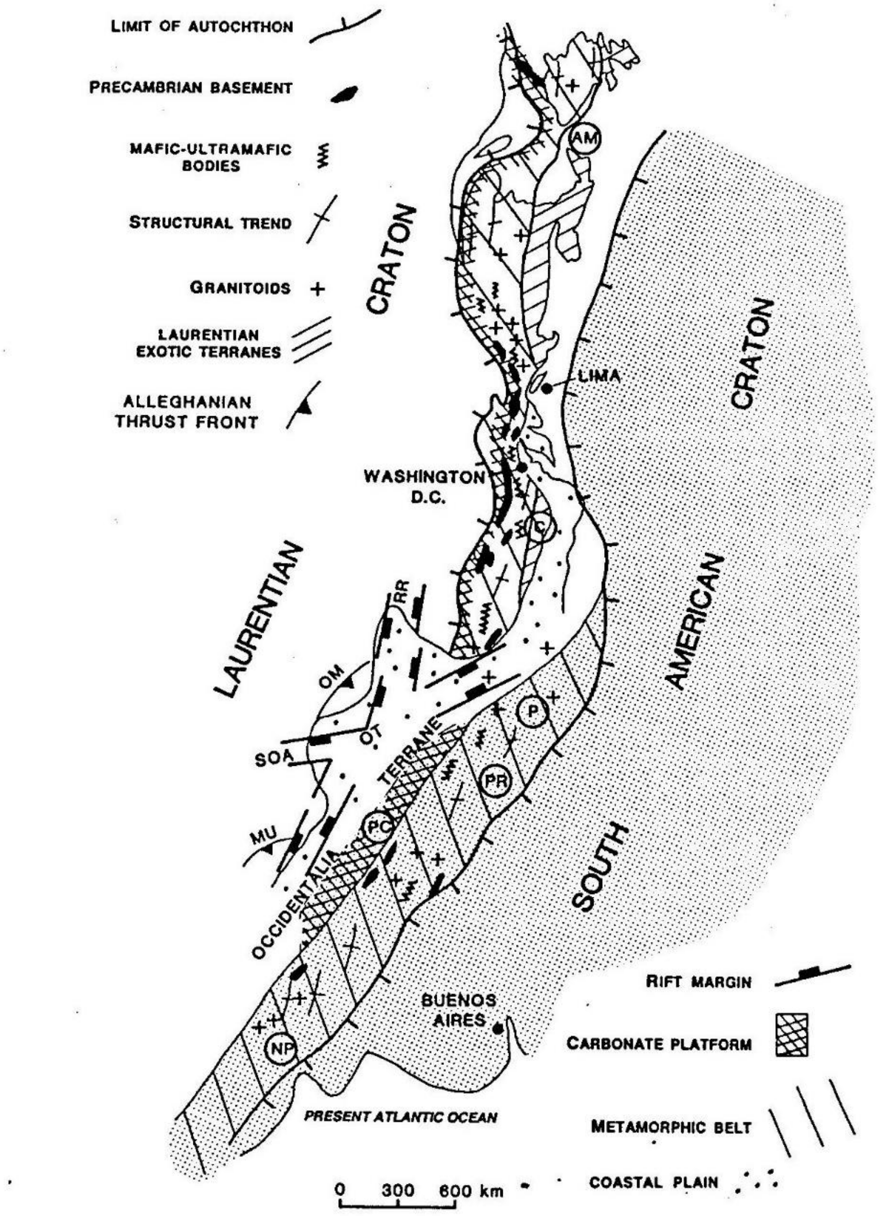


Figure 3. Reconstruction of Taconic-Famatinian orogenic belt as proposed for Middle Ordovician. Laurentia: AM—Avalon-Meguma terrane; C—Carolina terrane; MU—Marathon uplift; OM—Ouachita fold belt; OT—Ouachita trough; RR—Reelfoot rift; SOA—South Oklahoma aulacogen. South America: NP—North Patagonia massif; P—Puna; PC—Precordilleran belt; PR—Pampean Ranges.

Source: Dalla Salda et al, (1992b)

Figure 7-7: The Ordovician of the Central Andes (Cunningham et al., 1994b)

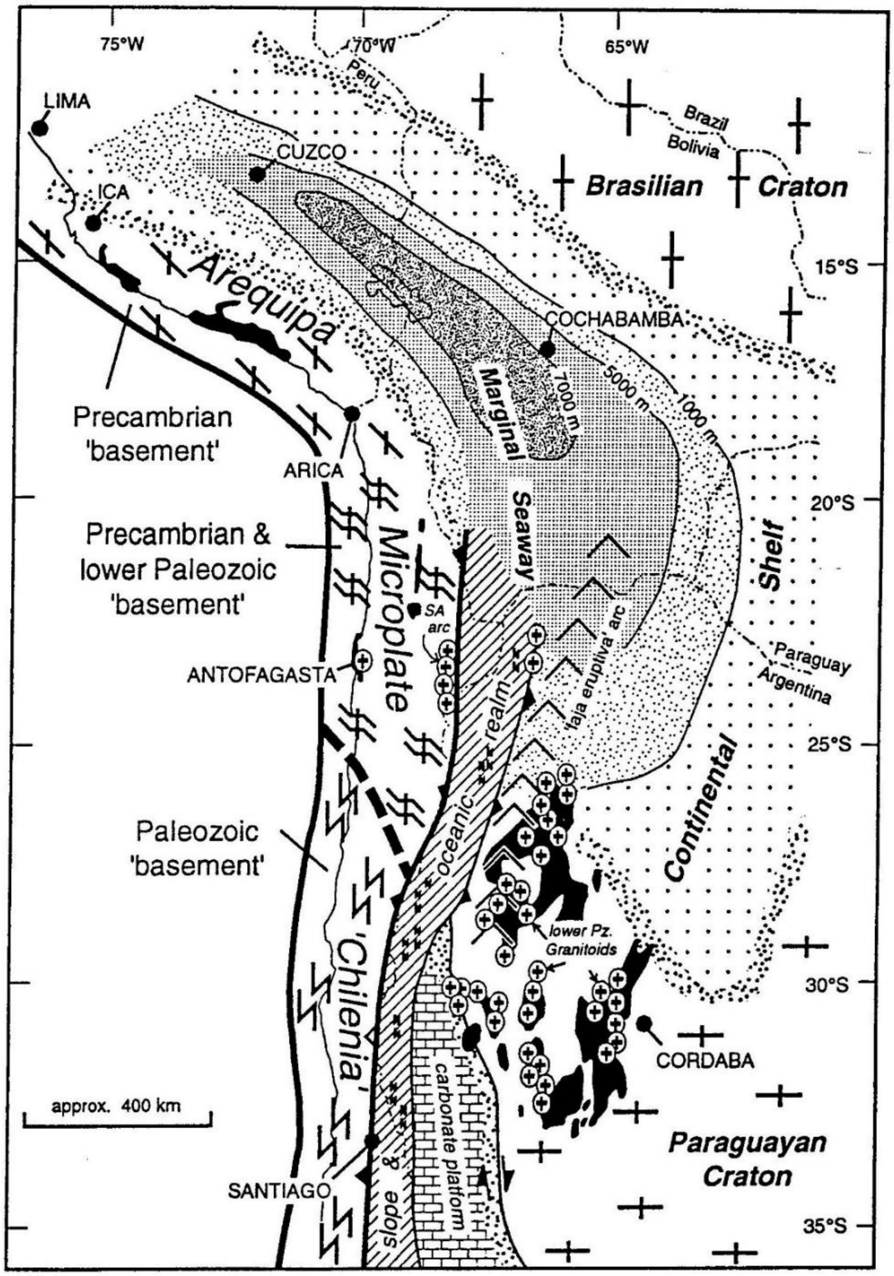


Fig. 1. Tectonostratigraphic map of the Central Andes. Modified from Delmarac et al. [1980], Martinez [1980], Dalziel and Forsythe [1985], Coira et al. [1982], and Ramos et al. [1986]. Contours indicate approximated thicknesses of Ordovician strata, and blackened areas are the principal outcrop areas of Precambrian and lower Paleozoic metamorphic basement rocks. Small pluses and inverted v symbols are lower to middle Paleozoic calcalkaline magmatic suites. Study area is the "SA arc" just to the east of Antofagasta.

Source: Forsythe et al, (1993)

7.3.2 Tacsarian Cycle (Upper Cambrian to Ordovician)

During the Upper Cambrian to Caradoc Tacsarian Cycle a broad marine back-arc rift basin existed in Bolivia-Peru with its axis in the Eastern Cordillera. There was oceanic spreading in the southern part of the basin, the Puna Straits in NW Argentina, preserved as ophiolites, with intrusion of basic dikes and sills further north in the Bolivian basin. A possible magmatic arc on the Arequipa Terrane to the west, represented by calc-alkaline plutonic and volcanic rocks dated at 487-429 Ma (Mpodozis & Ramos, 1989), separated the back arc basin from a forearc. The Arequipa microplate swung about a hinge to the NW to form the Puna Straits and Bolivia-Peru back arc basin, in a Gulf of California-type basin (Sempere, 1991) or Japan-type basin (Forsythe et al., 1993). This was bordered to the east by another subduction-related magmatic arc in western Argentina, the Puna arc and its southward continuation, the Sierras Pampeanas magmatic arc represented by a granitoid belt (Mpodozis & Ramos, 1989). The Ocloyic Orogeny closed the Puna Straits Ocean basin during the Llanvirn-Caradoc, with granitic magmatism.

In SW Bolivia the sedimentary sequence begins with shallow marine clastic sediments of the basal Tremadoc transgression, which grade upwards into open marine thick graptolitic shales intercalated with subordinate turbidites and slumps of late Cambrian – Llanvirn age. The base of this super sequence outcrops in several localities along the Cochabamba-Chapare Road (central part of the Eastern Cordillera), which were described as part of the Limbo Group and of other Cambrian formations (Castaños & Rodrigo, 1978). In most of the outcrops, thick and monotonous Lower to Middle Ordovician shale beds, with subordinate siltstones and sandstones are part of the Cochabamba Group, which from base to top includes the Capinota, Anzaldo, and San Benito Formations. In the southern part of Tarija, the sequence base includes shallow marine clastic rocks. These grade upward to thick, marine graptolitic shales with subordinate Cambrian turbidites of the Condado, Torohuayco, and Sama Formations (Castaños & Rodrigo, 1978).

Further north the sequence is of thick graptolitic and cephalopodic shales: these acted as the main decollement during the Neogene, hence older rocks are rarely exposed in the Bolivian Andes. In southern Bolivia these sediments were affected by the Ocloyic deformation with development of folding, cleavage and schistosity. The effects of this orogeny diminished to the east and north, and are unknown north of 20°S. Here the basin then functioned as the marine foreland basin of this deformation with deposition of a thick, monotonous sequence of shallowing upward, shallow marine siliciclastic interbedded sandstone and shale in the Middle to Late Ordovician (Llanvirn - Caradoc) (Sempere, 1990a, b, 1991, 1993).

7.3.3 The Cordilleran Cycle (Late Ordovician to Late Devonian)

During the Late Ordovician to Late Devonian Cordilleran Cycle (Chuquisaca Super sequence), the Bolivia-Peru basin occupied a back-arc setting, then from the late Llandovery formed a marine foreland basin. This lay east of the Puna arc on the Arequipa block, which continued south as the Sierra Pampeanas magmatic arc granitoid belt until the Early Carboniferous. These arcs were related to an eastward-dipping subduction regime east of the Precordillera. The cratonic Chilenia Terrane of the Cordillera Frontal collided with the continental margin in the latest Devonian to early Carboniferous, causing intense deformation in the western Precordillera. (Mpodozis & Ramos, 1989; Ramos et al., 1986; Ramos, 1988; Sempere, 1993).

The cycle began in Bolivia with rapid deepening of the basin as a back-arc with black pyritic-shale deposition (Tokochi Formation) followed by resedimented glacial-marine diamictites sediments in the Ashgill (Cancañiri Formation) with rare thin fossiliferous limestones. These are overlain by thickly bedded, thinning-upward turbidites (Llallagua Formation) and/or dark shales with minor turbidites (Uncía/Kirusillas Formation) from late Llandovery to Ludlow. Deposition in the basin was controlled by active normal faulting with facies succession induced by a major glacio-eustatic sea level low (the Ashgillian ice age) which developed between two maximum flooding episodes. The Uncía/Kirusillas Formation was the first of three main shallowing-up megasequences, which began with thick dark shales and ended with sandstone dominated units, of late Llandovery - Lochkovian, Pragian - early Giventian and late Giventian - middle Famennian ages. These were deposited in a large subsident marine foreland basin covering the Bolivian Andes, Subandean zone and Chaco-Beni plains, reaching as far as the SW edge of the craton where they onlap the Chiquitos Supergroup (Litherland et al., 1986). This interval was a time of onlap towards the northeast and of deposition of major hydrocarbon source rocks in Bolivia. (Sempere, 1990a; b;1991; 1993).

The Cordilleran Cycle is generally considered to have been terminated by the Late Devonian to Early Carboniferous Hercynian Orogeny, which is defined in Perú where the effects are much stronger. The presence of Hercynian orogenesis in Bolivia has been questioned however, due to Late Triassic age dates (U-Pb zircon 225 Ma, Farrar et al., 1990) for both foliated and weakly foliated facies of the Zongo-Yani granite, and by implication its wide metamorphic aureole, which was assigned an "Eohercynian" age by Bard et al. (1974).

