NI 43-101 TECHNICAL REPORT
UPDATED RESOURCES AND RESERVES ASSESSMENT
AND PRE-FEASIBILITY STUDY

SANTA CRUZ GRAPHITE PROJECT
BAHIA BRAZIL

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1.0 SUMMARY

1.1 GENERAL

Dompieri Tecnologia em Mineração (DTM) was retained by South Star Mining Corp. (South Star) to prepare an independent Technical Report on the Santa Cruz Graphite Project (the Project), located near the town of Itabela, in the state of Bahia, Brazil. The purpose of this report is to support the disclosure of an updated Mineral Resource and Reserves estimate, designing to a pre-feasibility level (+/- 25%) the appropriate facilities required for mining, processing, waste management, ancillary facilities and infrastructure.

This Technical Report conforms to NI 43-101 Standards of Disclosure for Mineral Projects (NI 43-101). This Technical Report builds off the previously released Preliminary Economic Assessment (August 2017) and updated Resource Estimate (August 2019). The current study summarizes the exploration history, resource and reserves estimates, mine design, metallurgical testing, process design, infrastructure design, environmental studies, capital and operating cost estimates, project implementation planning, risk assessment and economic analyses performed during the Study period.

The mineral resource and reserve estimate incorporates the results of the 2018 field investigations and drilling information from Reverse Circulation (RC) and Diamond drilling (DDH) campaign on São Manuel North (B1) and São Rubens West target areas. DTM visited the property from June 17 to 18, 2019.

Brasil Grafite S.A., a wholly owned subsidiary of South Star, holds 100% interest in the Santa Cruz Graphite Project comprised of 13 mineral rights near the town of Itabela, Bahia, Brazil, totaling approximately 13,000 hectares.

1.2 PROPERTY DESCRIPTION, LOCATION AND TENURE

The Project is located near the town of Itabela in the southern part of Bahia state, Brazil. Access to the project can be made via 90 km of paved federal highways from the International Airport of Porto Seguro.

Basic services are available in Itabela (population 28,500), where the company field office is located, while medical services, hospitals, banks, commercial centers, schools and other services are available in the regional main town, Eunápolis (100,200 population), located approximately 28 km to the north.

The Project is comprised of 13 exploration licenses, all duly registered and in good standing with the Agência Nacional de Mineração (ANM), the Brazilian mining regulatory body.

1.3 GEOLOGICAL SETTING AND MINERALIZATION

The Project is in the Araçuaí Orogen, in the central eastern portion of Brazil, which partially covers the states of Bahia, Minas Gerais and Espírito Santo. This Orogen is located on the southern border of the São Francisco Craton and the belt has a long history with many subductions and several developments. Its history begins around 880 My, in the Macaúbas basin.

The Project origin can be classified as sedimentary. During late Precambrian age, pelites and carbon were deposited at the same time. Later in early Cambrian age, orogenic movements transformed these sediments to high grade metamorphic rocks, and these movements transformed the carbon to graphite (Kinzigite Complex).

The project is placed in Unit 3 of the Kinzigitic Complex with rock assemblages rich in graphitic gneiss and quartzite intercalations, layers and lenses of graphitic gneiss. These are of economic importance because they host some of the most important producing assets of large flake graphite in the Americas.

Mineralization was shifted by a regional fault and is controlled by the presence of soft materials along the shear zone associated with this fault. These soft zones contain many folds that are rich in high grade, large flake graphite deposits. In general, the deposit has a strike following this regional fault and dips from vertical to 65° northeast.

Structural domain varies throughout the Araçuaí Orogen, with the Project being in the eastern region of the Unit, where higher metamorphism with strong deformation is present and partial melting (anatexis) is observed. It`s possible that the eastern region of the Unit with the higher grades of metamorphism and significant foliation have led to larger flake deposits, when compared to other deposits located further west in the Unit.

Mineralization appears in the soft zones with partial anataxis, following a general NW strike regionally although with small variation to EW in localized area such as São Rubens. In the previous campaign the Santa Cruz geologists identified at least three different mineralized targets: São Manuel; São Ruben West, which extents towards south and north (proven with the holes 55-SCP-RC-029, 55-SCP-RC-030, 55-SCP-DDH-008; 55-SCP-RC-031 and 55-SCP-SC-032); and São Rubens Central. Several other targets have been identified based on preliminary investigations and drilling results. It is usual to observe high dips (sub vertical to vertical) where high metamorphism and highly deformed granites are most likely responsible for the graphite concentration. In general, mineralization is structurally controlled by the shearing zone along the regional fault.

The main mineralized targets of São Manuel and São Rubens show a continuous strike of approximately 8 km in length, and in general, follow the soft material and structural control along the valley floor. Widths vary from 40 m to 200 m wide in areas where folding is accentuated. Mineralization is easily identified visually with the presence of jumbo, large and medium graphite flakes within the metamorphosed sedimentary rocks.

1.4 EXPLORATION AND DRILLING

Santa Cruz Graphite Project is a recent discovery with no known exploration work prior to 2012 or previous reports currently identified in the project claims area. South Star has conducted detailed geological studies including, ground geophysical surveys, regional soils surveys, mapping and sampling and auger, diamond and reverse circulation drilling. The most recent exploration program occurred between October and December of 2018 and included 33 reverse circulation (RC) and 8 diamond drill holes (DDH), respectively totaling 1,285 m and 530 m in the São Manuel North (B1) and São Rubens West targets.

Hole locations were selected to better understand mineralization controls, define limits and expand the overall resource estimate.

1.5 SAMPLING ANALYSES

The Company has a comprehensive drill sampling security and Quality Assurance/Quality Control (QA/QC) program in place to ensure a high degree of confidence in sample results. Sampling methods, sample preparation and QA/QC procedures meet industry standards. All samples collected at the project have been delivered to a certified laboratory at SGS Geosol in Belo Horizonte, Brazil or SGS Lakefield in Ontario, Canada. Once sample results are received, the company geologist inserts proper grade into each corresponding database sample, thus providing a complete description for each data point including X, Y and Z coordinates, lithologic description, sample type, target area and grade result.

Laboratory pulps were then returned to the company and have been stored in a secured facility either at the field office or storage facility.

The QA/QC program consisted of:

- 1 standard for every 100 (one hundred) samples in order to test laboratory accuracy
- 2 blanks for every 100 (one hundred) samples in order to test contamination potential
- 2 duplicates for every 100 (one hundred) samples in order to test for splitting procedures

In addition, the QP collected 51 twin samples in order to further check splitting, storage and laboratory efficiency, returning positive and similar results.

Reverse circulation holes had samples collected every meter, resulting in higher average sample of 15-30 kg. Quartering was performed in the field using a riffle splitter and later the samples were sent to SGS laboratory. For every 100 samples of drilling, 5 duplicate, 3 blanks and 2.5 standards were included.

Other samples including boxes of chip, panel and trench samples have also been collected, following similar sampling and storage procedures.

1.6 MINERAL RESOURCE ESTIMATE UPDATE

DTM performed a mineral resource estimation update on São Manuel North (B1) and São Rubens West targets of Santa Cruz Graphite Project.

The database for the mineral resource estimation update contains 8 diamond drilling, 85 reverse circulation and 494 rotary drill holes. This database totals 4,976 m of drilling and 3,565 samples.

For the August 2019 TR Resource Update, the following items were completed: review of geological model; grade estimation; and classification of mineral resources. Also, during the Update, the following sets of factors were taken into consideration: quantity and spacing of available data; interpretation of mineralization controls; type of mineralization; and quality of utilized data.

The Effective Date of the Resource Update was established as at 30th June 2019, which was when the resource modeling was completed.

Table 1.1 – Santa Cruz Graphite Mineral Resources Summary, after São Manuel North (B1) and São Rubens West updates

Mineral Resource Estimate	Tonnage	Cg	In-situ Graphite
	(t)	(%)	(t)
Measured	3,947,550	2.40	95
Indicated	10,955,570	2.25	247
Total M & I	**14,903,100**	**2.29**	**341**
Inferred	7,911,450	2.32	184

Notes:

1) *Mineral Resources are as defined by the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves.*
2) *Mineral Resources are estimated using ordinary kriging method and a three-dimensional block model using a cut-off grade of 0.75% and 1% Cg, depending on the modeled zones.*
3) *Numbers have been rounded.*
4) *Mineral Resources that are not Mineral Reserves do not have economic viability.*
5) *Inferred Mineral Resource in this estimate are exclusive of the Measured and Indicated Resources.*

6) *Inferred Mineral Resource have a lower level of confidence than that applied to an Indicated Mineral Resource. It is reasonably expected that the majority of the Inferred Mineral Resource could be upgraded to an Indicated Mineral Resource with continued exploration.*

1.7 MINERAL PROCESSING & METALLURGICAL TESTING

The principal objective for the metallurgical testing was to produce a final concentrate with Cg ≥ 93-95% using minimal grinding and, as much as practical, to preserve the large and jumbo flake size. To date, several rounds of metallurgical testing have been performed for Santa Cruz´s ore confirming its amenability to simple processing, using proven and straightforward milling and flotation circuits.

Five separate test work rounds have been performed beginning with bench scale tests and ultimately to completion of a bulk sample of over 31,000 kg being tested through a pilot plant. Test work included:

- **Lyntek & RDi (Lakewood, CO – USA):** Bench scale test work performed in 2013 aimed at providing testing viability and initial estimates of concentrating Santa Cruz´s ore

- **CDTN (Belo Horizonte, MG – Brazil):** Bench scale test work performed in 2013 for PEA level engineering process work

- **Fundação Gorceix (Ouro Preto, MG – Brazil):** Bench scale and pilot plant test work performed in 2014 and 2015 involving large volume feasibility level engineering aimed at providing trade off analysis (reagents, retention times, grinding cycles and media), optimizations and flow sheet for Santa Cruz.

- **Processamento & Caracterização Mineral (Ouro Preto, MG – Brazil):** Bench scale and bulk sample testing were completed in 2018 aimed at updating 2014/2015 pilot plant testing, including trade off analysis (reagents, types of screens, retention times, grinding cycles and media), optimizations and final definition of flow sheet for Santa Cruz Project. One of the main goals of the program was to update the flow sheet to include filtered tails and simplify permitting and licensing requirements. More than 60 samples were tested, and the

mass and water balance were finalized for Phase 1 (5,000tpy) and Phase 2 (25,000tpy) operations.

- **URBIX (Mesa, AZ – US):** Detailed purification and expandability testing program performed to characterize and optimize the Santa Cruz concentrate for high end uses, including battery metals applications. The scope of work includes pre-purification and post purification analysis using the URBIX purification process (size and shape, impurity and mineralogy composition, classification of feed stock, classification of purified graphite and expandability testing.

1.8 MINERAL RESERVES ESTIMATE

1.8.1 MINERAL RESERVE ESTIMATE

The mineral reserve for the project includes three main ore bodies: São Manuel North, São Manuel South and São Rubens West. The reserve totalizes, with proved and probable, 12.308.431 tonnes with 2.40% of Cg. The table below shows the reserve by orebodies and separated on proved and probable.

Table 1.2 – Santa Cruz Graphite Mineral Reserve by orebodies

	Proved Reserves		Probable Reserves		TOTAL	
	TONNES	GRADE (%Cg)	TONNES	GRADE (%Cg)	TONNES	GRADE (%Cg)
São Manuel North	2,099,166	2.40	5,640,948	2.26	7,740,115	2.30
São Rubens West	1,890,468	2.60	2,045,521	2.54	3,935,989	2.57
São Manuel South			632,327	2.59	632,327	2.59
TOTAL	**3,989,635**	**2.49**	**8,318,796**	**2.35**	**12,308,431**	**2.40**

Notes:

1) *Mineral Reserves are as defined by the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves.*
2) *Mineral Reserves are based on Mineral Resources (Published on July 8th, 2019) estimated using ordinary kriging method and a three-dimensional block model using a cut-off grade of 0.75% and 1% Cg, depending on the modeled zones.*
3) *Numbers have been rounded.*
4) *Mineral Reserves have incorporated cut-off, pricing, costs, recovery & FX.*

1.9 MINING METHODS

Current resources lie within altered, oxidized material that can be excavated without blasting. The mining method selected for the Project is conventional open pit with excavator, dozer and haul trucks. Life of mine strip ratio is favorable, at 1.6 tonnes of waste for each tonne of rock mined. Operations for the Life of Mine (LOM) have been divided into following two phases:

- Phase 1 Pilot Plant Operations (5,000 tpy of concentrate); &
- Phase 2 Operations (25,000 tpy of concentrate).

A contracted fleet has been considered for Phase 1 & 2 operation.

This report will discuss dilution, costing and pricing assumptions, pit geometries and geotechnics, pit sequencing, grade control and operational assumptions in the next chapters.

1.10 RECOVERY METHODS

The results of the tests show high quality graphite with recoveries of 82% achieved via simple grind + flotation circuits, indicating no major difficulties in concentrating to 94-95% Cg.

Based on the results of the pilot plant tests, a process flow circuit consisting of material homogenization, segregation, grinding, conditioning, flotation, drying and packaging was developed.

Filtered tails testing was successfully completed and incorporated into the flow circuit and allows improved water recirculation while also eliminating the requirements for tailings storage facility.

The tailings filter cake will be co-disposed in the waste rock facility.

1.11 GRAPHITE CONCENTRATE

Santa Cruz´s concentrate from the testing programs, shown on Table 1.3, successfully achieved a high-quality product with large percentages of jumbo and large

flake sizes coupled with high grade Cg (> 94/95%). The results confirm that the Project can produce attractive concentrates with a premium product range of flake sizes.

Table 1.3 – Santa Cruz's Graphite Concentrate

	Distribution	% Cg
30#	4%	95%
50#	32%	95%
80#	27%	97%
140#	17%	97%
-140#	20%	97%
Recovery 82%		

An ultra-pure +99.95% Cg concentrate has also been produced using the URBIX purification system, demonstrating the Project is also able to provide product for the projected high growth battery market.

1.12 PROJECT INFRASTRUCTURE

Ancillary buildings, waste storage facilities, closure costs as well as general support services and infrastructure have been included in the engineering design and capital cost estimates for the Project.

The town of Itabela, which is located less than 5 km from the Project, will serve as the base of operations. The deepwater port of Ilhéus is located approximately 270 km to the north via paved federal highways and provides favorable access to Brazilian and international markets.

Phase 1 & 2 Project infrastructure includes:

- Off-site and on-site access roads, including haul roads
- Workshops & warehouse;
- Fuel storage;
- Waste storage facility (WSF) and overburden dump;
- Open Pit;
- Run-of-mine (ROM) stockpile;

- Process facilities;
- Power supply and distribution system;
- Water supply (Wells) and distribution system;
- Drainage structures and sediment control facilities;
- Sewage collection and management facility;
- Solids waste collection facility;
- Administration structures; &
- Communications.

1.13 MARKET STUDIES & CONTRACTS

According to USGS data, China is the world's leading producer of natural flake and amorphous graphite, supplying approximately 67% of the market. Mozambique, Brazil, India, Canada and Madagasgar collectively contribute an additional 30% of global production. Total mine production in 2019 was estimated to be approximately 1.1Mt.

Benchmark Minerals estimates world-wide graphite demand to significantly increase over the next 5 to 10 years to over 4M tpa, principally associated with the growth of battery metals, electric vehicles and electronics. Industrial applications for natural graphite production has risen at a CAGR of about 2.3% between 1900 and 2014. Forecast market growth assumes moderate growth in traditional markets such as refractories and significant growth in spherical and expanded graphite.

Risks include overproduction of flake graphite in China, a slowing steel industry, slower sales of electric and hybrid vehicles than predicted (hence lower battery production) and battery technology shifts.

The key to a successful graphite project (as with other industrial minerals) is to be able to produce a balanced range of products for a range of markets, ensuring that all production can potentially be sold and dilute risk across market cycles.

Available metallurgical test data indicates that the Santa Cruz project has the potential to supply a range of traditional markets (e.g. refractories, steels and components) and also to supply growth markets such as spherical graphite and expandable graphite.

According to the pilot plant work completed, there is flexibility to modify flake size distribution by changing the process to either remove coarse flakes at an early stage, or to mill / regrind and screen to achieve a broad range of products.

Based on current pricing and metallurgical test results, a CIF basket price of $1,287 per ton of flake graphite >93-95% C is used as the base case for a PFS.

1.14 ENVIRONMENTAL AND MINING RIGHTS PERMITTING & LICENSING

The simplified environmental permit for Phase 1 operations was approved and published in the Itabela municipality official gazette in Feb.19th, 2020. The license is valid for 1 year and is renewable on an annual basis.

The trial mining license (“Guia de Utilização”) for Phase 1 operations was submitted to the ANM in December 2019 and is in evaluation.

The Project area is largely deforested and is currently used for small scale agriculture, cattle grazing and eucalyptus plantations. The goal of the Project is to minimize additional environmental impacts. Filtered tailings was incorporated into this study phase in order to avoid the requirements of a tailings storage facility (TSF) and the schedule required to permit this structure.

Operations are staged in a two-phase approach. Phase 1 operations are based on a pilot plant scale production of 5,000 tpy of concentrate. Graphite, like many industrial metals, requires a qualification process where progressively larger samples are sent to potential buyers, which leads to large scale orders, once the technical specification of the products are tested and ensured.

The environmental permitting process for Phase 1 operations was based on a simplified approach where an Environmental Authorization for small scale mining and production was requested in order to confirm the commercial viability of the production as well as work through the product qualification process. The process involved a simplified approach using a RCA/PCA (environmental control report and environmental control plan), where baseline conditions and the Project area of influence were determined. Environmental and social impacts were evaluated and monitored in an on-going basis. A

simplified plan of mitigating construction and operational impacts was presented at this phase for the pilot plant Project. This environmental permitting process was pursued at the Municipal level, which is administering the process for State and Federal Agencies, as allowed by current legislation.

Phase 1 Mining License is based on the trial mining (Guia de Utilização) within Agência Nacional de Mineração (ANM) based on limit of 5000 tpy production of concentrate.

Phase 2 operations will be for 25,000 tpy production of concentrate. More complete approach, involving the traditional three environmental licensing steps will be proceeded: the preliminary license (LP), Construction or Installation License (LI) and finally the operating license (LO).

This permit provides authorization for the operation of the facility or project, following verification of effective compliance with the requirements of the Preliminary and Installation Permits (LP/LI). The operating permit is usually valid for a minimum of four years and a maximum of ten years, depending on the impact classification and is renewable, based upon the environmental compliance record.

Phase 2 Mining License is based on submittal and approval of the full mining concession (Portaria de Lavra) administered by Agência Nacional de Mineração (ANM). The environmental and mining license processes will be applied for in parallel and approval of both are required for operations. Concessions are deemed granted when published in the National Official Gazette.

1.15 CAPITAL & OPERATING COSTS

Capital Expenditure (CAPEX) were estimated for the Project, including the following major items:

- Initial Capital Expenditure – direct costs, indirect costs and contingency.
- Sustaining – expenditure with mine roads development and others; and
- Mine closure – mainly expenditure associated with good environmental practice.

Capex estimation accuracy is “pre-feasibility level”, so based on conceptual projects and designs, informal quotes of main equipment and structures and indices-based estimations.

Capex data (basic) sources were the following:

- Mining operations will be contracted, limiting required investments in mining equipment
- Pre-stripping cost is based on earth moving volume and waste removal unitary cost estimate
- Plant equipment
- Plant construction cost
- Waste and tailings deposit area preparation cost
- All other Capex costs were estimated based on DTM’s database on similar projects and industry cost estimation indices
- All values were estimated in Brazilian currency (BRL), and then converted to American dollars (USD) at a rate of BRL 3.95 per USD
- Working capital was estimated as 6 months of operational expenses
- Financing (project, equipment, etc.) was not considered in this study and report but will be considered, obviously, if available and “cost effective”

1.16 ECONOMIC ANALYSIS

The financial analysis shows very favorable and robust results that highlight the Santa Cruz´s projects advantages in the graphite sector.

Key Financial Results:

- Phase 1 Average Production of 5,000 tpy of 95% Cg Concentrate in Years 1 & 2

- Phase 2 Ramping up from 13,500 tpy of 95% Cg Concentrate in Year 3 to an average production of 25,000 tpy in years 4-11
- Average Basket Price of Products of US$1,287/t
- Open-pit mining with strip ratio of 1.6 Life of Mine (LOM)
- 12-Year LOM
- Exchange Rate of R$3.95 to US$1.00
- Post-Tax NPV5% of US$81.2M and internal rate of return of 35%
- US$129M Post-tax Cash Flow LOM
- Payback Period of 4 years
- CAPEX & OPEX Parameters for Each Phase are listed below:

Parameter	Phase 1 (US$)	Phase 2 (US$)	Phase 1 & 2 (US$)
CAPEX	7.3M	27.2M	34.5
OPEX ($/t Concentrate)	604	386	396

1.17 ADJACENT PROPERTIES

The project area is generally rural, agricultural land used mostly for cattle grazing, small crops with some lumber interests. The main ore bodies of São Manuel and São Rubens are open to the east, south and northwest, which are currently being evaluated for further drilling and resource upgrade.

Other large companies and operators like Nacional de Grafite and RHI Magnesita also have mineral rights in the region where South Star has a dominant key strategic position.

2.0 INTRODUCTION

2.1 GENERAL

This technical report contains an update of the resource evaluation of Santa Cruz Graphite Project (the “Project”) near the town of Itabela, Bahia state, Brazil. Itabela is a town with approximately 28,500 inhabitants and is accessible via 90 km of paved federal highways from the International Airport in Porto Seguro.

Brazil is the third largest producer of graphite in the world and is home of the largest high-quality flake graphite producer outside of China. Brazil has two producing companies that combined have an approximate annual output of approximately 100,000 tonnes of graphite out of 4 operating mines, which is close to 10% the total world supply. The Project is in one of the most established and prospective areas in Brazil for graphite with 3 active open pit mines (over 70 years of continuous production) and several development projects and exploration targets located in the region. The Project has excellent infrastructure and logistics and is in a proven area with historic mining activities and within a state that promotes, supports, and invests in mineral resource development.

2.2 SOURCES OF INFORMATION

Information used in this report has been provided by South Star Mining and its consultants, with revision, preparation, consolidation and approval by Luiz Eduardo Pignatari, independent Qualified Person.

2.3 QUALIFIED PERSONS

Eng. Luiz Pignatari (QP for Resources and Reserves – Comisión Calificadora de Recursos y Reservas Chile)

2.3.1 QUALIFIED PERSON'S TEAM

The following staff worked under the QP's supervision:

- Prof. Dr. Maurício Dompieri – Mining Engineer
- Maurício Prado – Senior Geologist

- Felipe Baffi – Mining Engineer
- Márcio Massashi Goto – Senior Mining Engineer
- Sérgio Oliveira Souza – Mechanical Engineer
- José Geremias dos Reis – Project Technician
- Pedro Paulo Batista – Senior Mining Engineer
- Ronald J. E. Stewart – B.Sc. Metallurgy
- Gustavo Duran – Senior Metallurgical Engineer
- Cassiano Teixeira – Senior Mechanical Engineer
- Edmar Palleta – Senior Electrical Designer
- Plácido Borges Campos – Senior Process Engineer
- Juarez Mesquita – Senior Mechanical Engineer

2.4 PREVIOUS REPORTS & INFORMATION SOURCES

In August of 2017, South Star completed a NI43-101 Preliminary Economic Analysis (PEA) Technical Report.

In August of 2019, South Star completed a NI43-101 Updated Resource Technical Report.

These reports were prepared by DTM and serve as the basis for this report.

2.5 TERMS OF REFERENCE & ABBREVIATIONS

The technical report is a review of previous information and resource estimates performed by South Star Mining on the Santa Cruz Graphite Project and incorporates new field investigations and drilling results into an updated resource estimate.

All measurements used in this report are presented in metric units and monetary units are presented in United States dollars (USD), and in Brazilian currency where indicated (BRL). Geographic units are presented in UTM coordinate system. A table of abbreviations is presented in Table 2.1.

Table 2.1 – List of Abbreviations

abbreviation	parameter
tonnes or mt	metric tonnes
tpy	tonnes per year
tpd	tonnes per day
tph	tonnes per hour
kg	kilograms
ha	hectares
m	meters
km	kilometers
m^3	cubic meters
ºC	degrees Celsius
g	grams
Cg	carbon graphite
g/t	grams per tonne

2.6 EFFECTIVE DATE AND DECLARATION

The effective date of this Technical Report is January 31th, 2020.

The Authors believe that the basic assumptions contained in the information above are factual and accurate, and that the interpretations are reasonable. The Authors have relied on this data and have no reason to believe that any material facts have been withheld. The Authors also have no reason to doubt the reliability of the information presented herein.

2.7 SITE VISIT

The latest site visit occurred on June 17 and 18, 2019 by the team listed below:

- Luiz Eduardo Pignatari (QP Resources/Reserves) – Mining Engineer
- Maurício Prado – Senior Geologist
- Nestor Alvarez – South Star Senior Geologist

3.0 RELIANCE ON OTHER EXPERTS

The following professionals have been consulted in the making of this report, regarding specific project information:

- Aldo Moreno – (2017 PEA QP Resources) – Senior Geologist
- Nestor Alvarez – South Star Senior Geologist
- Juan Manuel Alvarez – South Star Senior Geologist

4.0 PROPERTY DESCRIPTION AND LOCATION

4.1 PROJECT OWNERSHIP

Brasil Grafite S.A., a wholly owned subsidiary of South Star Mining, holds 100% interest in the Santa Cruz Graphite Project. The current ownership structure of Santa Cruz Project is presented in Figure 4-1.

Figure 4-1 – Santa Cruz Graphite Project Ownership

4.2 PROJECT LOCATION

The Project is located near the town of Itabela in the southern part of the state of Bahia, Brazil. According to the 2010 census, Itabela is a town with approximately 28,500 inhabitants and is accessible via 90 km of paved federal highways from the International Airport in Porto Seguro, Bahia. The airport is served with daily national and international flights. The main mineral target is centered on coordinates UTM: E:435,640m and N: 8,169,520 m. A location map is presented in Figure 4-2.

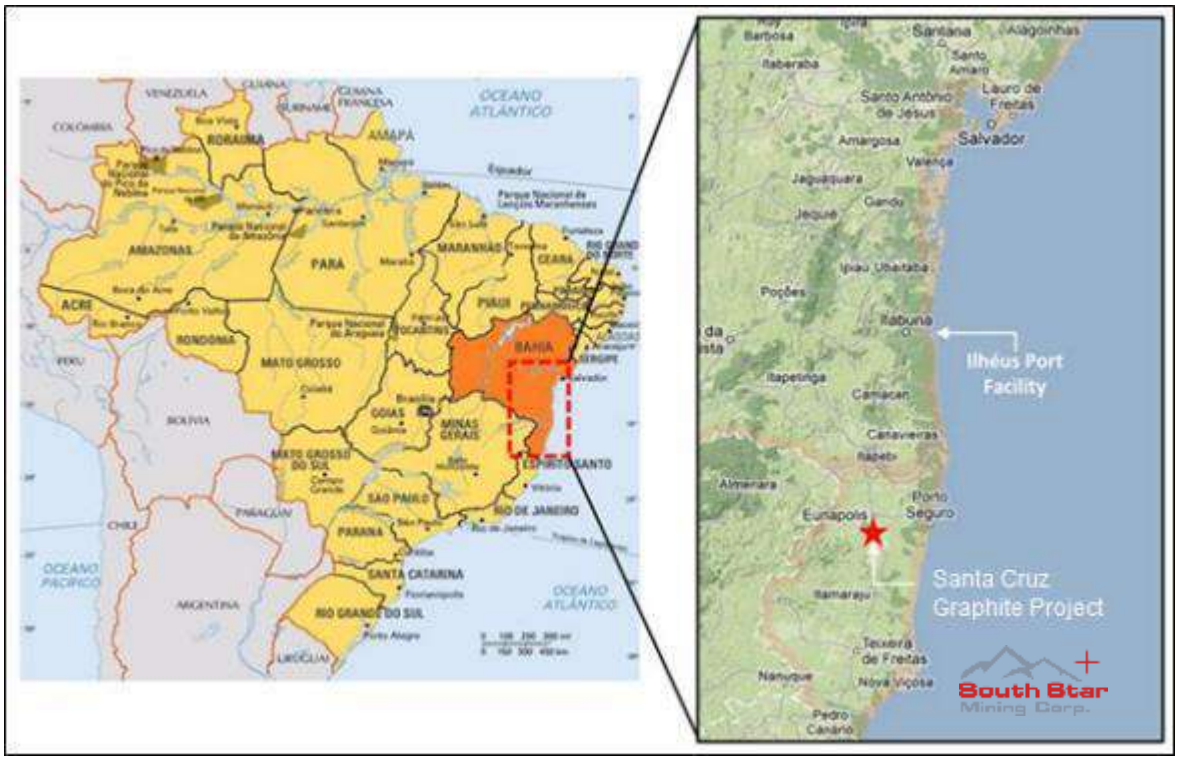


Figure 4-2 – Project Location Map

4.3 MINING TENURE AND PROPERTY DESCRIPTION

4.3.1 MINING TENURE

Within the 1988 Brazilian Federal Constitution, mineral resources are defined as assets of the Federal Government. The legal right to mine is assigned to the mining company by the Federal Government of Brazil in the form of a Mining Decree in accordance with the Mining Code that was originally established under Decree Law No. 227, dated February 28, 1967. Under Brazilian law there is a separation of the surface (land) rights (and ownership) from the mineral rights. A company or individual may hold valid mining rights from the Federal Government but must still negotiate legal access with the surface rights holder.

The Mining Code, which has been amended several times since passage, addresses both issuance of exploration permits as well as a Mining Concession permit, which is issued after the project proponent has demonstrated the technical and economic viability of the project. The Mining Concession, along with the appropriate environmental permitting forms the basis of the right to mine a mineral deposit. The mining concession is granted for a specific area and for the exploitation of a specific mineral.

EXPLORATION LICENSE

The Federal Department responsible for issuing the mining rights is the Agência Nacional de Mineração, ANM (National Mining Agency). Exploration licenses are typically granted for 3 years and can be extended for an additional 3 years maximum, subject to ANM approval. An exploration license allows the holder to explore for minerals in the granted concession, but not to conduct commercial mining.

License applications must include applicant details, the elements or metals to be explored for, the application license area, and be accompanied by stipulated technical documents that have been prepared under the responsibility of a qualified geologist or mining engineer. Such documents typically include budget forecasts for the planned exploration program, maps of the intended area, payment of governmental fees and taxes, and proof of sufficient funds or financing for the investment forecast set forth in the proposed exploration plan. Licenses are deemed granted when published in the National Official Gazette.

In order to renew the exploration license, ANM shall take into consideration the development of the work performed. The request for renewal of the exploration license must be presented 60 days prior to the expiration date of the original license. As to the renewal request, a report must be presented of the work already carried out, indicating the results achieved, as well as reasons justifying continued work. The renewal of the exploration license does not depend on the publication of a new license, but only on the publication of the decision to renew.

A final exploration report summarizing the economic viability and technical feasibility of the claim must be supplied to ANM prior to the expiration of the granted time period.

Such report must be prepared under technical responsibility of a legally qualified professional and must also contain:

(i) Information on the area means of access and communication;

(ii) Plan of the geological survey;

(iii) Description of the main aspects of the deposit;

(iv) Quality of the mineral substance and definition of the deposit;

(v) Genesis of the deposit, as well as its qualification and comparison to similar deposits;

(vi) Report of the industrialization assays;

(vii) Demonstration of the economic feasibility of the deposit; and

(viii) Necessary information for the calculation of the reserve, such as the density, area, volume and content.

The final exploration report must be presented independent from the results of the work and shall conclude the existence or non-existence of a mineral deposit that can be further developed and exploited. Approval of the report is not discretionary and as long as a drilled mineral deposit can be confirmed, ANM shall grant authorization for the company to move forward towards a mining license; typical process period is from 6-12 months. The holder of an exploration license who does not present a final exploration report within the date established by the regulations will be fined. Nevertheless, the exemption from presentation of the report is permitted in certain cases of license relinquishment by the titleholder. ANM must confirm the relinquishment, provided it happened in one of the two following instances:

(i) At any time, if the titleholder has not been successful at entering the area, despite all the efforts made, including judicial means; or

(ii) Before one-third (1/3) of the term of duration of the exploration license has passed.

A concession holder has one year from approval of the report to apply for a mining concession. The application period may be extended for longer than a year at the discretion of ANM, if requested by the holder prior to the expiration date, with necessary motivations and justifications (for example more time for obtain environmental approvals or conduct better studies on economic viability and technical feasibility).

TRIAL MINING LICENSE

It is possible to extract mineral substances before the mining concession is granted, by means of a Trial Mining License ("Guia de Utilização"). Extraction may only occur if the interested party has obtained a proper environmental license and has entered into an agreement with the surface owner as to the extraction work.

The Trial Mining License may be granted by ANM for the extraction of up to 5,000 tons of product per year of graphite, for each exploration license.

The holder of an exploration license in which the Trial Mining License has been granted shall be responsible for the payment of the Financial Compensation for the Exploitation of Mineral Resources (CFEM).

