Competent Person's Report on the Serrote Mine, Alagoas, Brazil

ACG Acquisition Company Limited

SLR Project No: 233.03777.R0000

Effective Date:
December 31, 2022

Signature Date:
June 12, 2023

Prepared by:
SLR Consulting (Canada) Ltd.

Competent Persons:
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Orlando Rojas, AIG
Andrew Bradfield, P.Eng.
Anthony Maycock, P.Eng.
Daniel Servigna, PE

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FINAL

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1.0 SUMMARY

1.1 Executive Summary

SLR Consulting (Canada) Ltd. (SLR) was retained by ACG Acquisition Company Limited (ACG) to prepare Competent Person's Report (CPR) on the Serrote Mine (the Mine or Serrote), located in Alagoas, Brazil. Mr. Orlando Rojas, GeoEstima SpA (GeoEstima); Mr. Anthony Maycock, MM Consultores SpA (MM Consultores); Mr. Andrew Bradfield, P&E Mining Consultants Inc. (P&E); Mr. Daniel Servigna, WSP USA Environment & Infrastructure Inc. (WSP); and Mr. David JF Smith, SLR Consulting, are collectively the Competent Persons (CPs) for this CPR.

The purpose of this CPR is to support a listing on the London Stock Exchange (LSE). The CPR conforms to Financial Conduct Authority (FCA) Primary Market Technical Note 619.1.

The Serrote copper-gold mine is located in Alagoas in northeast Brazil and is owned and operated by Mineração Vale Verde Ltda (MVV), a subsidiary owned by ANRH Cooperatief U.A. (ANRH). The operation is a conventional, low-strip open pit operation targeted to produce 20,000 tonnes of copper equivalent per year for the remaining mine life of 12 years.

1.1.1 Conclusions

1.1.1.1 Geology and Mineral Resources

- As of December 31, 2022, inclusive of Mineral Reserves, Measured Mineral Resources for open pit operations are estimated to total 61,415 thousand tonnes (kt) at 0.55% copper (Cu) and 0.10 g/t gold (Au), and Indicated Mineral Resources are estimated to total 35,254 kt at 0.53% Cu and 0.08 g/t Au. In addition, Inferred Mineral Resources are estimated to total 4,883 kt at 0.52% Cu and 0.07 g/t Au.
- Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves (CIM (2014) definitions were followed for Mineral Resources.
- The Serrote deposit and Caboclo exploration target are examples of mafic–ultramafic magmatic copper sulphide deposits and are very well understood by the MVV staff. Caboclo is located approximately 20 km from the Serrote processing facilities.
- Protocols for drilling, sampling preparation and analysis, verification, and security meet industry standard practices and are appropriate for the purposes of a Mineral Resource estimate.
- Drill programs included insertion of blank, duplicate, and standard reference material samples.
- The QA/QC program as designed and implemented by Serrote and Caboclo is adequate, and the assays values are suitable for use in Mineral Resources estimate.
- Data have been validated using numerous checks that are appropriate and consistent with industry standards.
- Database construction and security were adequate.
- The geological models are reasonably constructed using available geological information and are appropriate for Mineral Resource estimation.
- The assumptions, parameters, and methodology used for the Serrote Mineral Resource estimate are appropriate for the style of mineralisation and proposed mining methods.

- Drilling was completed at regularly spaced intervals over the mineralisation and is considered representative of the deposits.
- Sample collection, preparation, analysis and security for reverse circulation (RC) and core drill programs are in line with industry-standard methods for copper–gold deposits.
- The use of wet samples for density measures is acceptable because the Mine rock types typically have <1% porosity when fresh, thus the wet and dry densities are very much the same.
- Exploration completed to date is appropriate and has been adapted to the local regolith development. The programs have identified the Serrote deposit and Caboclo exploration target and most of the exploration results have been followed up with drilling.
- Queimada Bonita prospect has anomalous copper, gold, and nickel values that warrant additional investigation.
- The Caboclo area presents a reasonable potential that should be considered for further exploration, such as the Rogério, Petrúcio, and Zezé targets.