7.3.4 Subandean (Gondwana) Cycle (Upper Paleozoic)

The Upper Paleozoic Gondwana Cycle was characterized by establishment of eastward subduction along the new Pacific margin west of Chilenia (Cordillera Frontal) and development of a broad forearc accretionary prism, which includes blue schists and ocean floor fragments. A magmatic arc lay to the east of the subduction zone. This cycle was terminated by deformation during the lower Triassic Gondwanide orogeny, the effects of which increase to the south. (Mpodozis & Ramos, 1989; Ramos et al., 1986; Ramos, 1988).

In Bolivia the Upper Paleozoic Subandean Cycle is characterized by a complete change in the type of sedimentation. The Late Devonian (Late Famennian) - Early Carboniferous (Mississippian) Villamontes Supersequence, deposited in the Subandean zone, Chaco and Titicaca basin, is mainly marine and comprises mudstone, black shale, sandstone, coal, glacial-marine sediments, diamictites and slumps, the stratigraphy of which is conflictive due to rapid facies variations (Sempere, 1993). The Eastern Cordillera was emergent. This was a period of high epeirogenic activity and synsedimentary tectonic instability coeval with the Hercynian deformation in Peru. Sempere (1993) considers the Mississippian sedimentation to have been the culmination of the Silurian - Devonian evolution.

The Late Carboniferous (Pennsylvanian) - Early Triassic Cueva Supersequence was a period of low subsidence and subtropical climate. In western Bolivia there was a shallow carbonate platform in the Titicaca Basin (Copacabana Formation) with deposition of white littoral-fluvial-eolian sands and evaporites on the eastern platform in the Subandean zone. The compressional Gondwana (Late Hercynian) deformation in the middle Permian of the Eastern Cordillera of Peru had weak effects in the Eastern Cordillera of Bolivia. This was accompanied by transgression of the marine carbonate platform to the east. Post-orogenic calc-alkaline magmatism in the Early - Middle Triassic evolved in the late Middle Triassic toward continental tholeiitic compositions, reflecting the extension which initiated the Andean Cycle (Sempere, 1990a; b; 1993; Soler & Sempere, 1993).

7.3.5 The Mesozoic to Cenozoic Andean Cycle: The Serere, Puca and Corcoro Supersequences

The Andes developed during the Mesozoic to Cenozoic Andean Orogenic Cycle. Distension in the Middle to Upper Triassic related to the initial break up of Gondwana marked the start of the Andean Cycle. In the first part of the cycle, from Triassic to mid Cretaceous, an eastward dipping subduction zone existed along the length of the Pacific margin of Peru and Chile with a magmatic arc and back-arc basin, which in some segments had oceanic crust. In Chile the arc was superimposed on the Late Paleozoic accretionary prism and an eastward younging coastal batholith was intruded. (Cobbing, 1985; Dalziel, 1986; Mpodozis & Ramos, 1989).

During the Middle Triassic - Middle Jurassic, the Andean region of Bolivia lay within the stable cratonic regime. An initial rifting process of late Middle Triassic age developed in several areas, and numerous narrow grabens were filled by fluvio-lacustrine red beds and evaporites, accompanied by tholeiitic to transitional basalts (Sempere, 1990a; 1993; Soler & Sempere, 1993). Abortion of rifting in Bolivia was probably a consequence of a regional tectonic reorganization at about 220 Ma, which probably marked the resumption of subduction along the Pacific margin. The subsequent Late Triassic - Middle? Jurassic onlapping sedimentation of fluvial and eolian sands was probably controlled by post-rift thermal subsidence. The environment was of sandy deserts on the craton, akin to the Arabian Shield (Sempere, 1990a; 1993). These deposits of the Serere Supersequence occur in the Eastern Cordillera and Subandean Zone.

Since the Late Jurassic, Bolivia has been part of the Pacific subduction regime. This was marked by a Kimmeridgian rifting event in Bolivia, the “Araucana Phase”, with extrusion of alkaline basalts which initiated the Puna Supersequence (Sempere et al., 1989; Sempere, 1993; Soler & Sempere, 1993). Bolivia lay in a back arc setting to the east of the Pacific margin arc and back-arc basin, with deposition of coarse clastic continental sediments and alkali basalts in the Potosí and Titicaca basins in a distensive regime related to a transtensional continental margin until the Aptian (Sempere et al., 1989).

The Upper Cretaceous and Cenozoic of Perú - Chile was characterized by a subduction-related continental magmatic arc with no back-arc basin. In Peru the Coastal Batholith was emplaced into the Jurassic - Early Cretaceous back-arc basin volcanic pile between the Mochica and Incaic 1-fold phases between 110 - 60 Ma (Pitcher et al., 1985). In the Central Andes the magmatic arc migrated eastwards. Large parts of the forearc zone and Mesozoic arc were removed during the Cretaceous and Tertiary, either by subduction erosion or by longitudinal strike-slip faults such as the Atacama Fault (Mpodozis & Ramos, 1989).

The mid Cretaceous compressive event inverted the Tarapacá back-arc basin of north Chile (Late Triassic - Early Cretaceous) to form the proto-Domeyko Cordillera fold-thrust belt (Mpodozis & Ramos, 1989). In Bolivia sedimentation of the Puca Supergroup continued in a distal external foreland basin, with deposition controlled by rifting and eustatic marine transgressions from the NW. The sequence is transgressive with successively younger units covering greater areas and reaching a total thickness of up to 5,600 m in the Sevaruyo area. The strata consist of fine red-bed sediments, evaporites and alkali basalts, with marine red shales in the Aptian and marine carbonates in the Cenomanian, Campanian and Maastrichtian. (Riccardi, 1988; Sempere et al., 1989; Soler & Sempere, 1993). The end of the Puca Supersequence is marked by an important unconformity at the end of the Paleocene, followed by deposition of thick red beds in the Altiplano and Eastern Cordillera in an external continental foreland basin during the Eocene and Oligocene (53 - 27 Ma; Sempere 1990a).

The Cenozoic evolution of Bolivia was dominated by considerable horizontal shortening (Sempere, 1990). Cenozoic basins of the Corocoro Supersequence developed in the Cordillera and in the plains in that time are related to the uplift of the Andes.

During the Lower Paleocene-Lower Oligocene, a foreland basin formed east of the Andes. A thickening of the crust enabled the accumulation of 2.5 km of red beds in the Altiplano and Eastern Cordillera (Sempere, 1995).

7.3.6 The Andean Orogeny

The first major deformation in the Andean Cycle in Bolivia occurred during the Late Oligocene to Early Miocene (27-19 Ma) when the orogenic front jumped from west of Bolivia to the Eastern Cordillera, and the Bolivian Andes started to develop as a mountain belt. Major crustal shortening by thrusting occurred in the Eastern Cordillera, and deformation of the Subandean Zone also began. Since the Late Oligocene, the Altiplano has functioned as an intermontane foreland basin with deposition of thick continental sediments, with smaller intermontane basins in the Eastern Cordillera.

The external foreland basin moved east to the Subandean - Llanura (Beni-Chaco) Basin. The second major period of thrusting occurred between 11-5 Ma. Thrusting is mainly eastward-verging towards the foreland, with an important west-verging back-thrust belt in the eastern Altiplano and western side of the Eastern Cordillera.

7.3.7 Mesozoic to Cenozoic Magmatism

Rift-related granites were intruded in the Cordillera Real in the Triassic–Jurassic (227-180 Ma) (Everden et al., 1977; McBride, 1977; Grant et al., 1979; Farrar et al., 1990).

Alkaline volcanic activity was initiated in the Late Oligocene (28-21 Ma) in the Western Cordillera and western Altiplano, coincident with the first major period of deformation. At the same time granitoid plutons were intruded in the southern part of the Cordillera Real (Illimani, Quimsa Chata, Santa Vera Cruz) with related tin-tungsten-silver-lead-zinc-polymetallic mineralization (28-20 Ma). Similar deposits to the south as far as Potosi, such as Colquiri and Chicote Grande, are hosted by Paleozoic sediments and related to buried plutons of this age. The main period of magmatism was the Middle Miocene (17-12 Ma) with an eastward "breakout" of magmatism in an unusually broad arc across the Western Cordillera, Altiplano and Eastern Cordillera, generally forming small extrusive (domes) and intrusive (stocks, sills) bodies. Further magmatism occurred across this wide arc during the Late Miocene (10-5 Ma) during the second main period of crustal shortening. This was characterized by stratovolcanoes, ash-flow calderas, and major ignimbrite shields such as Los Frailes and Morococala in the Eastern Cordillera. (Baker, 1981; Baker & Francis, 1978; Evernden et al., 1977; Grant et al., 1979; McBride et al., 1983; Redwood, 1987; Redwood & Macintyre, 1989; Soler & Jimenez, 1993; Thorpe et al., 1982.)

7.4 Local Geology

The Bolivar deposit is located in the Cañadón Antequera or Avicaya-Bolivar district about 85 km southeast of Oruro, together with the Martha, Totoral, and Avicaya deposits (Figure 7-8). Bolivar was discovered in 1810 and was mined for silver in the nineteenth century, for tin in the twentieth century and, since 1995 for Zn-Ag-Pb. It was owned by Hochschild from 1935 and was nationalized to become part of COMIBOL in 1952. It was rented to Tihua Mines from 1964 to 1971 which installed a tin volatilization plant. COMIBOL formed a joint venture with COMSUR in 1993, which modernized the mine and built a 1,000 t/d plant to produce concentrates of Pb-Ag and Zn-Ag that started operating in 1995. COMSUR was bought by Glencore in 2005 and the operating company changed to E.M. Sinchi Wayra S.A. A new contract was signed in 2013 under a new operating company, Sociedad Minera Illapa S.A. The geology has been described by Ahlfeld & Schneider-Scherbina (1964) and Sugaki et al. (1981a, b) (Figure 7-9).

The district is underlain by the Silurian Llallagua and Uncía Formations that consist of thickly-bedded turbidites and black shales, respectively. These are folded into the NW-striking El Salvador anticline and there are NW-trending thrust faults and NE-trending strike-slip faults. The felsic porphyry stocks of China Chualla, Chualla Grande, Pan de Azúcar, Pepito, and Chuallani. were intruded in the Miocene. These have narrow contact metamorphic aureole, with tourmaline-rich hornfels and quartzites. There are also several porphyritic cupola-like bodies and dikes present in the tourmaline- and quartz-rich zones near the Chualla Grande stock. The stocks have not been dated but sericite from a vein selvedge at Avicaya was dated by K-Ar at: 20.5 ± 1.0 Ma, while fine grained, supergene alunite from Avicaya was dated at 6.7 ± 0.7 Ma, and fine grained supergene jarosite from Bolivar was dated at 3.9 ± 0.7 Ma. Sugaki et al. (2003)

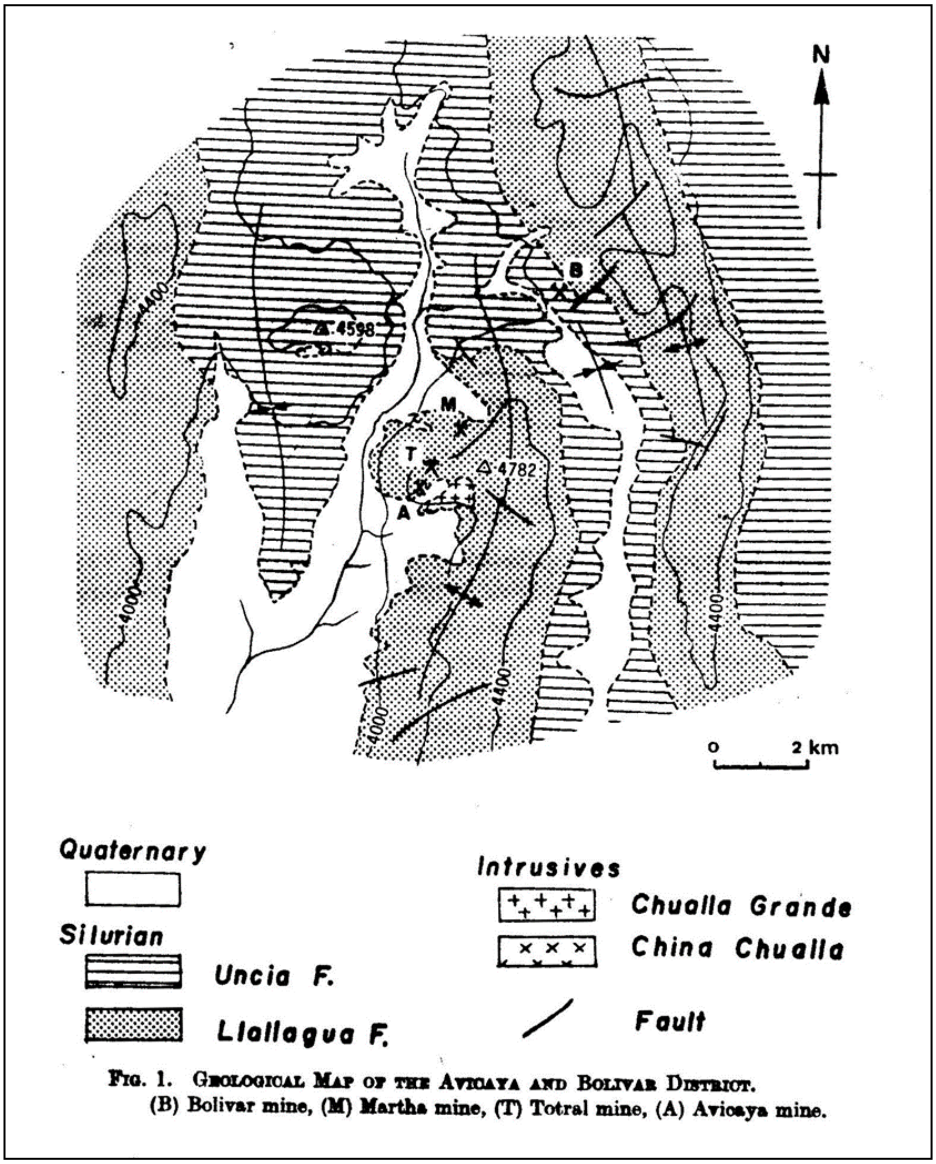
A 7 km x 2 km zone of mineralization extends northeast from the Chualla Grande stock with sericite-silica-tourmaline alteration and is terminated by a N- to NW-striking reverse fault system. Within this there is the well-developed metal zonation from proximal tin veins at Avicaya, Totoral and Martha (with coarse cassiterite, quartz, tourmaline, pyrrhotite, pyrite, and arsenopyrite); medial zinc-silver veins at Bolivar (with sphalerite, microscopic cassiterite, pyrite, jamesonite); and distal lead-antimony veins (with galena, stibnite, pyrite, sphalerite, arsenopyrite) (Sugaki et al., 1981b). The zoning is Sn to Zn-Ag to Pb-Sb. It is interpreted to be the result of lateral fluid flow from the porphyry stock from south to north, together with a thermal gradient from high to low temperature.