South Star has requested the trial mining license, and it is in evaluation by ANM.

MINING LICENSE

In cases where the exploration potential of concessions is proven to be economically viable, the exploration license may be converted into a mining concession by completing an exploration study to quantify the existence of mineral resources, a feasibility study to show technical feasibility and economic viability of the project, and the granting of the environmental license to mine the concession.

ANM grants a mining concession if the required studies have been completed and indicate a commercially viable mining operation. Mining rights can be denied in some circumstances, as for example where a public authority considers that a subsequent public interest exceeds that of the utility of mineral exploration. Where the concession is not granted, the Brazilian Federal Government must compensate the mining rights owner, if the exploration report was approved.

Once the legal and regulatory requirements are met, including the proper environmental licensing (which varies according to the State), and the Economic Feasibility Plan is approved by ANM, the mining concession is granted through a "Portaria de Lavra". Concessions are deemed granted when published in the National Official Gazette.

Brazilian mineral legislation does not establish the duration of mining concessions. The concessions remain in force until the complete exhaustion of the deposit.

The holder of a mining concession:

(i) Has the exclusive right to execute the mining work for the mineral substances specified and indicated in the concession title and within the authorized area. However, if another substance is found in the authorized area, the titleholder may request an addendum to the concession, so that the new substance is also included in the concession;

(ii) Has the right to temporarily suspend mining work;

(iii) May obtain easements on the property where the mine is located, as well as on bordering and neighboring properties, with prior indemnification; and

(iv) May divide the concession into 2 or more distinct concessions, provided that it is not harmful for the development of the deposit.

The holder of a mining concession has the following obligations:

(i) To start the mining work as per the development plan, within six months from the date of the publication of the concession in the Official Gazette of the Republic;

(ii) To execute the work in accordance with the development plan approved by ANM;

(iii) To extract solely the substances indicated in the concession;

(iv) To communicate to ANM the discovery of a mineral substance not included in the concession title;

(v) To carry out the work in accordance with regulatory norms;

(vi) To offer the management of the work to a duly qualified technician;

(vii) Not to make it neither difficult nor impossible to use and exploit the deposit in the future;

(viii) To be responsible for the damage and loss caused to third parties, resulting from the mining work;

(ix) To promote and improve safe, healthy lodgings at the location;

(x) To avoid water diversions and to not use an amount that can cause harm and loss to neighbors;

(xi) To avoid air or water pollution resulting from the mining work;

(xii) To protect and preserve the water sources, as well as to use them according to the technical instructions and requirements when dealing with mineral water deposits;

(xiii) To observe and comply with all the provisions of the inspection entities;

(xiv) Not to interrupt the mineral activities without notice to ANM;

(xv) To keep the mine in good condition when temporarily suspending the mining work;

(xvi) To restore the areas degraded by the mining work; and

(xvii) Advise of the discovery of radioactive minerals.

4.3.2 MINING RIGHTS DESCRIPTION

The Santa Cruz Graphite Project consists of 13 approved exploration licenses in the State of Bahia totaling 13,316.4 ha.

A summary table is presented in Table 4.1.

A location map containing all mineral rights is presented in Figure 4-3.

All concessions, taxes and payments are current as of the publication of this report.

Table 4.1 – ANM Claims Summary Table

No. of ANM process	State	Mineral	Area (ha)	Publication Date	Status
871.722/2010	BA	Graphite	1999.84	15/12/2010	Approved Exploration License – (final exploration report submitted)
872.328/2010	BA	Graphite	948.3	06/04/2011	Approved Exploration License – (final exploration report submitted)
872.329/2010	BA	Graphite	918.21	06/04/2011	Approved Exploration License – (final exploration report submitted)
872.732/2010	BA	Graphite	994.39	13/05/2011	Approved Exploration License – (final exploration report submitted)
872.733/2010	BA	Graphite	988.62	13/05/2011	Approved Exploration License – (final exploration report submitted)
872.734/2010	BA	Graphite	799.99	13/05/2011	Approved Exploration License – (final exploration report submitted)
872.735/2010	BA	Graphite	985.58	26/04/2011	Approved Exploration License – (final exploration report submitted)
872.736/2010	BA	Graphite	931.66	26/04/2011	Approved Exploration License – (final exploration report submitted)
872.737/2010	BA	Graphite	947.57	26/04/2011	Approved Exploration License – (final exploration report submitted)
872.874/2010	BA	Graphite	934	26/04/2011	Approved Exploration License – (final exploration report submitted)
871.052/2011	BA	Graphite	979.5	04/07/2011	Approved Exploration License – (final exploration report submitted)
871.053/2011	BA	Graphite	936.94	04/07/2011	Approved Exploration License – (final exploration report submitted)
871.524/2013	BA	Graphite	951.26	11/12/2013	Approved Exploration License – (final exploration report due Apr20)

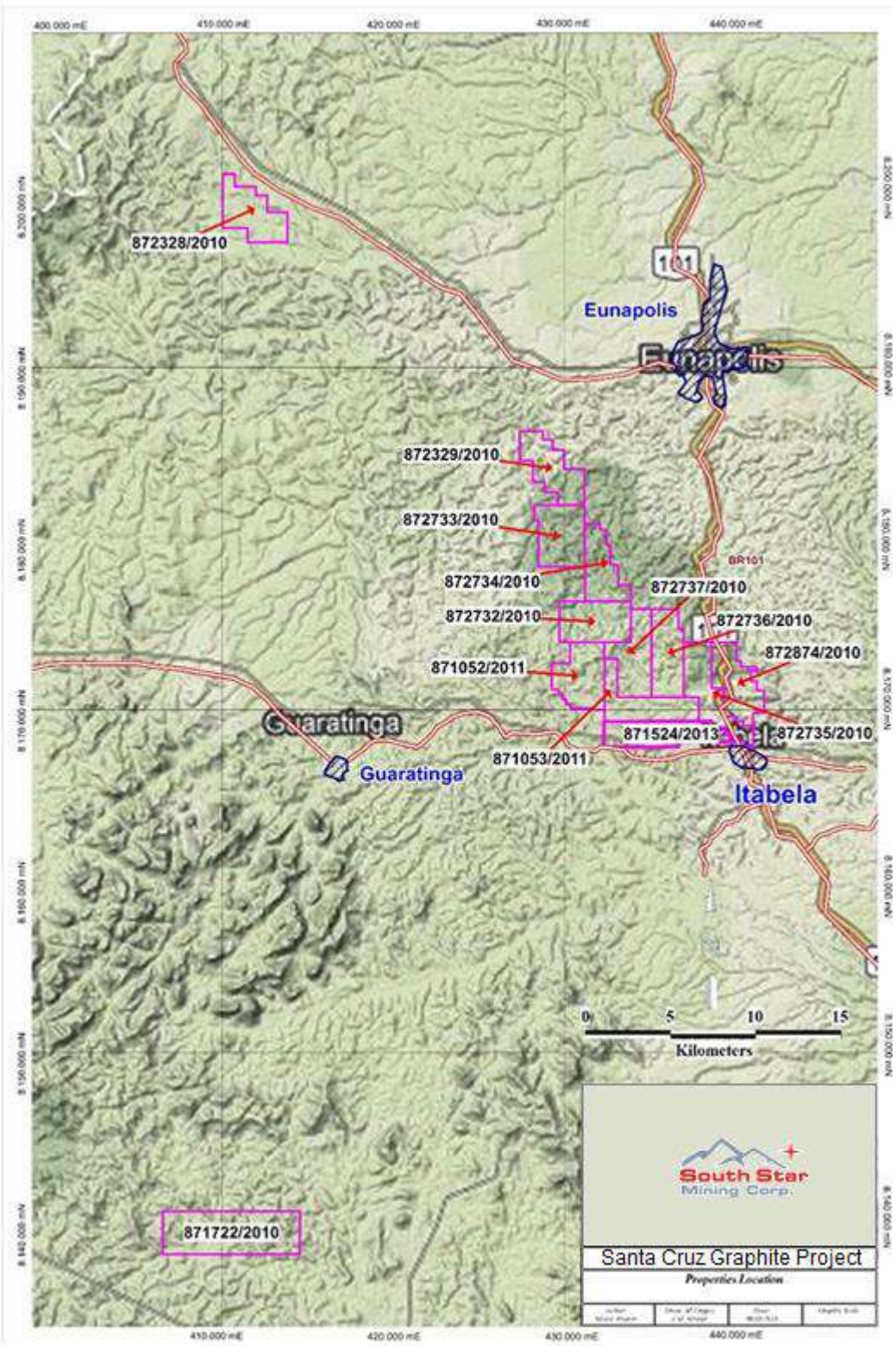


Figure 4-3 – Claims Location Map

4.4 PROPERTY (LAND) OWNERSHIP

Under Brazilian law, mineral rights and surface rights are separated. A mining company may hold valid mineral rights but must still negotiate with the surface rights owner. There is a legal process for the equivalent of condemnation of the surface rights if a negotiated settlement with the surface owner cannot be reached.

For exploration and prospecting licenses, a concession holder may negotiate payment to the surface rights owner as compensation for land use and any damage caused by exploration activities. In cases where an agreement is not reached between the involved parties (mining rights holder and surface rights owner) with regards to the indemnification amounts to be paid and/or the landowner does not allow the company's employees to access the area, the mineral rights holder is guaranteed legal access through a judicial process and court order.

For mining licenses, the holder must pay the surface rights holder 50% of the Financial Compensation for the Exploitation of Mineral Resources (CFEM). Holding a valid agreement with the surface rights holder is a pre-requirement for mining lease grant. If no agreements can be reached, judicial processes can be used.

Agreements are currently in place for exploration activities with the owners of the surface rights for the principal exploration targets. These agreements have been registered with ANM.

4.5 ROYALTIES AND AGREEMENTS

There are two main types of levies payable by mining companies: an annual tax per hectare (TAH) and the CFEM (Financial Compensation for the Exploitation of Mineral Resources).

TAH is payable by the exploration license holder annually to ANM (Law No. 7,886/1989 and Law No. 9,314/1996). This tax is currently charged on a fixed value set forth in ANM Ruling No. 163/2014 (Portaria do Diretor-Geral da ANM), and consists of approximately BRL 2.61/hectare for exploration licenses during the duration of the original license grant term, increasing to BRL 3.95/hectare for licenses where an extension of term has been granted.

CFEM is based on the net revenue from the sale of a mineral product, defined as the total of sales less taxation, transportation and insurance expenses. The rate to be applied varies according to the mineral product. Currently, ANM levies are:

- Gold: 1.0%
- Bauxite, manganese ore, rock salt and potassium: 3.0%
- Precious carbon, colored, cut table stones and precious metals: 0.2%;
- Iron ore, fertilizers, mineral coal and other mineral substances: 2.0%.

Graphite is taxed at a 2.0% rate.

Penalties are imposed if either payment is not made and can vary from a letter notice to concession forfeiture. No additional royalty payments, option agreements or encumbrances have been identified at this point.

4.6 ENVIRONMENTAL PERMITS AND LIABILITIES

4.6.1 ENVIRONMENTAL PERMITS

The Brazilian Federal Constitution addresses environmental and social impacts of mining projects. Overall environmental regulations are a federal responsibility developed by the Ministry of Environment (Ministério do Meio Ambiente). Implementation is by the National Council of Environment (Conselho Nacional do Meio Ambiente or CONAMA), which formulates the standards and policies under which environmental regulations are implemented. Control and supervision of the environmental licensing process is with the Brazilian Institute of Environment and Renewable Resources (Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis or IBAMA). While IBAMA is the lead licensing agency and is responsible for overseeing the process, in practice, state environmental protection agencies generally review and authorize the environmental licenses.

Environmental licenses for new mining operations are provided in three stages:

1.) A preliminary license (Licença Prévia – LP) can be awarded at the time the environmental impact analysis has been approved. An Environmental Impact Assessment

("EIA") must be executed, and the respective Environmental Impact Report ("RIMA") must also be produced at this time. An EIA/RIMA submission is required for this permit together with some further documents. This permit approves the project site location and conceptual design while evaluating the social and environmental feasibility of the proposed project. This phase defines the basic design and determining factors to be considered in the subsequent stages of implementation. The permit can be valid for up to five years.

2.) Construction or Installation License (Licença de Instalação – LI) at the time detailed design of the facility is completed and determined to comply with the requirements established in the preliminary license. For this stage, the project proponent has to submit the Environmental Control Plan (Plano de Gestão Ambiental – PGA) and complete other requirements and supply further documentation about the project. This permit provides authorization for the construction of a project and its infrastructure, in accordance with the specifications set out in the approved plans, drawings, and designs including the PGA and all other determining factors that are required for approval. The permit can be valid for a period of up to six years depending on the project schedule.

3.) An operating license (Licença de Operação – LO) at the time the project is constructed and has been determined to comply with the environmental standards. This permit provides authorization for the operation of the facility or project, following verification of effective compliance with the requirements of the Installation Permit (LI). The permit is valid for a minimum of four years and a maximum of ten years, depending on the impact classification and is renewable, based upon the environmental compliance record as determined by IBAMA.

4.6.2 ENVIRONMENTAL PERMITS FOR THE TRIAL MINING LICENSE

As mentioned before, it is possible to extract mineral substances before the mining concession is granted, by means of a Trial Mining License ("Guia de Utilização"), but the extraction may only occur if the interested party has obtained a proper environmental license.

For purposes of obtaining the environmental license, the holder shall request an Environmental Authorization ("Autorização Ambiental"), under the terms of State Law no.

10,431/2006 and its respective Decree no. 14,024/2012 as amended by Decree no. 15,682/2014 (article 142-B 'I').

The environmental permit for Phase 1 operations was approved and published in the Itabela municipality official gazette in Feb.19th, 2020.

4.6.3 VEGETATION SUPPRESSION AUTHORIZATION

If the holder of an exploration license intends to suppress native vegetation in the area of its activities, it shall first obtain the proper environmental license.

For purposes of obtaining the environmental license, the holder shall request an Environmental License ("Licença Ambiental"), under the terms of State Law no. 10,431/2006 and its respective Decree no. 14,024/2012 as amended by Decree no. 15,682/2014 (article 142-B, sole paragraph, 'I')

4.6.4 WATER RIGHTS

Under Brazilian Law No. 9,433/1997, several water usages are regulated, including:

- Diversions or impounding of water existing in a water body for final consumption, including public supply or productive process;
- Impounding of water from an underground water body for final consumption or productive process
- Disposal of sewage waste and other liquid or gaseous residues, whether treated or not, into a water body for dilution, transportation or final disposal;
- Other uses that alter the system, quantity or quality of the water existing in a water course or body.

A water use permit has a maximum term of 35 years and can be renewed. Permits typically have conditions attached, which primarily relate to compliance with the Water Resources National Plan and the watercourse quality maintenance. Exploitation of water resources is under the jurisdiction of ANM and is subject to similar reporting and jurisdictional requirements as other mineral types.

4.7 SUDENE TAX INCENTIVE

SUDENE tax incentive is a tax incentive program developed by the Brazilian Government under the responsibility of the Superintendence for the Development of the Northeast Region (SUDENE).

The goal of this program is to attract new investments and to generate wealth and employment, enabling a more efficient social policy to develop the most underdeveloped regions of Brazil.

SUDENE Tax Incentive represents a 75% reduction of the Brazilian corporate income tax rate of 25% for a period of 10 years commencing in the calendar year following the receipt of an appraisal certificate (an Appraisal Certificate) from SUDENE attesting that a company has fulfilled all the legal requirements to enjoy this tax incentive.

The Company plans to apply for the tax credit for the Project.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 ACCESSIBILITY

Santa Cruz Graphite Project is located near the town of Itabela in southern Bahia state and is accessible via 90 km of paved federal highways BR-367 and BR-101 from the International Airport in Porto Seguro, Bahia state. The airport is served with daily national and international flights. A location map is presented in Figure 5-1.

Figure 5-1 – Accessibility and Location Map

5.2 CLIMATE

The climate is greatly influenced by the coastal proximity and the project area is classified as humid-tropical according to the Koppen-Geiger climatological system. Precipitation averages 1,238 millimeters a year with rainfall throughout the year, although it is noticeably less in the winter seasons of May through September. Temperatures in general are high with monthly averages varying between 22 ºC to 26 ºC. Average monthly climate data for Itabela is presented in Figure 5-2.

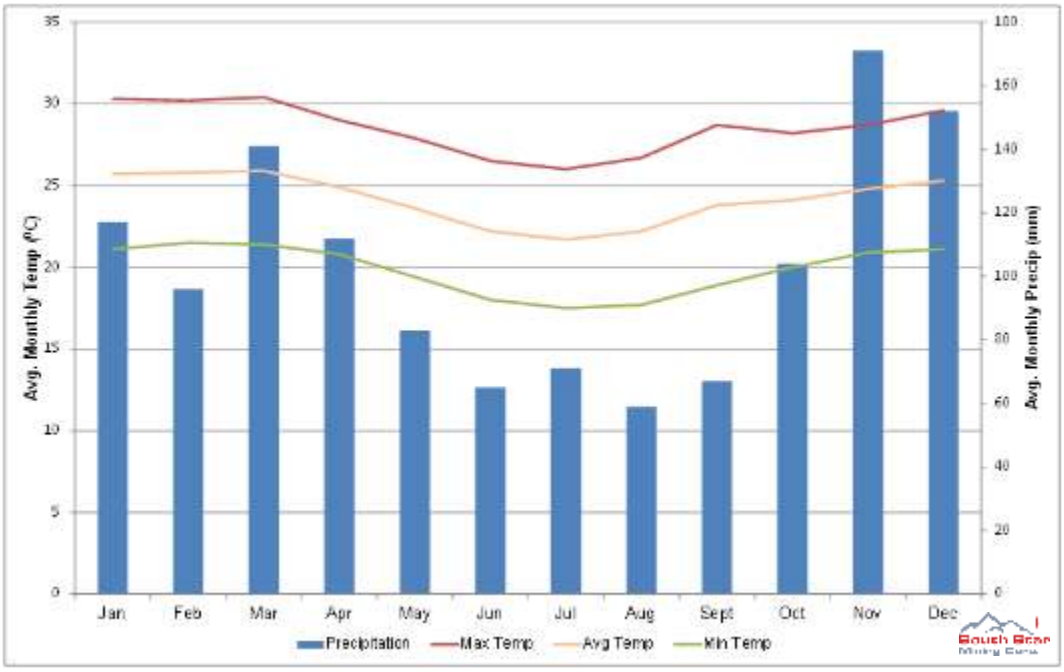


Figure 5-2 – Average Monthly Precipitation

5.3 LOCAL RESOURCES, INFRASTRUCTURE AND LOGISTICS

5.3.1 ACCESS ROAD AND TRANSPORTATION

The project area is in a rural area of southern Bahia state with the main population center being Eunápolis, which is located approximately 28 Km to the north of Itabela. Eunápolis has approximately 100,200 inhabitants, while Itabela has a population of about 28,500, according to the 2010 census data. Basic services are available in Itabela, while medical services, hospitals, banks, commercial centers, schools and other services are available in Eunápolis.

The Project plant site is located close to a municipal gravel road used to access local farms. It is used as well for eucalyptus transportation produced by a cellulose producer located approximately 80 km distant. There is a turn off from the federal highway BR-101.

For the purpose of the Project, the turn-off from the BR101 will likely require improvements due to truck traffic. An improved interchange will likely be required, and this will be dealt with the DNIT (Departamento Nacional de Infraestrutura Terrrestre). Figure 5.3 show the dirty road between the highway BR 101 and the plant site.

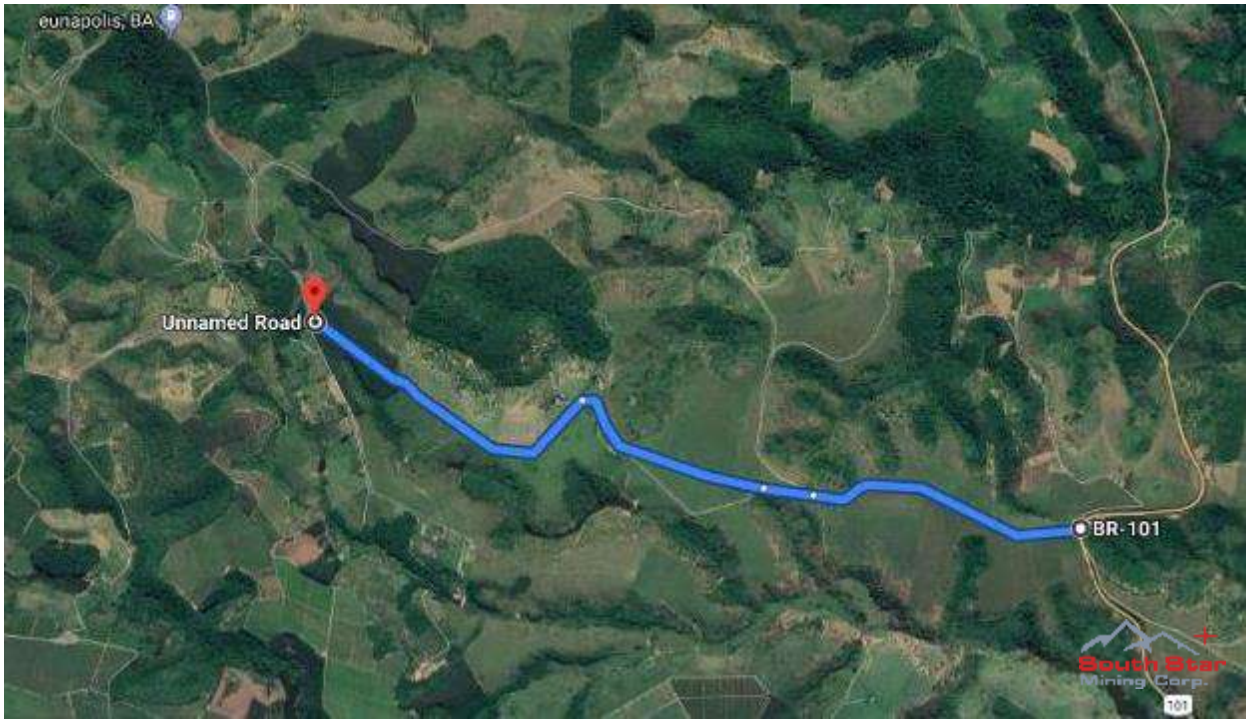


Figure 5-3 – Gravel access road between BR 101 and the Plant site

The consumables for operations that will be transported to site are not considered excessive and do not require any special procedure. Equipment and materials for the Project implementation do not require any special freight procedure. The work force transportation to site will be served by buses, assuming most of the work force will be based in Itabela.

Figure 5.4 shows the Project site, mine and the access road.

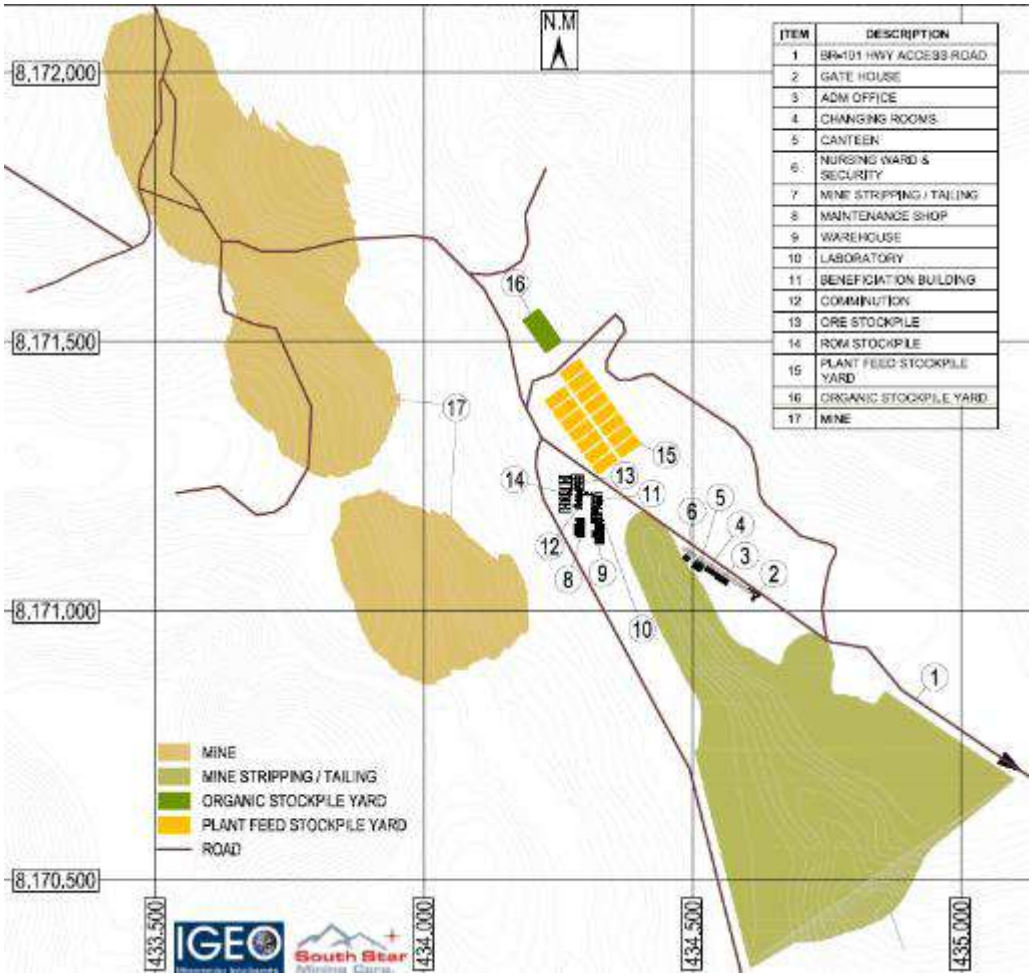


Figure 5-4 – Phase 1 Plant Site General Facilities Arrangement & Access

- **Sea Port**

The deepwater port of Ilhéus is approximately 270 km to the north on paved federal highways BR 101 and BR 415. The port is administered by the Companhia Docas do Estado da Bahia (CODEBA) whose capacity is currently being expanded in order to accommodate the new West-East Railway (“FIOL”). This will be used as a basis for potential graphite exports. Figure 5.5 and Figure 5.6 present the route to Ilhéus and the port general view, respectively.

Figure 5-5 – Ileus Sea Port General View

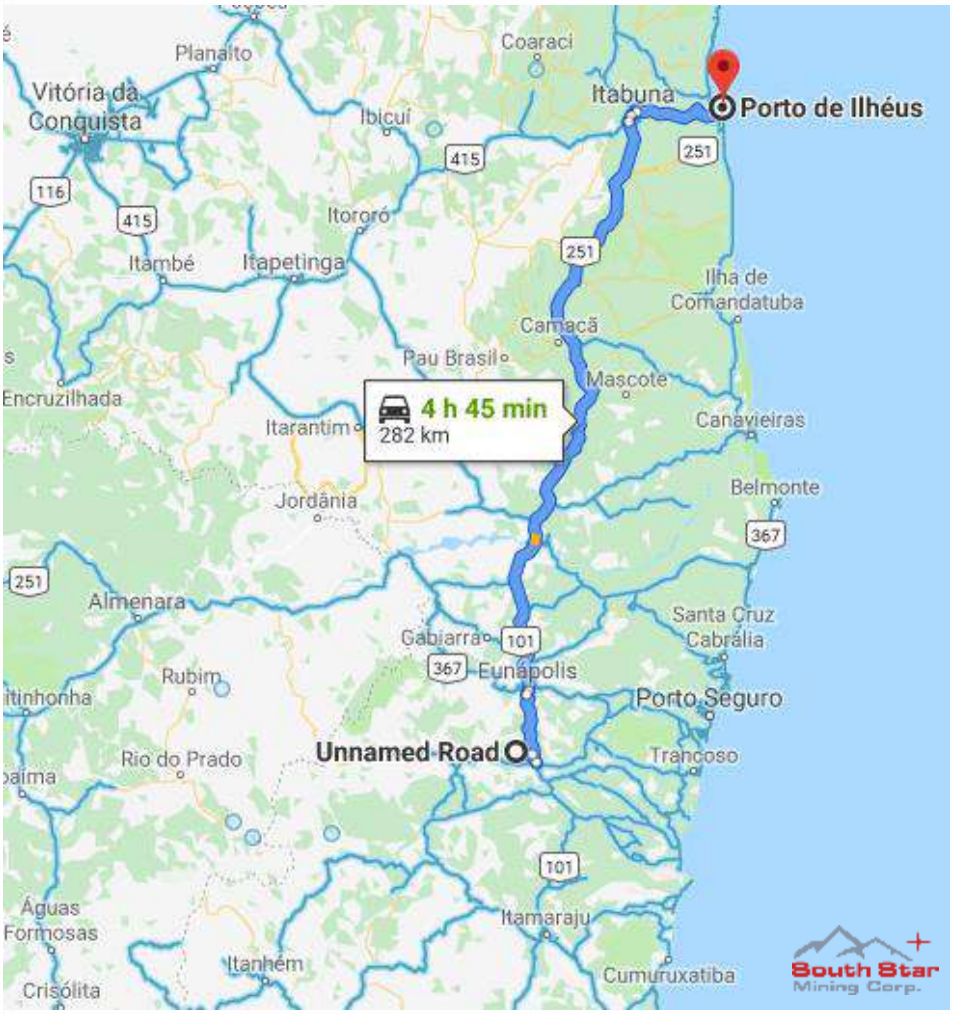


Figure 5-6 – Ihéus Ground Transport Route

5.3.2 POWER & WATER

Electricity in the region is supplied by Companhia de Eletricidade do Estado da Bahia (COELBA) by means of a 13,8 kV 3-phase transmission line along the BR-101 highway.

There are 2 (two) alternatives to supply the Project and COELBA is studying the best option whether connecting at the Itabela substation or at Eunápolis substation and in one or another alternative, COELBA will contribute with BRL 915,000 being the remaining expenses the Project responsibility.

The connection at the Itabela substation results in a transmission line of 10,1 km, while connecting at Eunápolis requires 36 km line. The transmission line to the plant site will be responsibility of the Project, which will carry out a bidding process to select the best supplier. COELBA would co-sponsor the improvements and could also be awarded with the construction contract. On completion, the Project will donate the transmission line to COELBA, as required by Brazilian regulations. Figures 5.7 and 5.8 show the routes for the two alternatives for the transmission lines.

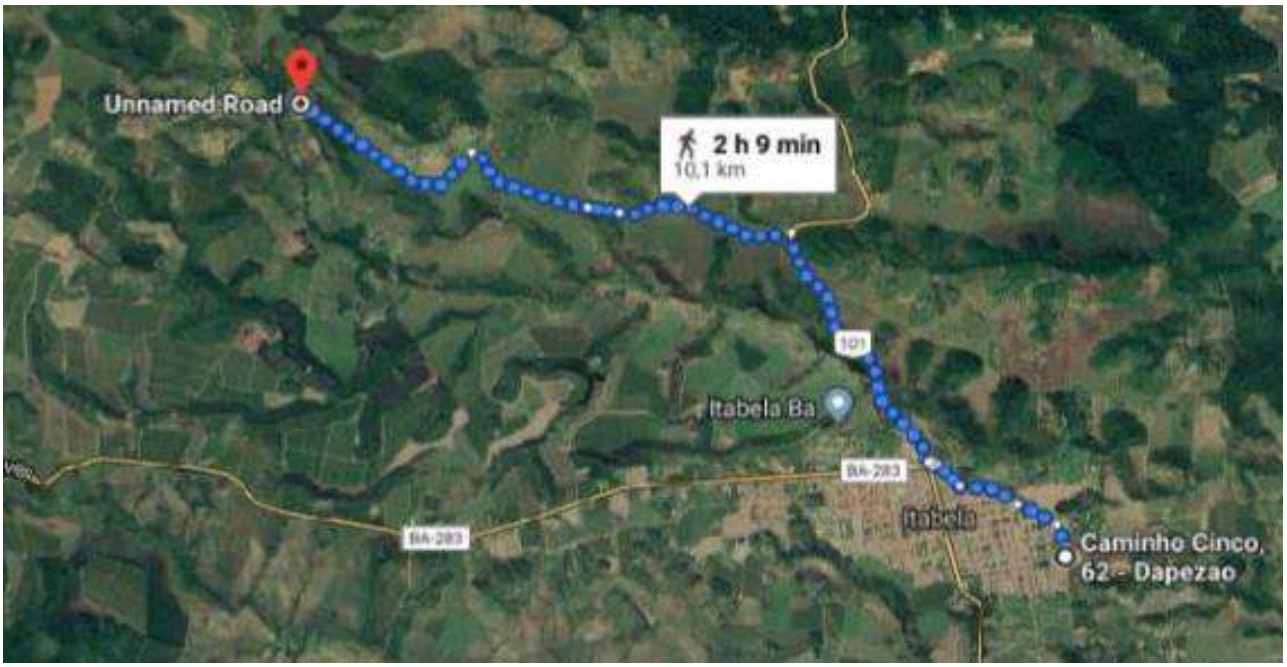


Figure 5-7 – Transmission Line From Itabela

Figure 5-8 – Transmission Line From Eunápolis

Natural gas can be supplied by truck and stored in large tanks on site. In addition, one of the most important natural gas pipelines in Brazil ("GASENE") passes within 5 km of the Project. It may be possible to supply the Project demand from the pipeline.