1.1.1.2 Mining and Mineral Reserves

- As of December 31, 2022, the Mineral Reserves were estimated as:
  - Proven Mineral Reserves: 41.17 million tonnes (Mt) at 0.59% Cu and 0.10 g/t Au
  - Probable Mineral Reserves: 5.56 Mt at 0.54% Cu and 0.08 g/t Au
  - Total Mineral Reserves: 46.73 Mt at 0.58% Cu and 0.10 g/t Au
- The Mineral Reserve estimation for the Mine incorporates industry-accepted practices and is reported using CIM (2014) definitions.
- Measured and Indicated Mineral Resources that were classified by material type as sulphide were converted to Mineral Reserves. Inferred Mineral Resources in sulphide and material classified as oxide were considered as waste. Only copper and gold economic values were considered.
- The Mineral Reserve estimates are based on detailed pit limit designs, which were validated by a life-of-mine (LOM) mine plan.
- A sensitivity analysis established that the Serrote open pit limit geometry is robust in the north, east, and west parts of the open pit for a wide variation of the design parameters, due to the orebody geometry. This part of the orebody is higher grade and has a lower stripping ratio. In contrast, the geometry of the south part of the pit is more sensitive to changes in the design parameters.
- Information that affects the cut-off grades used for estimating the Mineral Reserves include the copper and gold metal prices, exchange rates, overall mine and process plant variable and fixed costs, and copper concentrate transport, smelting, refining, and processing costs.
- The CP is not aware of any other factors that could materially impact the estimate of the Mineral Reserves for Serrote that are not presented in this CPR.
- Mining operations are conducted year-round. The Serrote Mine has been developed as a conventional open pit operation using conventional equipment. The Serrote pit will be developed in five phases. The current mine plan was prepared using a peak mine production rate of 12.7 million tonnes per annum (Mt/a) and a mine operating life of 12 years. Ore is delivered to the crusher pad adjacent to the process plant at an average rate of 11,390 tonnes per day (t/d) or 4.1 Mt/a.

- Mining is carried out by a contractor that supplies its own fleet of mining equipment up to the end of 2024; from 2025 onwards, MVV will own and operate a new fleet. The equipment type and size selection were carried out by MVV, and both the contractor and MVV fleets will be of compatible sizes.
- Mining activities will generate four types of overburden/waste materials: topsoil, saprolite (overburden), transitional weathered rock, and waste rock. There will be one waste rock storage facility (WRSF), an oxide material stockpile, and a temporary sulphide ore stockpile.

1.1.1.3 Mineral Processing

- The process plant using Woodgrove flotation cells, until recently, had not been able to reproduce the copper recovery or concentrate grades achieved in the metallurgical testwork that was carried out up to the end of 2020. The flowsheet changes implemented in July 2022 resulted in an increase in recovery to the design levels; however, the concentrate grades continue to be lower than design.
- The testwork carried out by SGS Geosol in 2022 showed the potential for significantly increasing concentrate grade and increasing recovery. The work also showed that an increase in the impeller tip speed in the conventional laboratory cells increased recovery.
- Pilot scale testwork carried out by Woodgrove in 2022 showed the recovery could be improved by increasing the impeller tip speed and using a different gangue depressant; however, the improvement did not indicate that the design recovery or concentrate grades could be achieved.
- A large proportion of the copper losses occur in liberated copper minerals <5 µm and >40 µm in size and copper minerals locked in complex gangue particles. Laboratory testwork has shown high recoveries and concentrate grades can be achieved with selective regrinding and additional flotation residence time in conventional cells.
- The Caboclo material appears to be similar to the Serrote ore and responded well to the original flowsheet designed for Serrote. Future testwork should take into consideration the lessons learned in the Serrote plant.
- In spite of lower copper recoveries during Serrote's ramp-up period, copper in concentrate production has been either in line or above plan.

1.1.1.4 Infrastructure

- The Serrote Mine is accessed via paved roads from the cities of Craíbas and Arapiraca. Road access is used for the supply of materials and equipment to the mine site and for transporting concentrate to the port of Maceió approximately 140 km from the Mine site. Concentrate has been transported to the port of Maceió since the first shipment in Q4 2021.
- Existing infrastructure includes the gatehouse, trucker support building, change house, administration offices, workshop offices, first aid post, kitchen/canteens, process plant with workshop, laboratory, process control room, main workshop building, tire shop, welding area, drilling maintenance bay, fuel station, wash bay, and power sub-station. All infrastructure construction necessary for the Serrote Mine operations was completed by the end of 2021.
- No on-site accommodation is available. Employees and contractors reside in Arapiraca, Craíbas and surrounding communities. Arapiraca is the second largest city in Alagoas and had an estimated population of 233,000 inhabitants in 2020.
- Electrical power is supplied via a 21 km long powerline that connects the Serrote sub-station with the national grid at the Arapiraca III substation. Plant emergency power is provided by a

480 V packaged diesel generator located in the thickening and filtration substation. Emergency power supports critical loads only, and does not maintain production.