The Bolivar zinc-silver-tin deposit is located in the polymetallic zone 7 km northeast of the Chualla Grande porphyritic stock. A series of predominantly east-west and northeast trending veins up to 2,000 m long are hosted by Silurian shales, sandstones and quartzites. The veins vary in width between 0.6 and 3.0 m. The Bolivar vein, one of the principal veins, has an average width of 1.1 m, strikes 070 to 080º, and is zinc-rich. Other important zinc veins are the 3.0 to 4.0 m wide Pomabamba vein and the Nané vein that has a moderate dip of 35º to 50º to the northwest. The veins are up to 1,800 m long (the composite Pomabamba-Nené-Bolívar vein), are mined to the -300 level (3,700 masl) over >600 m vertical distance and are known by drilling to the -620 level (3,400 masl) for over 1000 m vertical mineralization.

The mineralogy of the deposit is sphalerite, galena, cassiterite, jamesonite, pyrite, arsenopyrite and marcasite in a gangue of quartz. The Bolivar paragenesis is an early low sulfidation mesothermal Zn assemblage of quartz-pyrite-Fe-rich sphalerite, with a later intermediate sulfidation epithermal Zn-Sn-Ag-Pb-Sb assemblage of sulfides and sulfosalts (low Fe sphalerite, microscopic cassiterite, and Pb-Sb sulfosalts including. jamesonite, frankeite, teallite, tetrahedrite), and late stage galena-siderite-quartz. The Avicaya deposit also includes a final high sulfidation stage of alunite.

This district is typical of the Bolivian polymetallic vein-type deposits including a genetic relationship with a Miocene felsic intrusion, even though the deposit is sediment-hosted, fault control of the veins, zoned hydrothermal alteration, and a multiphase, zoned, polymetallic, and telescoped mineral paragenesis.

Figure 7-8: Geological Sketch Map of the Avicaya-Bolivar District



Source: (Sugaki et al., 1981b)

Figure 7-9: Metal Zoning of the Avicaya-Bolivar District

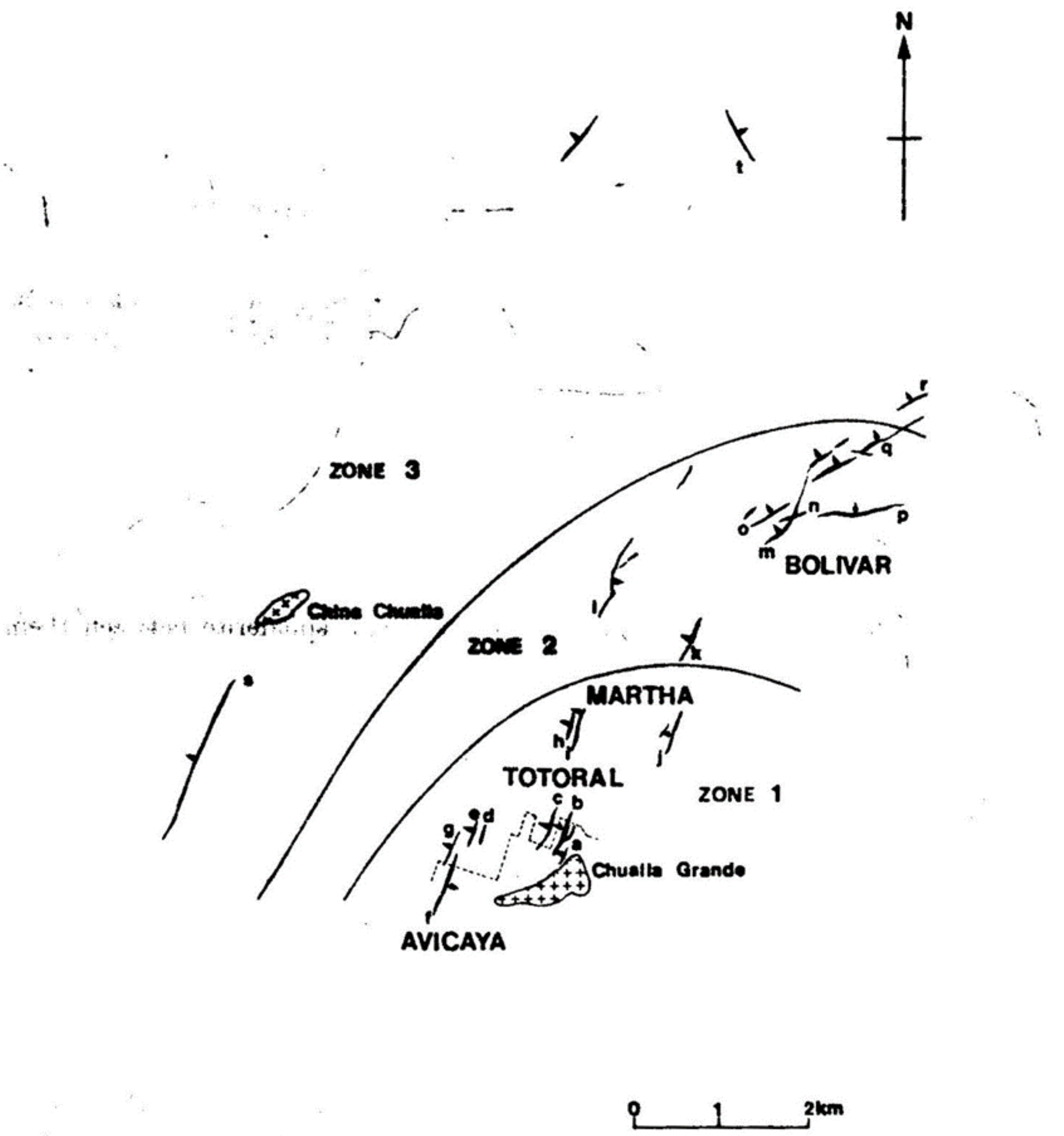


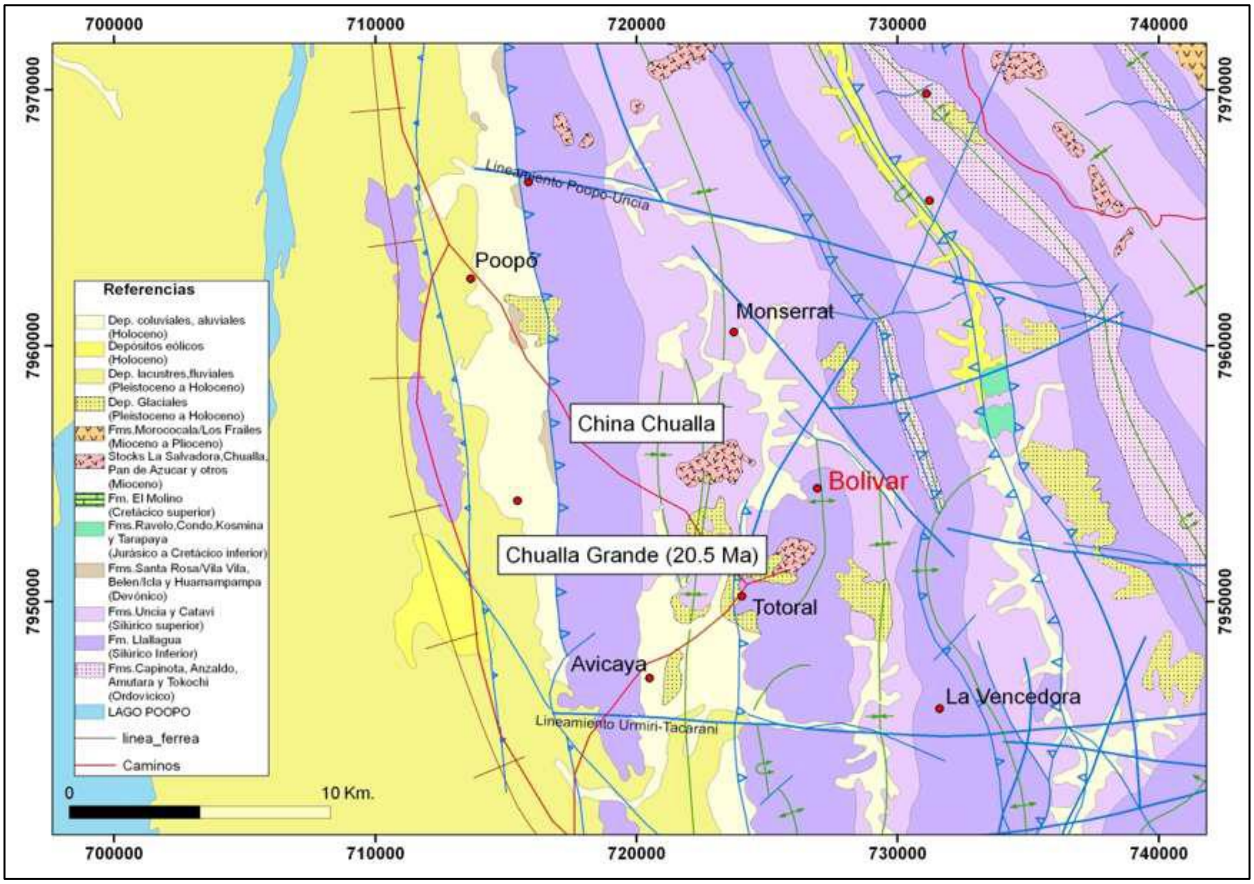
FIG. 4. ZONAL ARRANGEMENT OF ORE AND GANGUE MINERALS IN THE AVICAYA AND BOLIVAR MINING DISTRICT.

Vein names: Avicaya mine: (a) Dike, (b) San Francisco, (f) Porvenir, Totoral mine: (c) Exaltacion (d) Negro, (e) Azul, (g) Manto, (j) Esperansa, Martha mine: (h) & (i), Bolivar mine: (k) Venus, (l) Rosario, (m) Name, (n) Rey, (o) Ponabanba, (p) Santa Rosa, (q) Bolivar, (r) San Jorge, others: (s) galena-sphalerite vein, (t) Jesus.

Source: (Sugaki et al., 1981b)

Structurally this region is characterized by the presence of a series of subparallel folds of general course N 15 degrees W with anticlinals and sinclinals dislocated by the intrusions of the Chualla Stocks Grande and China Chualla, located 5 km SW and 6 km to the W of Bolivar respectively and by transverse faults (Figure 7-10). The deposit is located in the northern part of the Pazña – Antequera mineralized zone, where there are numerous mineral deposits related to the Chualla Grande and China stocks.

Figure 7-10: Structural Features and Local Geology



Source: Glencore (2020)

The Bolivar Mine is located in the Cordillera de los Azanaques, forming the western edge of the Cordillera Oriental, which is detached from the Cordillera de los Frailes, belonging to the group of central mountain ranges. Characterized by the essence of undulating plateaus, outstanding mountains parallel to the course of the Andes, with elevations that vary between 3,400 and 4,600 msnm. The area is part of the polymetallic belt of the altiplano and the Cordillera Occidental.

It is located in Cenozoic rocks of the middle to upper Silurian, constituted almost entirely by marine sediments of variable depth: from infraneritic, neuritic and bathyal environments.

Stratigraphically, during the Silurian (Lower Silurian) Middle began the deposition, with the formation of sediments of glacial-marine origin, which in Bolivian territory reaches the central part, being so that in areas surrounding the Bolívar mine it is documented by the presence of the Cancañiri Formation (Figure 7-11 and Figure 7-12). Likewise, the sequence of deposition continued with the formation of sandy and clay materials giving rise to the sandstones and shales corresponding to the members of the Lallagua and Uncía Formation.

These stratigraphic sequences have a considerable thickness forming the Silurian formations, it is made up of fine materials with sands and conglomerates (Uncía case) with leads to have an idea of the behavior of the sea during the deposition of these materials, which correspond to stages of regressive and transgressive character (Figure 7-13).

Following the formation of the Silurian rocks, the sediments of the region were folded regionally during the Upper Paleozoic by compressive dominant tectonics (Hercynic Orogeny) and at the end of the Cretaceous and/or Lower Tertiary by the Andean Orogeny.