Project water supply will be provided from on-site sources. Wells or a small water dam will be the primary water supply with basin inflows being captured and stored for use as freshwater make-up for plant demand. Drinking water shall be provided by wells or there may be a possibility of bringing a treated water line from Itabela, which will be investigated at future project stages. A small wastewater facility may be constructed on site or a septic system installed with waste trucked to Itabela for treatment. Solids waste will be trucked to the Itabela landfill for disposal.

5.3.3 COMMUNICATIONS

Telephone communications are comprised of cellular transmission with 4G, as well as fixed land line service along with high-speed internet.

5.4 PHYSIOGRAPHY

The project area lies within the Southeast Atlantic hydrographical basin, which incorporates parts of the states of Sergipe, Bahia, Minas Gerais and Espírito Santos. Principal rivers include Paraguaçu de Contas, Salinas, Pardo, Jequitinhonha, Mucuri and Itapicuru. The main project area is located between the rivers Jequitinhonha and Mucuri in relatively hilly terrain with elevations varying between 125 m and 280 m.

The area around the principal target has suffered from extensive anthropogenic disturbances and little native vegetation remains. Currently, land use is mostly rural pastureland for cattle along with some small-scale agriculture and eucalyptus plantations. There are also several small dams constructed for watering livestock.

The principal geologic target is in the lower portions of the valley and mineralization appears to follow the low laying areas and valley bottoms.

6.0 PROJECT HISTORY

Santa Cruz Graphite Project is a recent discovery with no known exploration work prior to 2012 or previous reports currently identified in the project claims area.

The project lies within one of the most active graphite provinces in the world with three operating mines: Pedra Azul, Minas Gerais state (~36,000 tpy), Salto da Divisa, Minas Gerais state (~18,000 tpy), and Maiquininque, Bahia state (~30,000 tpy) along with several development projects and exploration targets.

According to the most recent edition of the Brazilian Mineral Yearbook, which was published in 2010, Brazil has approximately 119,000,000 tonnes of graphite mineral resources identified with 95 percent of this vast reserve being within a 170 km radius of the Santa Cruz Graphite Project.

Table 6.1 provides a summary of the Brazilian official graphite resources estimates by region and figure 6-1 presents the project along with other mines and development or exploration projects in the area.

Table 6.1 – Brazilian Graphite Resources (2009)

Municipality	State	Resource (Tonne)
Eunapolis	BA	404,547
Guaratinga	BA	3,136,913
Maiquinique	BA	8,566,228
Total Bahia state (BA)		**12,107,688**
Baturité	CE	1,040,000
Total Ceará state (CE)		**1,040,000**
Almenara	MG	5,329,833
Arcos	MG	3,157
Cachoeira de Pajeú	MG	218,715
Carmo da Mata	MG	423,136
Itapecerica	MG	1,222,952
Itaúna	MG	126,733
Jordânia	MG	751,512
Mateus Leme	MG	1,994,367
Pedra Azul	MG	29,793,054
Salto da Divisa	MG	64,918,692
Santo Antônio do Monte	MG	657,754
São Francisco de Paula	MG	33,404
Total Minas Gerais state (MG)		**105,476,311**
Total Brazil:		**118,620,999**

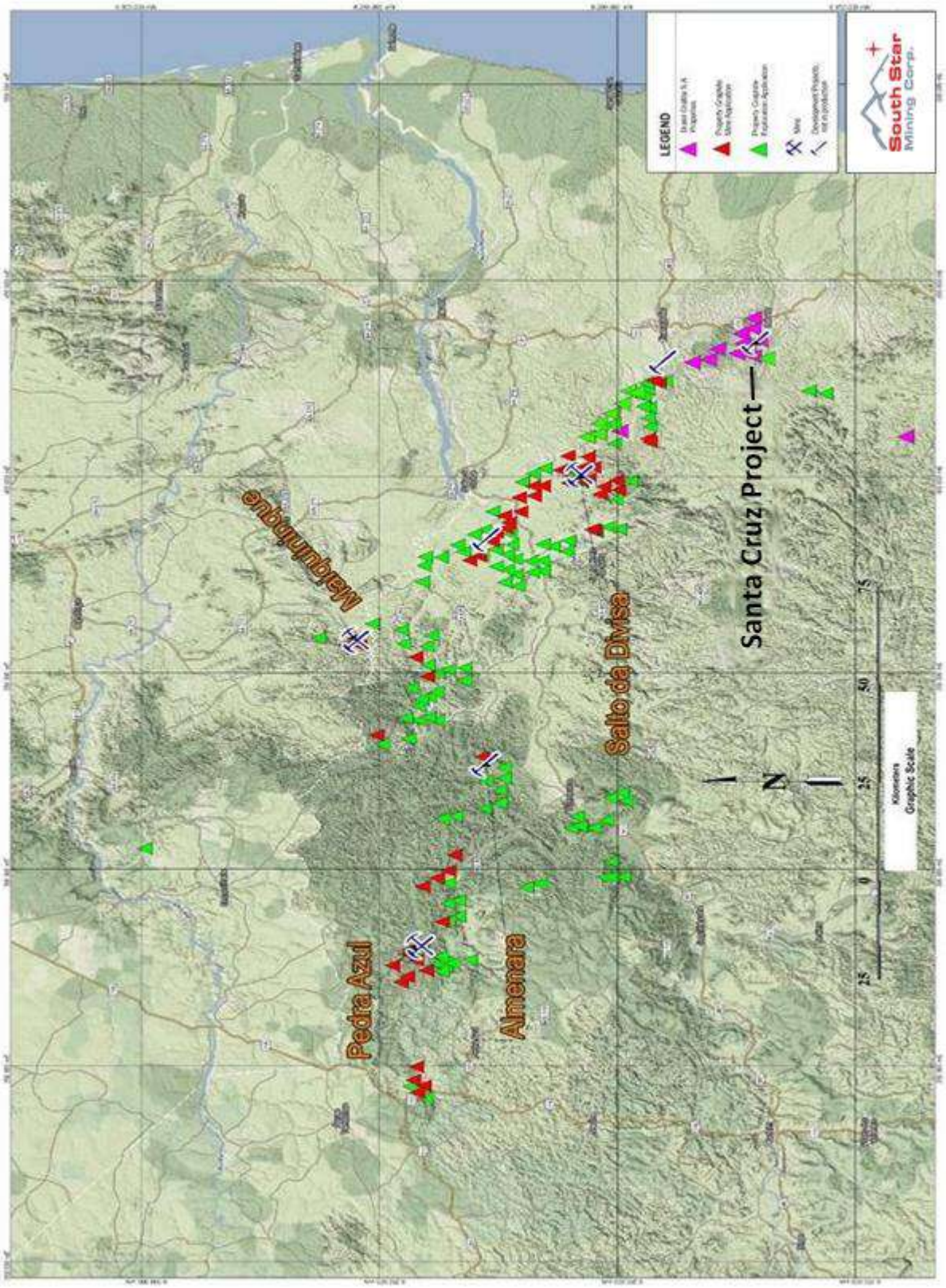


Figure 6-1 – Nearby Mines, Development Projects and Exploration Targets

7.0 GEOLOGICAL SETTING AND MINERALIZATION

7.1 REGIONAL GEOLOGY

The Project is in the belt known as Araçuaí Orogen, (Bahia State, Brazil). Araçuaí Belt is a Brazilian orogenic domain developed along the southeastern margin of the São Francisco Craton and is now viewed as part of the external zone of the so called Araçuaí – West Congo orogen. The terrain between the Araçuaí Belt and the Brazilian continental margin exhibits a whole series of complex features that is confined to a tongue-shaped enclave between the São Francisco and Congo Cratons.

Araçuaí – West Congo Orogen can be subdivided into ten compartments with the project hosted within the core zone.

The tectonic evolution of Araçuaí – West Congo orogen can be best explained by a model that involves the closure of Macaúba basin which is partially floored by oceanic crust. It began around 880 My through a mechanism that resembles the operation of a nutcracker. São Francisco and Congo cratons acted like pincers of the nutcracker.

The Project is hosted in the core of this orogen, and the metamorphism of this area is the highest inside this region, reaching the amphibolite – granulite grade with anatexis reached in some areas. Different authors mention that the age for this metamorphism ranges from 585 to 560 million years, related to the syncollisional stage (Carlos Mauricio Noce, Antonio Carlos Pedrosa – Soares and other et al 2016 Jequitinhonha Complex). In these zones, there are many outcrops of gneisses and paragneisses assigned to the Jequitinhonha or Paraiba do Sul complex. In this group, we can see the development of a granite body synkinematic to the regional foliation.

The complex of paragneisses, known as Kinzigitic, are rocks composed essentially of paragneisses with variable contents of peraluminous silicates, such as biotite, almandine, cordierite, sillimanite, kinsigite (stricto sensu is the graphite) – sillimanite – cordierite – garnet – biotite gneiss and the rock composed of different

amount of these peraluminous silicate associated to quartz – K-feldspar, plagioclase and trace of graphite. The Kinzigite protolith is a pelite rich in aluminous clay fraction, with minor carbonaceous material, such as paragneiss. Kinsigite characterizes the metamorphism of pelites in the high amphiolite-granulite facies. It is generally accompanied by a profuse partial melting as shown in Figure 7-1.

These Jequitinhonha complex gneisses have strong deformation and present granite, pegmatite and migmatite developments, which are products of partial anatexis. Regarding the granites and pegmatites, they can be concordant with the lithology, but in some cases cut the stratification and migmatite level is normal to the stratigraphic column. Sometimes these granites and pegmatite bodies can have graphite development near the borders. Finally, in the Cretaceous age there was sedimentation of unconsolidated sandstone and basal conglomerate that covered the top of small hills, which is called Barreiras formation.

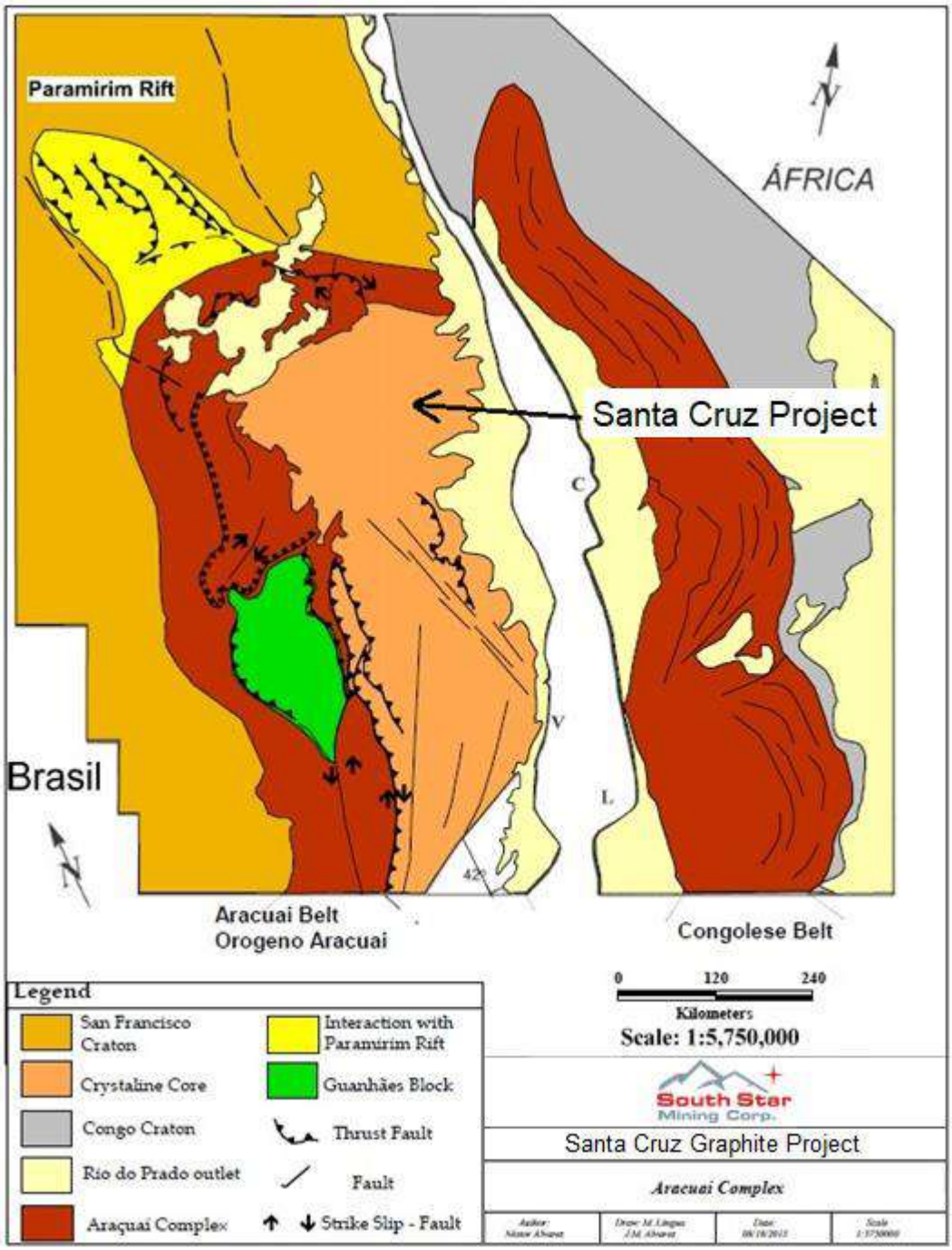


Figure 7-1 – Project locations in the Araçuaí Orogen

The Kinzigitic complex is subdivided into three main units: Unit a) is the rock assemblage of the Kinzigitic Complex exposed in the southern region of Espírito Santo State, south of Victoria City, this sub-unit is characterized by thick layers of marble enveloped by paragneisses.

Unit b) is the rock assemblage of the Kinzigitic complex exposed in the northern region of Espírito Santo State and eastern Minas Gerais State, particularly in the region of

the Rio Doce and Mucuri Rivers. The geologic section that has been studied by Pedrosa – Soares and collaborators, suggests that this subunit is rich in Kinzigite, has less aluminous paragneisses and is very poor in the other rocks referred to above.

Unit c) is exposed in the northeastern region of Minas Gerais State (north of Mucuri River) and the southernmost region of Bahia State. This unit comprises the rock assemblage of the Kinzigitic Complex, rich in graphite gneiss and quartzite intercalations. The layers and lenses of graphite gneiss are of major economic importance because they include the most important deposits of flake graphite that have been explored and mined in South America, including where the projects located.

As shown in Figure 7-2 there is a large belt with development of different graphite deposits and projects between the Bahia and Minas Gerais State in Brazil, but with an important difference: the eastern sector location developed a higher-grade metamorphism, as mentioned before, and also has the best large flake deposits in Brazil. This sector is where the Santa Cruz Project is located.

The structural domain varies through the Araçuaí Orogen. The Project is located in a zone of higher metamorphism with strong deformation, which has attained a degree of partial melting (anatexis). Regionally, an overturned fold can be recognized, especially in the Jequitinhonha Group, which has been affected by thrust and transtentional faults and can be recognized in a large lineament via satellite imagery that points towards the main deposit and other mineralized target areas.

For this reason, the main and higher-grade mineralizations appear in lenses associated with the bedded and folded structure, especially in the anticline zone. In the regional domain the structure can have a N-S strike to NW- SE with overturn folds.

In the district and the regional zone there is much evidence of anatexis, as shown in Figure 7-2. This figure demonstrates the type of folds of second or third order in the large structure. Figure 7-3 displays the regional geology.

Figure 7-2 – Second order folds that affects the rocks

Regional and detailed local geologic maps and cross-sections for the mineralized areas are presented in Appendix 2.

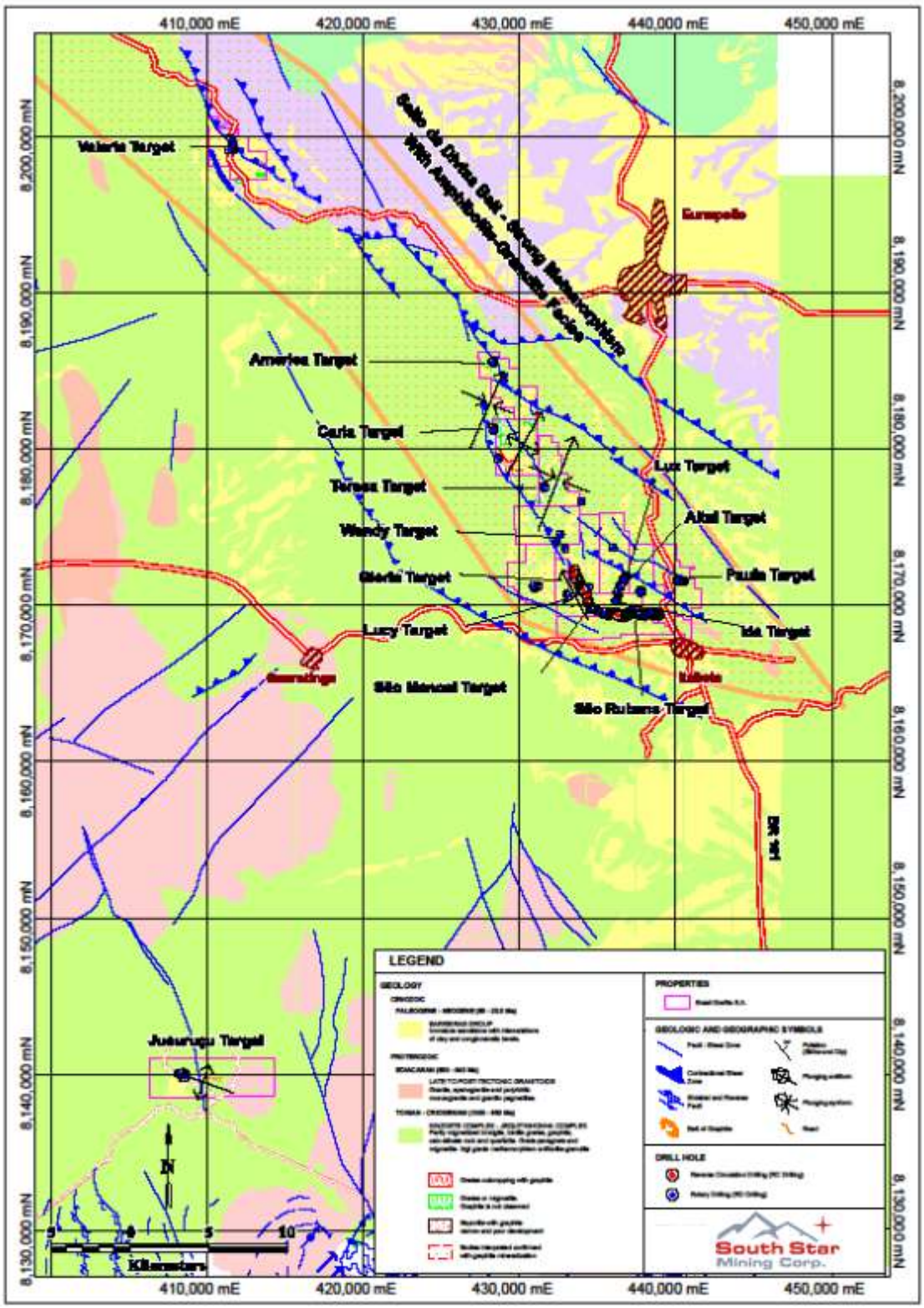


Figure 7-3 – Regional Geology and Projects

7.2 LOCAL GEOLOGY

The main target area is located near the town of Itabela and is comprised of two continuous mineralized zones denominated as São Manuel and São Rubens. The southernmost claim (process ANM 871.722/2010) has a large mineralized target denominated Jucuruçu. Local geologic mapping was focused on the main target areas with less detail available on secondary targets and throughout the main properties.

The main targets of São Manuel and São Rubens show a continuous, between both the mineralization run by over 8 Km, and in general mineralization follows the soft material and structural control along the valley floor. Secondary targets have been identified and include Paula, Altai, Ida Gloria and Lucy, amongst others. Many of the hillsides are covered with the Barreiras Formation, which is not mineralized, while towards the creek and valley bottoms some outcrops of gneiss and migmatite from the Jequitinhonha complex or Kinzigitic complex are present. To the east there are strongly foliated granites, which are likely of similar age to the Kinzigitic Complex. In general, gneiss and migmatite are located below the Barreiras Formation with an angular unconformity. In the district, there are other intrusive bodies present with strong foliation. To the north of the district there is a contact with the Rio Pardo Group (composed of meta-limestone, meta-dolomite, quartzite and phyllite) and the Kinzigitic Complex. The Rio Pardo Group is assigned an early Precambrian age, around 800 age.

The district where the Salto da Divisa operating mine and Santa Cruz Project are located has a complex and long structural history, but the main, significant control is a regional fault with a NW-SE strike. This control is a sinistral thrust fault, based on the presence of second order folds on the São Manuel target, seen in Figure 7.3, and, in general, the fault dips N-E, depending on the strike position. This fault likely controls the graphite mineralization as well as the granite and granodiorite intrusion of Cambrian age.

This regional fault has an Az 350° strike in the São Manuel target changing to Az 290° strike in the São Rubens target. This fault and the presence of soft materials appear to provide a structural control for mineralization (see cross-sections in Appendix B).

The southernmost Jucuruçu property is mainly composed of granites and granodiorites along the ridges, which are generally pink feldspar and biotite. These

outcrops are Cambrian Age, or Suite 4 as commonly referred to by the Brazilian geologic community. Some folds with NE-SW strikes that plunge to the north are present along the north of the property. These folds are an anticline and syncline dome zone.

7.3 MINERALIZATION

As previously noted, the Project is located within a region where mineralized deposits are hosted in paragneisses with higher degrees of metamorphism between amphibolite and granulite with intense anatexis. In general, the mineralization is structurally controlled by the shearing zone along the regional fault and the presence of softer materials.

The Project has disseminated mineralization that is easily identified visually with +65% of flake size +80 mesh (large flake) including ~35% +50 mesh (jumbo flake) (see Figures 7-4, 7-5, 7-6, 7-7 and 7-8), important to note both numbers are for final concentrates, hence one can assume run of mine ore has an even bigger amount of +80# flakes. Moreover, the mineralization is present in massive stratus layers found in strong association with the main structure control.

Initially, the mineralization appeared to be quite simple, and was thought to be sedimentary in nature, but after further field investigations, drilling, mapping and literature review, it is now believed that the mineralization is structurally controlled and is hosted in the many folds, shearing zones and mylonitic gneisses.

Figure 7-4 – Mineralized Sample – São Rubens and São Manuel.

Figure 7-5 – Mineralized Samples – São Rubens and São Manuel

Figure 7-6 – Lump Samples – São Rubens and São Manuel

Figure 7-7 – Typical Mineralization São Rubens and São Manuel – Graphite layers in Dark Colors and Disseminated Graphite in Lighter Colors

Figure 7-8 – Jumbo and Large Flakes- São Rubens and São Manuel

In general, the larger flake size appears to be associated with the higher degrees of metamorphism, while large volumes of high-grade mineralized material are often concentrated in the many folds.

The mineralized zone in the main target areas of São Rubens and São Manual is in the friable upper layers close to surface. There is approximately 8 km long continuous strike with widths varying from 30 to 200 m, with some depositional areas much wider because of the presence of significant folds. Mineralization is oriented sub vertical to vertical with some holes having more than approximately 80 meters of mineralization. The ore body is open at depth and along strike. There is also the presence of disseminated mineralization in several of the channel samples taken from rock outcrops in the São Rubens target as well as in various road cuts throughout the region. São Manuel target shows foliated gneisses with Az 330°/ 90° to Az 350°/80° East strike. To the south, the bedding changes from being 90° to 65° East.

There are various secondary targets near the main target area (See Appendix 2) that are also promising:

- Paula target is located to the east of property. It is characterized by banded and disseminated mineralization in the gneisses that strike Az 290°/ 90°. 49 rotary holes were drilled in this target intercepting a mineralized zone that is 490meters long and 20 meters wide with a general E-W strike. The samples display strong flakes with high carbon grade (but these samples have not been considered in the resource calculation because they presented a series of inconsistencies in their collection). This area was affected by post – mineralized faults.

- Luz target is located toward the west of Paula and is composed of graphitic gneisses with a N-S/60° E strike. This zone has been less explored.

- Altai target is located to the south west of Luz target and shows strong graphite mineralization with thick flakes. The zone has been less explored.

- Ida´s target is located towards the south of Altai and shows strong graphite mineralization and thick flakes striking N-S/90°. In this area 27 Rotary holes were drilled with 11 of them showing thick and medium flakes. These were not included in the resources because they were done during the earliest phase of exploration and were not subject to standardized sampling methods.

- Lucy target is located to the west of the San Manuel target. There are 47 Rotary Drilling holes in this area with three of them showing encouraging results: FTB-004 with 3.4 meters @ 4.67% Cg; FTB-005 with 6.2 meters @ 3.4% Cg and FTB-015 with 3 meters @ 3.42% Cg. These holes display thick to medium flakes. This target area is 900 meters long and 20 meters wide. It is located to the west of São Manuel.

- Gloria target is located between the San Manuel and the Lucy target with a 350°/90° strike. It appears to be part of the São Manuel´s antiform. The area is 280 m long by 25 m wide. The outcrops display thick flakes. The initial exploration results are encouraging but it is currently not part of the resource calculation.

- Other interesting targets are located towards the north of São Manuel and are hosted along the regional master fault. It is important to note that all these targets

have positive exploratory holes with encouraging assay results demonstrating significant resource upside potential.

Figures 7-9, 7-10, 7-11 and 7-12 depict work being carried out by the exploration team on the target sites.

Figure 7-9 – Rotary Drilling Team

Figure 7-10 – Sample Collection

Figure 7-11 – RC Drilling Equipment

Figure 7-12 – DDH Drilling Equipment

8.0 DEPOSIT TYPE

The Project can be classified as sedimentary – metamorphic. During late Precambrian age, pelites and carbon were deposited at the same time. Later in early Cambrian age, orogenic movements transformed these sediments to high grade metamorphic rocks, and these movements transformed the carbon and the hosted rock to gneiss with graphite (this type of mineralization with the different metamorphic minerals is known as the Kinzigite Complex).

The mineralization was shifted by a regional fault, which dictated alignment of the host rock (gneisses and paragneisses) and coupled with the soft nature of the graphite, made the association of such strike and fold (anticlines) changes to host mineralized zones and thicker lenses. Several deposits, including the Santa Cruz Graphite Project, are hosted in this regional area that covers over 25,000km². The region is known to produce high-quality natural flake graphite, which occurs as flat, plate-like particles with either hexagonal or angular edges. The graphite is derived from carbon rich sediments and is generally disseminated throughout the mineralized zones, but often with periodic lens-shaped pockets of higher-grade materials.

Flake size has a strong impact on demand and as a result pricing, with larger flake sizes generally being higher in value. Natural flake graphite is generally classified in the industry by flake size as follows:

1.) Jumbo: +50 mesh (0.3 mm)

2.) Large: –50 mesh to +80 mesh (0.18mm)

3.) Medium: –80 mesh + 140 mesh (0.105 mm)

4.) Small: –140 mesh.

9.0 EXPLORATION

9.1 GENERAL EXPLORATION

An extensive exploration program has been completed to date resulting in the areas where current resources are defined in this report as well as confirming several other mineralized targets. Channel samples, trenches, mapping and drilling have been performed and include:

1) Geologic surface mapping at a scale of 1:5,000 in the main sectors of São Manuel and São Rubens and at a scale of 1:50,000 over the regional claims.
2) Geophysics program
3) Channel samples (these were not used in the resource calculations)
4) Surface trenching
5) Rotary drilling (with several twin holes drilled for confirmation)
6) Reverse circulation drilling in the São Manuel and São Rubens target areas
7) Diamond drilling in the São Manuel and São Rubens target areas.

9.2 GEOPHYSICS

A geophysics campaign has been started in the main target zone with one 460 m long section in the São Manuel target completed as of the publication of this report. The resistivity equipment is made by a Brazilian manufacturer and is powered by a 12-volt motorcycle battery. The current configuration can penetrate to approximately a depth of 30 – 40 m depending on field conditions and groundwater levels, although noise and interference increases significantly in the final 10 – 15 m. The completed cross-section location is presented in Figure 9-1 along with the interpretation of the section, which is presented in Figure 9-2.

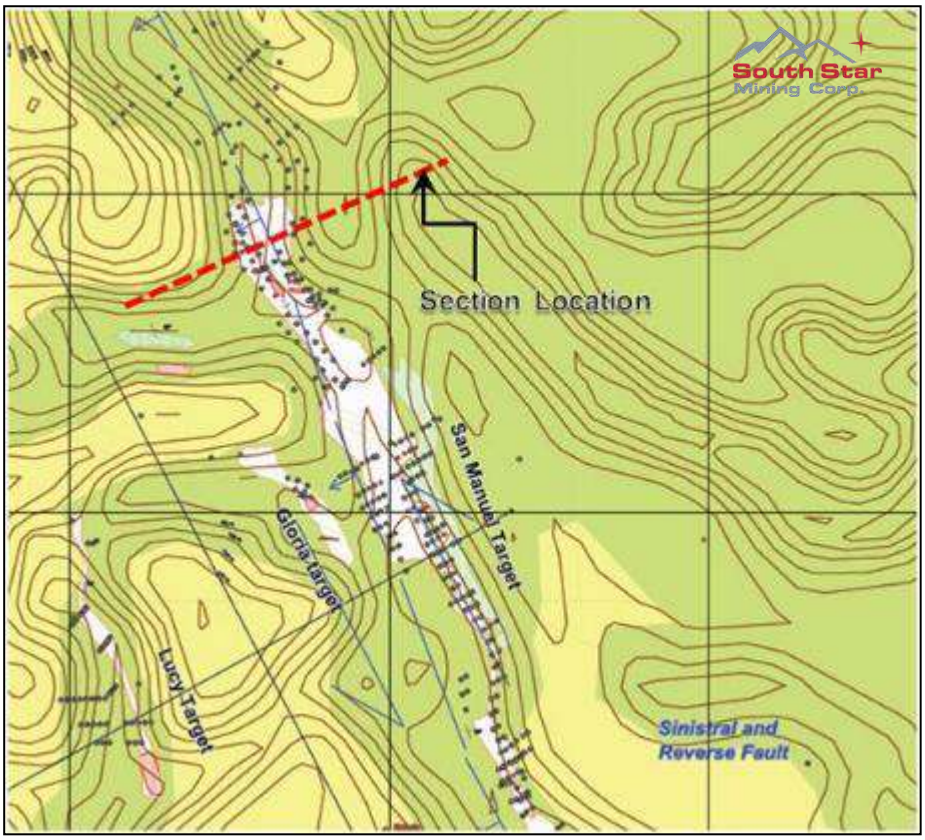


Figure 9-1 – Geophysics Cross-Section Location

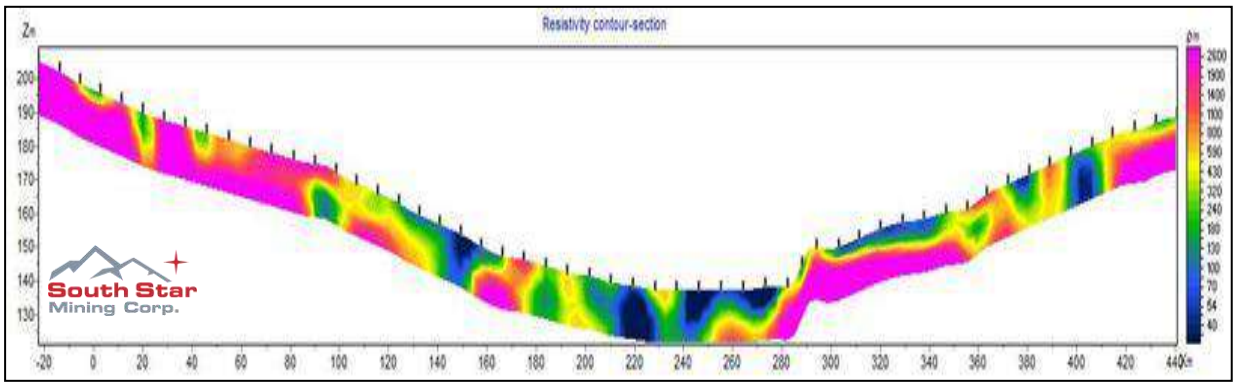


Figure 9-2 – Geophysics Cross-Section

The initial geophysics results are good when compared to the geologic cross-section with strong mineralization in the central zone of the section with some additional potential targets identified between stations 140 and 160 as well at 400 and 420. Additional sections will be completed once the main target is drilled out. Moving

forward, geophysics will be a valuable tool to identify additional targets while cutting down on the number of holes.