- MVV is tied into the CASAL (the Alagoas state water utility) pipeline that provides the water supply for Arapiraca. The pipeline feeds a freshwater reservoir on site. Process water is supplied from a combination of recirculated flow from the thickeners, water reclaimed from the tailings storage facility (TSF), and water contained in the run-of-mine (ROM) material. Fresh water is used to top up this supply when required.
- Water management infrastructure was designed to Brazilian standards. Structures specifically requiring diversion drainage management are the sulphide and oxide stockpiles, the WRSF and the open pit.

1.1.1.5 Environment

1.1.1.5.1 Environmental

- The environmental impacts of the Serrote Mine were identified and evaluated for the construction, operation and closure stages, along with proposals for control, mitigation, monitoring and environmental compensation actions.
- The Mine has undergone an independent Environment and Social Due Diligence review process against national legislation and international standards (including IFC Performance Standards, Equator Principles, and Good International Industry Practice). MVV has implemented an action plan to address the findings which includes quarterly audits to assess status of actions identified in the Environmental and Social Action Plan (ESAP).
- Tailings geochemistry studies to date indicate Phase 2/3 and Phase 4 tailings are non-acid-generating and have a low potential for metal leaching, consistent with Phase 0/1 tailings. Additional geochemical characterization is ongoing to augment the existing understanding, characterize metal solubilization aspects of the mine rock, pit walls, and tailings, and inform management strategies. Results will be integrated into a water balance and water quality effects model extending site-wide and into the receiving environment.
- MVV commissioned the consulting group Ferreira Rocha to prepare an updated Environmental and Social Impact Assessment (ESIA) and Environmental Social Management Plan, who then completed the document in June 2022. MVV is using the updated ESIA to guide development of ongoing environmental and social management plans.
- MVV has legal requirements for monitoring air quality, climate, ambient noise and vibration, water quality, and flora and fauna. The monitoring programs are stipulated in the Mine's Environmental Control Plans (PCAs); these documents were submitted to the state environmental agency during the Mine's installation licence permitting process.

1.1.1.5.2 Permitting

- MVV advised on May 21, 2021, that Project permitting is up to date with all permits for the operations phase obtained. The Operating Licences for the Operations Phase of the Mine and for Mineral Processing and Tailings Management were issued by the state environmental agency on May 27, 2021, and will be due for renewal in May 2025.

1.1.1.5.3 Closure

- The most recent site-wide update of the Mine's conceptual closure plan and associated cost estimate was carried out in January 2023. Per the Project's Operating Licence issued May 27, 2021, an updated closure plan shall be submitted at the time of licence renewal in early 2025.

- A total of US$18.8 million (R$98.1 million at an exchange rate of R$5.21 per US$1) is assumed in the cost model for closure.

1.1.1.5.4 Social

- There are 14 communities within the area of direct Project influence. MVV is in constant communication with the residents, and holds regular community meetings, under the company's Social Dialogue Initiative. MVV uses the WhatsApp messaging application as a tool to support communications between the communities and MVV's community relations team.
- A resettlement program was undertaken from 2012 to 2020, under which 153 families residing in the area needed for the mining operations were resettled. To the Effective Date of the CPR, MVV has no record of complaints and/or complaints lodged using the Grievance Mechanism in relation to the resettlement process. MVV maintains an ongoing social dialogue with the resettled families including regular meetings.
- A Grievance Mechanism is in place. MVV has a contract with a specialized third-party, which guarantees confidential treatment of information. A computer database records and monitors the stakeholder communications, and MVV's responses, agreements and commitments adopted.
- MVV has a Stakeholder Engagement Plan in place that set out the company's guidelines for addressing stakeholder concerns, stakeholder communications, and stakeholder relationships. The plan is constantly updated to reflect the Mine development stage, scenario changes, stakeholder profiles, and the type and nature of stakeholder feedback.
- MVV instituted an "Open Doors" (Portas Abertas) program which consisted of guided tours of the Mine that provided external stakeholders with Project-specific information, in particular, on aspects of the environmental and engineering disciplines. The Open Doors program extends to general community-related information updates on the Mine. These include individualized information provision to stakeholders, weekly information emails, and monthly newsletters on social and environmental actions. MVV is also active in the print and social media spheres to ensure that all stakeholders remain informed as to MVV's activities.
- MVV developed a portfolio of social projects in conjunction with communities in the area of direct Project influence, which focused on the areas of social entrepreneurship, environmental education, science and technology.