In the area, this Orogenic cycle ended with an intense Pliocenaean folding and tectonics of the region, giving rise to the presence of folds with very inclined dips.

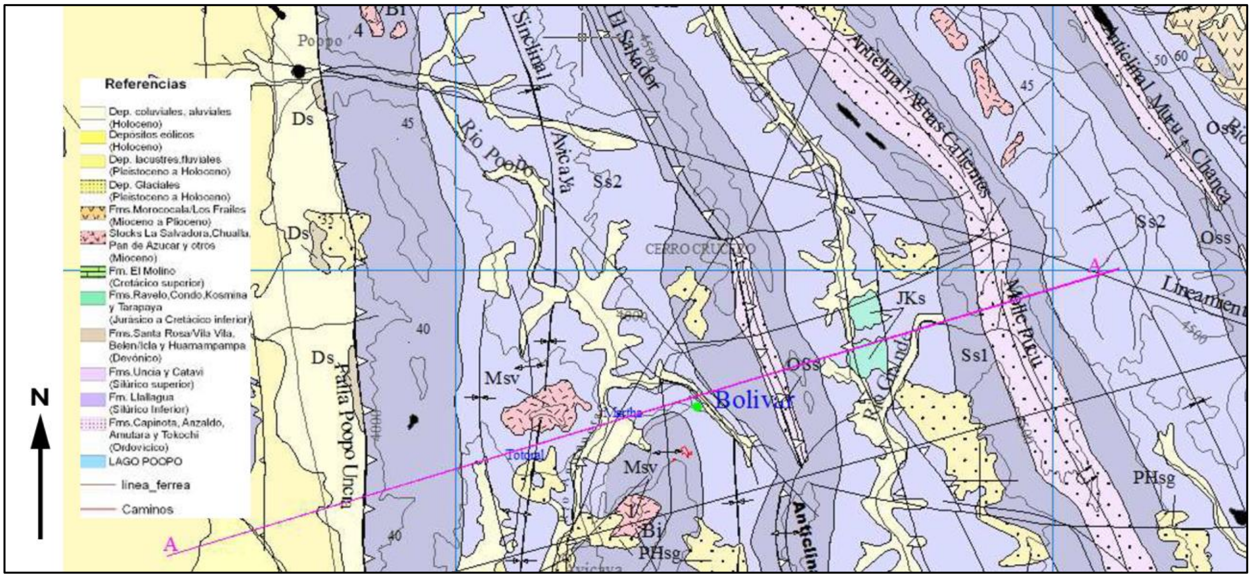
The magmatic activity observed regionally, represented by the stocks of Sugar Loaf, China Chualla, Chualla Grande, etc., called "Andean Andesitic Inter-Andean Volcanism", plays an important role in the geological history of the place, as it constitutes the different intrusions in addition to being the factor responsible for the mining lización present in the area and to which a Miocene-Pliocene age is assigned.

The geomorphological features presented by the study area are conditioned by the climatic events that occurred during the Pleistocene, in which glacial activity models the landscape, where glacial cirque and moraine can be observed, fluted surfaces and deposits of stanniferous veins, all of glacial origin.

The presence of large alluvial plains and terraces that are observed in the western part of the area, are related to the existence of "Minchin Lake", of contemporary age to the Pleistocene glaciation.

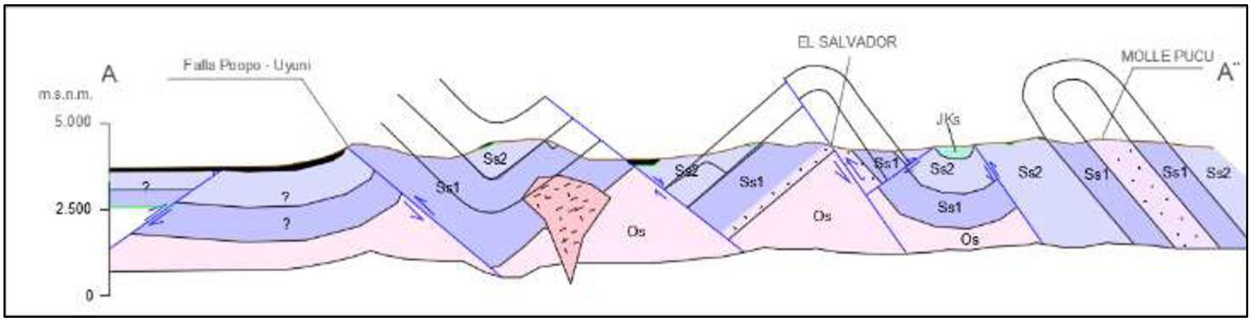
Recent Quaternary sediments were deposited in a discordant form on the folded and failed Silurian rocks.

Figure 7-11: Property Geology of Bolivar (Section A-A')



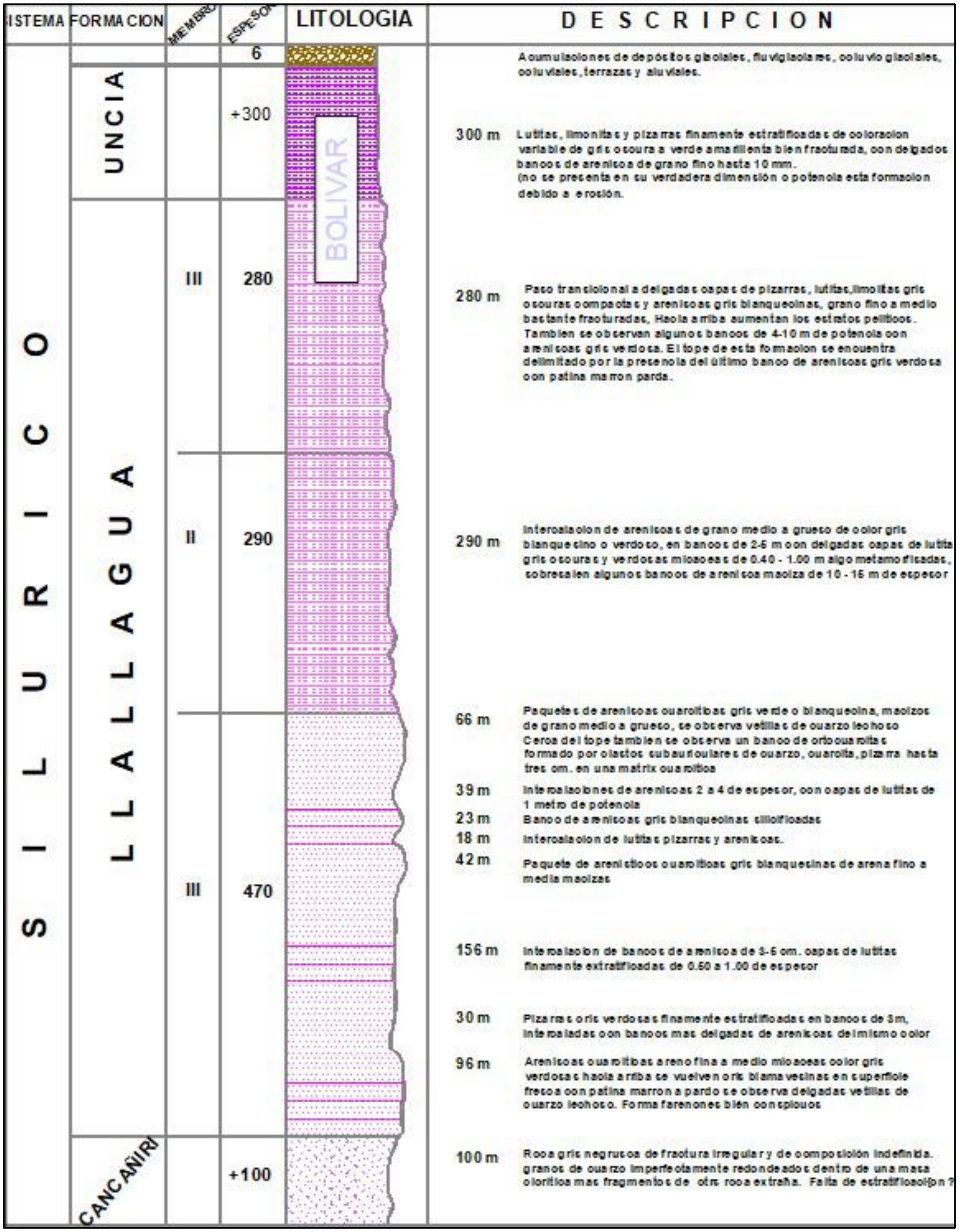
Source: Glencore (2020)

Figure 7-12: Section A-A' Property Geology of Bolivar



Source: Glencore (2020)

Figure 7-13: Stratigraphic Column at Bolivar



Acumulaciones de depósitos glaciales, fluvioglaciares, coluvio glaciales, coluviales, terrazas y aluviales.

300 m Lutitas, limonitas y pizarras finamente estratificadas de coloracion variable de gris oscura a verde amarillenta bien fracturada, con delgados bancos de arenisca de grano fino hasta 10 mm. (no se presenta en su verdadera dimensión o potencia esta formacion debido a erosión.

280 m Paso transicional a delgadas capas de pizarras, lutitas, limolitas gris oscuras compactas y areniscas gris blanquecinas, grano fino a medio bastante fracturadas, Hacia arriba aumentan los estratos pelíticos. Tambien se observan algunos bancos de 4-10 m de potencia con areniscas gris verdosa. El tope de esta formacion se encuentra delimitado por la presencia del último banco de areniscas gris verdosa con patina marron parda.

290 m Intercalacion de areniscas de grano medio a grueso de color gris blanquecino o verdoso, en bancos de 2-5 m con delgadas capas de lutita gris oscuras y verdosas micaceas de 0.40 - 1.00 m algo metamorfisadas, sobresalen algunos bancos de arenisca maciza de 10 - 15 m de espesor

66 m Paquetes de areniscas cuarcitícas gris verde o blanquecina, macizos de grano medio a grueso, se observa vetillas de cuarzo lechoso Cerca del tope tambien se observa un banco de ortocuarcitas formado por clastos subauriculares de cuarzo, cuarcita, pizarra hasta tres cm. en una matrix cuarcitica

39 m Intercalaciones de areniscas 2 a 4 de espesor, con capas de lutitas de 1 metro de potencia

23 m Banco de areniscas gris blanquecinas silicificadas

18 m Intercalacion de lutitas pizarras y areniscas.

42 m Paquete de areniscas cuarciticas gris blanquesinas de arena fino a media macizas

156 m Intercalacion de bancos de arenisca de 3-5 cm. capas de lutitas finamente extratificadas de 0.50 a 1.00 de espesor

30 m Pizarras gris verdosas finamente estratificadas en bancos de 3m, intercaladas con bancos mas delgadas de areniscas del mismo color

96 m Areniscas cuarcitícas areno fina a medio micaceas color gris verdosas hacia arriba se vuelven gris blanquecinas en superficie fresca con patina marron a pardo se observa delgadas vetillas de cuarzo lechoso. Forma farenones bién conspicuos

100 m Roca gris negruzca de fractura irregular y de composición indefinida. granos de cuarzo imperfectamente redondeados dentro de una masa cloritica mas fragmentos de otra roca extraña. Falta de estratificación ?

Source: Glencore (2020)

7.5 Mineralization

The Bolivar system is a network epigenetic hydrothermal base metal type veins and faults filled mineralization hosted within a variety of lithologies from volcanic tuffs to sedimentary packages. The main mineral assemblages are composed of sphalerite, marmatite, galena, silver rich galena and silver sulfosalts. The resources are usually based on multiple structures containing several veins. The typical dimensions of these structures ~500 m in length and ~450 m depth profile with mineralization continuing to be open at depth with vein widths of between 0.2 m - 4.0 m.

The occurrence of a mineral deposit is related to two primordial aspects: 1) a hot intrusive body generating mineralizing fluids and 2) a pre-mineral geological structure receiving mineralization.

The non-presence of an intrusive body very close to the deposit, makes one conclude that its formation is due to the influence of the Chualla Grande Stock, with minerals of higher temperature in its vicinity such as: 1) coarse cassiterite accompanied by quartz and tourmaline (Totoral and Avicaya); 2) an intermediate or transitional zone with minerals of Fe-Sn (Buenos Aires, San Francisco, Venus) and; 3) an external zone where Bolívar is located with minerals of Zn-Pb-Ag-Sn.

The Pomabamba mineralization corridor has a simplified mineral paragenesis of sphalerite – pyrite – sulfosalt type of Ag-Pb-Sn that differs from the Rosario mineralization corridor whose paragenesis is sphalerite – galena – pyrite – siderite. This allows one to conclude that there is a lateral zone in the mineralization that corresponds to the central part of the deposit (Pomabamba corridor).

The Pomabamba vein has its own characteristics longitudinally, with a predominance of marmatite-pyrite mineralization in its northern sector and abundant pyrite in the south. Vertically and at depth the pyrite becomes more dominant and the marmatite subordinate. A remarkable aspect is that pyrite is associated or is intergrown with Ag minerals mainly to the south. Another aspect to note is that, at higher levels, there is a band of brown sphalerite that can be distinguished within the marmatite-pyrite association, whose longitudinal inlay had no preferential location.

The mineralogical characteristics of the Nané vein differs from that of Pomabamba, with predominant brown sphalerite, and galena sulfosalts in smaller proportions and generally as much sphalerite and pyrite with subordinate marmatite at depth.