10.0 DRILLING RESULTS

10.1 DRILLING PROCEDURES

South Star has conducted drilling programs at the Project since its acquisition of the property in 2011. Prior to drill mobilization, the exploration manager obtains all required permits. A field visit to the planned drill sites is conducted to document and photograph the area, vegetation type, proximity to any preservation areas and access.

The exploration manager provides the project geologist and senior project mining technician with the information required to commence drilling including:

- Objective of the drill program;
- Location of the drill pads;
- Azimuth, dip and length of drill holes;
- Sampling and internal QA/QC procedure;
- Drill core checking and core sampling criteria (intervals);
- Sample security and chain of custody procedure;
- Sample shipment procedure;
- Data transfer procedure;
- Logging procedure;
- Company responsibilities; and
- Drill contractor responsibilities.

Prior to drill mobilization, the senior project mining technician liaises with landowners to discuss the program and obtain their authorization for the drill to mobilize

to their property. Exploration activities only commence following agreement with the landowner.

Daily checks are conducted to ensure that all Company personnel are equipped with Personal Protective Equipment ("PPE") and that all tools and ancillary equipment are in good working order.

DIAMOND DRILLING (DDH)

All diamond drilling is carried out with HQ (63.5 mm) core tools. The drill hole locations, orientation, and planned final depth are checked by the senior project mining technician prior to start of drilling each hole. Azimuth and dip of each drill hole are checked by the senior project mining technician at regular intervals during drilling to monitor any deviation which may occur.

The drill company is informed of the strict requirement to collect quality core samples. Onsite supervision is maintained, and site inspection visits are carried out at regular intervals to ensure that the contractor is working within the contractual parameters.

All holes outside the mine area are sealed and marked with a concrete plinth and identification tag and are surveyed in using RTK GPS by the surveyor. Approximately 0.5 m of casing is left in the top of holes to permanently mark the collar. The surveyed northing, easting and elevation of the hole collar coordinates are entered into the drill hole database.

PROCEDURES AT THE DRILL

The core boxes are labeled, and arrows drawn so that the core is systematically laid in the box. A wooden marker or aluminum tag is placed in the core box after each run and the meters down hole are written on the marker. Transfer of the core from the core barrel to the box is done as carefully as possible so that no core is allowed to fall on the ground. A plastic or rubber mallet is used to loosen core from the core tube. As soon as a core box is full a lid is properly secured. Regular inspections are carried out to ensure that core boxes are clean, sturdy and suitable for core storage.

Irregularities are documented to address potential inaccuracies in depth labeling of the core boxes.

CORE TRANSPORTATION PROCEDURE

Transportation of core from the drill site to the logging facility is conducted in a manner that minimizes or eliminates shifting of material in the core boxes. Transportation and storage of cut or split core is conducted in a manner which ensures that the remaining core does not shift and that marked sample intervals remain intact.

Appropriate measures are taken to eliminate the possibility of sample tampering through proper chain of custody management and documentation.

DRILL CORE CHECKING

The core boxes are checked on arrival at the core logging facility to ensure that they are intact. The core boxes are opened sequentially, and the core is aligned by matching broken pieces. The depth intervals are measured in each box and any lost core or depth inaccuracies noted. The boxes are labeled with metal or plastic labels listing hole name and interval. Geotechnical measurements, including recovery and RQD, are taken before sample intervals are selected. This work is carried out by trained technicians.

10.1.1 PHOTOGRAPHY

All drill core is systematically pictured following the procedure below:

- Digital core photography is supervised by the database coordinator;
- Core is photographed in its entirety from top to bottom of hole immediately following interval checking and box labeling and prior to logging or sampling;
- Any excess dirt, grease or drilling fluids are removed, and the core is dampened prior to photography and sampling;
- Core photographs are always taken under consistent conditions; and
- Core photographs are stored digitally for future reference.

10.1.2 CORE LOGGING

Core logging commences following photography. An initial summary log containing the main lithological contacts, structures and mineralization is completed and the core is sent for cutting. Detailed core logging restarts when the cut core is returned to the geologist responsible for logging the hole.

Core logging contains all required data fields including collar, survey, lithology, alteration, structure, mineralization, veins, assay, QA/QC and downhole survey, if applicable.

10.1.3 SAMPLE SECURITY

Drill core sample security from the drill site to the analytical laboratory is a vital component of the drilling program. South Star's procedure involves direct drill management, secure transportation methods, secure sampling and logging areas and secure sample storage facilities. Core is not left unattended and all core and sample storage facilities are locked and monitored when not in use.

Core is secured from outside inspection and interference or accidental internal interference. Chain of custody is maintained during transportation, sample collection, shipping and preparation to avoid tampering or inappropriate release of privileged information. Assay results are maintained confidential and only released to those on a need to know basis.

10.2 REVERSE CIRCULATION DRILLING

Planning procedures for Reverse Circulation (RC) drilling closely resemble those utilized for diamond drilling programs. Drill siting is determined by the Exploration Manager. Drill samples are collected at continuous 1 m intervals in large plastic sacks. Samples are quartered on site and the lab sample is sealed, labeled and shipped to the commercial sample preparation laboratory following normal chain of custody procedures. The remaining sample not sent to lab is sealed, labeled and stored in the core shed.

10.3 AUGER DRILLING

Planning procedures for auger drilling closely resemble those utilized for RC drilling programs. Drill siting is determined by the Exploration Manager. Drill samples are collected at continuous 1 m intervals in large plastic sacks. Samples are quartered on site and the lab sample is sealed, labeled and shipped to the commercial sample preparation laboratory following normal chain of custody procedures. The remaining sample not sent to lab is sealed, labeled and stored in the core shed.

Details of the drilling database is presented in Appendix 1.

11.0 SAMPLE PREPARATION, ANALYSIS AND SECURITY

11.1 SAMPLE PREPARATION

All drillings conducted at the project were collected, logged and supervised by trained geologists. For auger drilling, samples were collected at the drilling head averaging 8-10kg. For RC drilling, samples were collected directly into bags from the cyclone averaging 15-30 kg, collected every meter.

All meters were properly placed in plastic bags being numbered and easily identified with proper hole number, depth interval and ID. Material was then transported to the field office where geologists logged and described each meter, inserting them digitally onto the project database.

Splitting was then performed at the field office, using a riffle splitter which were then divided into 2 samples; one for laboratory testing and one for storage at the project storage facility to serve as future duplicates and sample security for further potential QA/QC audits and procedures. RC and auger samples are properly labeled, numbered and cataloged, and stored in a specific designated area in the warehouse. Core boxes are properly labeled, cataloged and stored in a specific designated area within the warehouse, as illustrated by Figure 11-1 and Figure 11-2.

Figure 11-1 – Diamond Drilling Core Photo Registry

Figure 11-2 – Diamond Drilling Typical Core

11.2 LABORATORY ASSAY

All samples collected at the project have been delivered to certified laboratory at SGS Geosol in Belo Horizonte, Brazil or SGS Lakefield in Ontario, Canada. Once sample results are received, company geologist inserts proper grade into each corresponding database sample, thus providing a complete description for each data point including X,Y,Z coordinates, lithologic description, sample type, target area and grade result.

All samples in the 2018 campaign were submitted to SGS Geosol Laboratory in Belo Horizonte, Minas Gerais, Brazil and were analyzed for graphitic carbon (Cg) using the LECO carbon-sulfur analyzer and high temperature combustion infrared detection methodology (SGS code CSA05V). Laboratory pulps where then returned to the Company and have been stored in warehouse.

11.3 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

A total of 1334 samples were collected during the 2018 exploration campaign and incorporated into the database. The 2018 chemical analysis (assays) quality control on the database provided by South Star included:

- 18 certified standard samples using reference material from Geostats lab;
- 44 blanks sampled; &
- 32 duplicates samples.

The quantity and quality of QA/QC data was within the industry standard and represents 7% of the total 2018 samples included the database and used in the updated resource estimate. It is DTM's opinion that the sample preparation, analytical procedures and security meet industry best practices.

A summary description of the QA/QC samples follows:

- One (01) of the 18 standard samples is just outside of the tolerance limits of 2 standards deviation of the reference material.

- Five (05) of the blank samples present analytical results higher than the detection limit of the SGS Geosol lab analytical method graphitic C% assays.

- Two duplicate samples have discrepancies.

Figures 11-3, 11-4 and 11-5 below, show the graphical interpretation of the results.

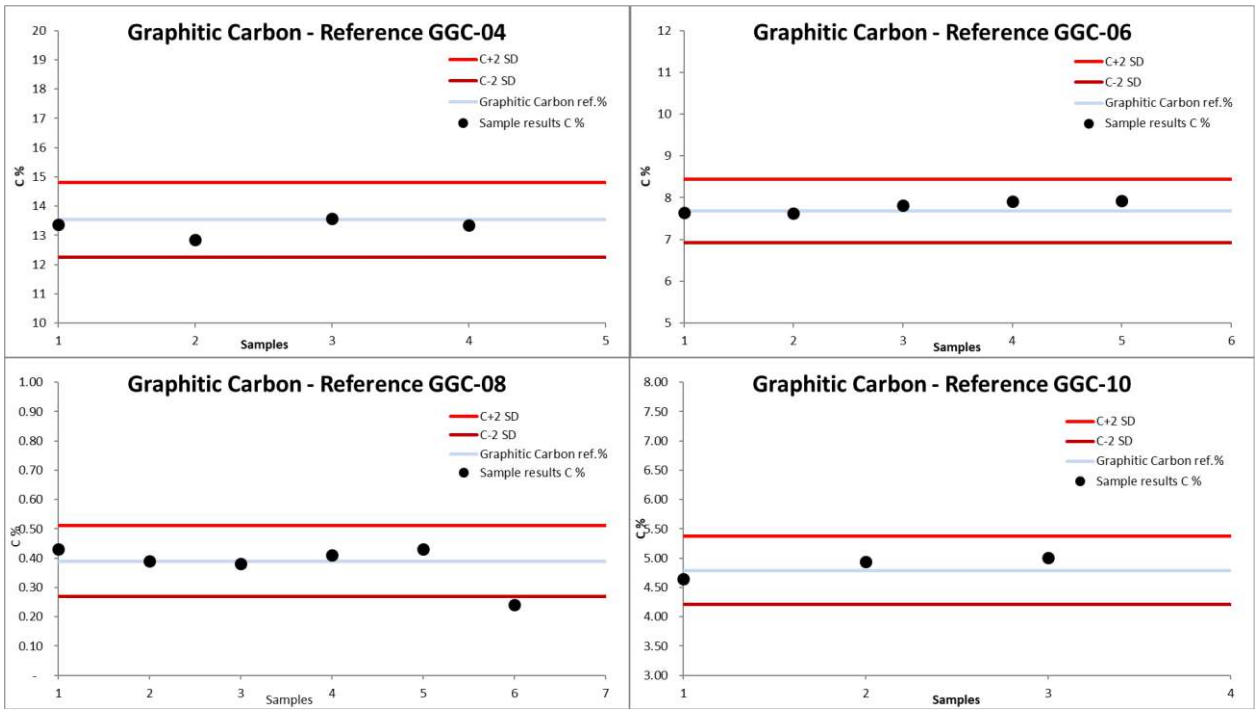


Figure 11-3 – Graphical interpretation of standard sample results from the Project database.

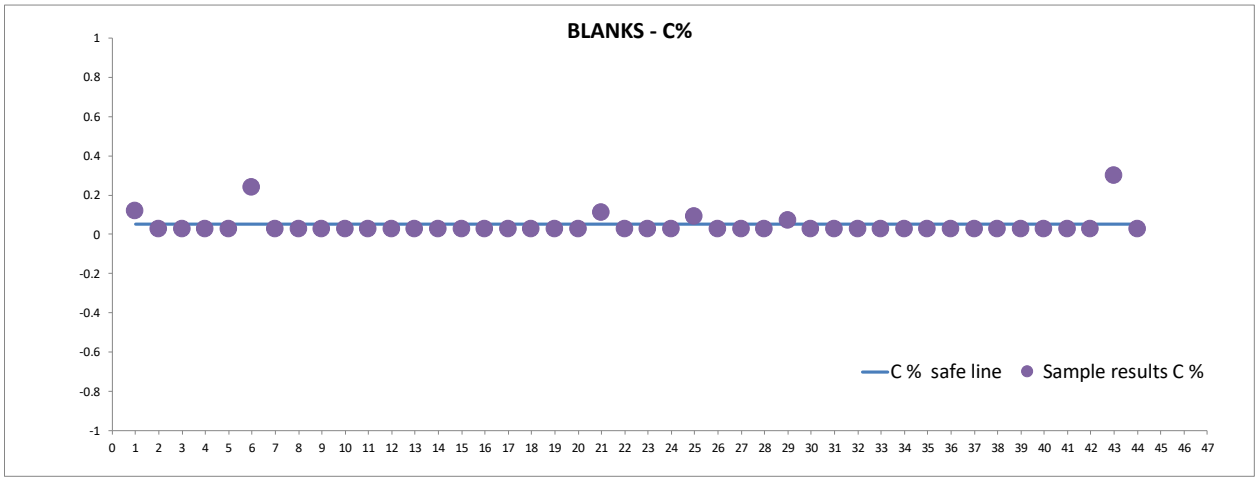


Figure 11-4 – Graphical interpretation of the BLANK sample results from the Project database.

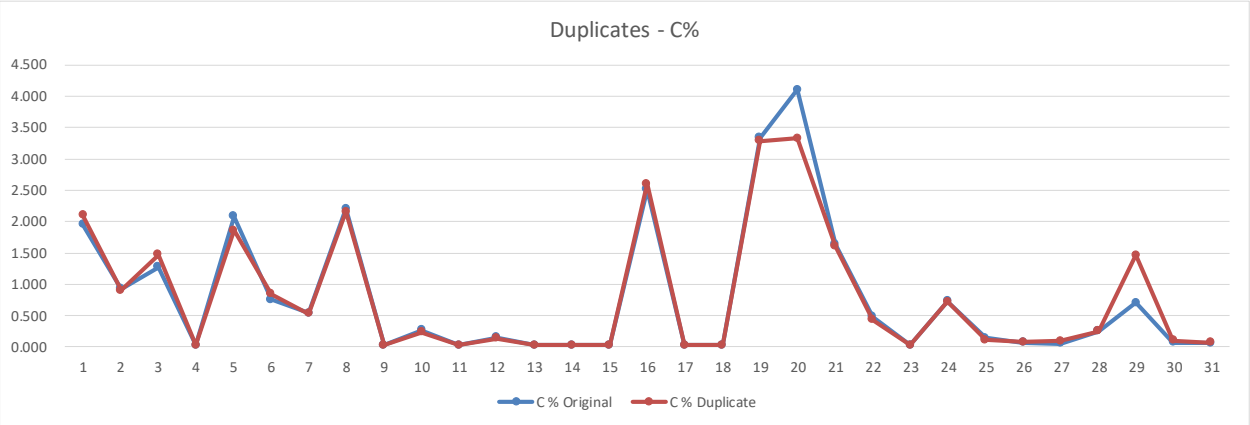


Figure 11-5 – Graphical interpretation of the DUPLICATE samples from the Project database.

12.0 DATA VERIFICATION

12.1 DATABASE

South Star provided DTM with the information that was used to develop this report, specifically during the execution of the work that is described herein. This work reflects the technical and economic conditions at the time that it was executed. DTM executed, whenever possible, an independent verification of the data that it received, in addition to field visits in order to corroborate said data. This information was supplied in the form of an exploratory drilling database, certifications, maps, technical reports and a topographical survey. The data is a combination of historical and newly generated information.

DTM carried out one field visit to the project on 17 and 18 June 2019 with the aim of expanding its geological knowledge of the venture and to verify the procedures adopted in the surveying and exploratory drilling stages.

DTM visited and verified the reverse circulation and diamond drilling markers. The coordinates of the markers were collected using handheld GPS for subsequent comparison with the Project database. Small differences found were within the acceptable variation range, caused by a lack of precision in field measuring methods.

Figure 12-1 – Drill hole marker visited in the field.

DTM visited the South Star core shed in Itabela (figure 12-2) where the company maintains the sample reserves. Sample descriptions and sampling are also prepared there.

Figure 12-2 – Photos of core house.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 INTRODUCTION

The overall approach to the process plant design was to focus on the following fundamentals:

1.) Take advantage of the abundant, high quality, shallow friable material with traditional milling and flotation circuits;
2.) Concentrate the graphite to a minimum of 93-95% Cg while maintaining the natural presence of jumbo/large flake size and other favorable physical characteristics so that Brasil Grafite products compare favorably with current market products;
3.) Keep construction costs low and design the circuit based on straightforward, proven technology that can mostly be fabricated in country, can be brought on-line quickly, and has been shown to be successful in other Brazilian operating mines; and
4.) Keep operating costs to a minimum and focus on quickly achieving consistent, positive cash flow while maintaining a favorable, sustainable operating margin.

The ore is suitable to produce high quality, natural flake graphite concentrate with standard commercial specifications. Additional specialty testing also showed the concentrate is suitable to produce specialty products such as purified concentrates as well as expandable and spheroidal graphite.

Mineral processing tests showed that conventional ore dressing techniques such as comminution, desliming, milling, flotation and product conditioning would fit the production process.

The PFS incorporates filtered tailings technology with the moisture reduced to 15-20% with co-disposed together with the mine wasterock in the waste dump.

The Project will start with a pilot plant facility capable of producing 5,000 tpy of graphite concentrate (Phase 1), with detailed engineering included as part of the PFS.

Phase 2 construction and operations would start in two years after start of Phase 1 and would have a industrial scale plant capable of producing after 25,000 tpy of graphite concentrate.

The key project criteria are presented in Table 13.1.

Table 13.1 – Key Project Criteria

items	unit	Phase 1	Phase 2
Avg. Ore Throughput	tph	165,000	1,097,900
Avg. Ore grade	%	3.5	2.3
Avg. Carbon recovery	%	82	82
Avg. Concentrate grade	% C	93-95	93-95
Avg. Concentrate production	tpy	5,000	25,000
Avg. Strip Ratio	W:O	1.1	1.6
Tailings Handling	Filter cake with <20% moisture		

13.2 PRELIMINARY METALLURGICAL SAMPLING AND TESTWORK

The preliminary testing program focused on small scale laboratory testing in order to determine material characteristics and suitability of the flotation.

Prior to testing at Centro de Desenvolvimento da Tecnologia Nuclear (CDTN) located on the Federal University of Minas Gerais in Belo Horizonte, MG, Brazil, preliminary process work was also conducted at Lyndtek Inc. facilities, CO – USA.

Experimental flotation tests at CDTN led to the results as shown in Tables 13.2 and 13.3.

Table 13.2 – Final concentrate – Test A results – FTM 06

SCREEN		Retained	Cumulative	Cg
Mesh	mm	%	%	%
20	0.841	1.6	1.6	95.4
30	0.595	5.0	6.6	94.6
50	0.297	35.4	42.0	93.5
80	0.177	30.5	72.5	90.2
100	0.149	9.5	82.0	88.6
-100		18.0	100.0	87.4
Average grade				**91.01**

Table 13.3 – Final concentrate – Test B results – L100

SCREEN		Retained	Cumulative	Cg
Mesh	mm	%	%	%
20	0.841	8.0	8.0	94.4
30	0.595	10.1	18.1	93.4
50	0.297	38.8	56.9	93.5
80	0.177	22.3	79.2	92.4
100	0.149	8.0	87.2	90.2
-100		12.8	100.0	88.9
Average grade				**92.8**

The conclusion of the tests was that it yielded a concentrate of excellent quality, indicating Santa Cruz´s material is easily processed and upgraded using conventional mill and float process.

Based on these results, a more comprehensive, pilot plant test was warranted and recommended.

13.3 BULK SAMPLE PILOT PLANT TESTS

During 2014, BGSA (Brasil Grafite S/A) conducted a complete, full scale pilot plant graphite test work in order to optimize and upgrade BGSA´s Santa Cruz Graphite Project concentration circuit, explore process tradeoffs and finalize the flowsheet.

Principal pilot plant test work objectives were:

1) To optimize and develop the process flowsheet at scale using the CDTN (Centro de Desenvolvimento de Tecnologia Nuclear – BH) bench scale results;
2) To produce final concentrates with a minimum of 93-95% Cg while minimizing fines and preserving the abundant large and jumbo size flake distribution naturally available in the Project`s ore;
3) To generate samples of concentrate for client testing and;
4) To develop detailed equipment lists and reagents use, which will serve as a basis for detailed plant CAPEX & OPEX estimates.

The pilot plant testwork was performed in Minas Gerais at Fundação Gorceix, one of the premier mineral processing plant facilities in Brazil, which operates at the Federal University of Ouro Preto (UFOP).

A series of determinations and analysis were also carried out during this process.

- Moisture determination
- Ore bulk density determination
- Density determination
- Determination of the water-soluble mineral salts
- Determination of HCl soluble ore
- Determination of crystalline water and ash in total sample
- Size and grade distribution

With the objective to characterize and better understand Santa Cruz's material, thus preparing and indicating more precise process alternatives for the pilot plant, a bench scale testwork was performed with the samples received.

Bench scale testwork analyzed the following variables:

- Optimal milling cycles;
- Optimal milling body (rod, balls, small balls, pebble, etc) – also evaluating flake size preservation;
- Flotation optimization, including retention times and reagents usage;
- Final product concentration vs. granulometry analysis and tradeoffs.

Figure 13-1 – Bench scale flotation tests

The results of the bench scale tests were used to develop a pilot plant circuit, shown in Figure 13-3, and generate, at scale, a final concentrate with Cg ≥ 93-95% using minimal grinding to preserve the large and jumbo flake size granulometry while optimizing recoveries.

Figure 13-2 – Pilot plant in Development at Fundação Gorceix

Figure 13-3 below shows a simplified version of the Project's flow sheet.

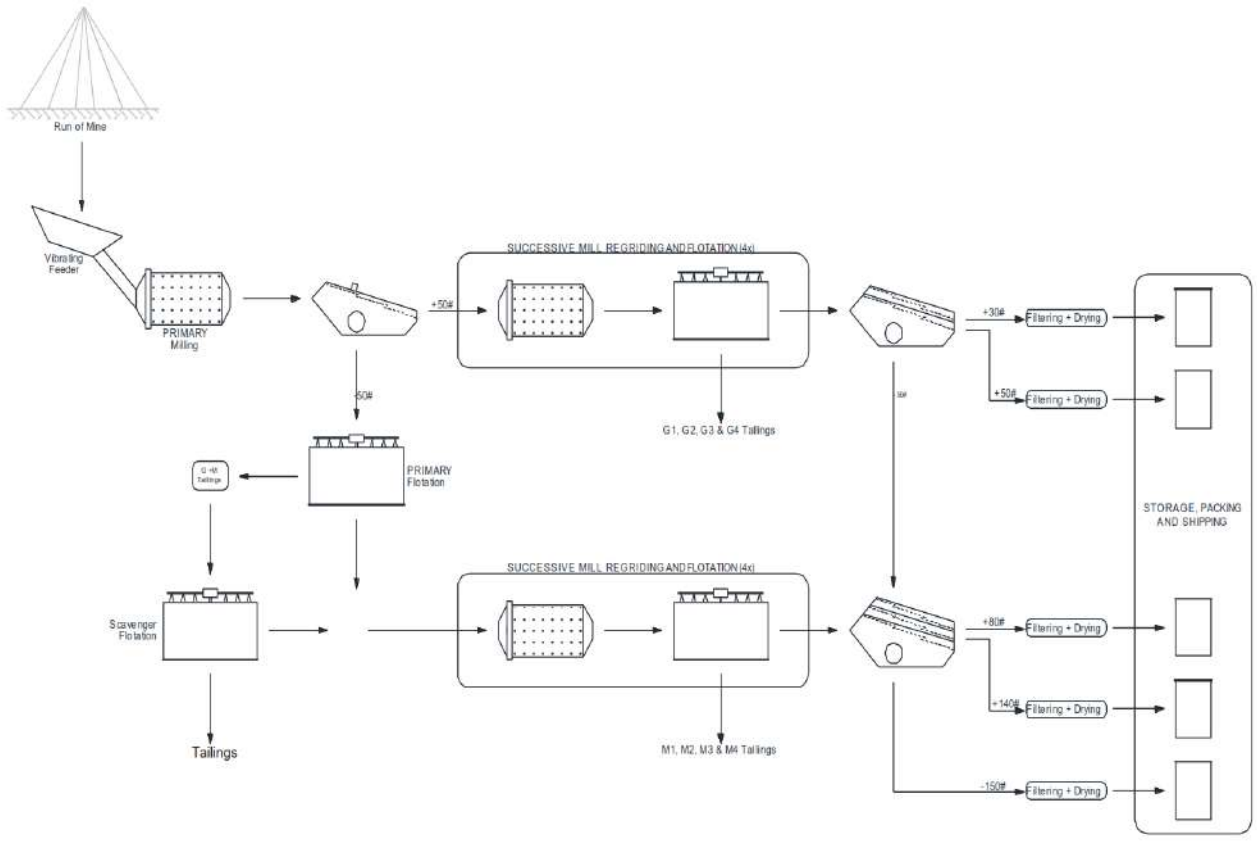


Figure 13-3 – Project Simplified Flowsheet

The characteristics of the concentrate obtained is presented in Table 13.4.

Table 13.4 – Project concentrate results

Screen size	Santa Cruz graphite	
	Weight	Cg
mesh	%	%
30	4	95
50	32	95
80	27	97
140	17	97
-140	20	97
Recovery		**88**

Filter press will reduce product moisture content to approximately 17%, and the water will be recirculated back into the process water.

Gas dryers will receive the product from the filter press and reduce product moisture to maximum 1%. Final product classification will be made with dry screens depending on client demand and product specifications. Silos will store final blends and supersacks or 25 kg bags will be used to package final products for shipping.

Figure 13-4 below shows an illustrative sample of the various concentrates.

Figure 13-4 – Concentrates in different mesh sizes

After the completion of the pilot plant test work, it was investigated the possibility of producing higher quality materials, and the results were favourable

13.4 2018 & 2019 ADDITIONAL TESTWORK

Additional tests were carried out in 2019 at PCM – Processamento e Caracterização Mineral Ltda – Mariana, MG – Brasil with the objective of screening / packing the concentrate obtained during the Pilot Test work Campaign in 3 different granulometries which are + 50 mesh, – 50 mesh and – 80 mesh and in addition, review the flowsheet conceived during the Pilot Scale Test work and obtain the mass balance in order to get information for Phases 1 and 2 projects

14.0 MINERAL RESOURCE ESTIMATE UPDATE

14.1 INTRODUCTION

During June of 2019 DTM executed an update of Project on São Manuel North (B1) and São Rubens West target areas' mineral resource estimation, shown in Figure 14.1.

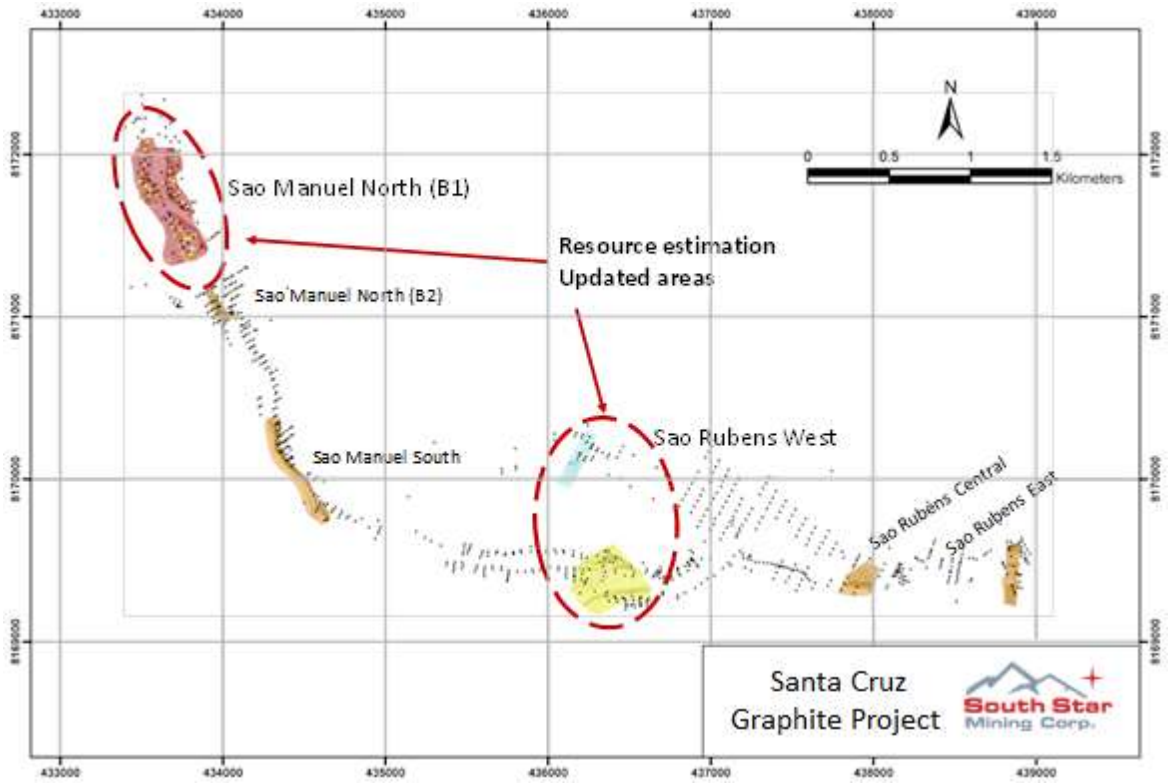


Figure 14-1 – Location of the areas with mineral resources updated of São Manuel North (B1) and São Rubens West, relative to the neighborhood target areas.

The mineral resource update included the most recent drilling information from RC and Diamond drilling campaigns on São Manuel North (B1) and São Rubens West target areas. The resource estimates for the other targets presented in February 2018 PEA have not been altered as no additional investigations have been performed.

For this update, DTM completed a review of the geological modelling, the grade estimation and the classification of the mineral resources. Also, during the update the following set of factors was taken into consideration: the quantity and spacing of the

available data, the interpretation of the mineralization controls, the type of mineralization, and the quality of the data utilized.

14.2 DRILLING DATA BASE

The drilling database for the resource estimation updated of São Manuel North (B1) and São Rubens West targets was received in MS-Excel format and were compiled in a MS-Access database.

The database for the mineral resource update includes 8 diamond drill holes, 85 reverse circulation holes and 49 rotary drill holes totaling 4,976 meters. Table 14.1 summarizes the drilling databases used for the mineral resource estimate update.

Table 14.1 – Summary drilling databases used for the mineral resource estimate update

Drill hole Types	2016 Campaign			2018 Campaign			TOTAL		
	Nr.	Meters	Samples	Nr.	Meters	Samples	Nr.	Meters	Samples
DDH (Diamond drill)	-	-	-	8	542	234	8	542	234
RC (Reverse Circulation)	48	2,449	1,879	37	1,349	1,023	85	3,798	2,902
RD (Rotary Drilling –Auger)	434	4,160	2,262	49	1,677	414	483	5,837	2,676
Total	**482**	**6,609**	**4,141**	**142**	**4,976**	**3,565**	**576**	**10,177**	**5,812**

The database includes collar coordinates, general survey, assays and geological log of all drill holes.

14.3 GEOLOGICAL MODEL

DTM received from South Star the datasets for São Manuel North (B1) and São Rubens West targets, including the wireframe geological models built by the South Star technical team as well as previous models from February 2018 PEA.

The wireframes were revised and modified using the "Snap to point" tool for section interpretations and considering the information contained on the geological logs of database, as below:

1- Mineralized zones can include the geological codes PGMJ, PGWJ, and OGJS, contained on the project database;

2- The weathering limit was used to delineate the saprolite geological domain and separate it from soils and fresh rock (using the wireframes provided by South Star);

3- The weathering limit was used to delineate the fresh rock geological domain and separate it from saprolite rock (using the wireframes provided by South Star).

Barreiras sedimentary rock unit occurs predominantly on top of the mineralized wireframes and was logged with a geological code STB in the database. This material was considering as waste for the geological model used in this mineral resource estimation update. Figures 14.2 and 14.3 present cross sections on the São Manuel North (B1) and São Rubens West target areas respectively with the wireframe limits assumed on this work.