1.1.1.5.5 TSF

- The TSF is a conventional cross-valley TSF to be constructed in two phases. Construction of the TSF first phase was competed during January 2021. Operations at the TSF began in mid-June 2021 and are ongoing. Phase 1 will operate for four years from the commencement of operations in June 2021; Phase 2 will operate for the remaining LOM and will require a dam raise, which is anticipated to be completed in two raises, one 4 m raise and a final 3 m raise.
- The Mine will produce approximately 54 Mt of ore over the 14-year mine life, and the TSF was designed to contain the LOM tailings volume. However, if additional resources are discovered during the LOM, additional tailings storage capacity may be required beyond the currently proposed final TSF design.
- The TSF has been designed and operated in accordance with all applicable Brazilian regulations, as well as to meet the Canadian Dam Association (CDA) guidelines considered international standard. Operations at the TSF follow the strict governance framework put in place by MVV, which meet regulations defined by the national dam policy of the Ministry of the Environment, and the laws and regulations of the Agência Nacional de Mineração (ANM).

Operating permits for Tailings Management were issued by the state environmental agency on May 27, 2021, and will be due for renewal in May 2025. The facility is currently registered as “In Operation” as of June 20, 2022, with ANM. Application for “Granting of Water Works” required for the TSF Phase 2 raise was submitted on September 22, 2022; the permit is currently in processing.

- Geotechnical instrumentation records of the dam are within the expected parameters. Increases in piezometric levels were recorded on the upstream slope and no piezometric levels were recorded on the downstream slope. The dam inclinometers did not register displacements above safety levels and the seepage flow remained constant throughout the year, indicating a good functioning of the internal drainage system. Water quality monitoring indicate that seepage flows downstream of the dam meet environmental discharge regulations. Seepage flows are currently directly discharged to the downstream environment.
- Annual dam safety inspections indicate that the dam is performing well with minor damages to ancillary TSF features due to the major storm events that occurred at the site. Minor repairs include minor erosional damage repair on embankment slopes, finishing upstream riprap placement, establishing full vegetative cover on the downstream slope, minor repairs to the spillway, and abandonment of the seepage collection pond.

1.1.1.6 Markets and Contracts

- MVV has a single contract in place with a large global trader covering 100% of the copper concentrate production.
- Copper and gold are payable in the concentrates. At a projected 24% to 40% copper the Serrote concentrate is considered a high-grade concentrate and has attracted good terms from the off-taker. At a projected 2.55 g/t to 5.75 g/t Au, the gold content in the Serrote concentrates is relatively low and is suitable for all smelters/refineries.
- MVV’s base case metal price assumptions are considered to be in line with the periodic forecasts of future copper and gold prices prepared by several banking institutions and research analysts. The forecasts used vary for the period 2023–2026, reverting to long-term pricing in 2027. The long-term prices include US$3.59/lb Cu and US$1,615/oz Au. The long-term Brazilian reais to US$ exchange rate forecast used in the economic analysis is 5.55.
- The open pit mining contract is with Fagundes Construção e Mineração S/A.

1.1.1.7 Costs and Economics

The Serrote Mine was built from 2019 to the end of 2021 at an estimated capital cost of $194.5 million with all taxes included. The cost accounts for all infrastructure necessary to begin operations such as the processing plant, initial tailings dam facility, mining pre-production, administration buildings and warehouse, plus Owner’s costs and commissioning. Process plant capacity was designed at 4.1 Mt/a.

MVV declared commercial production on December 27, 2021, and the mine has been operating continuously since then. This CPR considers a mine plan with a start date of January 1, 2023. All capital costs in the LOM plan are considered as sustaining capital.

- The sustaining capital cost over the LOM is estimated to be US$132 million, including costs related to mining, process plant, tailings storage facility expansion, and mine closure.
- The LOM operating cash cost is estimated to be US$14.60/t ore processed, and the all-in sustaining cost (AISC) is estimated at US$19.74/t ore processed which is equivalent to $1.85/lb Cu payable.