The Bolivar vein, which is an extension in the north direction of the Nané, presents as sphalerite (brown), sulfosalts of Pb-Sb-Ag-Sn, marmatite and pyrite, which is enriched in Ag content as a result, characteristic of its south and center sector. However, in the north, the pyrite becomes predominant and the sphalerite-sulfosalts subordinate.

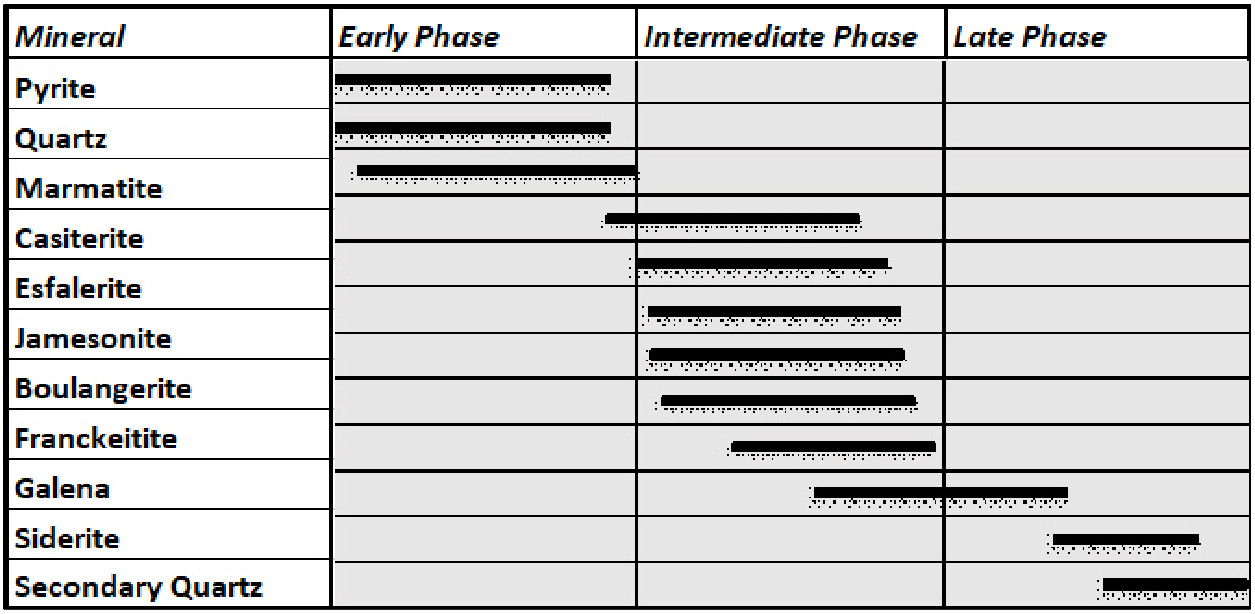
The polymetallic mineralization in the Bolivar deposit according to the mineragraphic studies (Figure 7-14) concludes that it would have formed in different phases or mineralization events with a clear telescopic deposition:

- An early phase would comprise the mineral association of quartz – pyrite – sphalerite (of the marmatite type);

- Sphalerite (brown) – jamesonite – boulangerite – cassicrite (of the needle tin type) – stannine – galena – franckeite would correspond to the intermediate phase of mineralization; and
- Finally, the second generation carbonates (siderite) and quartz correspond to the late phase.

The composition and events of the mineralization illustrate that the deposit was formed from hydrothermal solutions under intermediate temperature conditions of 250º - 300ºC, and that it classifies as a meso- to epithermal hydrothermal deposit.

Figure 7-14: Paragenesis Bolivar Site

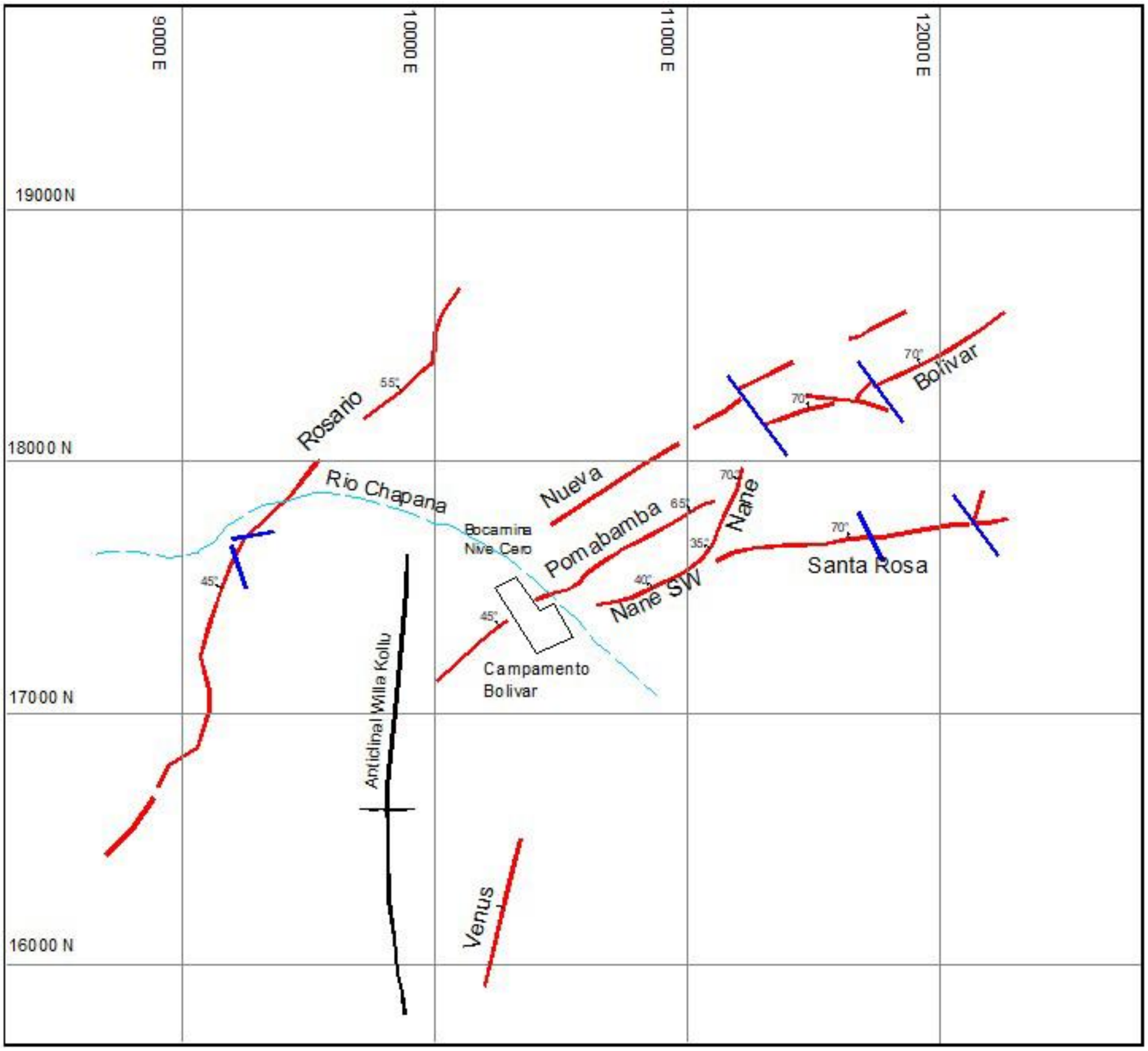


Source: Glencore (2020)

7.6 Bolivar Veins

The Bolivar Deposit is currently composed sixteen (16) mineralized structures (Figure 7-15) with varying geometric, structural and mineralogical characteristics. These veins have been identified and developed for greater than 550 m at Level 0 and -340.

Figure 7-15: Bolivar Veins



Source: Glencore (2020)

7.6.1 3000 Veta Pomabamba (PBA)

This vein has been identified and developed for 550m at Level 0 and -340. The diamond drilling confirms the vertical extension of the Pomabamba Veta up to 3,432 msnm (2 00 m below Level -340), having a total vertical extension of 650m has been identified.

This mineral structure is a general strike of N 60°-70° E, with dips ranging from 65° to 45° NW in the extreme southern part. The average power of this structure varies between 0.50 m to 3.00 m as a resource, although at higher levels it exceeds 5.00 m of power.

The Pomabamba Vein is a well-defined structure in upper levels (-300 upwards) going to irregular for lower levels, it is of tabular geometry, of fairly regular mineralization and continues, it contains abundant dark Sphalerite (Marmatite) and Pyrite being this the main characteristic of this structure. It is also found along the vein filled with clear Sphalerite, Lead Sulfosalts – Antimony, which has probably been deposited in a later phase of mineralization, a characteristic very evident at levels above -300. Previous information mentions the presence of Cassiterite and others at the upper levels.

Zinc mineralization has been shown with high values in the upper levels while there is a marked decrease towards the lower levels and also from north to south. Silver and Lead shows a correlation to Zinc, illustrating vertical decrease in its concentrations. Horizontally from south to north this characteristic is not consistent.

7.6.2 3010 Veta Nané (NAN)

Veta Nané has an average length of 200 m to 400 m from Level 0 to depth (level -580). It is located between the Veins Pomabamba to the SW and Bolívar to the NE. It is located in an area of intense fracturing near the joint with Pomabamba, the mineralization is irregularly distributed and consists of Sphalerite, Marmatite, Stannine, Cassiterite, Jamesonite, Zinckenite, Boulangerite, Pyrite, Quartz and Frankeite. The presence of tin minerals is restricted to the upper levels.

The overall strike of this structure is N 30°60° E and its average dip of 62° towards the NW. The vein has an average width that varies from 0.50 m to 2.50 m, the diamond drilling confirms the vertical extension of the Nané Vein to the height of 3,415 msnm (273 m below the Sub Level -330), having a total vertical extension of 700 m recognized.

7.6.3 3020 Veta Bolivar (BOL)

Veta Bolívar is horizontally recognized for around 1,000 m of development in the upper levels and identified with drilling for up to 120 m below the last Level -340. The general strike of this structure is N 40 E, with dips that vary between 60 and 75 NW, the average widths vary between 0.50 and 2.00 m. which towards the north thins significantly. The vertical development of this structure up to the current development level is 650 m.

The mineralogical content of this vein is variable according to the area, but in general it occurs with dark Sphalerite (Marmatite), light Sphalerite accompanied by Cassiterite, Galena, Boulangerite, Jamesonite, Pyrite, Quartz, Arsenopirite and Siderite. In the SW part it is strongly mineralized with Frankeite and Jamesonite with high silver values. Cassiterite is preferentially associated with Quartz and Sphalerite, as individual crystals in the form of 15 μm needles.

This structure is dislocated transversely by two faults called Rica and Salvadora with offsets not exceeding 25 m.

7.6.4 3030 Veta Ramo Bolivar

The Ramo Bolivar vein is recognized from levels -140 to -300 it is a splay that is detached from the main Bolivar and joining it at about 15 m below the last recognized level. Its width can vary from 0.60 to 3 m.

Its mineralogical content is Sphalerite accompanied by an important presence of Sulfosalts, which gives it its high concentration of Ag particularly toward the NE.

7.6.5 3031 Veta Ramo Bolívar Central (RBC)

The Ramo Bolivar Central Vein is located between the Nané and Bolivar SW veins, in an area of intense fracturing near the joint with Boliva. The mineralization is irregularly distributed in the developed levels and is composed of Sphalerite, Marmatite, Pyrite, and Quartz. The thickness ranges from 0. 2 to 1.2 m. Branch

7.6.6 3032 Veta Rama (RMA)

The Veta Rama has irregular width, located on the western flank of the Ramo Bolivar Vein as a splay, it has been identified from on levels -215 to -260 extending approximately 120 m. it is minerolically comprised of Marmatite, Pyrite and scarce Sulfosalts.

7.6.7 3033 Veta Regina (REG)

Developed on levels -260 and -270, it is located on the roof of the Bolivar Vein, has a high Zn and Ag content, its thickness varies from 0.20 to 3.0 m, its horizontal extension is 90m. it is composed of Sphalerite and Sulfosalts such as Jamesonite, Frankeite which gives it its high Ag content.

7.6.8 3034 Veta Branch One (UBI)

This vein has been developed on levels -230 and -245 extending approximately 50 m, composed mineralogically of Sphalerite and trace Sulfosalts. It has widths ranging from 0.50 to 1.10 m. and is located on the roof of the Bolivar vein between Bolivar and the Ramo Bolívar.

7.6.9 3040 Veta Bolivar SW Ramo Nané (BSW RNA)

This structure has a general strike of N 45° E and dips of 55° – 65° NW. It has a length of 350 m of development at level -125 and a depth recognition of 210 m up to level -215 (3,813 msnm). Average widths of this vein are 1.50 m.

Its mineralogy is characterized by the presence of Sphalerite, Marmatite, Sulfosalts such as Jamesonite, Pyrite and Quartz.

This vein is of tabular geometry in sectors, and it separates from the Nané vein and joins to the north with Bolívar vein. It brecciated is some areas while being massive in others. In the south it joins again to the Nané vein, where it has been named Bolivar SW beyond this point.

7.6.10 3050 Veta Nueva (NUE)

Veta Nueva is a mineralized structure that is located on the roof of the Veta Pomabamba, has a development of 180 m on level -170 and sub level -185. It has been recognized at depth by diamond drilling being defined for 500 m in length and vertically for 300 m from level -170. It has a variable width from 0.30 m to 1.20 m. The overall strike is N 40°E and dipping 55° – 60° NW.