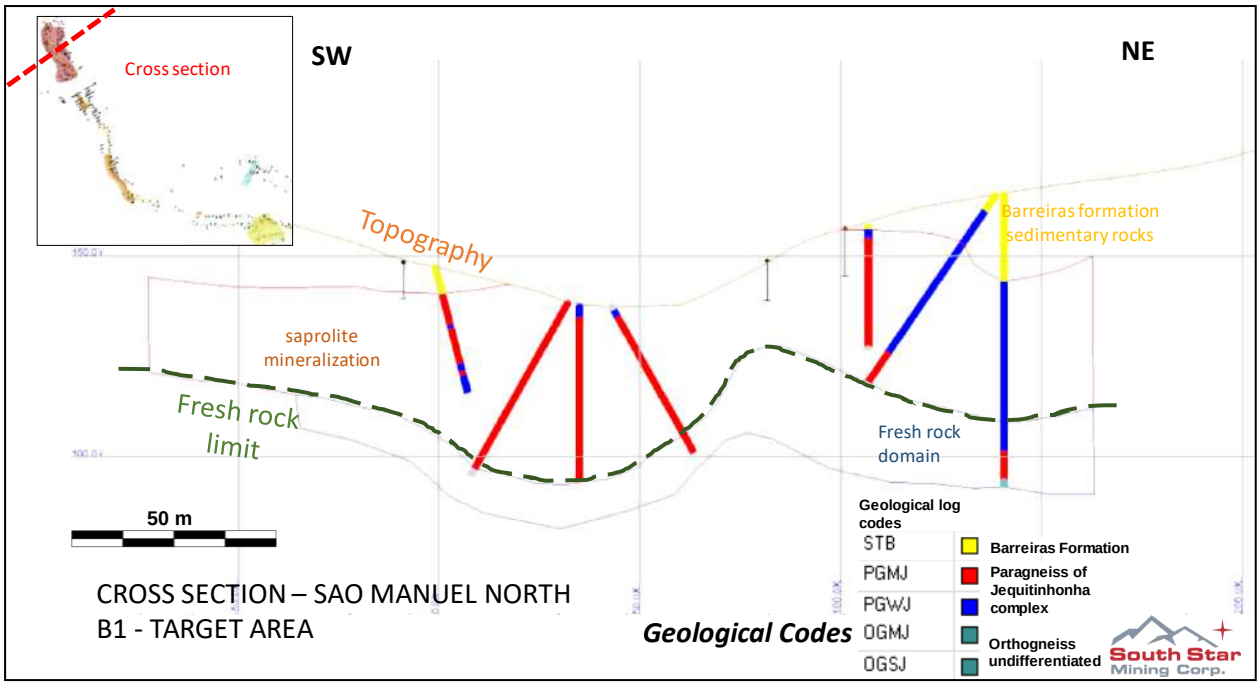


Figure 14-2 – Cross section at São Manuel North (B1) showing the weathering limit obtained from the provided wireframes by South Star.

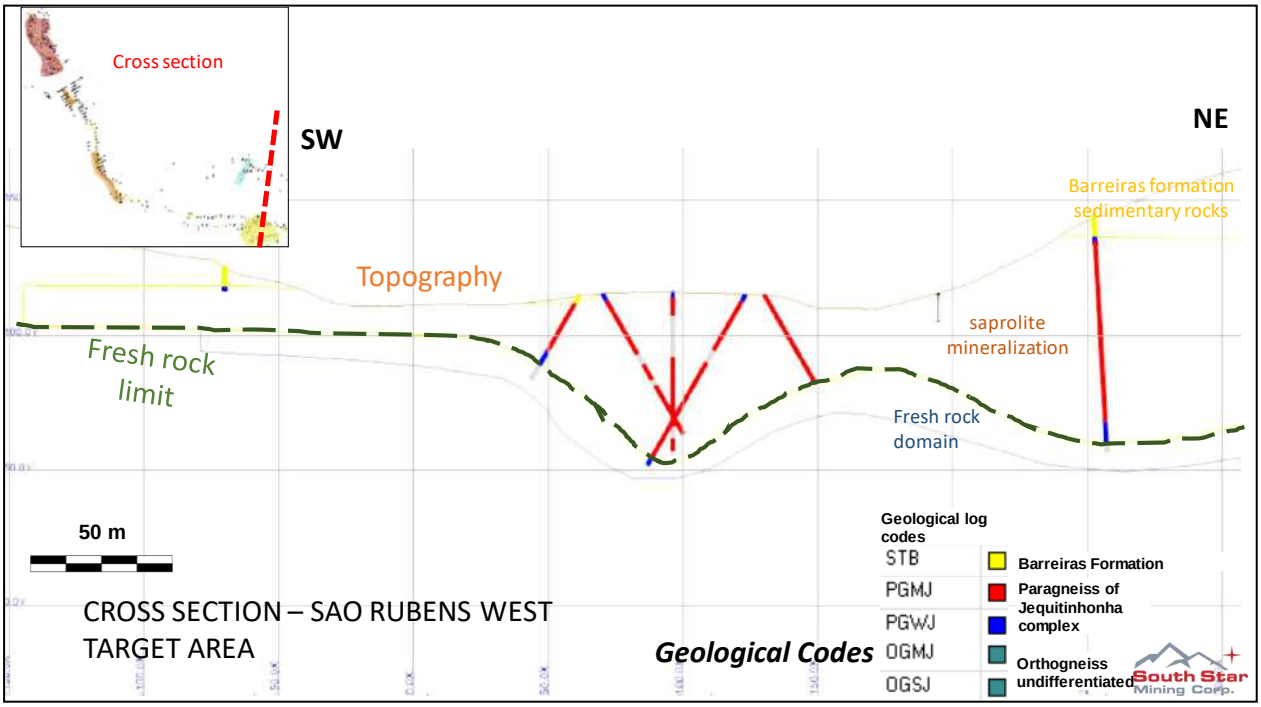


Figure 14-3 – Cross section at São Rubens West, showing the weathering limit obtained from the provided wireframes by South Star.

A total of five geological wireframes were used for this mineral resource estimation update, each one representing a geological domain of saprolite and fresh rock. For each one of the two targets, Table 14.2 shows the summary of the wireframes revised and used for the presented estimation.

Table 14.2 – List of geological wireframes considered for the mineral resource estimation update

Wireframe	Geological Code	Geological Domain	Target Area
1	1	Saprolite	São Manuel North (B1)
2	2	Saprolite	São Rubens (main area)
3	3	Saprolite	São Rubens (northeast portion)
4	5	Fresh Rock	São Manuel North (B1)
5	6	Fresh Rock	São Rubens (main area)

Figures 14-4 and 14-5 show the view of the mineralization wireframes separated by geological domains on São Manuel North (B1) and São Rubens target areas.

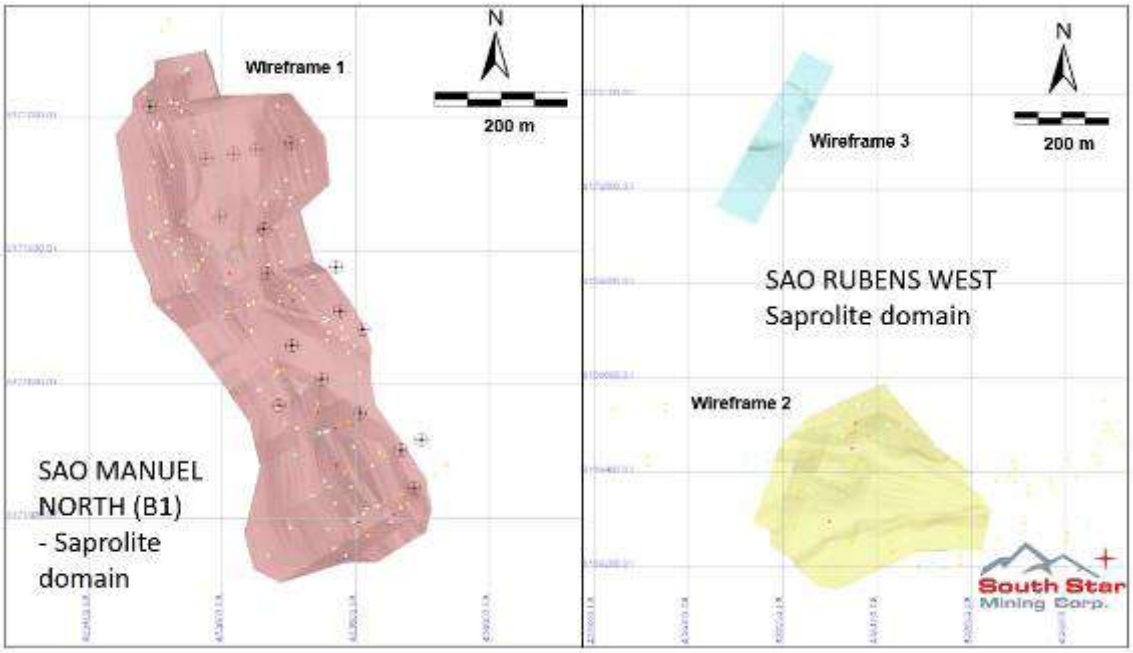


Figure 14-4 – Plan view of 3D Geological wireframes considered for the mineral resource estimation update wireframes 1, 2 and 3.

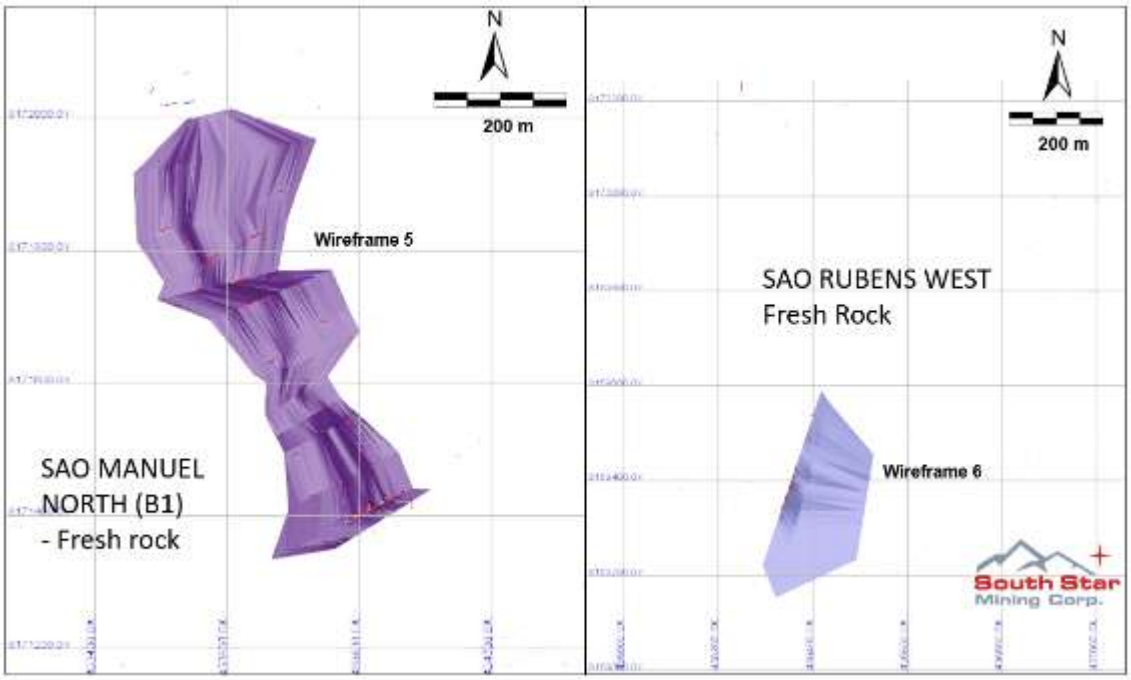


Figure 14-5 – Plan view of 3D Geological wireframes considered for the mineral resource estimation update, wireframes 5 and 6.

14.4 TOPOGRAPHY

For the resource estimation update of São Manuel North (B1) and São Rubens West the topography surface considered was provided by South Star. The stereo satellite imagery and digital terrain model were acquired by the Company, from data of Stereo

Pleiades-1 Satellite Sensor (1 m) coupled with ground point verification provided via a GNSS RTK GPS. Topography is in UTM (meters) coordinate system with SAD 69, Zone 24 – South Datum. The satellite imagery was orthorectified and used to develop 1 m topography for the region. All drill hole collars were surveyed in the field using a GNSS RTK GPS and incorporated into the topography.

14.5 BLOCK MODELING

Two 3D block models were constructed for the resource estimation update for São Manuel North (B1) and São Rubens West targets, shown in Table 14.3. User block size was based on previous estimation parameters provided by South Star from the preliminary mineral resource estimation of the Santa Cruz Graphite Project.

Table 14.3 – Summary of the block models geometry

SÃO MANUEL NORTH (B1)			
Item	**Y**	**X**	**Z**
Minimum Coordinates	8,170,800	433,400	40
Maximum Coordinates	8,172,100	434,200	260
User Block Size	4	4	4
Minimum Block Size	4	4	4
Rotation (°)	0	0	0
SÃO RUBENS WEST			
Item	**Y**	**X**	**Z**
Minimum Coordinates	8,169,130	436,000	40
Maximum Coordinates	8,170,350	436,680	200
User Block Size	4	4	4
Minimum Block Size	4	4	4
Rotation (°)	0	0	0

14.6 DENSITY

The historic data of density from the Santa Cruz Graphite Project contain forty-nine (49) samples analyzed at Lenc Laboratory, a French-based multinational part of Egis Group. This Laboratory has ISO/IEC 17025 certification. This result was an average of 2.7 g/cm^3.

For the saprolite geological domain, a density of 2.57 g/cm^3 was used based on the results from analysis of 226 samples of the mineralized gneiss. Table 14.4 shows the summary of the density measurements by geological type and from historical dataset.

Table 14.4 – Summary of the Density results

Sample Data	Lithocode	Rock description	Number of samples	Average of density (g/cm³)
Historical Data	-	-	49	2.71
Mineralized gneiss	OGMJ	Paragneiss, mineralized	20	2.57
	PGMJ	Mineralized Orthogneiss	226	
Total			**295**	

14.7 CUT OFF GRADE

For the Santa Cruz Graphite project resource estimation, dated August 2017, a general cut off grade of 1%C was used for all targets.

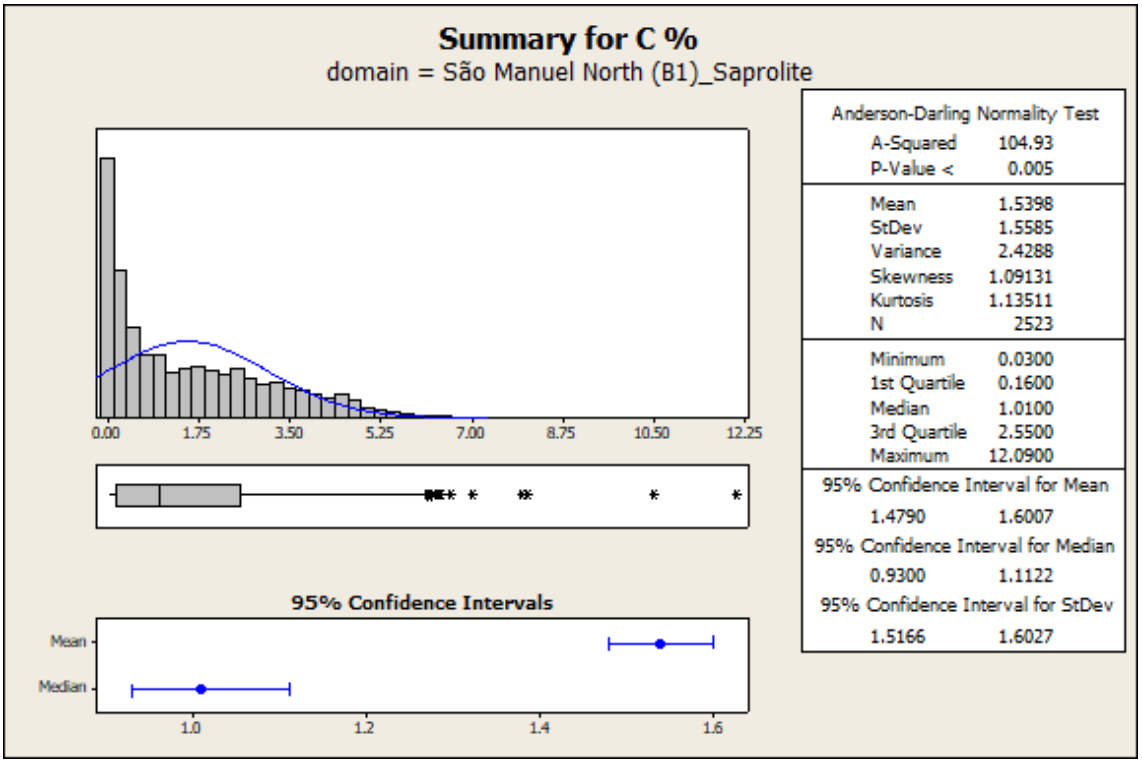
In the current mineral resource estimation of the São Manuel North (B1) and São Rubens West targets were updated using a cut off grade of 0,75 %Cg, as per parameters and considerations below.

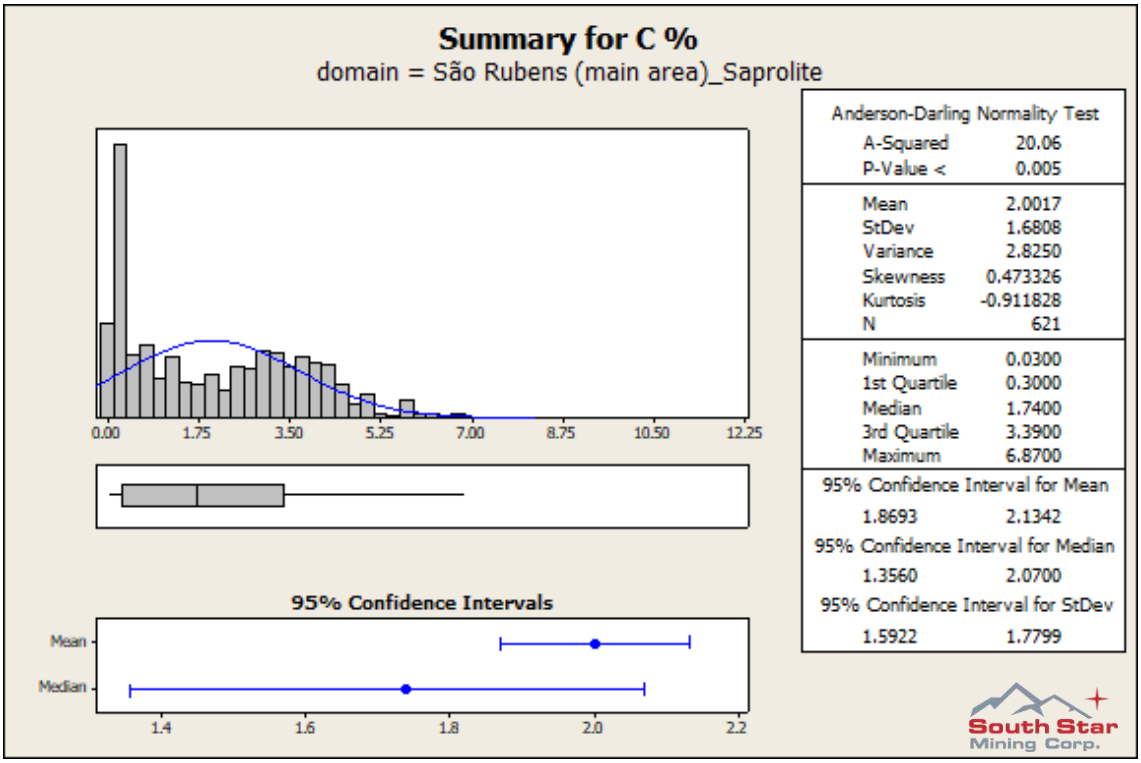
14.8 EXPLORATORY DATA ANALYSIS

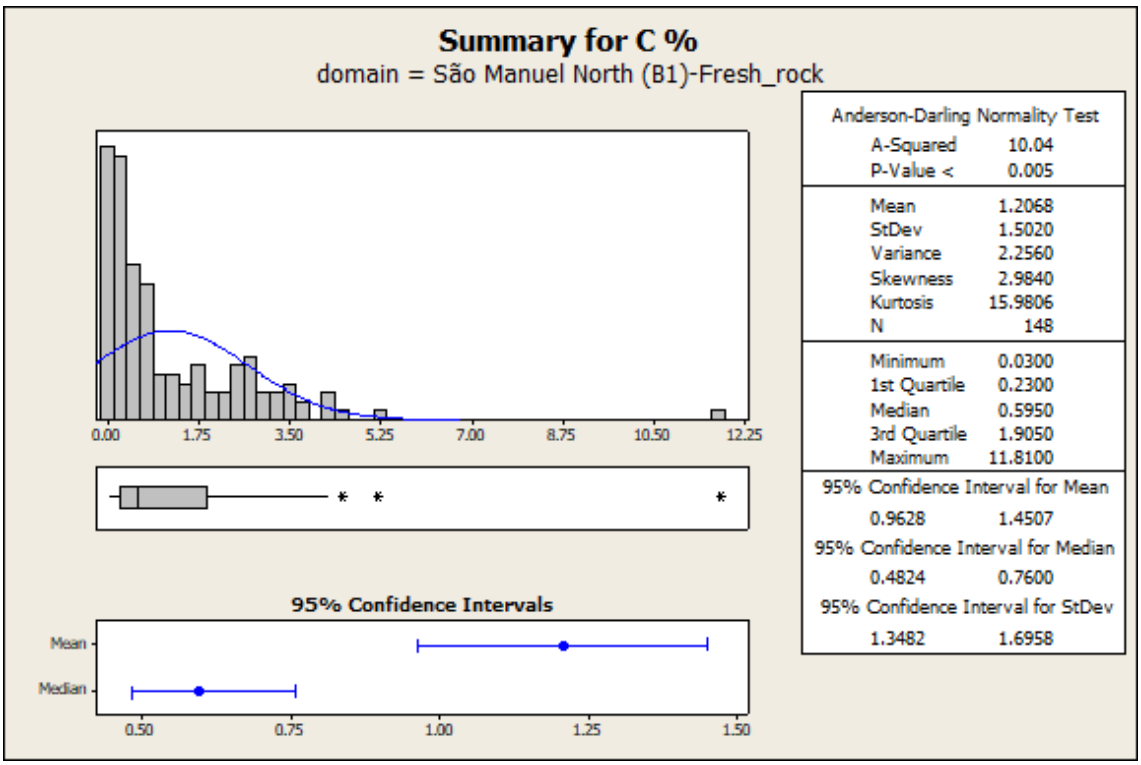
Exploratory data analysis (EDA) have been compiled with the samples inside the geological domains determined for São Manuel North (B1) and São Rubens West targets. The statistical examinations and the grade characteristics of the mineralized intervals for each domain were organized in Table 14.5. Graphical statistic summaries of the variable C % for each geological domain and target are shown in Figures 14-6 (a,b,c,d,e).

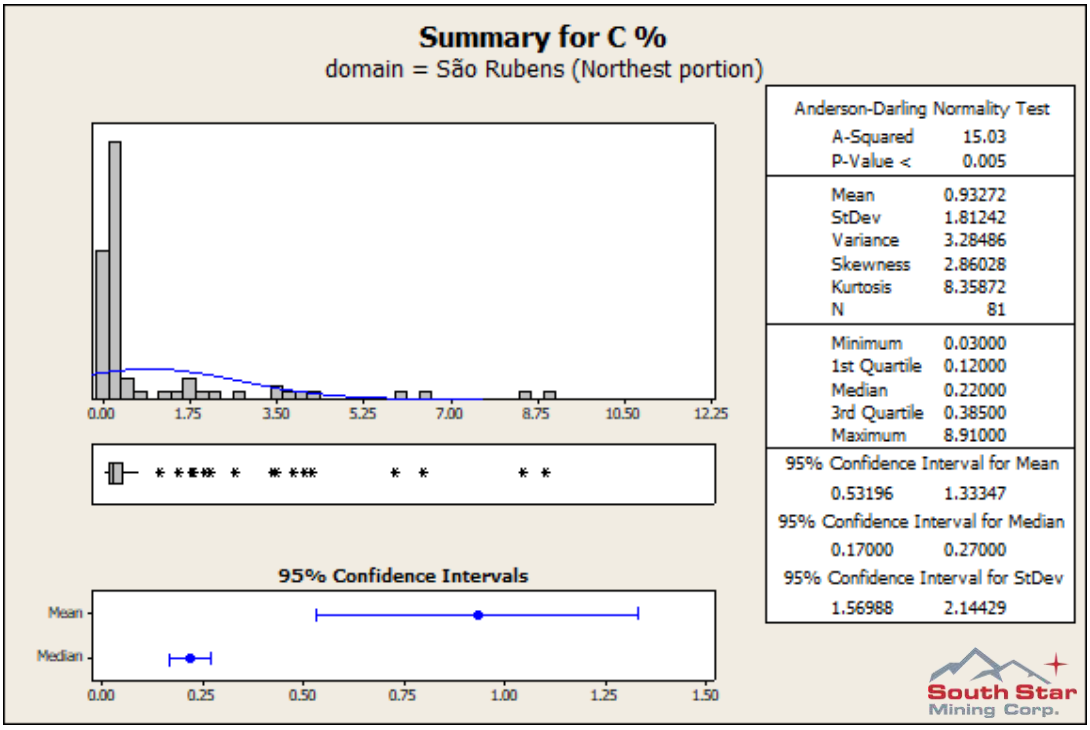
Table 14.5 – Basic Statistical Analysis Summary (C %)

Domain	Count	Min	Max	Mean	Median	StDev	Variance	CVariat
São Manuel North (B1) Fresh Rock	148	0.03	11.81	1.21	0.59	1.50	2.26	124
São Manuel North (B1) Saprolite	2,523	0.03	12.09	1.54	1.01	1.56	2.43	101
São Rubens (main area) Fresh Rock	39	0.03	5.06	1.70	1.22	1.60	2.55	94
São Rubens (main area) Saprolite	621	0.03	6.87	2.00	1.74	1.68	2.83	84
São Rubens (northeast portion)	81	0.03	8.91	0.93	0.22	1.81	3.28	194




Summary for C %
domain = São Rubens (main area)_Saprolite
Anderson-Darling Normality Test
A-Squared 20.06
P-Value < 0.005
Mean 2.0017
StDev 1.6808
Variance 2.8250
Skewness 0.473326
Kurtosis -0.911828
N 621
Minimum 0.0300
1st Quartile 0.3000
Median 1.7400
3rd Quartile 3.3900
Maximum 6.8700
95% Confidence Interval for Mean
1.8693 2.1342
95% Confidence Interval for Median
1.3560 2.0700
95% Confidence Interval for StDev
1.5922 1.7799
0.00 1.75 3.50 5.25 7.00 8.75 10.50 12.25
95% Confidence Intervals
Mean
Median
1.4 1.6 1.8 2.0 2.2
South Star
Mining Corp.


Summary for C %
domain = São Manuel North (B1)-Fresh_rock
Anderson-Darling Normality Test
A-Squared 10.04
P-Value < 0.005
Mean 1.2068
StDev 1.5020
Variance 2.2560
Skewness 2.9840
Kurtosis 15.9806
N 148
Minimum 0.0300
1st Quartile 0.2300
Median 0.5950
3rd Quartile 1.9050
Maximum 11.8100
95% Confidence Interval for Mean
0.9628 1.4507
95% Confidence Interval for Median
0.4824 0.7600
95% Confidence Interval for StDev
1.3482 1.6958
0.00 1.75 3.50 5.25 7.00 8.75 10.50 12.25
95% Confidence Intervals
Mean
Median
0.50 0.75 1.00 1.25 1.50



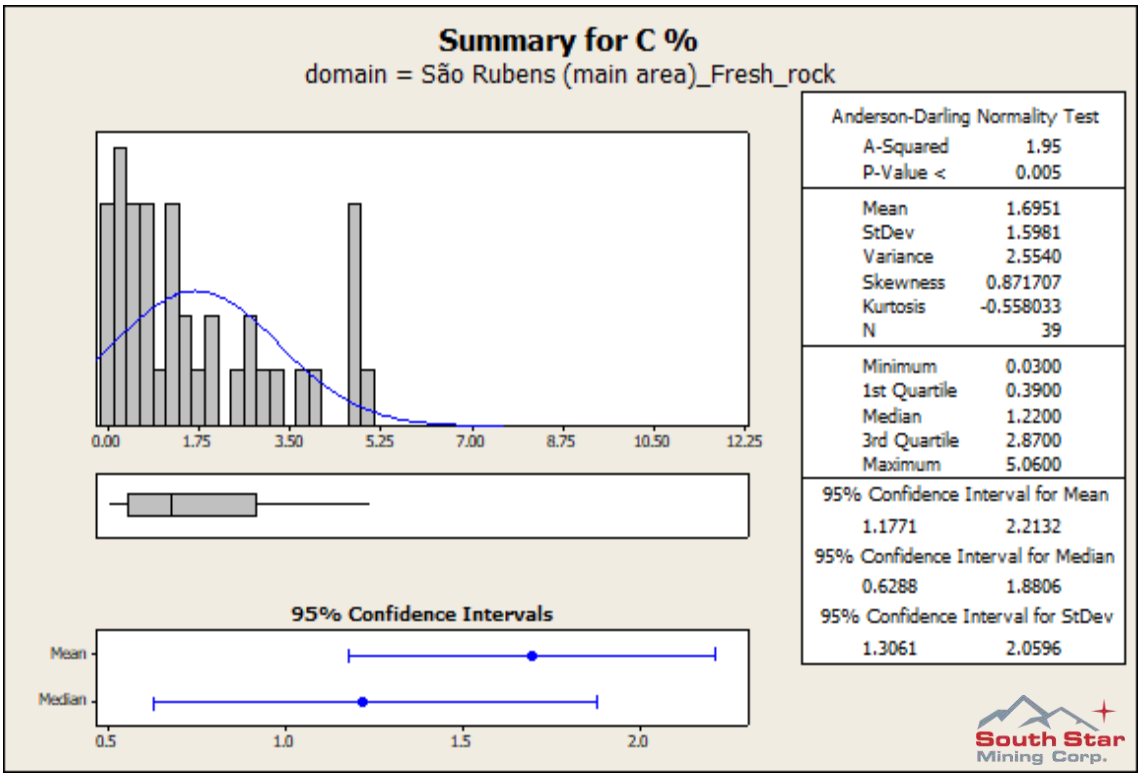


Figure 14-6 (a,b,c,d,e) – Graphical statistic summaries of the variable Cg % for each geological domain and target.

14.9 GRADE ESTIMATION AND ESTIMATION STRATEGY

Ordinary Kriging ("OK") method was used to estimate C (%) for the São Manuel North (B1) and São Rubens targets on saprolite domains. OK is one of the most common

geostatistical methods for grade estimation. In this interpolation technique, the contributing composited samples are identified through a search applied from the centre of each block. Weights are determined to minimize the variance error, considering the spatial localization of the selected composites and the modelled variogram. The grade of the weighted composited sample is combined to generate the estimation of the block grade and the variance. The fresh rock domains on São Manuel North (B1) and São Rubens West, due to the reduced number of samples, are estimated by IDW (inverse distance weighting).

The grade estimation methodology is summarized in Table 14.6.

Table 14.6 – Summary of the Estimation Methodology.

Target	São Manuel North (B1)	São Manuel North (B1)	São Rubens West (main area)	São Rubens West (main area)	São Rubens West (northeast portion)
Wireframe	1	4	2	5	3
Mineralization	Saprolite	Fresh Rock	Saprolite	Fresh Rock	Saprolite
proc	Ordinary Kriging	IDW2	Ordinary Kriging	IDW2	IDW2
pass	3	2	2	1	1
samples	2,523	148	621	621	621
1º Az	150	150	160	160	150
Dip	0	0	0	0	0
2º Az	240	240	240	240	240
search X axis	110	100	330	1,000	1,000
search Y axis	50	50	150	400	400
search Z axis	25	25	75	100	100
c0	0.5	0.5	0.5		
c1	0.8	0.8	0.8		
Sill	1.3	1.3	1.3		
Angle1	150	150	150		
Angle2	0	0	0		
Angle3	240	240	250		

Using the block model estimation of carbon grades (Cg%), a visual check of the cross sections was performed to verify the adherence of the estimated block with the limit of wireframes and to check the result of estimation versus the sample grades of the drill hole intervals. Figure 14-7 shows one section on São Manuel North (B1) and one section on São Rubens West to exemplify the visual check procedure.