- Annual operating costs range from US$59 million to US$74 million for full years of operation with variations in costs mainly attributable to mining costs, which vary due to strip ratios and equipment life cycles.

The cash outflows and inflows for the base case were estimated to calculate the NPV.

- The undiscounted unlevered free cash flow is estimated at US$781 million. The NPV after tax at a discount rate of 8% is estimated at US$540 million. IRR and Project payback years are not applicable in this case since the initial capital costs have been expended and are considered sunk costs as of Q4 2021.
- The Serrote Project is most sensitive to the copper price, followed by exchange rate. Sensitivity to grade is the same as for price because of the relationship between the grade, the product, and the metal price.

1.1.2 Recommendations

1.1.2.1 Geology and Mineral Resources

GeoEstima has the following recommendations for Geology and Mineral Resources

1. Update the Mineral Resource estimate with the results of the ongoing drilling program. The new drilling information may better define the limits of mineralisation, increase the volume of material in the deeper portion of the deposit, and upgrade the resource classification in some areas, thus increasing the life of the mine.
2. Improve the modelling and knowledge of the copper oxide zone at Serrote and investigate process options.
3. Build a detailed structural model and structural domains in order to customize local search anisotropies and directions.
4. Review the existing geochemical data in the Caboclo area to confirm lateral extents of mineralized bodies and infill the existing drill spacing gaps. The review should include the new data from the 2021 up to 2022 drilling campaign.
5. Develop metallurgical testwork program to check the Caboclo recovery assumptions.
6. Estimate Mineral Resources for the Caboclo area, which has good potential to extend the Serrote Operation.
7. Update the Mineral Resource pit shell and cut-off inputs based on current economic parameters.
8. Review cut-off input parameters to have a consistent baseline with the Mineral Reserve inputs in future resource updates.
9. Investigate the potential contamination observed in some blank samples for copper at ALS Chemex.

1.1.2.2 Mining and Mineral Reserves

1. Evaluate an area of a new pushback located in the south end of the open pit. This evaluation should include additional geotechnical and Mineral Resource drilling with US$3 million estimated investment. It is expected that a new and improved mine plan and financial model will be generated once this program is completed.

1.1.2.3 Mineral Processing

The CP is in agreement with the MVV testwork program and plan to improve and stabilize plant operations and performance, which includes the following components:

1. Fine tune plant controls.
2. Operate the high intensity grinding (HIG) mills at the optimum point (including classification effectiveness).
3. Improve understanding of the geometallurgy of the feed and the metallurgical response of each lithology type and head grade.
4. In 2023, to improve the copper grade in the concentrate, install a dedicated cleaner cell (tank cells in the range between 20 m^3 and 50 m^3 are available) for enrichment of the first rougher 1 concentrate (from around 24% Cu to >35%Cu with 90% recovery in the stage). This will increase the overall copper grade in the concentrate to 30% when combined with the cleaner 2 concentrate.
5. In 2024 and 2025, install one additional cleaner tank cell to improve the overall concentrate grade to 32% Cu.
6. In 2026, install a four stage cleaner circuit using tank cells with impellers with higher tip speeds to produce a 40% Cu concentrate.
7. Carry out locked cycle tests (LCT) and pilot plant testwork to further investigate the optimum cleaner circuit configuration and test higher flotation cell impeller tip speeds. The latter has been tested on conventional cells in the laboratory and at pilot scale for the Woodgrove cells with encouraging results. The goal is to produce a final concentrate of around 40% Cu, while maintaining recovery between 84% and 85%.

1.1.2.4 Infrastructure

There are no recommendations related to infrastructure.

1.1.2.5 Environment

2. Start the TSF Phase 2 embankment raise to crest elevation 254 masl construction in Q4 2023, so it is complete on or before the end of Q3 2024. The TSF embankment raise design should be based on conservative assumptions related to the upstream catchment's degree of saturation and should include a spillway design that adheres the updated Brazilian regulations (ANM, 2022), the relocation of the discharge system (i.e., spigots) to the crest of the embankment, and the development of a tailings beach over water. The design of this phase is underway, and completion is expected by Q3 2023.
3. Keep the water licence (required to capture fresh water from the Salgado stream in the TSF) active in case demand for fresh water cannot be met by CASAL at any point in time.
4. For the next closure cost revision, which must be reviewed and updated every five years, incorporate borrow and organic soil cover requirements and sourcing to assess the need to extend post-closure activities beyond five years for certain facilities such as the TSF.
5. Based on climate data, is it reasonable to assume a large portion of the TSF will remain inundated with only the outer edges requiring cover material placement. Once a quantitative water balance is completed to confirm this assumption, conduct a review of the closure plan and adjust the cost estimate accordingly.