This ore-filled fault structure is mineralogically made up of Marmatite, Pyrite, Sphalerite, Siderite, Quartz, Galena, Argentite and Alunite. The presence of milonite is present up to 0.20 m in both the ceiling and floor.

7.6.11 3060 Veta Nané Southwest (NSW)

The general strike of the Nané Southwest Vein varies between N 60° E, N-S and EW. The average dipping of this structure ranges from 35° to 55° NW. The average width of the structure is 2.40 m. In Level 0 it was recognized 550m that decrease to depth until the joint with Pomabamaba vein (sub level -330) where it barely reaches 60 m.

The mineral distribution is irregular, it is a brecciated structure with massive sectors, which have bands of sulfosalts. Mineralogically it is composed of Sphalerite, Marmatite (near the Pomabamba Vein), Sulfosalts (Jamesonite, Zinckenite and Boulangerite), Pyrite and Quartz.

7.6.12 3090 Veta Rosario (ROS)

Veta Rosario is located 1 km to the W of Mina Bolívar, in the vicinity of the town of Surumi, in the sectors called Hope and Abundance. This structure has a variable general direction, from N 20° E to N S in the NE sector, and dips ranging between 45° – 60° NW. The average width of the vein varies from 0.50 m to 2.50 m.

The structure, in surface emerges 2.2 km, and in level 0 is recognized for 750 m to the north and 200 m to the south, while drilling has identified it horizontally for over 1,500 m. The vertical continuity of this structure up to 3,770 m above sea level (250 m below Level 0).

Mineralogically, it consists of a brecciated structure with Marmatite, Pyrite, Quartz, Galena, Sphalerite, Siderite and traces of Sulfosalts. The distribution of mineralization along the vein is irregular, with higher zinc and silver in the central part and higher concentrations of silver and lead towards the NE, while towards the SW the presence of zinc is predominant.

7.6.13 3230 Veta Negrita (NEG)

This structure is the most recently discovered in the deposit established in 2010. It is a very irregular structure both in strike and thickness and dipping is also irregular changing direction in several sections.

This structure is recognized from Level -125 with the development of 67m towards the SW. It also has developed in sub levels -140, -155 and-170, with a length of 120 m. Continuity has not yet been determined.

Striking N 80 E S 80 W, with dips that oscillate between 60-70 NW, varying to the SE. This structure is brecciated throughout its length and is located in shales with intercalations of thin sandstone beds. Mineralogy includes Marmatite, Sphalerite, Silver Sulfosalts, Pyrite, with scarce Galena and Quartz.

The width of the structure is very variable from 0.30 m to 1.30 to as high as 3.00 m. It should be noted that is characterized by significantly high Zinc, making this an important structure despite the irregular behavior both horizontal and vertically.

7.6.14 3101 Veta Santa Rosa 3 (SR3)

Veta Santa Rosa 3 has irregular mineralization, general strike N 60° E, average dip of 70° NW, and average width of 1.00 m to 2.00 m. The developed length is 100 m in all levels worked, and its northern extension is defined by this structure and less mineralization. It extends 300 m defined by drilling.

Santa Rosa 3 mineralogically is composed of: fine-grained Sphalerite, Wurtzite, Cassiterite, Sulfosalts (Jamesonite, Zinkenite and Boulangerite) and Quartz.

7.6.15 3102 Veta Santa Rosa 4 (SR4)

The average width of this structure varies from 0.50 m to 1.10 m, the average strike is N 80° E and the average dip of 68°NE, it has been recognized in a length of less than 150 m.

Mineralogically it is similar to Santa Rosa 3.

7.6.16 3070 Veta Nané Extension (EXN)

This vein has a general E-W heading, an inclination that varies from 55° to 75°NW. It is bounded by the Pomabamba vein and Nané to the SW and Nané SW to the NE.

The mineralization is regular is made up mostly of Sphalerite, Wurtzite, Stannine, Cassiterite, Jamesonite, Zinckenite, Boulangerite, Pyrite, Quartz, Chalcopyrite and Siderite. The average width of this structure is 1.90 m.

Towards the level -300 is defined the vertical joint with Pomabamba and Nané SW veins delimiting it.

8 DEPOSIT TYPES

The most important ore deposits of the Eastern Cordillera are polymetallic hydrothermal deposits mined principally for Sn, W, Ag and Zn, with sub-product Pb, Cu, Bi, Au and Sb. They are related to stocks, domes and volcanic rocks of Middle and Late Miocene age (22 to 4 Ma). Mineralization occurs in veins, fracture swarms, disseminations and breccias. The deposits of the Eastern Cordillera are epithermal vein and disseminated systems of Au, Ag, Pb, Sb, as that have been telescoped on to higher temperature mesothermal Sn-W veins and, in some cases, porphyry Sn deposits. The telescoping is a characteristic of these deposits and is the result of collapse of the hydrothermal systems, with lower temperature fluids overprinting higher temperature mineralization. The systems show a fluid evolution from a high temperature, low sulfidation state to intermediate sulfidation epithermal and high sulfidation epithermal.

A typical example is the Cerro Rico where high temperature veins at depth, with a low sulfidation assemblage of cassiterite, wolframite, pyrite, arsenopyrite, bismuthinite and minor pyrrhotite (the main tin-tungsten ore stage), are overprinted at higher levels by an intermediate sulfidation epithermal assemblage of Ag-Pb-Sb sulfosalts (the main silver ore stage), with disseminated high sulfidation epithermal silver mineralization in the upper part of the system (a major silver resource).

These polymetallic deposits have been described as Bolivian Polymetallic Vein Deposits by the U.S. Geological Survey (Ludington et al., 1992). The characteristics of this type of deposit are as follows (Ludington et al., 1992; Redwood, 1993; Sillitoe et al., 1975):

1. Lithological Control. Paleozoic, Mesozoic and Cenozoic sedimentary rocks and metsediments;

2. Structural Control. Hinge zones of regional anticlines;

3. Subvolcanic Intrusions. Spatially and genetically related to stocks and volcanic rocks with 60-70 % SiO2, clusters of dikes and/or porphyritic domes of rhyolite, dacite, rhyodacite, or quartz latitite composition with alkaline tendencies. The mineralization can occur within the stocks and domes, in volcanic rocks (e.g., Porco, Caballo Blanco), or in sedimentary rocks distal to stocks (e.g., Bolivar) or inferred to be related to buried stocks (e.g., Huanuni);

4. Style of Mineralization. Disseminated, parallel veins, veinlets, fracture swarms, breccias;

5. Ore Minerals. Pyrite, marcasite, pyrrhotite, sphalerite, galena, cassiterite, arsenopyrite, chalcopyrite, stibnite, stannite, teallite, tetrahedrite, tennantite, wolframite, bismuth, bismuthinite, argentite, gold, and Ag-Sb-sulphosalts (freibergite, andorite), Pb-Sb-sulfosalts (zinkenite, boulangerite, jamesonite), Pb-Sn-Sb-sulfosalts (franckeite, cylindrite), and Bi sulfosalts. Telescoping of intermediate sulphidation epithermal mineralization of Au, Ag, Pb, Sb, As, etc. on to higher temperature mesothermal, low sulphidation Sn-W mineralization is characteristic;

6. Gangue Minerals. Quartz, barite, and Mn carbonate. There is a transition upward from massive sulfides, to quartz, quartz-barite, and barite-chalcedony towards the upper parts of the deposits; and

7. Hydrothermal Alteration. Sericitic (sericite-quartz-pyrite) often with tourmaline in the central part and zoned outward to argillic and propylitic alteration. The upper zones have advanced argillic lithocaps with alunite, residual vuggy silica and silicification. Breccias are common.

The Bolivar deposit is considered a “Bolivian-type” polymetallic deposit which has the primary reference and quoted as described in Arce-Burgao (2009).

This type of mineral deposit represents the most common type of mineralization in the country. It is the product of widespread hydrothermal activity between 22 Ma and 4 Ma. The deposits are characterized by a polymetallic signature which is usually telescoped coexistence of low and high temperature minerals and are spatially related to epi-zonal and meso-zonal intrusions.

Early stages of mineralization are high temperature, high salinity, and high pressure, indicative of great formations depths. Several overlapping stages of lower temperature events, due to later igneous events and supergene process is during evolution of the Andes, occurred between 11 Ma and 4 Ma.

These widespread deposits were classified as “Bolivian-type” polymetallic veins by Luddington et al (1992). In general, the deposits have similar origins although they differ with respect to metal signatures and/or fluid geochemistry.

The style of mineralization includes groups of veins, subsidiary vane swarms, veinlets, stockwork, and dissemination mineralization. The veins are hosted in a variety of host rocks that include paleozoic sedimentary and metasedimentary rocks, meso-zonal and epi-zonal stocks, and syn-kinematic flows, dikes and volcanic domes that are generally of rhyolitic, dacitic, and acidic compositions.

The identified metallic minerals, although not necessarily present in the same deposit, are cassiterite, sphalerite, galena, pyrite, pyrrhotite, arsenopyrite, chalcopyrite, stibnite, stannite, tetrahedrite, wolframite, native bismuth, bismutunite, argentite, native gold, and complex sulphosalts such as teallite, franckeite, and cylindiite. The main economical exploitable minerals are tin and silver, with less important tungsten, bismuth, an antimony.

Several of these deposits are classified as giant, such as Sierra Rico de Potosi and LIallagua or “world class” such as Oruro and Huanumi. The temperatures of homogenization and the salinities obtained from fluid inclusions in quartz and in sphalerite, and less commonly in cassiderite and barite, average 300 degrees C and 20% weight equivalent NaCl, respectively.

Turneaure (1970), based on studies of fluid inclusions identified an early boiling during mineral deposition, which was confirmed by later studies that showed boiling occurred intermittently throughout all stages of mineral deposition, which was confirmed by later studies that showed boiling occurred intermittently throughout all stages of mineral deposition (Arce Burgoa and Nambu 1989).

The Bolivian vein deposits can be identified into three subgroups:

1. Deposits associated with tin porphyries;

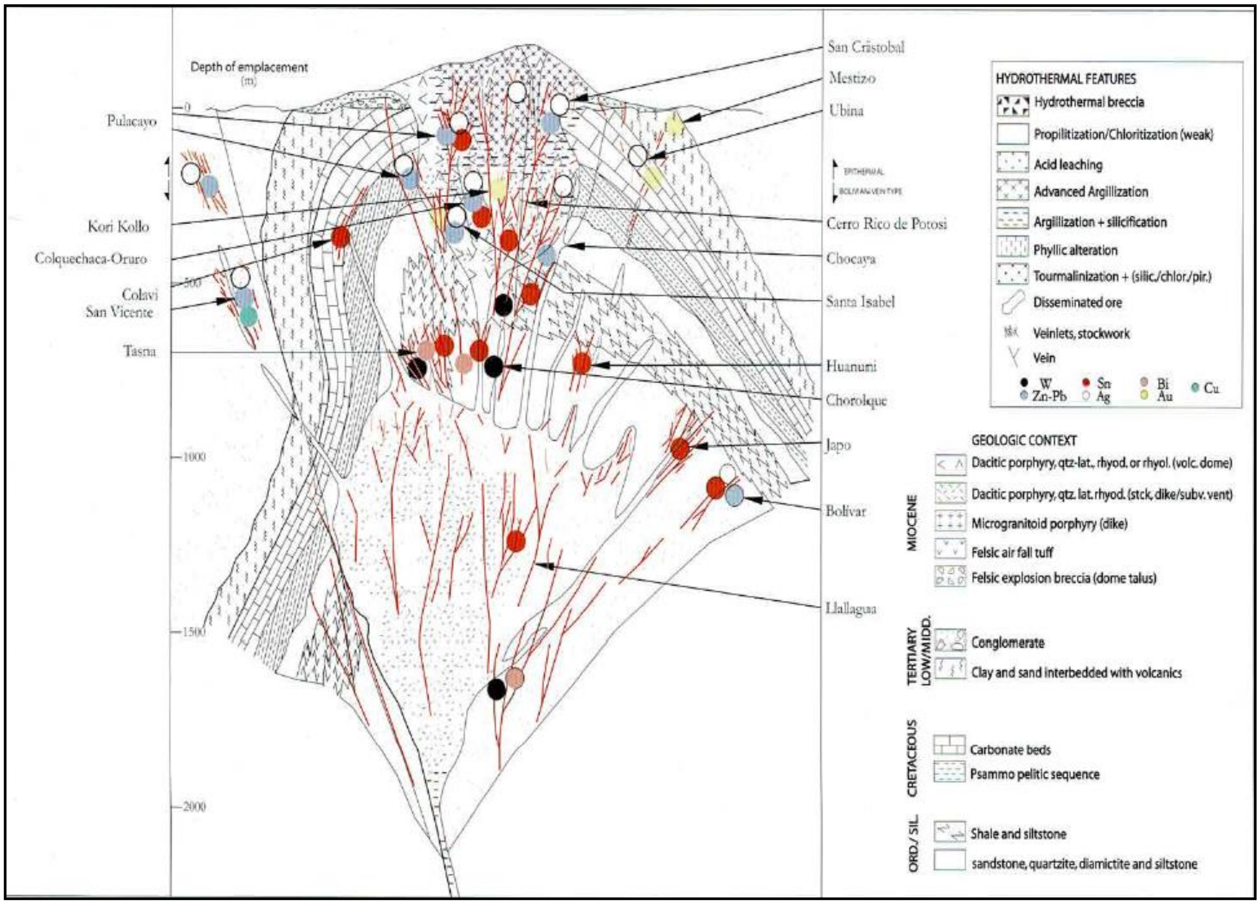
2. Deposits associated with volcanic domes and sub volcanic stocks; and

3. Deposits associated with sedimentary rocks. This classification is based mainly on host rock lithology.

On a district scale, deposits from the different subgroups may sometimes be spatially and or genetically associated.