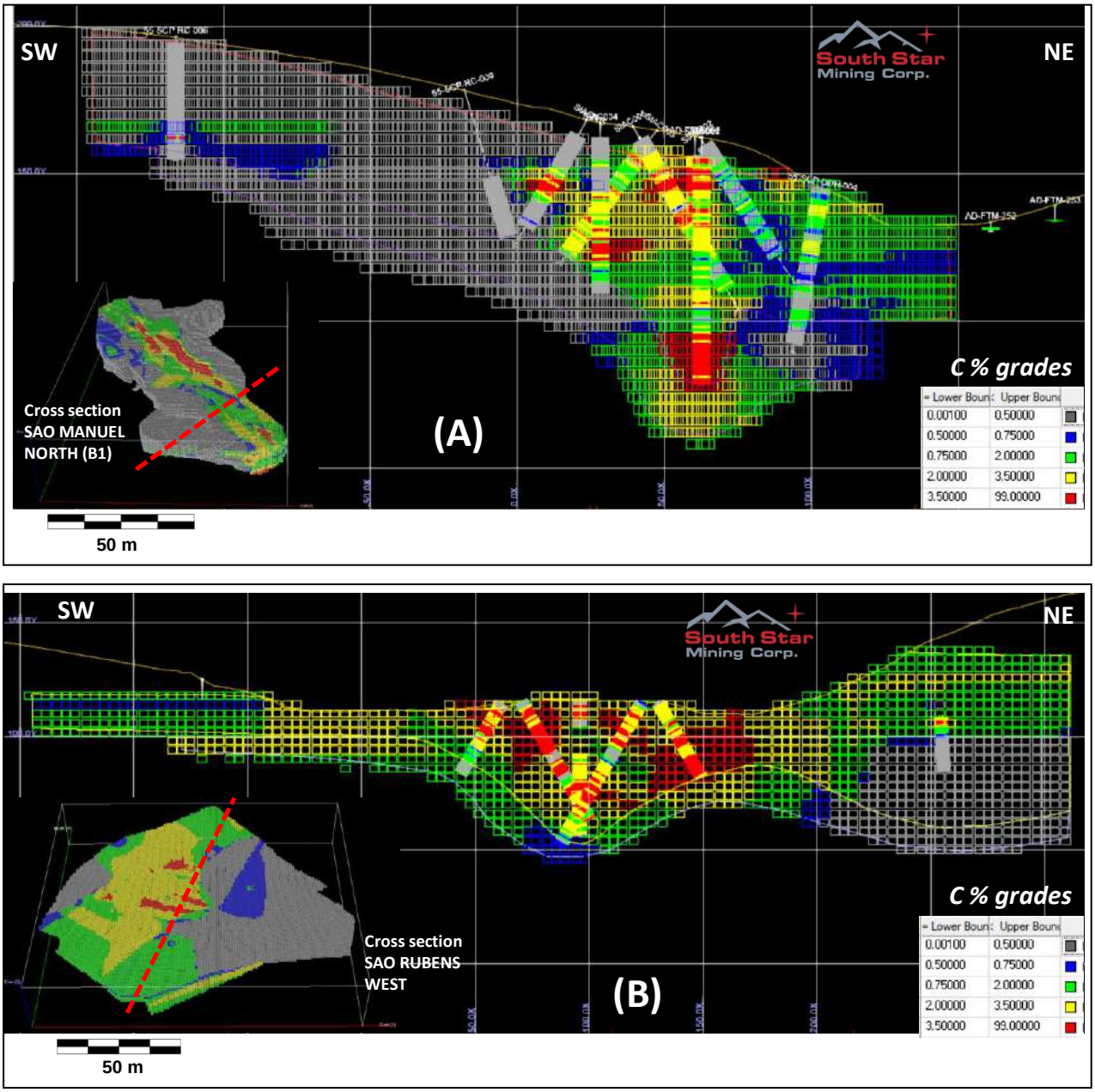


Figure 14-7 (A,B) – Visual validation of the estimated block model (A) Cross section at São Manuel North (B1) and (B) São Rubens West, showing the grades of %Cg on blocks and drill holes.

14.10 RESOURCE STATEMENT AND CLASSIFICATION OF MINERAL RESOURCES

The mineral resource updated on São Manuel North (B1) and São Rubens West was classified as Measured, Indicated and Inferred Mineral Resource based on the assessment of the input data, geological interpretation and quality of grade estimation. The key criteria assessed as part of the Resource classification are set out in Table 14.7.

Table 14.7 – Confidence Level of Key Criteria

Items	Discussion	Confidence
Drilling Techniques	Drill holes were composed by Reverse Circulation (60%), Auger drilling (35%) and Diamond drilling (6%) methods and are industry standard approach.	Moderate
Logging	Standard nomenclature and apparent good quality but not corresponding exactly to the limits of the geological wireframe.	Moderate
Sub-sampling Techniques and Sample Preparation	Sampling was planned on a variable length nominal interval from 1m to 2m. The field preparation and the lab preparation are industry standard.	High
Quality of Assay Data	The parameters from the quality control analysis of the reference samples from exploration are inside the acceptance limits.	Moderate
Drill hole Surveying	Diamond drill holes have no downhole survey data.	Moderate
Location of Sampling Points	The field samples and the drill hole collars were surveyed in using RTK GPS.	High
Data Density and Distribution	The drill spacing is not close enough to enable robust variography analysis results.	Moderate
Database Integrity	The drill hole database was presented without significant errors and inconsistencies in a Microsoft Access (mdb) format.	High
Geological Interpretation	Saprolite and fresh rock domains were based on indirect information and not drill hole logging.	Moderate
Density – Specific Gravity	The density data has adherent test results representing each geological type.	Moderate to High
Estimation and Modelling Techniques	Despite the low robustness of the variograms, Ordinary Kriging (OK) method has been used to obtain estimates of C (carbon)	High

14.11 MINERAL RESOURCE CLASSIFICATION UPDATE

The mineral resource classification of São Manuel North (B1) and São Rubens West is based on the confidence levels of key criteria (Table 14.7) and on technical factors that were either observed or measured. The following criteria were considered:

- Confidence in and quality of the data;

- Confidence in the lithological continuity;
- Quantity and spacing of the intersections in each mineralized zone;
- Confidence and continuity of grades and densities obtained in the observations on the Project Database;
- Search ellipse radius and of kriging parameters;

Considering those information and measurements DTM performed the Resources classification was in accordance with the following:

- Measured Resources were the estimated blocks of São Manuel North (B1) and São Rubens West with a cut off grade of 0,75 %Cg, inside of the saprolite domain that was estimated by the ordinary kriging method and with a search radius of 110 m distance representing the major continuity obtained by the directional semi-variogram. Also included are the estimated blocks with a kriging variance below 0.5 obtained by ordinary kriging estimation method.

- Indicated Resources were the estimated blocks of São Manuel North (B1) and São Rubens West with a cut off grade of 0,75 %Cg, inside of the saprolite domain that were estimated by the ordinary kriging method and with a search radius of 220 m distance representing the major continuity obtained by the directional semi-variogram. Also included are the estimated blocks with kriging variance below 0.5 obtained by ordinary kriging estimation method.

- Inferred Resources were considered as the entire fresh rock domain of São Manuel North (B1) and São Rubens West and the northeast mineralized saprolite body of São Rubens West that are discontinuous from the main area.

Table 14.8 shows the resources divided by target and category.

Table 14.8 – Resources by Target and Category

	Measured		Indicated		Measured + Indicated	
	tonnage	grade (%)	tonnage	grade (%)	tonnage	grade (%)
São Manoel North B1	2,375,585	2.26	5,877,528	2.10	8,253,113	2.15
São Manoel North B2	-	-	572,400	2.50	572,400	2.50
São Manoel South	-	-	1,309,500	2.80	1,309,500	2.80
São Rubens West	1,571,966	2.61	3,196,144	2.22	4,768,111	2.35
São Rubens Center	-	-	-	-	-	-
São Rubens East	-	-	-	-	-	-
TOTAL Main Rock	**3,947,551**	**2.40**	**10,955,573**	**2.24**	**14,903,124**	**2.28**
Jucuruçu	-	-	-	-	-	-
GRAND TOTAL	**3,947,551**	**2.40**	**10,955,573**	**2.24**	**14,903,124**	**2.28**

	Inferred Resource	
	tonnage	grade (%)
São Manoel North B1	2,131,488	1.82
São Manoel North B2		
São Manoel South		
São Rubens West	2,207,865	1.85
São Rubens Center	785,700	3.90
São Rubens East	631,800	1.70
TOTAL MAIN	**5,756,853**	**2.10**
Jucuruçu	2,154,600	2.90
GRAND TOTAL	**7,911,453**	**2.32**

15.0 MINERAL RESERVE

Mineral (or ore) reserves are estimated based on 2019 Updated Mineral Resources Estimate (Measured and Indicated), considering mining, metallurgical, economic, marketing, legal, environmental, social and government factors (the “modifying factors”), as illustrated in Figure 15-1 below:

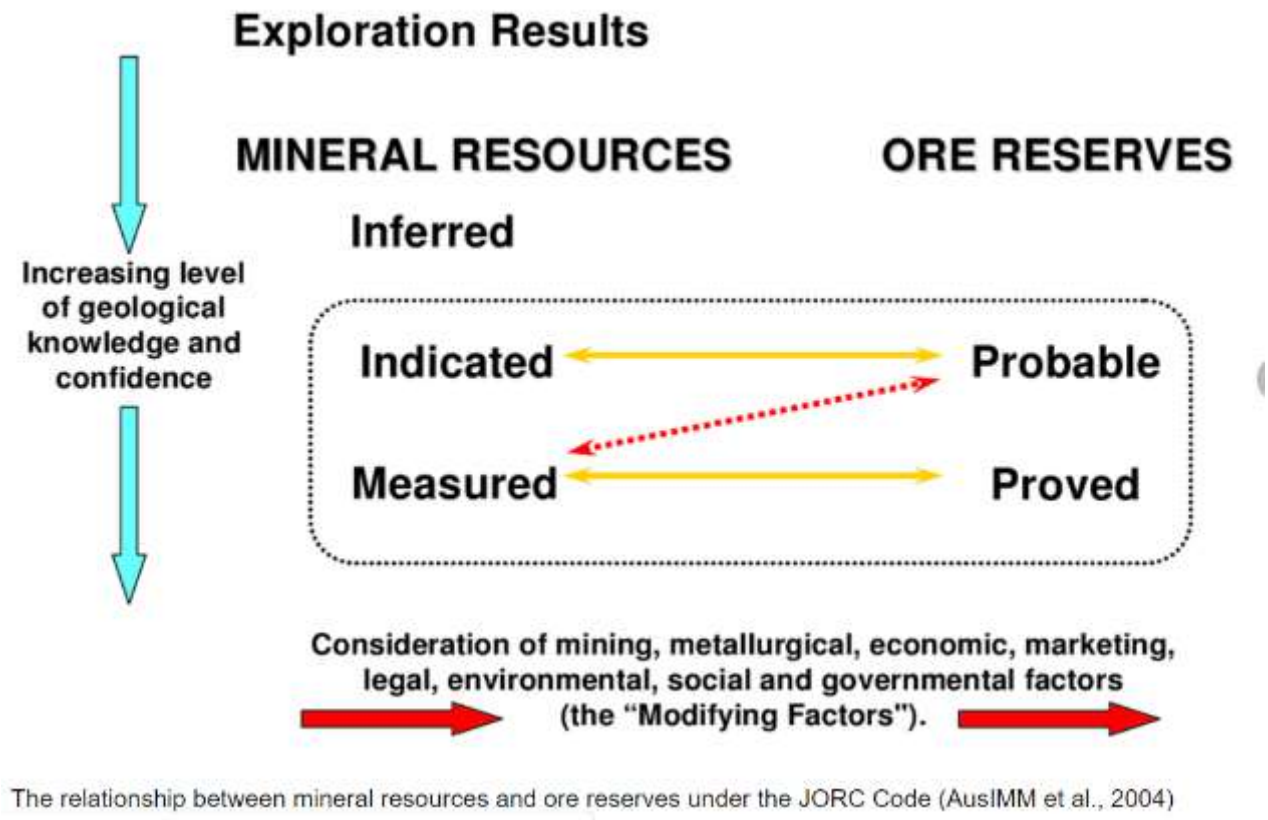


Figure 15-1 – Mineral Resources, becoming Ore Reserves

The Maiden Mineral Reserves have been developed using industry standards and best practices in Accordance with CIM guidelines and NI 43-101 reporting requirements.

Table 15.1 – Mineral Reserve Estimate

	Proved Reserves		Probable Reserves		TOTAL	
	TONNES	GRADE (%Cg)	TONNES	GRADE (%Cg)	TONNES	GRADE (%Cg)
São Manuel North	2,099,166	2.40	5,640,948	2.26	7,740,115	2.30
São Rubens West	1,890,468	2.60	2,045,521	2.54	3,935,989	2.57
São Manuel South			632,327	2.59	632,327	2.59
TOTAL	**3,989,635**	**2.49**	**8,318,796**	**2.35**	**12,308,431**	**2.40**

Notes:

1) *Mineral Reserves are as defined by the 2014 CIM Definition Standards for Mineral Resources and Mineral Reserves.*
2) *Mineral Reserves are based on Mineral Resources (Published on July 8th, 2019) estimated using ordinary kriging method and a three-dimensional block model using a cut-off grade of 0.75% and 1% Cg, depending on the modeled zones.*
3) *Numbers have been rounded.*
4) *Mineral Reserves have incorporated cut-off, pricing, costs, recovery & FX.*

Economic and technical assumptions along with optimization parameters used in the reserve estimate and the main mining Project parameters are presented in detailed in Section 16.0

General plan view of the mining area, showing the different mining areas (with indication of the final pit configuration), main mining structures (plant, waste disposal area, access roads, etc.) are shown for Phases 1 and 2 in Figures 15.2 and 15.3, respectively:

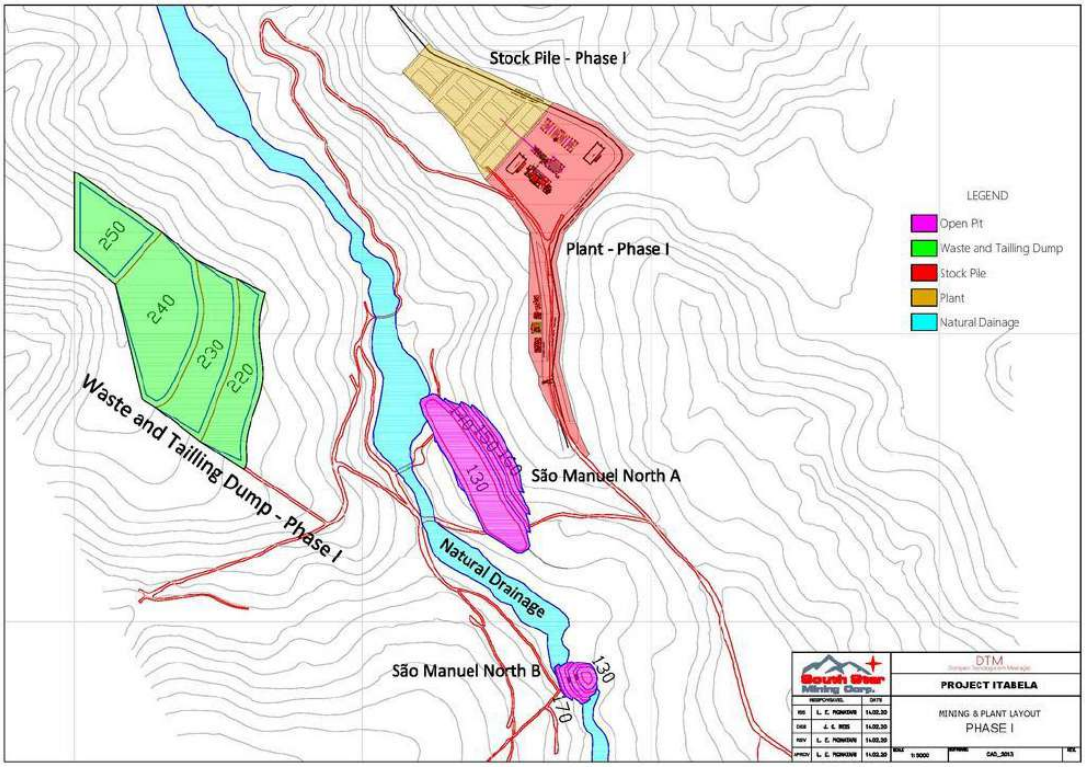


Figure 15-2 – Phase 1 General Facilities Arrangement Plan View

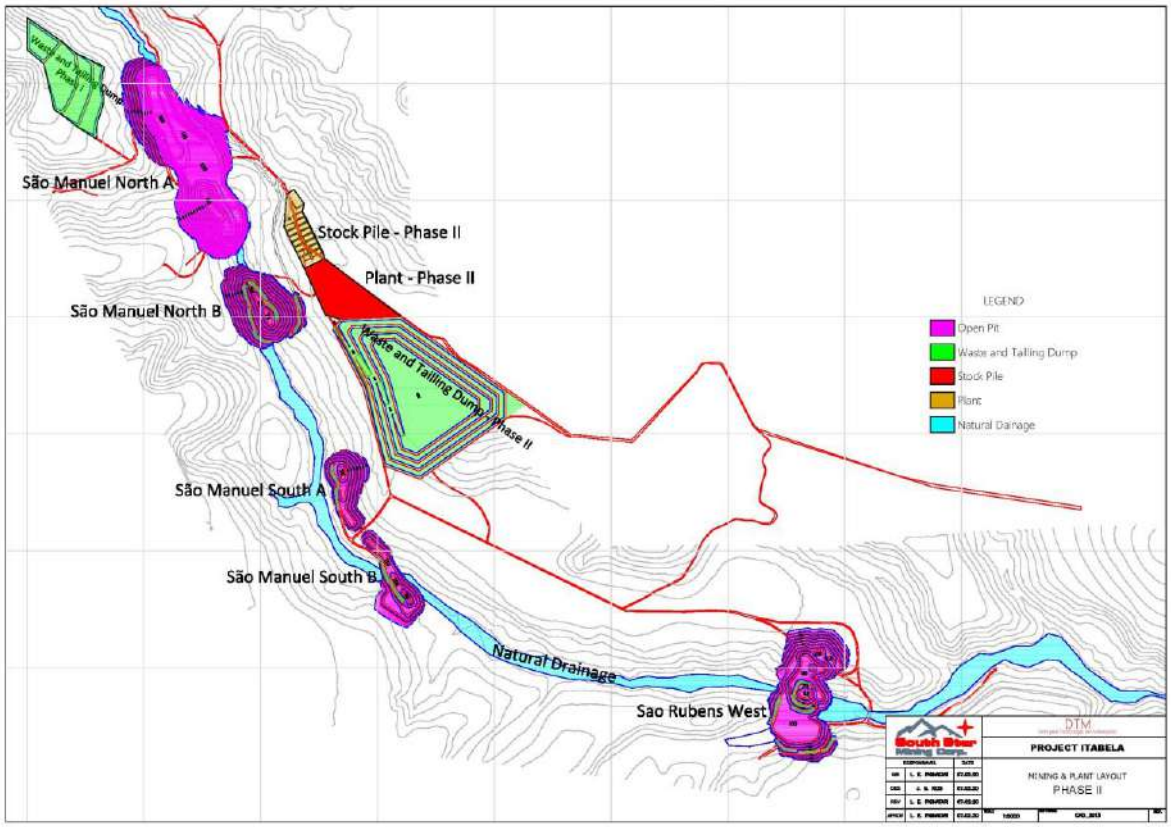


Figure 15-3 – Phase 2 General Facilities Arrangement Plan View

16.0 MINING METHODS

16.1 INTRODUCTION

This section of the PFS builds on the July 2017 Preliminary Economic Assessment of the Project. The current resources and reserves are generally within a shallow, oxidized zone that is amenable to excavation without the requirement for drilling and blasting.

The mining method selected for the Project is conventional open pit mining (of ore and of waste) using hydraulic excavators, dozer and haul trucks, assuming that all the mining operations will be contracted. Drilling and blasting operations are not necessary based on current information and are not considered in the analysis.

Grade control will be coordinated through a full-time grade control crew of technicians that will use channel samples taken at the pit face to identify the ore zones. When required, the grade control crew will execute drill holes at the mining faces to determine grade control parameters.

Auxiliary equipment include one bulldozer CAT D8 or equivalent, one grader, one wheel dozer, water truck, maintenance vehicles and service vehicles.

Other mining infrastructure includes mine offices, change house facilities and maintenance facilities. The mine office will provide for mine management, engineering, geology, and mine maintenance services. Other infrastructure required included a maintenance workshop for use by the mining contractor and fuel storage facilities.

Excavators will load conventional on-road 25 ton trucks that will transport the ore to the plant ore stockpile area and the waste to the waste storage facilities (WSF). The WSFs will have adequately prepared areas, and wasterock will be disposed in a controlled manner (compacted along with installation of surface drainage and revegetation, etc.) to guarantee the long-term physical and chemical stability of the deposit and facilities.

The WSF will also receive the filtered tailings from the processing plant as well be mixed with the mine waste (Co-disposal). This should avoid the requirement for tailing storage facility or any other ("pulp-form") tailing contention dam or structure.

Due to operational difficulties foreseen at the rain season in this region and the characteristics of the selected equipment, the mine is planned to operate ten months per year in average. The plant facility is designed to operate 12 months per year, so a ore stockpile area will be built in the dry season to feed the plant in the wet season as well as to serve as buffer feedstock too.

This chapter is intended to serve, basically, two purposes:

1) To support the final pit design that matches the Reserve figures stated in the previous chapter, and

2) To provide the main inputs and basis for economic parameters and analyses for the Project (basis for capex and opex estimations, environmental assessment, "affected" landowners and properties identification and basis for negotiation, logistics, interface with the beneficiation, etc.)

16.2 GEOTECHNICAL ASSUMPTIONS AND PIT GEOMETRIES

Detailed geotechnical investigations and analyses have not been performed for this phase of the Project. This study is using assumed parameters and geometries from similar operations in similar conditions, that are showing adequate stability conditions.

The pit optimization assumes the following conservative main geometric / geotechnical parameters (for ore and for waste), depicted in Figure 16.1:

- Slope face angle: 45°
- Bench height: 10 meters
- Berm width: 5 meters
- Overall pit slope: 37°

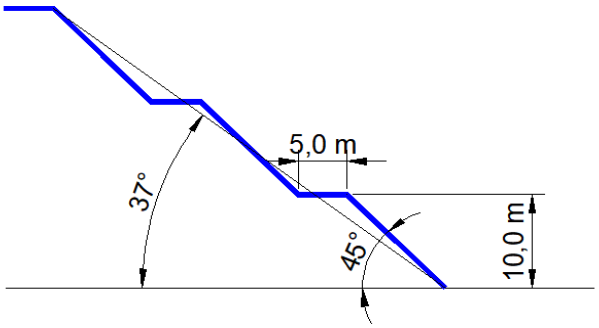


Figure 16-1 – Pit cut geometry

During pilot plant operations pit parameters and geometries will be optimized for Phase 2 operations to enable better working conditions, ore quality control / selectivity.

Detailed geotechnical and hydrogeological investigations and analyses will be undertaken in future study phases. Basic geotechnics were evaluated as shown in Attachments.

16.3 PRODUCTION SCHEDULE

Phase 1 pilot plant operations are important to optimize the flowsheet and process facilities as well as qualify material with future clients. It will provide the time required to complete the studies required for the full mining licensing and the environmental permitting efforts for the Phase 2 operations. A pit with approximately 1 million total tonnes was considered for Phase 1 (Figure 16-2).

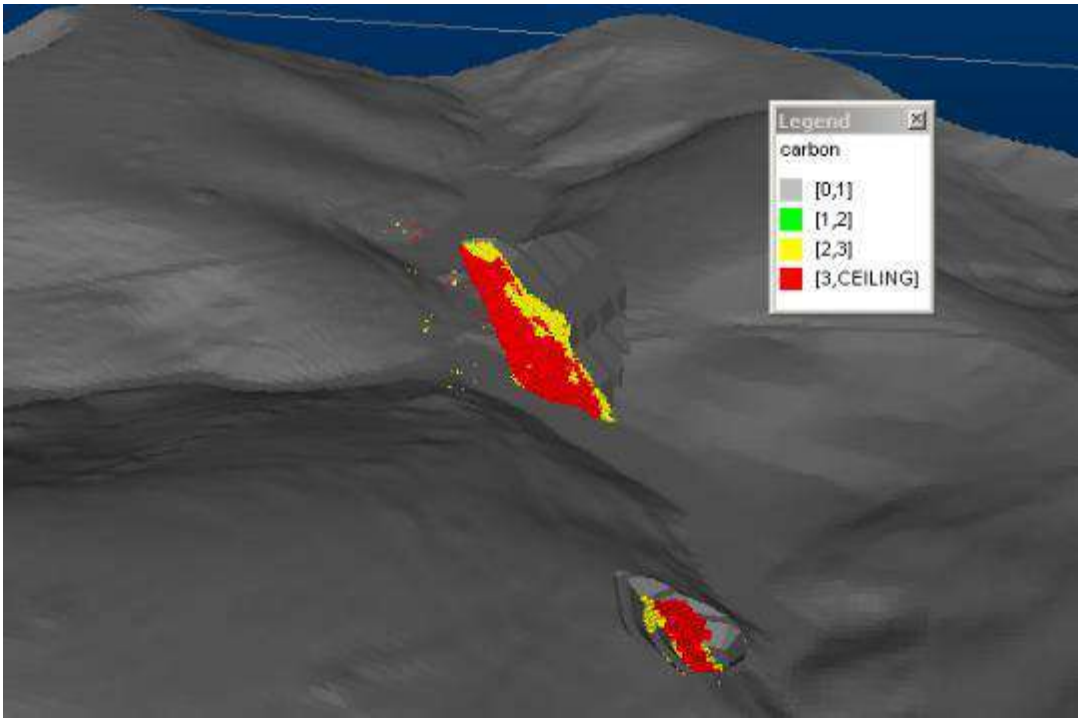


Figure 16-2 – Phase 1 Pit (1 million tonnes of ore)

This initial phase is located on São Manuel North Area. The grades for this phase are shown in Table 16.1 below:

Table 16.1 – Initial Phase Grades for São Manuel

	TONNES	%Cg
WASTE	**533,636**	
ORE		
LOW GRADE (1%<%Cg<2%)	93,569	1.57
MEDIUM GRADE (2%<%Cg<3%)	11,823	2.54
HIGH GRADE (%Cg>3%)	281,715	3.91
ORE – total	**497,107**	**3.14**

The Stripping Ratio for Phase 1 is 1.08:1, and it is considered on the schedule on this report, on the first two years. Phase 2 operations begin in operational year 3 and extend thru the life of mine.

16.4 MINE SEQUENCING PROCESS AND RESULTS

Mine production schedule was based on a Mine Sequencing that has been established using the standard Lerchs-Grossman pit optimization method, using

Micromine software. The following files, information and parameters have been used in the optimization runs:

Input file parameters:

- Number of records: 395,274 records
- Origin in X: 433,402.10 m
- Origin in Y: 8.169,155.0 m
- Origin in Z: 78.75 m
- Standard block size: 5 x 5 x 5 m
- Minimum Block size in X: 0.42 m
- Maximum Block size in X: 5.00 m
- Minimum Block size in Y: 2.00 m
- Maximum Block size in Y: 5.00 m
- Minimum Block size in Z: 2.50 m
- Maximum Block size in Z: 5.00 m

Dilution and recovery:

- Mining dilution: 5%
- Mining recovery: 95%

Geometrical and geotechnical parameters for the mine cut stability:

- Bench height: 5 m
- Global slope angle: 45°
- Maximum pit depth: 40 m

Geometrical and geotechnical parameters for waste and tailings deposit stability:

- Bench height: 10 m
- Bench face angle: 45°

Ore material properties:

- Density: 2.7 t/m³ in situ
- Swelling factor (after excavation, to load trucks):

Waste material properties:

- Density: 2.7 t/m³ in situ
- Swelling factor (after excavation, to load trucks):
- Compaction factor (after dozer traffic):

(“Dry”) tailing material properties:

- Density: 2.7 t/m³ after filtration and ready for disposal
- Compaction factor (after dozer traffic):

Mine sequencing process used for scheduling is illustrated in Figure 16.3.

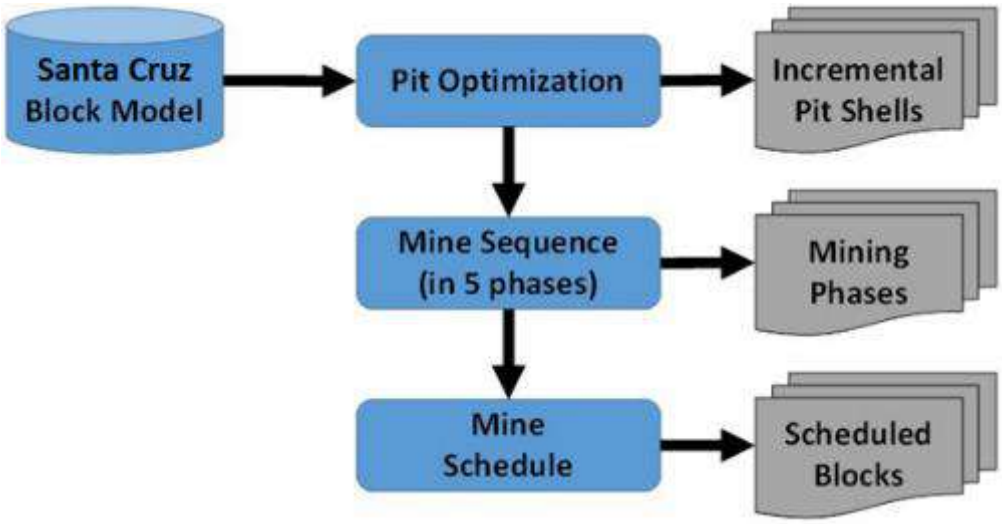


Figure 16-3 – Mine scheduling process for the Santa Cruz property

An optimized mining sequence was obtained for the first two years of operation (Phase 1) and further ten years of operation of the mine:

Table 16.2 – Mine Production Schedule

c	Mining Area	ROM	Waste	Tailings	Tons Produced	Ore (%Cg)	Hauling Distance			Waste: Ore
							Plant	Waste	Tailing	
1	SMN	165,500	267,727	160,496	5,004	3.5	1.2	1.9	2.7	1.6
2	SMN	165,500	267,727	160,496	5,004	3.5	1.2	1.9	2.7	1.6
3	SRW	687,066	481,359	671,702	15,364	2.6	3.2	2.2	1.0	0.7
4	SRW	1,070,373	769,885	1,045,373	25,000	2.7	3.2	2.2	1.0	0.7
5	SRW	1,159,633	1,232,844	1,134,633	25,000	2.5	3.2	2.2	1.0	1.1
6	SMN + SRW	1,176,596	1,426,366	1,151,596	25,000	2.5	3.2	2.2	1.0	1.2
7	SMN	1,293,227	1,339,364	1,268,227	25,000	2.2	1.5	2.1	1.2	1.0
8	SMN	1,361,626	2,057,572	1,336,626	25,000	2.1	1.5	2.1	1.2	1.5
9	SMN	1,270,331	2,488,633	1,245,331	25,000	2.3	1.5	2.1	1.2	2.0
10	SMN	1,273,441	3,104,234	1,248,441	25,000	2.3	1.8	2.4	1.5	2.4
11	SMN	1,282,664	3,527,874	1,257,664	25,000	2.3	1.8	2.4	1.5	2.8
12	SMN	403,643	909,224	398,295	5,347	1.5	1.8	2.4	1.5	2.3
Total		**11,309,601**	**17,872,808**	**11,078,881**	**230,720**					**1.6**

SMN = São Manuel North; SRW = São Rubens West

16.5 MINE LAYOUT AND DESIGN

Access roads, for ore, waste and tailings transportation were projected with 10 meters width and a maximum 10% grade, adequate to the type of trucks planned to be used in the operation.

Figure 16.4 (a,b) shows the mine and waste deposit configuration after year 2.

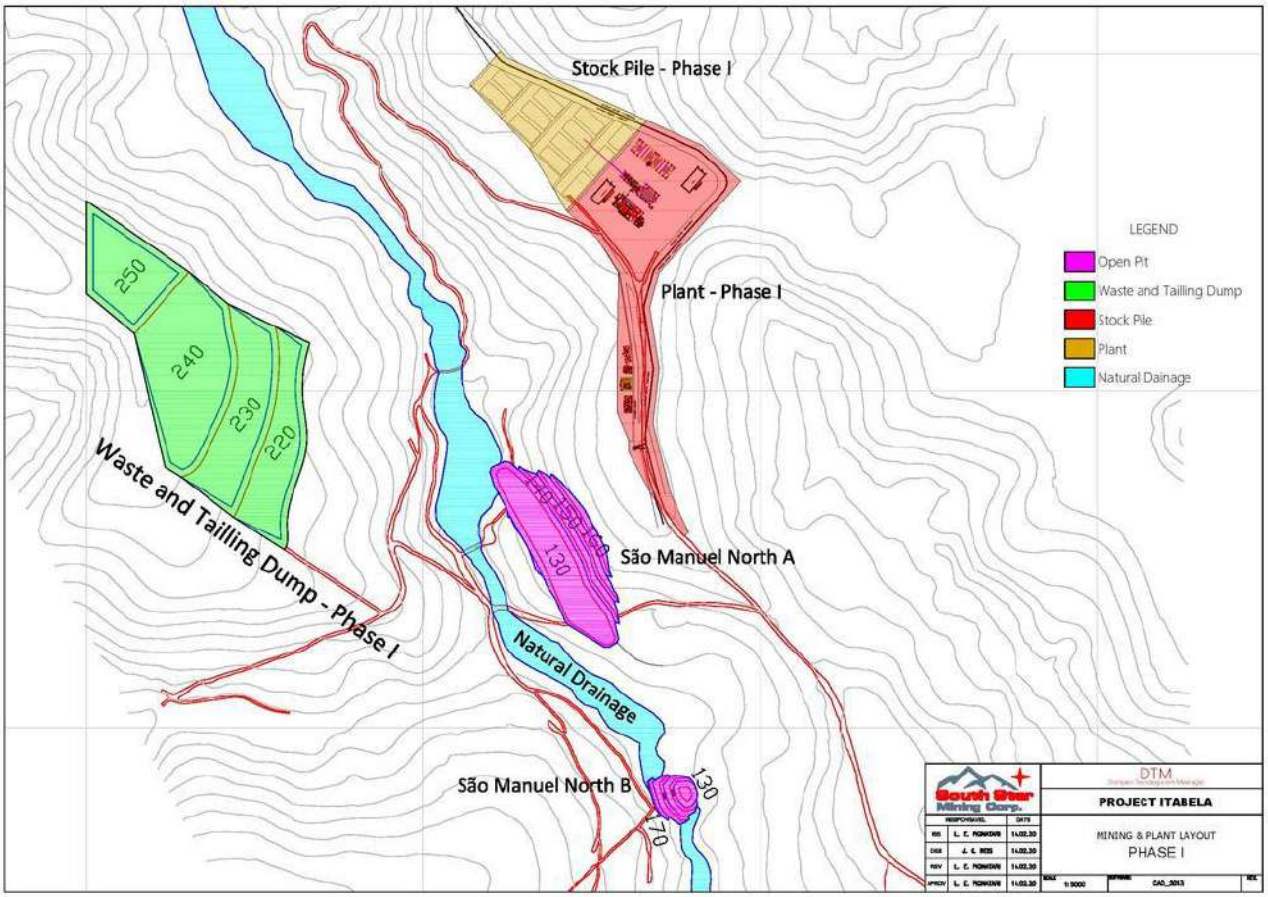


Figure 16-4 (a, b) – General Facilities Arrangement After Operational Year 2.