1.2 Economic Analysis

1.2.1 Cautionary Language

The results of the economic analyses discussed in this section represent forward-looking information. The results depend on inputs that are subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here.

Information that is forward-looking includes:

- Mineral Reserve estimates;
- Commodity prices and exchange rates;
- Mine production plan;
- Mining and process recovery rates;
- Mining dilution and mining recovery;
- Sustaining costs and operating costs;
- Closure costs and closure requirements;
- Environmental, permitting and social risks.

Additional risks to the forward-looking information include:

- Changes to costs of production from what is assumed;
- Unrecognized environmental risks;
- Unanticipated reclamation expenses;
- Unexpected variations in quantity of mineralized material, grade or recovery rates;
- Geotechnical or hydrogeological considerations during mining being different from what was assumed;
- Failure of mining methods to continue to operate as anticipated;
- Failure of process plant, equipment or processes to operate as anticipated;
- Changes to assumptions as to the availability of electrical power, and the power rates used in the operating cost estimates and financial analysis;
- Ability to maintain the social licence to operate;
- Accidents, labour disputes and other risks of the mining industry;
- Changes to interest rates;
- Changes to tax rates.

1.2.2 Basis of Estimate

A financial model was developed to estimate the Serrote Mine base case open pit LOM plan comprised of mining the Proven and Probable Mineral Reserve within the open pit. The LOM plan covers a period of 12 years beginning Q1 2023. Financial evaluation of the Mine was based on a discounted cash flow model, from which net present value (NPV) was determined. A measure of the internal rate of return (IRR) is not possible in this case since the initial capital costs have been expended and are considered sunk costs as of December 27, 2021, when commercial production was declared. The sensitivity of the NPV to changes in the base case assumptions was also examined.

The financial analysis was prepared on a constant currency basis with all cash flows expressed in Q1 2023 US dollars (US$) terms. Project revenues are determined by metal prices in US$ and capital expenditures and operating costs are denominated in R$ and US$. For the Mine base case, long term metal prices of US$3.59/lb Cu and US$1,615/oz Au with a long term exchange rate of R$5.55 = US$1 reflect consensus rates as of January 2023. The discount rate in the financial model is 8%.

The financial analysis includes provisions for Brazilian taxes applicable to the Serrote Mine. Taxable income is subject to federal income tax of 34% consisting of 25% base rate (*Imposto de Renda - Pessoa Jurídica*, IRPJ) and a 9% social contribution (*Contribuição Social sobre o Lucro Líquido,* CSLL). Capital and operating expenditures are subject to a state value added tax (*Imposto sobre Circulação de Mercadorias e Serviços*, ICMS) and federal tax (*Programa de Integração Social/Contribuição para o*

Financiamento da Seguridade Social, PIS/COFINS), which are recovered in full through other federal taxes (withholding tax, income tax and social contribution). Due to limitations on recoverability for exporting companies, only 10% of ICMS credits generated are treated as recoverable.

The base case assumes that the Serrote Mine is eligible for the *SUDENE* program, which encourages economic development in Northeast Brazil. This incentive program provides for a 75% reduction in the base income tax rate, for a period of 10 years from the start of operations.

The base case also includes the Drawback Regime consisting of the deferral of the taxes generated by products that are used in the production process of exported goods (copper concentrate). The Drawback Regime is designed to stimulate exports by exemption of taxes related to imports and acquisitions in the internal market (PIS/COFINS for domestic purchases). The most relevant goods that will be purchased under the Drawback Regime are explosives, reagents, mill liners and mill balls. The recovered taxes are shown as a tax rebate in the operating costs. The recovery rates are specified in a tax report by KPMG Assessores Ltda. (2020).

The base case also includes benefits from the Alagoas State integrated development program (*Programa de Desenvolvimento Integrado*, Prodesin) into which MVV was accepted on 22 May 2012. Among others benefits, this allows the deferral of the ICMS on imports and domestic acquisitions related to MVV's capital expenditure.