The Bolivar zinc-tin deposit is located 90 km southeast of Oruro, in the Canadon Antequera district (Figure 8-1). Mineralogy of the deposit includes sphalerite, galena, cassiterite, jamesonite, pyrite, arsenopyrite and marcasite in a dominant gangue of quartz.

Figure 8-1: Conceptual Modelo of Bolivian Polymetallic Vein Type Deposits (modif. From Heuschmidt, 2000)



Source: Heuschmidt (2000)

9 EXPLORATION

There has not been any exploration performed on behalf of Santacruz.

10 DRILLING

There has not been any drilling performed on behalf of Santacruz.

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

No sampling has been performed on behalf of Santacruz.

12 DATA VERIFICATION

12.1 Verifications by the Authors of this Technical Report

Multiple site visits were conducted by the QPs, as detailed in Section 2.2 (Table 2-1). The purpose of these visits was to fulfill the requirements specified under NI 43-101 and to familiarize with the property. These site visits consisted of underground tours of non-mineralized development headings, sampling, storage areas and existing infrastructure.

No limitations or failures to conduct data verification were identified by the QPs in the preparation of this Technical Report.

12.2 Geology and Resources

Garth Kirkham, P. Geo., visited the property between August 10 through August 13, 2021. The site visit included an inspection of the property, offices, underground operations, core storage facilities, and tours of major centres and surrounding villages most likely to be affected by any potential mining operation.

The tour of the property showed a clean, well-organized, professional environment. On-site staff led the author through the methods used at each stage of the resource estimation process. All methods and processes are up to industry standards and reflect best practices, and no issues were identified.

A visit to the underground operations showed that extensive, on-going mining operations.

Based on the site visit and an inspection of all aspects of the project, the author is confident that the data and results are valid, including all methods and procedures. It is the opinion of the independent author that all work, procedures, and results have adhered to best practices and industry standards required by NI 43-101. No duplicate samples were taken to verify assay results, but the author believes that the work is being performed by a well-respected, large, multi-national company that employs competent professionals that adhere to industry best practices and standards.

The core is accessible, and the core is stored in covered racks. However, going forward it is recommended that the company refurbish some of the core facilities. In addition, it would be recommended that the core be re-arranged for easier access and analysis along with creating a core map.

The author is confident that the data and results are valid based on the site visit and inspection of all aspects of the project, including methods and procedures used. It is the opinion of the independent author that all work, procedures, and results have adhered to best practices and industry standards required by NI 43-101. No duplicate samples were taken during the April 2015 site visit to verify assay results and the author was satisfied with the results from previous verification sampling. In addition, there were no limitations with respect to validating the physical data or computer-based data. The author is of the opinion that the work was being performed by a well-respected, large, multi-national company that employs competent professionals that adhere to industry best practices and standards.

12.3 Metallurgy

The metallurgical data used in this report is taken from operating information. The reconciled data was compared to the daily sampling data, which was used for this report, to check that the daily data is within a reasonable range compared to the reconciled data.

The reconciled data is based on the sale of concentrates to a smelter. The concentrates are weighed and sampled by a third party whose function is to act without bias to determine the metal received at the smelter in order to determine the correct payment for the concentrates.

12.4 Site Visit for Mining, Infrastructure and Environment & Permitting

The description of mining processes, methods and production rates used in this report is based on mine surface and underground visits to representative work areas on August 11, 2021, and production reports subsequently provided by Glencore. The author's analysis and reconciliation of the data shows that it accurately describes the operation at the time of the visit. Mine and plant Infrastructure, including tailing facilities and water treatment plants was also observed to be as described in provided information as described herein.

Technical software and methods are modern and professionally applied. The author is confident that the property is described accurately to the level of detail required for this stage of report.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

No metallurgical testing has been performed on behalf of Santacruz.

14 MINERAL RESOURCE ESTIMATE

There is no current mineral resource estimate on behalf of Santacruz.

15 MINERAL RESERVE ESTIMATE

There is no current mineral reserve estimate performed on behalf of Santacruz.

16 MINING METHODS

There are no current mining methods for the property.

17 PROCESS DESCRIPTION / RECOVERY METHODS

There are no current process description / recovery methods for the property.

18 PROJECT INFRASTRUCTURE AND SERVICES

There are no current project infrastructure and services for the property.

19 MARKET STUDIES AND CONTRACTS

There are no current market studies and contracts performed on behalf of Santacruz.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACTS

There are no current environmental studies, permitting and social or community impacts performed on behalf of Santacruz.

21 CAPITAL COST ESTIMATE

There is no current capital cost estimate performed on behalf of Santacruz.

22 OPERATING COST ESTIMATE

There is no current operating cost estimate performed on behalf of Santacruz.

23 ECONOMIC ANALYSIS

There is no current economic analysis performed on behalf of Santacruz.

24 ADJACENT PROPERTIES

There are no adjacent properties.

25 OTHER RELEVANT DATA AND INFORMATION

Additional properties under Glencore management and ownership that contribute to the Glencore Bolivian metal production are Porco and Caballo Blanco. Resources for all these properties including Bolivar, which is the subject of this report, are tabulated in Table 25-1.

Table 25-1: Glencore Resource Estimates for Bolivian Properties

Property	Commodity	Resource			
		Measured	Indicated	Measured and Indicated	Inferred
Bolivar	Mineralized Material (MM tonnes)	1.4	1	2.4	5.4
	Zinc (%)	12.7	12.2	12.5	9
	Lead (%)	1.4	1.3	1.4	0.9
	Silver (g/t)	308	283	297	350
Porco	Mineralized Material (MM tonnes)	0.7	0.4	1.1	2.2
	Zinc (%)	10.7	10.9	10.8	11.8
	Lead (%)	0.6	0.8	0.7	0.8
	Silver (g/t)	83	114	93	98
Caballo Blanco	Mineralized Material (MM tonnes)	0.9	0.6	1.6	2.3
	Zinc (%)	13.7	13.1	13.5	12.2
	Lead (%)	3.7	3.2	3.5	2.4
	Silver (g/t)	364	318	346	241

Source: Glencore (2020)

Glencore's Resources & Reserves report as of December 31, 2020 disclosed Bolivar, Porco and Caballo Blanco mineral resource statements as well as mineral reserve estimates as of December 31, 2020, which remain current for Glencore as of the date hereof. As the mineral resource and mineral reserve estimates pre-date Santacruz's agreement to acquire the Assets, Santacruz is treating them as "historical estimates" under National Instrument 43-101 - Standards of Disclosure for Mineral Projects (NI 43-101), but they remain relevant as the most recent mineral resource and reserves estimates for Bolivar, Porco and Caballo Blanco. Given the source of the estimates, Santacruz considers them reliable and relevant for the further development of the Project; and accordingly, they should be relied upon only as a historical resource and reserve estimate of Glencore, which pre-dates Santacruz's agreement to acquire the assets, however, the company is not treating the historical estimates as current Mineral Resources or Mineral Reserves.

A “Qualified Person” as per NI 43-101 has not done sufficient work to classify the historical estimate as current Mineral Resources or Mineral Reserves and Santacruz is not treating the historical estimate as current Mineral Resources or Mineral Reserves. Further drilling and resource modelling would be required to upgrade or verify these historical estimates as current mineral resources or reserves for the respective assets.

The resources have been reported as of December 31, 2020 at a Zinc Equivalent (ZnEq) cut-off grade 2%:

1. The Mineral Resources have been calculated in accordance with definitions in accordance with the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code), the 2016 edition of the South African Code for Reporting of Mineral Resources and Mineral Reserves (SAMREC) and the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Standards on Mineral Resources and Reserves (2014);

2. The ZnEq = (Zn% + (Pb% * 0.73) + (Ag g/t * 0.019290448));

3. The Mineral Resources have been calculated in accordance with definitions adopted by the Canadian Institute of Mining, Metallurgy and Petroleum. Employees of Glencore have prepared these calculations;

4. Mineral resources are not mineral reserves until they have demonstrated economic viability. Mineral resource estimates do not account for a resource’s mineability, selectivity, mining loss, or dilution;

5. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource and must not be converted to a Mineral Reserve. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration;

6. All figures are rounded to reflect the relative accuracy of the estimate and therefore numbers may not appear to add precisely;

7. Reported in-situ Mineral Resources do not consider mineral availability by underground mining methods; and

8. Historical Mineral Reserves and Resources are inclusive of Mineral Reserves shown at 100% ownership.

26 INTERPRETATIONS AND CONCLUSIONS

The current Bolivar mine complex consists of an underground mine, 1,100 t/d concentrator plant, maintenance workshop, shaft-winder, tailings storage facility, water treatment plants, supplies warehouse, main office, hospital, and camp.

On October 11, 2021, Santacruz entered into a definitive share purchase agreement (the "Definitive Agreement") with Glencore whereby Santacruz agreed to acquire a portfolio of Bolivian silver assets (the "Assets") from Glencore (the "Transaction"). The Assets include: (a) Glencore's 45% interest in the Bolivar Mine and the Porco Mine, held through an unincorporated joint venture between Glencore's wholly-owned subsidiary Sociedad Minera Illapa C.V. ("Illapa") and Corporación Minera de Bolivia ("COMIBOL"), a Bolivian state-owned entity; (b) a 100% interest in the Sinchi Wayra business, which includes the producing Caballo Blanco mining complex; (c) the Soracaya exploration project; and (d) the San Lucas ore sourcing and trading business. JDS Energy & Mining Inc. (JDS) was commissioned by Santacruz Silver Mining Ltd. (Santacruz) to prepare this Technical Report to support the disclosure of the acquisition for the Bolivar Project by Santacruz pursuant to the Transaction.

As the Bolivar Mine has been active for more than 200 years, mining procedures and methods have been developed empirically and customized to the geologic deposit characteristics, local conditions, and available technology. Glencore has embarked on a program of modernizing the mine, taking advantage of advances in mining equipment and methods:

- Safety is of paramount importance at the mine and concerns have been successfully addressed with the establishment of training programs, systems, and the incorporation of a safety culture into mine operations;

- Mine planning is well done with trained and motivated professionals using modern hardware and software tools. Redirection of these considerable resources aligned with goals set forth by new ownership can help to identify additional opportunities for value creation in this mature mine;

- Planned future development mostly follows the current resource down dip which will incur incrementally higher haulage, ventilation, and water handling costs with depth;

- Backfill generation and transport in longhole stopes seems to be a bottleneck to production, and forces modification of the stoping sequence to maintain production goals;

- The integrated approach in place towards environmental responsibility and community relations not only ensures compliance with local regulations and permit requirements but allows Bolivar to aim their programs and achievements towards international best practice standards;

- Illegal mining (as opposed to that carried out by legal Cooperativas) remains an issue, and control of unauthorized personnel into the mine is a challenge for the owners. Unauthorized access and mining, increases the potential for safety risks as well as impact to the resource itself, mine production and productivity; and

- Historic processing at the Bolivar mill demonstrates the metallurgy of the material mined at Bolivar. The operational data is validated by the monthly reconciliation based on the concentrate shipped to the smelter and the final reconciliation between the smelter and the mine.

Many risks exist which are common to most mining projects including operating and capital cost escalation, permitting and environmental compliance, unforeseen schedule delays, changes in regulatory requirements, ability to raise financing and metal price. Many of these ever-present risks can be mitigated with adequate engineering, planning and pro-active management. The most significant risks to this project and its continued development are related socio-economic and geo-political factors:

- Areas surrounding and adjacent to Bolivar are being actively mined by mining cooperatives which are organized independent mining bodies. They are an influential population recognized by the government as a valid economic entity for local development, and conduct their activities on separate claims, in abandoned mines, or granted areas adjacent to existing operations. They are an important group with which to work for good community stability, and rogue operators within this group can pose specific risks related to ownership and safety; and

- The Bolivar Mine, along with the other Glencore operations have established mechanisms for purchase and processing of mineralized material, and strong mutually beneficial working relationships with many of the local mining cooperatives. Currently an environment of good business and good community relations exists.

Current operation of the Bolivar Mine is subject to a joint venture agreement with the Bolivian government (“COMIBOL”) which has been in effect since 2014. Continued operation under this agreement is reliant upon a stable political and socio-economic climate. Impacts of government instability are difficult to predict and preempt:

- Historic political instability in Bolivia has cost Glencore dearly in nationalized assets. The current JV structure with COMIBOL seems to be a reasonable response to minimize this risk, but not eliminate it completely.

27 RECOMMENDATIONS

The Bolivar complex has been in operation for decades and continued operation under new ownership is expected to continue under similar operating parameters. Therefore, the recommended work program is focused on immediate validation and verification of the historic resource in compliance with NI-43-101, followed by or concurrent with, an operational focus on technical evaluation of production planning and operation to identify areas to increase profitability.

The QPs recommend verification and delineation of the Historic Resource, which is the subject of this report, along with targeted resource expansion. Total cost of the program is estimated at US $3.4 MM (Table 27-1) and consists of:

- Plan and execute a resource expansion program including drilling and underground sampling to fully identify and upgrade resources proximal to active mining areas for inclusion in the 2-year mine plan. This is important so that existing mine development can be fully utilized, and reductions in mine development requirements and rate of vertical descent realized;
- Review and revise resource classification criteria to insure NI43-101 compliance; and
- Validate and verify the historic resource and complete a technical report in order that the resource be considered current and may be relied upon.