Figure 16.5 (a, b) shows the mine configuration after year 12.

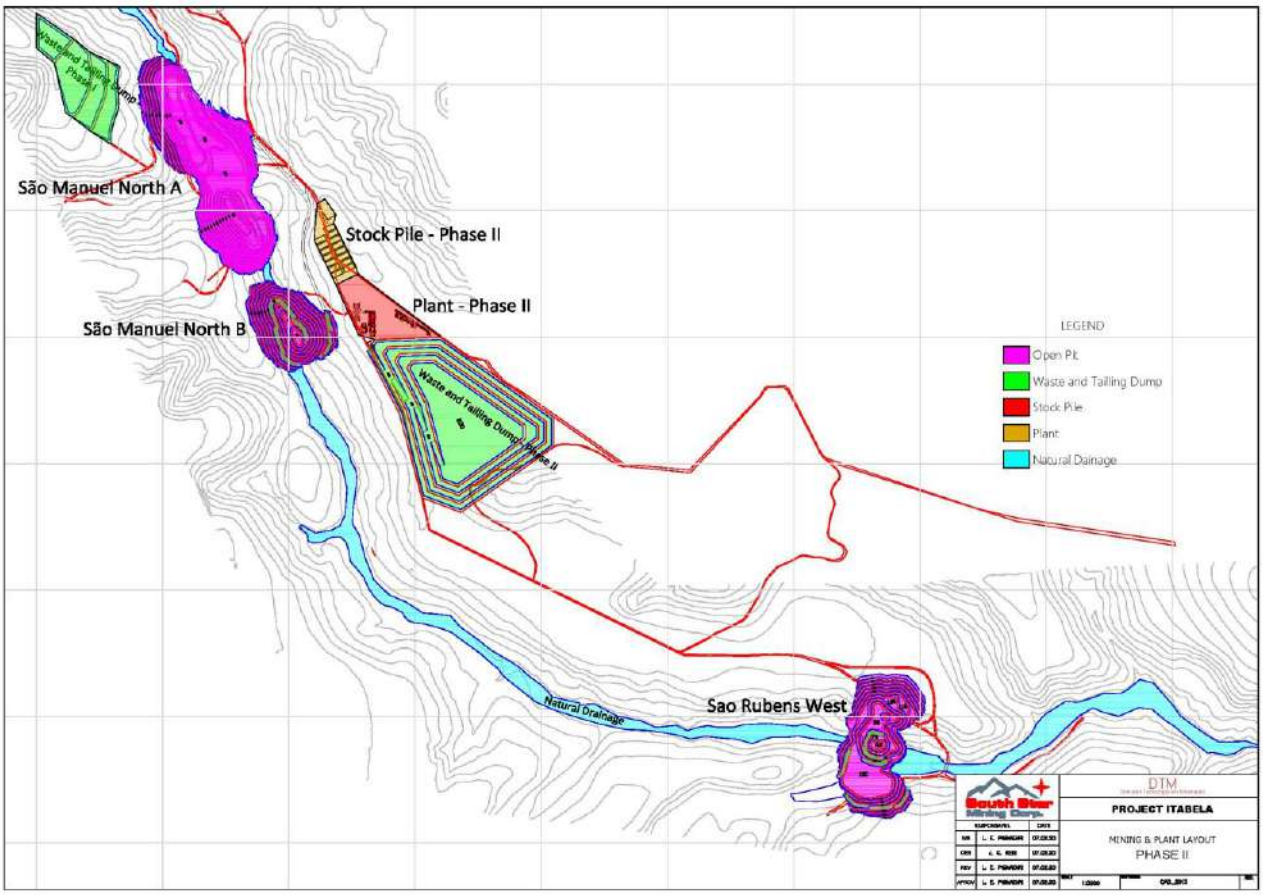


Figure 16-5 (a, b) – General Facilities Arrangement After Operational After Year 12.

16.6 MINE WASTE AND PLANT TAILING DISPOSAL

Two wasterock storage facilities (WRF) are planned in this study and located to minimize transport distances and haul costs. Figures 16-5 and 16-6 show the location and geometry of the mine waste and plant tailing disposal structure.

The WSF design criteria are presented in Table 16.3.

Table 16.3 – WSF Design Criteria

ITEM	CRITERIA
Wasterock Disposal Method	Haul Trucks and Dozer
Wasterock Density	2.0 t/m3 in situ
Surface Drainage	Open channels with riprap drop structures
Placement Method	End dumped in 5 meter lifts and compacted by dozer passes
Lift Heights	10 m
Berm Widths	5 meters
Lift Face Angle	37^0
Closure Concept	Progressive reclamation with placement of soils cap, revegetation and internal drainage structures leading to peripheral drainage channels

Waste coming from the mine should have natural moisture content and stability / mechanical properties similar to the fresh “rock”, although obviously in fragmented size and disaggregated. Tailings coming from the plant should have finer characteristics (tailings from flotation, after grinding and other processes), and it should have been dewatered (thickened and filtered). Tailings will be spread together with the wasterock and co-disposed in progressive layers.

Geotechnical studies of the WSF areas and of the waste material characteristics will need to be developed in future studies.

16.7 MINING EQUIPMENT

Mining operations are planned to be contracted and possible equipment types and number along with efficiencies and cycle times were estimated. The results are summarized in Table 16.4:

Table 16.4 – Equipment planned hours and efficiency factors, and list

	Equipment Type	Reference Brand and Model	Planned hours per month	Availabilty [%]	Utilization [%]	Efficiency [%]
Years 1-2	Truck	Volvo FMX 460 6x4 R	200	90%	80%	72%
	Excavator	Caterpillar 336D2L	200	92%	85%	78%
	Wheel Loader	Caterpillar 930G	200	92%	80%	74%
	Dozer	Caterpillar D6K	200	85%	80%	68%
	Grader	Caterpillar 120K	200	85%	75%	64%
Years 3 >>	Truck	Volvo FMX 460 6x4 R	400	90%	80%	72%
	Excavator	Caterpillar 336D2L	400	90%	85%	77%
	Wheel Loader	Caterpillar 930G	400	90%	80%	72%
	Dozer	Caterpillar D6K	400	85%	80%	68%
	Grader	Caterpillar 120K	400	85%	75%	64%
Ancilary	Crane	TBD – 25 ton.	-	-	-	-
	Shop truck	TBD	-	-	-	-
	Water truck	TBD – 25.000 liters	-	-	-	-
	Fuel truck	TBD – 4.000 liters of fuel + lube	-	-	-	-
	Pick up	Mitsubishi L200 GL Diesel 4x4	-	-	-	-

16.8 MINE PERSONNEL

Personnel requirements are estimated and presented at the Operational Cost session of the report, together with the other sectors of the company.

17.0 RECOVERY METHODS

17.1 MINERAL PROCESSING OVERVIEW

Phase 1 operations consist of a pilot plant with a capacity of 5,000 tpy of concentrate for the first 2 years followed by Phase 2 operations consisting of a full scale industrial plant with a capacity of 25,000 tpy of concentrate for the remainder of the life of mine.

The plant is designed for year-round, 24-hour operations with the philosophy of enabling the material flow through the feed system with the objective of minimizing manpower requirement mainly in the reception bin, belt conveyors and transfer chute. The plant front-end will operate 2 (two) shifts per day while the concentration plant will operate 3 shifts per day.

The total Project production is therefore characterized as in Table 17.1.

Table 17.1 – Summary of Project scope

Item	Unit	Phase 1	Phase 2
Avg. Ore throughput	tpy	165,500	1.097.860
Avg. Ore grade	%Cg	3.2	2.3
Avg. Carbon recovery	%	82	82
Concentrate C content	%Cg	93-95	93-95
Concentrate production	tpy	5,000	25,000
Flakes production (+80 mesh)	% of total	63	63
Fines production (-80 mesh)	% of total	37	37
Product granulometry	+50#, +80#, –80#, +140#, –140#		
Commercial product conditioning	big bags and 25 kg bags		

The key issues of note with respect to these implementation phases are:

1) The strategy for development of the Project to its nameplate capacity will be to initially construct a pilot plant with production capacity of 5 000t/year of concentrate. This will operate for a period of at least two years, after which an additional plant will be constructed to result in a total project capacity of 25 000 t/year of concentrate.

2) The open pit will be mined only during the dry season in order to minimize the negative impact of excessive moisture on the handling characteristic of the material as well as mining difficulties. Ore stockpiles at the plant will be used for plant production during the rainy season.

3) Water recycling will be maximized in order to minimize the quantity of fresh water make-up. It will be recovered from the tailings filtering system and pumped to a tank or small reservoir for reuse in the process.

4) The final products will be 5 different granulometries such as + 50 mesh, + 80 mesh, –80 mesh, which are obtained from the flakes treatment circuit, and +325 mesh and –325 mesh which are obtained from the fines treatment circuit.

For the production of 95 %Cg concentrate, the process encompasses the following key stages:

a. Comminution – required for sizing the material and concentration of the carbon content (%Cg). Crushing, milling and screening process equipment is used.

b. Desliming – required for the elimination of the clay fines, which is poor in carbon content and problematic effective recoveries in the downstream process.

c. Tailings filter press – required to dewater the tailings slurry and obtain a filter cake with 15-20% water content, which is suitable for trucking and co-disposal in the WSF.

d. Flotation – required for the concentration of the carbon content (%Cg) in the concentrate.

e. Drying and packing – required for drying and packaging the concentrate into lots that can be shipped via trucks or containers.

17.2 PROCESS FLOWCHART

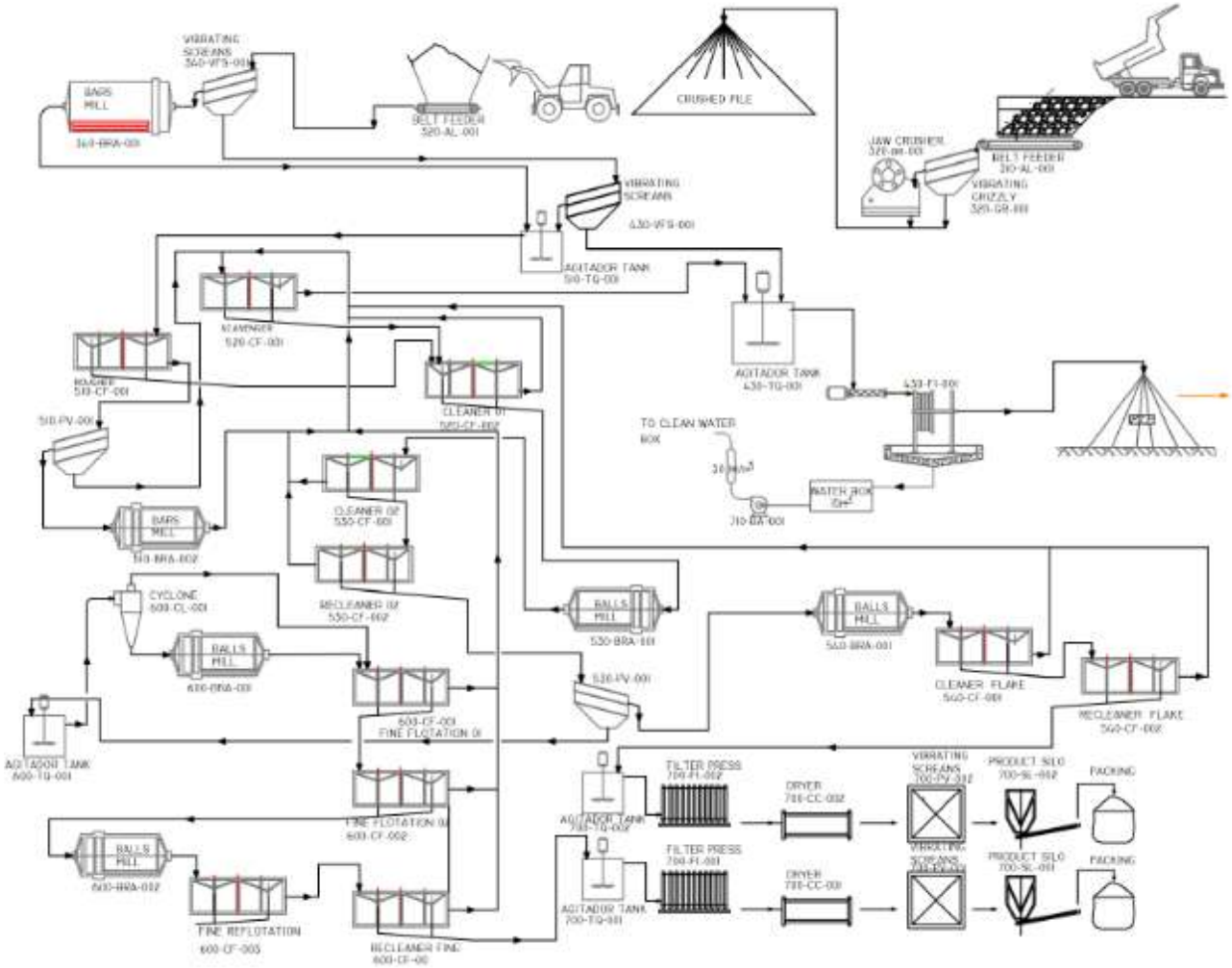


Figure 17-1 – General Process Flowchart

17.3 FLOWSHEET SEQUENCE

Reagents include MIBC (mibcol), diesel oil or kerosene and lime. Based on the investigations, alternatives analyses and extensive testwork performed to date, the Project`s flowsheet can be detailed as follow:

1. Following primary jaw crushing and screening circuit, ROM is placed on a vibrating feeder where material is disaggregated to 6.25mm;

2. Material is milled in a rod mill to –2.00mm;

3. A wet screen separates material into two different circuits: +50 mesh & – 50mesh;

4. The +50 mesh circuit follows:

a. Four successive series of grinding (using ball, steel shot and pebbles) + flotation;

b. After 4th series and final cleaning flotation, a screen separates +30 mesh and +50 mesh to be filtered, dried and packaged;

c. The under after the 4th series are directed to tailings reprocess tank, to be mixed with –50 mesh final tailings and reprocessed in the –50 mesh circuit for optimal recovery.

5. The –50 mesh circuit follows:

a. Primary flotation, then (4) four series of grinding (using steel shot) + flotation;

b. After 4th series and final cleaning flotation, a screen separates +80 mesh, +140 mesh and –140 mesh to be filtered, dried and packaged;

c. Tailings of the five flotations are directed to tailings reprocess tank, to be mixed to +50 mesh circuit final tailings and reprocessed in this circuit for optimal recovery.

6. Filter Press, Drying and Packaging

a. All product streams incorporate a filter press, dryer and packaging system.

b. The fines and flake concentrates will be treated in batches separately in order to avoid contamination.

c. The filter press will reduce product moisture content to approximately 17%, and the water will be recirculated back into the process water.

d. Gas dryers will receive the product from the filter press and reduce product moisture to maximum 1%.

e. Final product classification will be made with dry screens based on client demand and product specifications.

f. Silos will store final blends and supersacks or 25kg bags will be used to package final products for shipping.

18.0 PROJECT INFRASTRUCTURE

18.1 GENERAL INFRASTRUCTURE

18.1.1 SITE GRADING & ACCESS ROAD

The existing landform will be regraded to facilitate the functions and traffic circulation of the site plan and facilitate surface drainage. The Project buildings, plant and access road levels will be higher than the surrounding ground, and adjacent areas will slope away so that problems with surface runoff are avoided. These modifications will be restricted to a minimum extremely necessary in order to maintain the natural landscape.

18.1.2 POWER SUPPLY & DISTRIBUTION

The transmission line will be armed concrete constructed post with approximately 10.1 km length if connected at Itabela substation or 36 km length if connected at Eunápolis substation, as mentioned already at Section 5.

At the plant site, the 13,8 kV tension will be stepped down by means of transformers to 2 (two) 440 V lines, one line to supply power to the plant with capacity for 2,0 MVA and another line dedicated to the fire extinguishing system with 112,5 kVA capacity.

One 220 V line will serve the administration, shops, canteen, lightning and general services.

18.1.3 WATER SUPPLY

Water supply will be provided from on-site sources. The primary water requirement comes from process tailings that will be thickened and press filtered resulting in clean water for recycling to the process and a cake of solids that will be disposed of together with the mine stripping material. Make-up water will be supplied from artesian wells.

Drinking water shall be provided from artesian wells, bottled water or there may be a possibility of bringing treated water line from Itabela, which will be investigated at future project stages.

A small wastewater facility may be constructed on site or a septic system or bio-digestor installed with waste trucked to Itabela for treatment. Solids waste may be trucked to the Itabela landfill for disposal.

18.2 WASTE DISPOSAL

18.2.1 ORGANIC STOCKPILES

The upper surface material will be removed and stockpiled for revegetation and closure planning. The prestrip soils will be transported by trucks from different sites in the plant area and spread using bulldozer in a 2800 m² area terrain, which has been provided in the site lay-out.

18.2.2 WASTEROCK & CO-DISPOSAL FACILITIES

Oversized material retained on the ore bin grizzly will be stockpiled using a front-end loader in a specific site in the surrounding area where it will be visually inspected and tested for Cg grade. Oversized materials containing graphite will be broken up with a pneumatic hammer and recycled to the reception grizzly. If no graphite is evident, it will be trucked to the WSF.

The plant tailings will be treated by thickener and press filter. The underflow pulp will be conveyed to press filters and the cake containing 15-20% moisture will be trucked to the disposal site as shown in Figures 16-5 and 16-6. The thickener overflow will recycle to an elevated reservoir for reuse in the process.

18.2.3 SOLIDS WASTE AND WASTE WATER

Solids waste service will be contracted and hauled to the town dump for disposal. Wastewater amounts to 158.7 m³/h, mainly due to the 30% water substitution, which has been defined in order to avoid the risk of clayey saturation in the process water. It will be discharged as an inflow to a natural water stream in accordance with the Brazilian regulations, regarding the chemical composition and solids content.

Sewage waste water will be conveyed to septic tanks where the organics will be decomposed. The effluent will be treated in order comply with the sanitary regulations prior to disposal to the natural water stream.

18.3 WATER MANAGEMENT

18.3.1 CONCEPTUAL WATER BALANCE

Maximized water reutilization is a key philosophy for the Project. Water contained in the tailings will be recovered and recycled to the process via reservoir with capacity of 150 m³ for distribution to the process, as required.

Table 18.1 presents a summary of the water balance.

Table 18.1 – Water balance

	In			Out		Balance
	Recycled	New water	Fresh water	Recycled	Loss	
	m³/h	m³/h	m³/h	m³/h	m³/h	m³/h
Process	1,195.4	457.2	0.0	1,642.1	8.7	1.8
Hygiene and cleaness			3.0		3.0	0.0
Water renovation			137.2		137.2	0.0
Water for general utilization			1.5		1.5	0.0
OVERALL TOTAL	**1,195.4**	**457.2**	**141.7**	**1,642.1**	**150.4**	**1.8**

18.3.2 SURFACE WATER MANAGEMENT

The surface water management plan will be developed in order to avoid the risk of surface water flooding and controlling sediment discharge. The plant site is located in a hilly landscape in such a way that the plant and associated structures have been planned to be built in a minimum risk area in the site that drain easily to the natural drainage.

Perennial surface waters which are present throughout the year, flow throughout a small water stream in the valley floor. Semi-perennial water bodies are which are those that only hold water for part of the year is not the case in the surroundings of the Plant site. Man-made surface water can also be held in properly designed structures ensuring the plant site and associated structures will be free of flooding of any nature.

18.3.3 PIT DEWATERING

Pit dewatering will be carried out by pumps as required, and the water discharged to the nearby stream downstream of the pit areas. Mining in the areas that may be affected by surface runoff will only be mined in the dry season.

18.3.4 SEDIMENT MANAGEMENT

In order to control and capture sediment from disturbed areas, perimeter drainage structures will be designed on the downslope side of the facilities to collect and safely convey runoff to the natural drainage while limiting erosion. During Phase 1 operations, the small downstream pit will be mined in approximately 3 months and subsequently used during the rainy season to collect and decant suspended solids. It will periodically be cleaned, and fines placed on the WSF. During Phase 2, Sao Rubens West pit will be used to to collect and decant sediment.

18.4 SITE BUILDINGS AND INFRASTRUCTURE

18.4.1 PHASE 1 OPERATIONS

During Phase 1 pilot plant operations, most of the structures, offices and ancillary facilities will be temporary structures (tents) or containers. Where required, cement block buildings or metallic warehouse facilities will be constructed. General facilities arrangements for Phase 1 are presented in Figures 16-5. A 15,000 liter fuel skid will be mounted on a concrete pad and containment structure for the Phase 1 operations.

18.4.2 PHASE 2 OPERATIONS

The plant design is based on simple, proven technology that can mostly be fabricated in country, can be brought on-line quickly, and has been shown to be successful in other Brazilian operating mines. General facilities arrangements for Phase 2 are presented in Figures 16-6. Principle structures include:

1. A large, metallic covered patio will be constructed to maintain stockpiles of blended ore for feeding the plant;
2. Covered, metallic plant facility to house mills and screening facilities, flotation cells, filters, dryers, and packaging equipment as well as appurtenant mechanical, electrical and control systems;
3. Concrete block construction buildings that will house maintenance and repair shops; laboratory; administrative offices; warehouse; kitchen and cafeteria as well as showers and changing rooms;
4. Site fire protection consisting of a water storage tank and the use of the water truck pumps, water cannon and hoses.
5. Site Substation;
6. Lightening Protection System; &
7. Fuel Station

19.0 MARKET STUDIES & CONTRACTS

19.1 GRAPHITE PRODUCTION

Global graphite production has risen tenfold from about 90,000 tpy in the early 1900s to an estimated 1.1 Mt in 2019. The global carbon and graphite product market was worth USD 32.12 billion in 2019. It is expected to grow at a compound annual growth rate (CAGR) of 11% and reach USD 47.71 billion by 2023.

According to USGS 2018 data, China is the world's leading producer of natural flake and amorphous graphite, supplying approximately 68% of the market. Brazil, Canada, India and Mozambique collectively contribute an additional 30% of global production, although Indian production is believed to be significantly less than claimed. Natural graphite production is estimated to comprise flake (73%), amorphous (26%) and vein graphite (<1%) by tonnage, according to IM Graphite Market Outlook 2021.

19.2 GRAPHITE MARKET

World natural graphite demand is directly linked to industrial applications, including refractories, steel making, automotive parts, batteries and lubricants.

The largest natural graphite market is in refractories which account for approximately 40% of total graphite consumption (Metal Bulletin Research, 2017). Metallurgy is the second largest market for natural graphite and is estimated to account for approximately 20% of total graphite output.

Batteries are estimated to be the third largest graphite market, consuming around 23% of worldwide graphite production. This is potentially the fastest growing market requiring more specialist grades of graphite to manufacture spherical graphite. Production is currently dominated by China which produced about 30,000 tonnes of uncoated product in 2014.

The fourth largest market for both flake and amorphous graphite is in components, which includes motor vehicle brake pads, carbon brushes for electric motors and pencils and solid lubricants (lubricants based mainly on amorphous graphite) and is estimated to account for about 15% of total consumption.

Other markets such as expandable graphite account for approximately 2% of consumption. Expandable graphite markets are anticipated to grow, in applications such as fire retardation to replace halogenated retardants, insulation and heat transmission applications. These markets are likely to require large flake products.

Most forecasters are predicting growth in battery anodes. Currently there are three Tesla's 'gigafactories' operational and another one planed by 2021, moderate growth in traditional markets such as refractories and growth in expanded graphite (from a low base). Based on these assumptions, the flake graphite market is estimated to grow from approximately 1.1 Mt in 2019 to approximately 2.0 Mt by 2025 (additional 0.9 Mtpy compared with 2019).

19.3 GRAPHITE QUALITY AND SPECIFICATIONS

Key quality aspects are generally considered to be flake size distribution and carbon content (purity) of a concentrate product. As a general rule, flake concentrate products should have a minimum graphitic carbon content of 90% total graphitic carbon ("TGC"), also referred to as Carbon content ("C") although 94% TGC is often quoted as a minimum for entry into markets such as batteries.

There are no set industry specifications for graphite, although in countries such as China the government has established national standards. As with other industrial minerals, independent graphite producers typically establish their own specifications, in conjunction with customers.

Refractories are the main flake graphite consuming market, for which flake size distribution and purity vary according to application. For example, magnesia carbon bricks may use 90-95% Cg, with a broad flake distribution –100 to +50 mesh.

Chinese producers use minus 100 mesh (94 %Cg) small flake for making spherical graphite (for battery anode applications), although many listed graphite explorers have had the perception that large flake (+80 mesh) probably works better due to higher purity and lower process losses.

The key to a successful graphite project (as with other industrial minerals) is to be able to produce a balanced range of products to supply a range of markets, ensuring that all

production (the basket of products) can hopefully be sold and spreading risk across market cycles.

19.4 OPPORTUNITIES IN NATURAL GRAPHITE MARKETS

Battery anode markets are the biggest known existing opportunity for natural graphite. Graphene applications are expected to grow. While the graphene market is in its infancy and is unlikely to become a volume consumer of natural graphite, the value-added potential of the industry is considerable.

Expandable graphite markets are anticipated to grow, for applications such as fire retardants to replace halogenated retardants, insulation and heat transmission applications. These markets are likely to require large flake products.

19.5 RISKS TO NATURAL GRAPHITE MARKETS

Risks include overproduction of flake graphite in China, a slowing steel industry, slower uptake of electric vehicles than predicted (hence lower battery production) and battery technology shifts. Battery technologies are continually evolving, driven by the need to find more efficient (energy dense), reliable and quicker charging batteries – especially for automotive use. Li-ion storage batteries that rely on spherical graphite anodes may be replaced. New technologies, such as aluminium and titanium yolk-shell nanoparticles are one example of many. A shift in battery technology that replaces natural graphite is seen as a high risk to emerging producers.

19.6 PRODUCTS' PRICE

Products' prices were estimated considering Marketing Reference (Similar Project):

Table 18.1 – Products' price

product	price (USD/ton)
+ 30 Mesh	2,300
+ 50 – 30 Mesh	2,000
+80 – 50 Mesh	1,025
+100 – 80 Mesh	825
< 100 Mesh	690

19.7 CONCLUSIONS AND COMMENTS ON MARKET

Considering the growing market conditions and the planned quality of the product of this Project, and the market risks and opportunities, it was concluded that there the planned production volumes cannot be difficult to be sold in the market.

Although South Star has no commercial contract agreed so far, there has been many contacts with potential clients and consumers, that also reinforces the above conclusion.

20.0 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

South Star obtained the simplified environmental permit for Phase 1 operations, as published in the Itabela municipality official gazette in Feb.19th, 2020.

The company seeks to make the mining process more sustainable, in agreement with social, environmental and economic principles, and aiming to reduce potential impacts to the environment and local stakeholders and communities.

Some programs and studies towards this objective, as approved in the Phase 1 environmental license are presented below.

20.1 ENVIRONMENTAL EDUCATION PROGRAM

The Environmental Education Program aims to propose socioenvironmental and interdisciplinary educational initiatives with the different stakeholders and communities near South Star's Project area. The goal is to present educational strategies addressing themes related to the preservation and recovery of natural resources, as well as the appreciation of the socio-environmental heritage of the Itabela municipality.

Furthermore, the Program's objective is to contribute to the consolidation of Environmental Education in the municipality and surroundings, allowing the population to understand the real aspects concerning the potential environmental impacts resulting from mining and industrial activities. Educational and impact mitigation measures will be adopted, allowing the community to participate in the environmental management and conservation process.

20.2 NEIGHBORHOOD IMPACT REPORT – RIV

The Neighborhood Impact Report – RIV was prepared as part of the licensing process in order to identify the characteristics of the impacted areas from operations, in order to make it possible to propose mitigation and conservation guidelines for stakeholders and nearby communities.

Through the studies carried out, it was possible to verify that the Project, due to its smaller size and simple operational requirements, will not produce a significant increase in traffic that could compromise or affect the region's road system, nor interfere in services demanded by the population. Preventive measures will be adopted, in addition to monitoring and evaluating the changes resulting from the interventions carried out for the installation and operation of the Project.

The RIV showed that the negative impacts potentially caused by the Project can be effectively administered and mitigated, and that the positive Project impacts will provide a powerful stimulus and opportunities for the local population. Furthermore, the Project will contribute to the increase in local municipal revenue from the direct and indirect economic activities.

20.3 EFFLUENT DISCHARGE & NOISE MONITORING PROGRAMS

For effluent discharge control, the Project will implement a septic tank / sink system for the treatment of domestic effluents, a OWS (oil water separator) box for oily effluents and water treatment and recirculation technology in the graphite ore processing. For such effluent control and treatment systems, monitoring will be carried out in accordance with the criteria covered by current legislation, throughout the mine's operational phase.

To control noise and particulates emission, procedures will be adopted in the enterprise's implementation and operation phase, with a view to ensuring workplace noise level compliance for employees and collaborators as well as nearby communities. Mitigation strategies will be adopted as required.

It should also be noted that the Project is approximately 5 km from the city of Itabela with no significant residential areas in the operational area vicinity that could be directly impacted by the normal operational activites.

20.4 FLORA AND FAUNA CONSERVATION PROJECTS

The Flora Inventory, prepared as part of the scope of the required studies for the environmental licensing, was submitted to INEMA to support the request for Authorization for Vegetable Suppression – ASV. This study presented the areas planned for vegetation suppression, with the goal of minimizing vegetation suppression. Such interventions, as

well as in the Permanent Preservation Area, will be subject to monitoring and compensation, as required based on federal and state legislation.

The area where the Project will be built has largely been impacted by farming, cattle and eucalyptus plantations. Few areas of native vegetation and fauna habitat currently exist, as can be seen in Figures 16-5 and 16-6. There are some environments with little anthropic alterations, and these will be preserved as Legal Reserve. Such reserves are mainly responsible for sustaining the greatest fauna diversity, as well as specimens whose behavior is more specialized in terms of foraging and nesting.

The preservation of Legal Reserves, forest remnants and streams will be important in ensuring local biodiversity. In addition, replanting with native plant species will be carried out, with the aim of compensating and enriching vegetation, as well as contributing to floristic diversity and increased food supply for fauna.

20.5 RISK MANAGEMENT PROGRAM – PGR

The Risk Management Program (PGR) presents guidelines necessary to mitigate cases in which some eminent or effectively risky situations occur in the execution of the Project's operating activities. The risk analysis presented in this document consisted of identifying the Project's operational dangers, as well as preparing procedures and precautions to mitigate these risks.

Worker safety and training is one of the most important activities in the PGR focused on ensuring employees are trained to perform their functions and are continually updated for the development of their activities. The PGR is dynamic, and should be periodically reviewed and updated to incorporate new information and lessons learned.

20.6 ENVIRONMENTAL EMERGENCY PLAN – PEA

The Environmental Emergency Plan (PEA) presents guidelines for dealing with accidents related to the project's implementation and operation activities, seeking procedures for preventing and reacting to accidents in the work environment, as well as safeguarding workers and the environment.

The plan consists of steps that must be taken when any emergency situation occurs, as well as training people to execute them, as part of the emergency brigade. All those

involved in this work will be responsible for continuous training. The PEA must be disclosed to all employees, and kept in an easily accessible place.

20.7 WASTE MANAGEMENT PLAN – PGRS AND PGRCC

The Solid Waste Management Plan (PGRS) is an essential tool to ensure correct procedures regarding the collection, storage, treatment and disposal of waste by the operational team. Periodic training will be held with employees on selective collection, recycling and correct classification and disposal of waste, in addition to lectures and specific training. It is noteworthy that an important objective of this program, in addition to avoiding risks, potential contamination and non-conformities, is to reduce the generation of waste.