Table 27-1: 2022 Recommended Work Program and Budget

Description	#	Unit	$/Unit	Total $000's
Drilling*	10,000	m	200	2,000
Underground Sampling*	12,500	#	50	625
Data Compilation, Model Update including QA/QC	120	hrs	250	30
Validate and Verify Historic Resources	120	hrs	250	30
Review and Revise Resource Classification	80	hrs	250	20
Reporting	150	hrs	250	38
Sub total				**2,743**
G&A				250
Contingency	15	%		411
Total				**3,404**

* Estimated with contractor rates; work can potentially be done in-house.

As well, other potential areas of opportunity were observed by the QPs during the site visit and data analysis stages of this report. It is suggested that in addition to routine continuous improvement programs, project management consider focusing technical and production resources in the following areas:

- Devote attention to material and personnel transport. Mine worker productivity is low partly because of excessive travel times to and from each work area. As well, the transport of waste rock is critical to stope productivity and stability with the mining methods being used. Mine transport is central to all aspects of the operation and a comprehensive program needs to be developed and executed;

- Good work is being done to identify and quantify specific stope dilution. Analysis and incorporation of findings into mining method selection, stope planning and mine operations is an opportunity to increase project value;

- Investigate opportunities to raise Process Plant throughput and reduce downtime to improve project economics;

- Metallurgical testwork to investigate opportunities to increase recoveries through grinding, reagent dosage or newer flotation technology;

- Environmental compliance and visual remediation projects make Bolivar a valued corporate citizen and these efforts should be continued. Especially useful are programs that introduce economic evaluations of community projects; and

- Continue open communication and fair business practices with mining cooperatives and surrounding communities to minimize risk of asset subjugation.

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29 UNITS OF MEASURE, ABBREVIATIONS AND ACRONYMS

Symbol / Abbreviation	Description
°	degree
°C	degrees Celsius
3D	three-dimensions
A	ampere
a	annum (year)
ac	acre
Acfm	actual cubic feet per minute
ACK	apparent coherent kimberlite
ALT	active layer thickness
ALT	active layer thickness
amsl	above mean sea level
AN	ammonium nitrate
ARD	acid rock drainage
Au	gold
AWR	all-weather road
B	billion
BD	bulk density
Bt	billion tonnes
BTU	British thermal unit
BV/h	bed volumes per hour
bya	billion years ago
C$	dollar (Canadian)
Ca	calcium
cfm	cubic feet per minute
CHP	combined heat and power plant
CIM	Canadian Institute of Mining, Metallurgy and Petroleum
cm	centimetre
cm^2	square centimetre
cm^3	cubic centimetre
Cu	copper
d	day
d/a	days per year (annum)
d/wk	days per week

Symbol / Abbreviation	Description
dB	decibel
dBa	decibel adjusted
DGPS	differential global positioning system
DMS	dense media separation
dmt	dry metric ton
DWT	dead weight tonnes
EA	environmental assessment
EIS	environmental impact statement
ELC	ecological land classification
ERD	explosives regulatory division
EWR	enhanced winter road
FEL	front-end loader
ft	foot
ft^2	square foot
ft^3	cubic foot
ft^3/s	cubic feet per second
g	gram
G&A	general and administrative
g/cm^3	grams per cubic metre
g/L	grams per litre
g/t	grams per tonne
h	hour
h/a	hours per year
h/d	hours per day
h/wk	hours per week
ha	hectare (10,000 m^2)
ha	hectare
HK	hypabyssal kimberlite
hp	horsepower
HPGR	high-pressure grinding rolls
HQ	drill core diameter of 63.5 mm
Hz	hertz
ICP-MS	inductively coupled plasma mass spectrometry
in	inch
in^2	square inch
in^3	cubic inch
IOL	Inuit owned land

Symbol / Abbreviation	Description
IRR	internal rate of return
JDS	JDS Energy & Mining Inc.
K	hydraulic conductivity
k	kilo (thousand)
kg	kilogram
kg	kilogram
kg/h	kilograms per hour
kg/m^2	kilograms per square metre
kg/m^3	kilograms per cubic metre
km	kilometre
km/h	kilometres per hour
km^2	square kilometre
kPa	kilopascal
kt	kilotonne
kV	kilovolt
kVA	kilovolt-ampere
kW	kilowatt
kWh	kilowatt hour
kWh/a	kilowatt hours per year
kWh/t	kilowatt hours per tonne
L	litre
L/min	litres per minute
L/s	litres per second
LDD	large-diameter drill
LG	low grade
LGM	last glacial maximum
LHD	load haul dump
LOM	life of mine
m	metre
M	million
m/min	metres per minute
m/s	metres per second
m^2	square metre
m^3	cubic metre
m^3/h	cubic metres per hour
m^3/s	cubic metres per second
Ma	million years

Symbol / Abbreviation	Description
MAAT	mean annual air temperature
MAE	mean annual evaporation
MAGT	mean annual ground temperature
mamsl	metres above mean sea level
masl	metres above sea level
MAP	mean annual precipitation
Mb/s	megabytes per second
mbgs	metres below ground surface
Mbm^3	million bank cubic metres
Mbm^3/a	million bank cubic metres per annum
mbs	metres below surface
mbsl	metres below sea level
Mct	million carats
mg	milligram
mg/L	milligrams per litre
MIDA	microdiamond
min	minute (time)
mL	millilitre
mm	millimetre
Mm^3	million cubic metres
mo	month
MPa	megapascal
Mt	million metric tonnes
MVA	megavolt-ampere
MW	megawatt
NG	normal grade
Ni	nickel
NI 43-101	National Instrument 43-101
Nm^3/h	normal cubic metres per hour
NQ	drill core diameter of 47.6 mm
OP	open pit
OSA	overall slope angles
oz	troy ounce
Pa	Pascal
PAG	potentially acid generating
PEA	preliminary economic assessment
PFS	preliminary feasibility study

Symbol / Abbreviation	Description
ppm	parts per million
psi	pounds per square inch
QA/QC	quality assurance/quality control
QP	qualified person
RC	reverse circulation
RMR	rock mass rating
ROM	run of mine
rpm	revolutions per minute
RQD	rock quality designation
s	second (time)
S.G.	specific gravity
Scfm	standard cubic feet per minute
SEDEX	sedimentary exhalative
SFD	size frequency distribution
SFD	size frequency distribution
SG	specific gravity
t	tonne (1,000 kg) (metric ton)
t	metric tonne
t/a	tonnes per year
t/d	tonnes per day
t/h	tonnes per hour
TCR	total core recovery
TMF	tailings management facility
tph	tonnes per hour
ts/hm^3	tonnes seconds per hour metre cubed
US$	dollar (American)
UTM	universal transverse mercator
V	volt
w/w	weight/weight
wk	week
wmt	wet metric ton
WRSF	waste rock storage facility
WRSF	waste rock storage facility

Scientific Notation	Number Equivalent
1.0E+00	1
1.0E+01	10
1.0E+02	100
1.0E+03	1,000
1.0E+04	10,000
1.0E+05	100,000
1.0E+06	1,000,000
1.0E+07	10,000,000
1.0E+09	1,000,000,000
1.0E+10	10,000,000,000

30 CERTIFICATES

CERTIFICATE OF QUALIFIED PERSON

WAYNE CORSO, P.E.

I, Wayne Corso, P.E., do hereby certify that:

1. This certificate applies to the Technical Report entitled "NI 43-101 Technical Report, Bolivar Project, Oruro, Bolivia", with an effective date of 21 December 2021, (the "Technical Report") prepared for Santacruz Silver Mining, Ltd.;
2. I am currently employed as Project Manager with JDS Energy & Mining Inc. with an office at Suite 900 – 999 West Hastings Street, Vancouver, British Columbia, V6C 2W2;
3. I am a graduate of the Colorado School of Mines. I have practiced my profession continuously since 1984. I have worked in technical, operations and management positions at mines in the United States and Canada. I have been an independent consultant for over thirteen years and have performed mine design, mine planning, cost estimation, operations & construction management, technical due diligence reviews and technical report writing for mining projects worldwide;
4. I am a Professional Mining Engineer (P.E. #58884) registered with the Arizona Board of Technical Registration. I am a member of the Society for Mining Metallurgy and Exploration;
5. I have read the definition of "qualified person" set out in National Instrument 43-101 and certify that by reason of education, experience, independence and affiliation with a professional association, I fulfil the requirements of a Qualified Person as defined in National Instrument 43-101;
6. I have visited the property on August 10, 2021;
7. I am responsible for Sections 1, 2, 3, 4, 5, 6.1, 6.2, 12.4, 25, 26, 27, 28 and 29 of this Technical Report;
8. I am independent of the Issuer and related companies applying all of the tests in Section 1.5 of the NI 43-101;
9. I have had no prior involvement with the property that is the subject of this Technical Report;
10. I am not aware of any material fact or material change with respect to the subject matter of the technical report that is not reflected in the Technical Report and that this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading; and
11. I have read National Instrument 43-101, Standards for Disclosure of Mineral Properties and Form 43-101F1. This technical report has been prepared in compliance with that instrument and form.

Effective Date: 21 December 2021
Signed Date: 21 December 2021

(Original signed and sealed) "Wayne Corso, P.E."

Wayne Corso, P.E.

CERTIFICATE OF AUTHOR

GARTH DAVID KIRKHAM, P.GEO.

I, Garth David Kirkham, P.Geo., do hereby certify that:

1. I am a consulting geoscientist and Principal of Kirkham Geosystems Ltd. since 1987 with an office at 6331 Palace Place, Burnaby, British Columbia;
2. This certificate applies to the Technical Report entitled “NI 43-101 Technical Report, Bolivar Project, Potosi, Bolivia”, with an effective date of 21 December 2021, (the “Technical Report”) prepared for Santacruz Silver Mining, Ltd.;
3. I am a graduate of the University of Alberta in 1983 with a B. Sc. I have continuously practiced my profession since 1988. I have authored many resource estimations and NI43-101 technical reports including Cerro Blanco Epithermal Au-Ag, Cerro Las Minitas Ag-Zn-Pb-Au-Cu, Avino Ag-Zn-Pb and Debarwa, and Kutcho Creek poly-metallic deposits;
4. I am a member in good standing of the Engineers and Geoscientists of British Columbia;
5. I have visited the property on August 10, 2021;
6. In the independent report entitled “NI 43-101 Technical Report, Bolivar Project, Potosi, Bolivia” with effective date 21 December 2021, I am responsible for Sections for Sections 1, 6.4, 7, 8, 9, 10, 11, 12.1, 12.2, 25, 26, 27 and 28;
7. I have not had prior involvement with the company nor the property that is the subject of this Technical Report;
8. I am independent of Santacruz Silver Mining, Ltd. as defined in Section 1.5 of National Instrument 43-101;
9. I have read the definition of “qualified person” set out in National Instrument 43-101 and certify that by reason of education, experience, independence and affiliation with a professional association, I fulfil the requirements of a Qualified Person as defined in National Instrument 43-101;
10. I am not aware of any material fact or material change with respect to the subject matter of the technical report that is not reflected in the Technical Report and that this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading; and
11. I have read National Instrument 43-101, Standards for Disclosure of Mineral Properties and Form 43-101F1. This technical report has been prepared in compliance with that instrument and form.

Effective Date: 21 December 2021
Signed Date: 21 December 2021

(original signed and sealed) “Garth Kirkham, P.Geo.”

Garth Kirkham, P.Geo.
Kirkham Geosystems Ltd.

CERTIFICATE OF QUALIFIED PERSON

Shane Tad Crowie, P. ENG.

I, Shane Tad Crowie, P. Eng., do hereby certify that:

1. This certificate applies to the Technical Report entitled “NI 43-101 Technical Report, Bolivar Project, Oruro, Bolivia”, with an effective date of 21 December 2021, (the “Technical Report”) prepared for Santacruz Silver Mining, Ltd.;
2. I am currently employed as Sr. Metallurgist with JDS Energy & Mining Inc. with an office at Suite 900 – 999 West Hastings Street, Vancouver, British Columbia, V6C 2W2;
3. I am a graduate of the University of British Columbia with a B.A.Sc. in Mining and Mineral Process Engineering, 2001. I have practiced my profession continuously since 2001. I have worked in technical, operations and management positions at mines in Canada. I have been responsible for recovery optimization projects, capital improvement projects, budgeting, planning, and pilot plant operations;
4. I am a Registered Professional Mining Engineer in British Columbia (#34052);
5. I have read the definition of “qualified person” set out in National Instrument 43-101 and certify that by reason of education, experience, independence and affiliation with a professional association, I fulfil the requirements of a Qualified Person as defined in National Instrument 43-101;
6. I have visited the property on August 10, 2021;
7. I am responsible for Sections 1, 6.3, 12.3, 26, 27 and 28 of this Technical Report;
8. I am independent of the Issuer and related companies applying all of the tests in Section 1.5 of the NI 43-101;
9. I have had no prior involvement with the property that is the subject of this Technical Report;
10. I am not aware of any material fact or material change with respect to the subject matter of the technical report that is not reflected in the Technical Report and that this technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading; and
11. I have read National Instrument 43-101, Standards for Disclosure of Mineral Properties and Form 43-101F1. This technical report has been prepared in compliance with that instrument and form.

Effective Date: 21 December 2021
Signed Date: 21 December 2021

(Original signed and sealed) “Shane Tad Crowie, P. Eng.”

Shane Tad Crowie, P. Eng.