The Civil Construction Waste Management Plan (PGRSCC) was prepared considering the Project's construction phase. This program will last during Project construction, with training for the collaborators who will be continuously present at the construction sites, as well as the managers responsible for such activities. As previously mentioned, the PGRCC will also have the main objective of reducing the generation of construction waste at the source, thus minimizing waste and disposal of materials that can be reused.

20.8 DEGRADED AREAS RECOVERY PLAN – PRAD

PRAD aims to propose the recovery of the intervention target area, in order to restore environmental aspects, as well as to recover the landscape and its integration with the local community. This plan consists of mitigation and restoration measures, which are necessary for local environmental conditions to be reestablished, similar to their original state prior to the Project. Therefore, the actions listed below aim to recover, enrich and restore the ecosystem in terms of soil, water resources (revegetation of springs), flora (heterogeneous reforestation), fauna (conservation and increase of the food and shelter source) and landscape.

The environmental recovery of the project's degraded areas will be carried out progressively, over the life of the project, comprising the following actions:

i. Isolation of the area subject to recovery;

ii. Regrading;

iii. Recovery of eroded areas;

iv. Restoration of the vegetation cover;

v. Implementation of tree curtain.

The PRAD will be continually reviewed throughout the life of the enterprise. The creation of a nursery of native seedlings is also planned for the Project, which in addition to being used to assist in the recovery of the anthropized areas of the Project, as well as enrichment of the legal reserve and APPs.

20.9 ENVIRONMENTAL CONTROL PLAN – PCA

The Environmental Control Plan (PCA) was prepared in order to characterize Physical, Biotic and Socioeconomic conditions and diagnose the potential impacts associated with the Project implementation and operation. It is designed to ensure proposed monitoring, controls and mitigation measures.

The Environmental Impact Assessment – EIA, consists of an instrument that improves the decision-making procedure, a planning tool, where information about the enterprise and the environment is made available, evaluating the insertion of the first in the second and its consequences, thus enabling the best decision for the adoption of controls and mitigating and / or compensatory measures. The PCA must be implemented and followed throughout the useful life of the Project, thus ensuring the performance of the activity with a view to sustainability.

21.0 CAPITAL AND OPERATING COSTS

21.1 CAPITAL COSTS (CAPEX) ESTIMATE

This Section of the report presents the Capital Expenditure (CAPEX) estimate for the Project, including the following major items:

- Initial Capital Expenditure – direct costs, indirect costs and contingency.
- Sustaining – expenditure with mine roads development and others; and
- Mine closure – mainly expenditure associated with good environmental practice.

CAPEX estimation accuracy is “pre-feasibility level”, so based on conceptual projects and designs, informal quotes of main equipment and structures and indices-based estimations.

This kind of estimation usually produces total values in the range of –20% to +25%. CAPEX and OPEX costs were estimated based on DTM’s databank, supplier cost quotes and cost estimation indices. All values were estimated in Brazilian currency (BRL), and then converted to American dollars (USD) at a rate of BRL 3.95 per USD

Table 21.1 shows the main items of CAPEX, with the summary and totalization at the bottom:

Table 21.1 – Life of Mine Estimated CAPEX

Capex Plant – thousand USD														
	Sector	Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12
Equipment	Equipment	3,719		14,091										
Implementation	Civil*	476		1,392										
	Buildings	56		706										
	Roads	48		154										
	Earthmoving	109		320										
	Semi Permanent Struct	269		786										
	Steel Plant Structures	421		1,231										
	Ore bin	73		214										
	Feeders	40		117										
	Conveyors	126		368										
	Hydraulics	76		444										
EPCM	Civil + Mech Assembl	471		1,377										
	Electric Assembl	81		236										
	EPCM	433		1,586										
	Project Design	0		616										
Owner's Cost (Construction Phase)		261		0										
Contingencies		640		3,546										
Total		**7,298**		**27,184**										
Sustaining Capital (mine)														
Projects (Geotechnics, Engineering, Water Resources)		25	25	25	25	25	25	25	25	25	25	25	25	25
Civil Infrastructure		25	25	25	25	25	25	25	25	25	25	25	25	25
Total – Mine		**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**	**51**
Other Investments (mine)														
Geology		0	89	89	89	89	89	89	89	89	89	89	89	89
Infill Drilling		0	100	100	100	100	100	100	100	100	100	100	100	100
Communities		0	25	25	25	25	25	25	25	25	25	25	25	25
Environmental & Licensing		300	300	100	100	100	100	100	100	100	100	100	100	100
Mine Closure		0	51	51	51	51	51	51	51	51	51	51	51	2,443
Total – Other Investments		**300**	**564**	**364**	**364**	**364**	**364**	**364**	**364**	**364**	**364**	**364**	**364**	**2,757**
Grand total		**7,649**	**615**	**27,598**	**415**	**415**	**415**	**415**	**415**	**415**	**415**	**415**	**415**	**2,807**

21.2 OPERATIONAL COSTS (OPEX) ESTIMATE

Table 21.2 – Life of Mine Estimated OPEX

(thousand USD)	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12
G&A												
Salaries	329	329	493	493	493	493	493	493	493	493	493	493
Small cars rental	11	11	27	27	27	27	27	27	27	27	27	27
Offices (Containers)	26	26	0	0	0	0	0	0	0	0	0	0
General Expenses	282	282	635	635	635	635	635	635	635	635	635	191
Total – G&A	**648**	**648**	**1,155**	**1,155**	**1,155**	**1,155**	**1,155**	**1,155**	**1,155**	**1,155**	**1,155**	**710**
Mining, Waste and Tailings												
Contracted – Ore + Waste	801	701	1,484	2,022	2,629	2,861	2,725	3,581	3,966	4,646	5,120	1,390
Contracted – Tailings	147	147	249	388	421	428	471	496	463	557	561	178
Mine Management Salaries	165	165	258	258	258	258	258	258	258	258	258	258
Total – Mining	**1,113**	**1,013**	**1,992**	**2,669**	**3,309**	**3,546**	**3,454**	**4,335**	**4,687**	**5,461**	**5,939**	**1,826**
Plant	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**	**Yr 5**	**Yr 6**	**Yr 7**	**Yr 8**	**Yr 9**	**Yr 10**	**Yr 11**	**Yr 12**
Salaries	498	498	936	936	936	936	936	936	936	936	936	936
Power Consumption	255	255	783	1,275	1,275	1,275	1,275	1,275	1,275	1,275	1,275	1,275
Consumables	131	131	350	478	488	490	504	511	501	501	502	69
Maintenance and Spare Parts	193	193	342	556	556	556	556	556	556	556	556	167
Natural Gas	43	43	131	212	212	212	212	212	212	212	212	64
Wheel loader	70	70	75	75	75	75	75	75	75	75	75	23
Contingencies/Other	119	119	262	353	354	355	356	357	356	356	356	253
Total – Plant	**1,309**	**1,309**	**2,879**	**3,887**	**3,898**	**3,900**	**3,915**	**3,923**	**3,912**	**3,912**	**3,913**	**2,787**
Grand total	**3,070**	**2,970**	**6,026**	**7,711**	**8,362**	**8,602**	**8,524**	**9,414**	**9,754**	**10,528**	**11,008**	**5,323**

Details of some specific CAPEX and OPEX items are presented below:

Table 21.3 – G&A (personnel)

G&A Salaries Breakdown					
Job Function	**Monthly Salary (BRL)**	**Phase I**		**Phase 2**	
		# Employees	**USD/yr cost**	**# Employees**	**USD/yr cost**
General Manager	18,000	1	98,430	1	98,430
Sales Manager	15,000	1	82,025	1	82,025
Safety Technician	5,000	1	27,342	4	109,367
Financial Coordinator	5,000	1	27,342	1	27,342
Admin & Finance Analyst	3,000	1	16,405	2	32,810
Environmental/Communities	3,950	1	21,600	1	21,600
Security	1,185	4	25,920	4	25,920
General Services	1,185	2	12,960	4	25,920
Procurement Manager	3,950	0	0	1	21,600
Procurement	1,580	1	8,640	2	17,280
Commercial/Sales Analyst	1,975	0	0	2	21,600
Bilingual Secretary / Reception	1,580	1	8,640	1	8,640
Total		**14**	**329,304**	**24**	**492,535**

Table 21.4 – G&A (containers)

Containers List	
Main Office	3
Locker Room/Restrooms	3
Refectory	3
Security Room	1
Nursery	1
Workshop	1
Warehouse (electric & mechanic)	2
Laboratory	2
Central Control Room	1
Electric Room	1
Mining Restrooms	1
Total	**19**
Container rental (BRL/month)	450
Opex (USD/year)	**102,600**
Capex (Air Conditioning) – BRL	1,600
Capex (furniture, PCs, etc) – BRL	10,000
Capex (USD)	**55,797**

Table 21.5 – G&A (general expenses)

General Expenses	Cost			cost/year	
		Phase I	Phase II	Phase I	Phase II
Number of employees				**14**	**24**
Employees transport	BRL/employee/day	5	5	93,000	121,500
Canteen	BRL/employee/day	20	20	372,000	486,000
Uniforms and IPI	BRL/employee/year	400	400	24,800	32,400
Hygiene and cleaning supplies	BRL/month	3,000	9,000	36,000	108,000
Travelling	BRL/month	10,000	40,000	120,000	480,000
Books and technical publications	BRL/month	500	1,000	6,000	12,000
Recreation	BRL/month	5,000	10,000	60,000	120,000
IT – Information technology	BRL/month	10,000	20,000	120,000	240,000
External consulting	BRL/month	30,000	60,000	360,000	720,000
Total BRL/year				**1,191,800**	**2,319,900**
Total USD/year				**301,722**	**587,316**

Table 21.6 – OPEX Summary

	PFS LOM (I+II)		PFS Phase I		PFS Phase II	
	USD	BRL	USD	BRL	USD	BRL
Mining ($/t mined ore)	$ 1.35	R$ 5.33	$ 2.45	R$ 9.70	$ 1.31	R$ 5.19
Processing ($/t processed ore)	$ 3.50	R$ 13.81	$ 7.91	R$ 31.24	$ 3.36	R$ 13.29
G&A ($/t processed ore)	$ 1.10	R$ 4.33	$ 3.92	R$ 15.46	$ 1.01	R$ 4.00
Mining ($/t product)	$ 171	R$ 674	$ 213	R$ 839	$ 169	R$ 666
Processing ($/t product)	$ 171	R$ 677	$ 262	R$ 1,033	$ 167	R$ 661
G&A ($/t product)	$ 54	R$ 212	$ 129	R$ 511	$ 50	R$ 199
Total	**$ 396**	**R$ 1,563**	**$ 604**	**R$ 2,384**	**$ 386**	**R$ 1,526**

22.0 ECONOMIC ANALYSIS

Table 22.1 – Cash Flow

			Yr 0	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7	Yr 8	Yr 9	Yr 10	Yr 11	Yr 12
	Unit	**Total**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
Mined Ore	'MM tonnes	11.31		0.17	0.17	0.69	1.07	1.16	1.18	1.29	1.36	1.27	1.27	1.28	0.40
Waste	'MM tonnes	17.87		0.27	0.27	0.48	0.77	1.23	1.43	1.34	2.06	2.49	3.10	3.53	0.91
Ore grade	%Cg	2.37		3.51	3.51	2.60	2.71	2.50	2.47	2.24	2.13	2.28	2.28	2.26	1.54
Mill recovery	%	81.84		81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8
Concs produc / sold	**'000 tonnes**	**230.7**		**5.0**	**5.0**	**15.4**	**25.0**	**25.0**	**25.0**	**25.0**	**25.0**	**25.0**	**25.0**	**25.0**	**5.3**
Concentrate grade	%Cg	95.0		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
Concentrate price	**000 USD/t**			**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**	**1.29**
+ 30 Mesh	USD/t	618		51	51	51	51	51	51	51	51	51	51	51	51
+ 50 - 30 Mesh	USD/t	4,942		412	412	412	412	412	412	412	412	412	412	412	412
+80 - 50 Mesh	USD/t	4,170		347	347	347	347	347	347	347	347	347	347	347	347
+100 - 80 Mesh	USD/t	2,625		219	219	219	219	219	219	219	219	219	219	219	219
< 100 Mesh	USD/t	3,089		257	257	257	257	257	257	257	257	257	257	257	257
Total Revenue	**US$ million**	**296.9**		**6.4**	**6.4**	**19.8**	**32.2**	**32.2**	**32.2**	**32.2**	**32.2**	**32.2**	**32.2**	**32.2**	**6.9**
CFEM tax	US$ 000	-5,939		-129	-129	-395	-644	-644	-644	-644	-644	-644	-644	-644	-138
Landowner	US$ 000	-2,969		-64	-64	-198	-322	-322	-322	-322	-322	-322	-322	-322	-69
Net revenue	**US$ million**	**288.0**		**6.2**	**6.2**	**19.2**	**31.2**	**31.2**	**31.2**	**31.2**	**31.2**	**31.2**	**31.2**	**31.2**	**6.7**
Operating Costs	US$ million	-91.3		-3.1	-3.0	-6.0	-7.7	-8.4	-8.6	-8.5	-9.4	-9.8	-10.5	-11.0	-5.3
Mining Costs	US$ million	-39.3		-1.1	-1.0	-2.0	-2.7	-3.3	-3.5	-3.5	-4.3	-4.7	-5.5	-5.9	-1.8
Processing Costs	US$ million	-39.5		-1.3	-1.3	-2.9	-3.9	-3.9	-3.9	-3.9	-3.9	-3.9	-3.9	-3.9	-2.8
G&A Costs	US$ million	-12.4		-0.6	-0.6	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-0.7
EBITDA	**US$ million**	**196.7**		**3.2**	**3.3**	**13.2**	**23.5**	**22.8**	**22.6**	**22.7**	**21.8**	**21.5**	**20.7**	**20.2**	**1.4**
EBITDA Margin	**%**	**47%**		**34%**	**36%**	**52%**	**60%**	**58%**	**57%**	**57%**	**54%**	**52%**	**50%**	**48%**	**11%**
Total Capex	**US$ million**	**-42.4**	**-7.6**	**-0.6**	**-27.6**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-2.8**
Capex	US$ million	-34.5	-7.3	0.0	-27.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sustaining Capital	US$ million	-7.9	-0.4	-0.6	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-2.8
Depreciations	US$ million	-38.4	-1.5	-1.6	-7.1	-7.2	-7.2	-5.7	-5.7	-0.3	-0.3	-0.4	-0.4	-0.4	-0.7
Earnings before taxes	**US$ million**	**158.4**	**-1.5**	**1.6**	**-3.8**	**6.0**	**16.3**	**17.1**	**16.9**	**22.4**	**21.5**	**21.1**	**20.3**	**19.8**	**0.7**
Tax - Social Contrib	US$ million	-14.7	0.0	-0.1	0.0	-0.5	-1.5	-1.5	-1.5	-2.0	-1.9	-1.9	-1.8	-1.8	-0.1
Tax - Income Tax	US$ million	-10.5	0.0	-0.4	0.0	-0.4	-1.0	-1.1	-1.1	-1.4	-1.3	-1.3	-1.3	-1.2	0.0
Working Capital	US$ million	0.0	0.0	-3.2	-0.5	-1.6	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	26.9
Cash Flow	**US$ million**	**129.1**	**-7.6**	**-1.2**	**-24.9**	**10.2**	**17.9**	**17.1**	**16.9**	**16.2**	**15.4**	**15.1**	**14.5**	**14.1**	**25.3**
Cummul. Cash Flow	**US$ million**	**129.1**	**-7.6**	**-8.8**	**-33.7**	**-23.5**	**-5.6**	**11.5**	**28.5**	**44.6**	**60.1**	**75.2**	**89.7**	**103.8**	**129.1**

	(%/yr)	5%	6%	7%	8%
Net Present Value	**US$ million**	**81.2**	**74.1**	**67.6**	**61.7**

Internal Rate of Return	**%**	**35%**
Payback	**Year**	**4.3**

Table 22.2 – Economic Model Assumptions

Assumptions

The evaluation model was construed such as be possible to derive the cash flow in US dollar in real terms.

The cash flows are averaged mid-period for it is assumed that the cash inflows and outflows will be evenly distributed over the years of project life.

		PFS Phase I	PFS Phase II	Source/Note
Real/Dollar Currency Exchange		3.95	3.95	5-Year FX Forecast (Itau, Bradesco, BCB Focus, Santander)
Social Contribution		9.0%	9.0%	Tax Reference
Income Tax		25.0%	25.0%	Tax Reference
Income Tax (with Sudene)		6.3%	6.3%	Tax Reference
Discount on NPV Base Case		5.0%	5.0%	Project Assumption
Discount on NPV Simulation		6.0%	6.0%	Project Assumption
Discount on NPV Simulation		7.0%	7.0%	Project Assumption
Discount on NPV Simulation		8.0%	8.0%	Project Assumption
Working Capital Year 1 (of Accounts receivables)		50%	8%	Project Assumption - 6 month
Working Capital Year 2 on (of Accounts receivables		8%	8%	Project Assumption - 1 month
CFEM tax		2.0%	2.0%	Tax Reference
Landower (CFEM ref)		1.0%	1.0%	Project Assumption
Waste/Ore Strip Ratio		1.62	1.58	Mine Sequencing
Average Mining Grade		3.5%	2.3%	Mine Sequencing
Average Recovery		81.8%	81.8%	Mine Sequencing
Average Concentrate %		95.0%	95.0%	Mine Sequencing
Average Throughput (t/yr)		165,500	1,097,860	Mine Sequencing
Products & Prices				
+ 30 Mesh Price	4%	2,300	2,300	Marketing Reference (Similar Project)
+ 50 - 30 Mesh Price	32%	2,000	2,000	Marketing Reference (Similar Project)
+80 - 50 Mesh Price	27%	1,025	1,025	Marketing Reference (Similar Project)
+100 - 80 Mesh Price	17%	825	825	Marketing Reference (Similar Project)
< 100 Mesh Price	20%	690	690	Marketing Reference (Similar Project)
Average Basket Price		1,287	1,287	
Debt Funding		70%		% of Debt (Third Party Debt)
Arrangement Fee		2%		% Cost of Debt
Repayment		6		Years of Repayment
Grace Period		2		Years of Grace Period
Interests		10%		% Interesnt
CAPEX Contingency		10%	15%	According Maturity of Project
Depreciation Equipament and Tools		5 year	5 year	Equipament and Tools Rate
Depreciation Sustaining Capital		10 year	10 year	Other
OPEX Processing Costs Contingency (Others)		10%	10%	Project Assumption

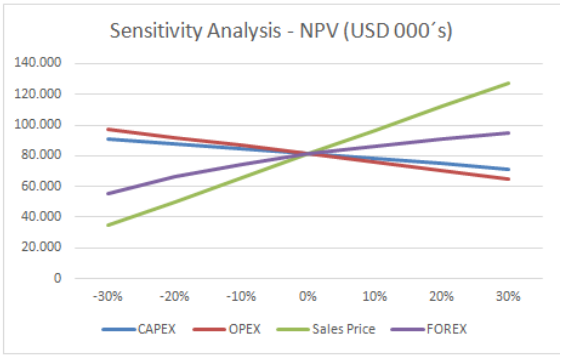
Table 22.3 – Sensitivity Analysis

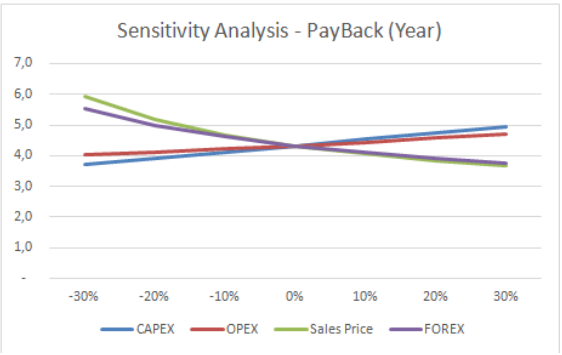
Sensitivity Analysis

Risk Factor

	Index	-30%	-20%	-10%	Base case	10%	20%	30%
Average Basket Price	1	-30%	-20%	-10%	Base case	10%	20%	30%
Real/Dollar Currency Exchange	1	-30%	-20%	-10%	Base case	10%	20%	30%
CAPEX	1	-30%	-20%	-10%	Base case	10%	20%	30%
OPEX	1	-30%	-20%	-10%	Base case	10%	20%	30%

Results			NPV (USD 000´s)	IRR (%)	Pay Back (Years)
Capital Expenditure	-30.0%	0.7	90,755	47.63%	3.7
	-20.0%	0.8	87,559	42.84%	3.9
	-10.0%	0.9	84,364	38.83%	4.1
	0.0%	1	81,168	35.42%	4.3
	10.0%	1.1	77,973	32.47%	4.5
	20.0%	1.2	74,777	29.89%	4.7
	30.0%	1.3	71,582	27.60%	4.9
Operating Cash Cost	-30.0%	0.7	97,582	40.90%	4.0
	-20.0%	0.8	92,111	39.08%	4.1
	-10.0%	0.9	86,640	37.25%	4.2
	0.0%	1	81,168	35.42%	4.3
	10.0%	1.1	75,697	33.58%	4.4
	20.0%	1.2	70,195	31.72%	4.6
	30.0%	1.3	64,678	29.85%	4.7
Sales Price	-30.0%	0.7	34,610	19.31%	5.9
	-20.0%	0.8	50,211	25.05%	5.2
	-10.0%	0.9	65,717	30.38%	4.7
	0.0%	1	81,168	35.42%	4.3
	10.0%	1.1	96,620	40.23%	4.1
	20.0%	1.2	112,071	44.86%	3.9
	30.0%	1.3	127,523	49.31%	3.7
FOREX	-30.0%	0.7	55,497	21.97%	5.5
	-20.0%	0.8	66,218	26.83%	5.0
	-10.0%	0.9	74,533	31.29%	4.6
	0.0%	1	81,168	35.42%	4.3
	10.0%	1.1	86,597	39.28%	4.1
	20.0%	1.2	91,121	42.92%	3.9
	30.0%	1.3	94,949	46.35%	3.8





23.0 ADJACENT PROPERTIES

The project area is generally rural, agricultural land used mostly for cattle grazing, small crops with some lumber interests. The main ore bodies of São Manuel and São Rubens are open to the east, south and northwest, which are currently being evaluated for further drilling and resource upgrade. Other large companies and operators like Nacional de Grafite and Magnesita Refratários also have mineral rights in the area where South Star has a dominant key strategic position. A summary map is presented in Figure 23-1.

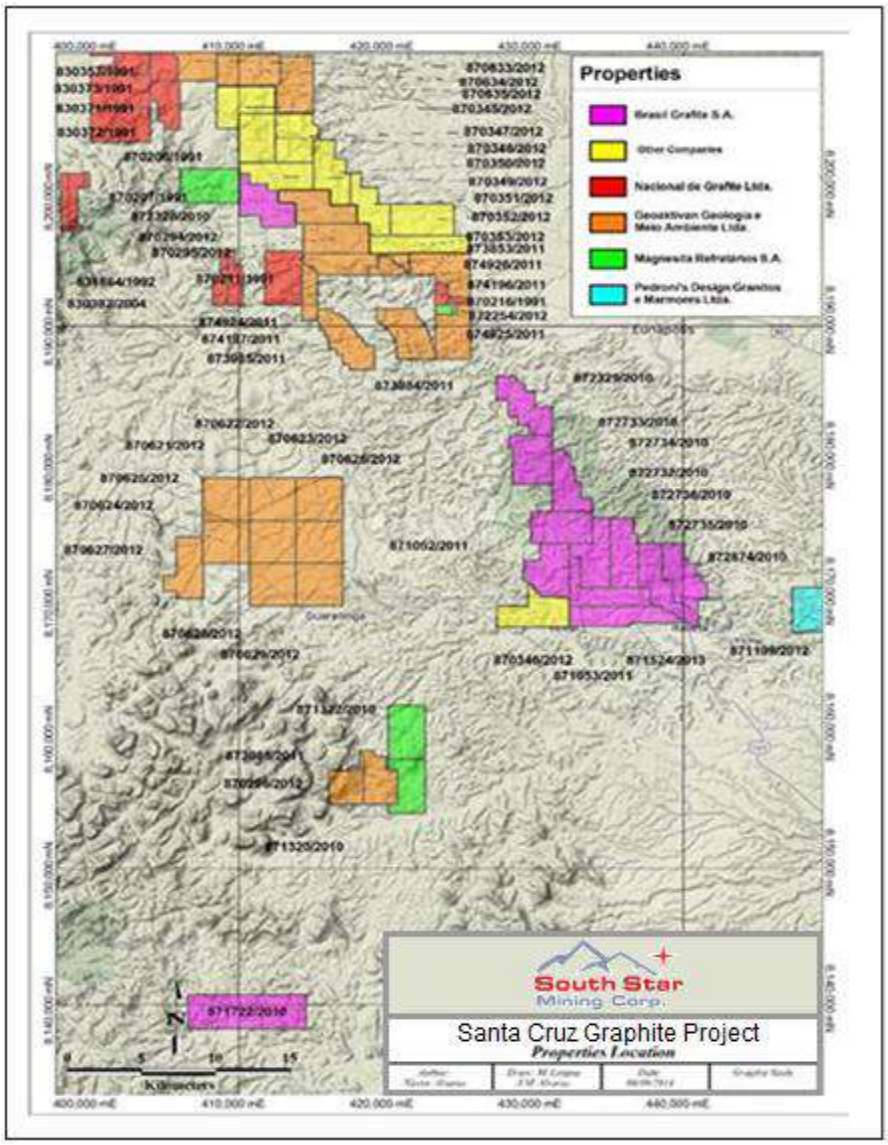


Figure 23-1 – Adjacent properties summary map

24.0 OTHER RELEVENT DATA & INFORMATION

There is no other data or information considered by the authors to be relevant for the purposes of this report.

25.0 INTERPRETATION & CONCLUSIONS

This PFS is based on the technical information, financial analysis and project assumptions presented in the previous sections. The Santa Cruz Graphite Project shows robust results, that contain substantial results that support further more advanced mining studies and advancement to investment decisions. In addition, further upside potential exists to increase resources and grade, with mineralized material that has excellent characteristics that can demand superior prices within the marketplace. Important deposit characteristics are highlighted below:

- Located in one of the highest quality, prospective graphite regions in the world with over 70 years of continuous production;
- Shallow, friable material that can be mined without explosives and minimal crushing;
- Excellent recoveries and concentration properties using proven technology;
- Large percentage of high quality, large flake graphite in deposit;
- Favorable logistics and infrastructure;
- Potential commercial production within 12 months of concluding financing;
- Large, quality geologic targets identified to expand resource and improve overall average grade.

Graphite is a growing global marketplace with increased demand for high quality product being developed at a rapid pace. The project has a combination of unique competitive advantages that make it a highly attractive asset, capable of producing premium quality graphite concentrate with a cost profile within the 1st quartile (comparable to Chinese production).

Financial highlights include:

- Phase 1 Average Production of 5,000 tpy of 95% Cg Concentrate in Years 1 & 2
- Phase 2 Ramping up from 13,500 tpy of 95% Cg Concentrate in Year 3 to an average production of 25,000 tpy in years 4-11

- Average Basket Price of Products of US$1,287/t
- Open-pit mining with strip ratio of 1.6 Life of Mine (LOM)
- 12-Year LOM
- Exchange Rate of R$3.95 to US$1.00
- Post-Tax NPV5% of US$81.2M and internal rate of return of 35%
- US$129M Post-tax Cash Flow LOM
- Payback Period of 4 years
- CAPEX & OPEX Parameters for Each Phase are listed below:

Parameter	Phase 1 (US$)	Phase 2 (US$)	Phase 1 & 2 (US$)
CAPEX	7.3M	27.2M	34.5
OPEX ($/t Concentrate)	604	386	396

Detailed design documents have been prepared for the Phase 1 pilot plant. A detailed 10-12 month construction schedule has been prepared.

25.1 Risk Evaluation

The study is preliminary in nature and project estimates are subject to change and revision as more information becomes available. Principal project risks include variations in average project graphite grade, average project flake size distribution, environmental and mine licensing, CAPEX and OPEX costs, exchange rate fluctuations and price of graphite products.

26.0 RECOMMENDATIONS

In order to advance the project to the next level of study, a recommended work program is presented in the following sections.

26.1 GEOLOGY AND MINERAL RESOURCE & RESERVES ESTIMATE

- Additional 2,000 – 3,000 meters of drilling (RC& DDH), with deep holes to reach fresh rock lithology to add and upgrade resources and reserves. In the current Resources estimate there are only inferred resources from this lithology.
- Additional 1,000 to 2,000 meters of drilling (RC& DDH) in satellite targets;
- Further auger drilling for exploration potential;
- Investigate further use of geophysics;
- Geologic mapping and preliminary investigations of satellite targets within the proposed mine footprint;
- Additional 1,000 meters of infill drilling to support Pilot Plant Operations; and
- Update Resource and Reserve estimates.

Total budget estimate for this work is US$750,00 – 800,000.

26.2 MINE DESIGN AND SEQUENCING

- Collect and perform basic geotechnical characterization of the pit ore, host rock and waste materials and waste and tailings co-disposal WSF and foundation conditions;
- Install piezometers and begin to collect periodic data on variations in groundwater levels over seasons;
- Complete preliminary investigations into pit dewatering characteristics, hydrogeologic modeling and surface water diversion plans;
- Complete condemnation drilling for all proposed facilities; and
- Develop more detailed mining cost estimate based on proposed mine plan and sequencing schedule after drilling program.

Total budget estimate for this work is US$200,000 – 300,000.

26.3 MINERAL PROCESSING AND METALLURGY

- Collect and perform further density analysis with representative samples from throughout the entire ore body and waste;
- Collect and perform basic geotechnical characterization for foundation design;
- Complete condemnation drilling for all proposed facilities; and
- Perform value engineering on the Phase 1 pilot plant detailed design.

Total budget estimate for this work is US$200,000 – 300,000.

26.4 CIVIL AND INFRASTRUCTURE

- Collect and perform basic geotechnical characterization for foundation design;
- Complete condemnation drilling for all proposed facilities; and
- Perform value engineering on the Phase 1 pilot plant detailed design.

Total budget estimate for this work is US$250,000 – 350,000.

26.5 MARKETS

- Investigate potential joint venture and R&D partners for investigating advanced graphite uses; and
- Perform more detailed price and supply/demand analysis in Brazilian market place.

Total budget estimate for this work is US$40,000 – 50,000.

26.6 ENVIRONMENTAL AND PERMITTING

- Continue to monitor trial mining license
- Implement required condition precedents for the simplified environmental license;
- Develop preliminary environmental monitoring program and complete EIA-RIMA study so that the integrated LP+LI+LO license can be applied for;
- Trade off analysis for strategic landowners acquisitions.

Total budget estimate for this work is US$300,000 – 350,000.

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APPENDIX 1

AUTHORS CERTIFICATE

CERTIFICATE OF AUTHOR

Luiz Eduardo Campos Pignatari – Comisión Calificadora de Recursos y Reservas Chile (Chilean Comission for the Qualification of Competencies in Resources and Reserves) – CH 20.235 nº 288.

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+55 11 999504854

I, Luiz Eduardo Campos Pignatari, do hereby certify that:

1. I graduated with degree in Mining Engineer from the University of São Paulo (1978) with Post Graduation in Mining Operations from the same institution.

2. I have worked continuously since graduation and have wide experience of operations, industrial processing, research, technical evaluation, economic and financial viability studies, with a focus on technology and operational intelligence, in the Gold, Phosphate and Cement industries, including major corporations such as Bunge Fertilizers, Yamana Gold and Camargo Correa Cement.

3. I have read the definition of "Qualified Person" as set out in the National instrument 43-101, and certify that I am a Qualified Person according to Comisión Minera CH-20.235 nº 288, accepted by NI 43-101 and JORC.

4. I am responsible for the direct oversite, preparation and compilation of all the sections of the Technical Report entitled " *NI 43-101 Technical Report, Updated Resource and Reserves Estimate and Prefeasibility Study on the Santa Cruz Graphite Project, Itabela, Bahia, Brazil*" with the issued date on March 18, 2020.

5. I am independent of Brasil Grafite S.A. as defined in section 1.5 of NI 43-101.

6. I have previously participated in the preparation of the "*Amended NI 43-101 Technical Report, Preliminary Economic Assessment Brasil Grafite S.A. on the Santa Cruz Graphite Project, Itabela, Bahia, Brazil"* with the effective date of August 21, 2017, and the *" NI 43-101 Technical Report, Updated Mineral Resource Estimate on the Santa Cruz Graphite Project, Itabela, Bahia, Brazil"* with the effective date of July 8, 2019.

7. I last visited the Santa Cruz Graphite Project on June 17and 18, 2019.

8. As at the date of the technical report on the Santa Cruz Graphite Project, to the best of my knowledge, information, and belief, the portions of the technical report for which I am responsible contain all scientific and technical information required to be disclosed to make the technical report not misleading.

I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 18th Day of March 2020.

"Original Signed Document on File with the Company"

Luiz Eduardo Campos Pignatari