An interstate tax is due to the state of origin, which is not covered by the Prodesin (this can be converted into a tax credit), and the difference between what would be due in an internal purchase and what was paid to the other state, should be paid by the state of Alagoas. This difference is also deferred by the Prodesin Regime.

During the mining operation, the main financial obligation arising from mineral rights is the Compensação Financeira pela Exploração de Recursos Minerais (CFEM, Financial Compensation for the Exploitation of Mineral Resources). For MVV the CFEM rate is 2% net smelter return (NSR) for copper and gold.

The landowner or any other holder of the surface rights where the mineral deposit is located is entitled to a royalty equivalent to 50% of the CFEM paid (for MVV 1% NSR for copper and gold).

Funds managed by Appian Capital have acquired a 35% gross revenue royalty on all proceeds from gold sales as part of the funding for the construction of the Mine, effective throughout the LOM.

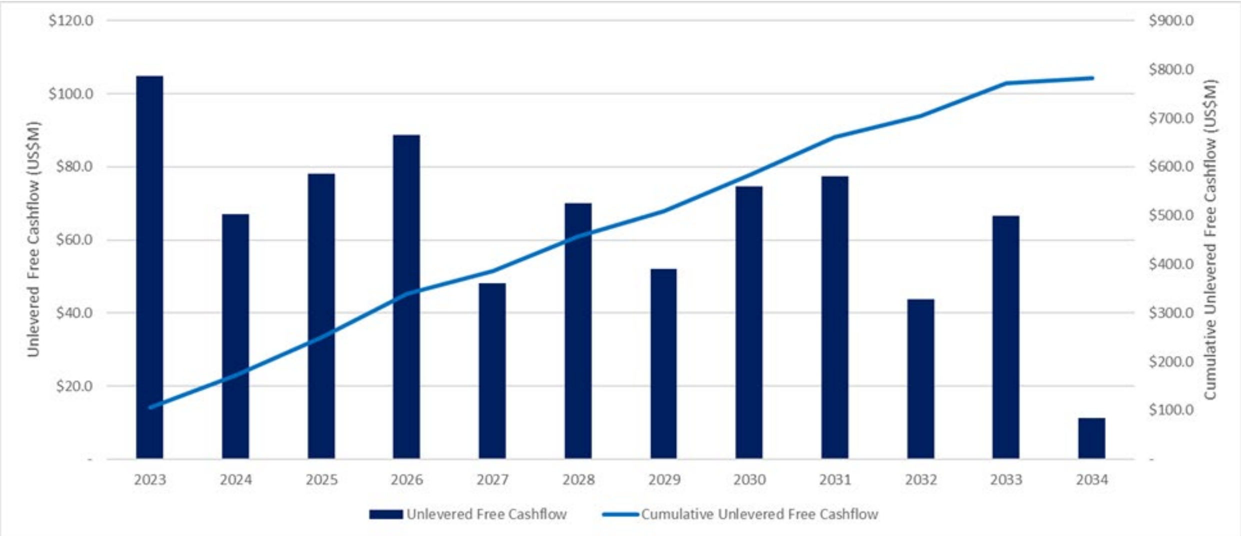
1.2.3 Economic Outcomes

The unleveraged LOM base case Project cash flow is presented in Table 1-1 and in Figure 1-1. The NPV at an 8% discount rate is estimated at US$540 million. Internal rate of return (IRR) and Project payback years are not applicable in this case since the initial capital costs have been expended and are considered sunk costs.

Table 1-1: LOM Unlevered Free Cash Flow Summary
ACG Acquisition Company Limited – Serrote Mine

Item	LOM Total (US$M)
Copper revenue	1,825.5
Gold revenue	145.0
Hedges	9.6

Item	LOM Total (US$M)
Royalties	(108.7)
Smelting and freight	(151.0)
Net Smelter Return	1,720.4
Mining	(222.9)
Processing	(327.6)
General and administration	(125.9)
Pre-Tax Cash Earnings	1,044.0
Income taxes	(138.4)
After-Tax Cash Earnings	905.6
Sustaining capital and closure	(131.6)
Working capital	6.7
Unlevered Free Cash Flow	**780.7**
Net Present Value After tax at Discount Rate of 8%	**540.3**



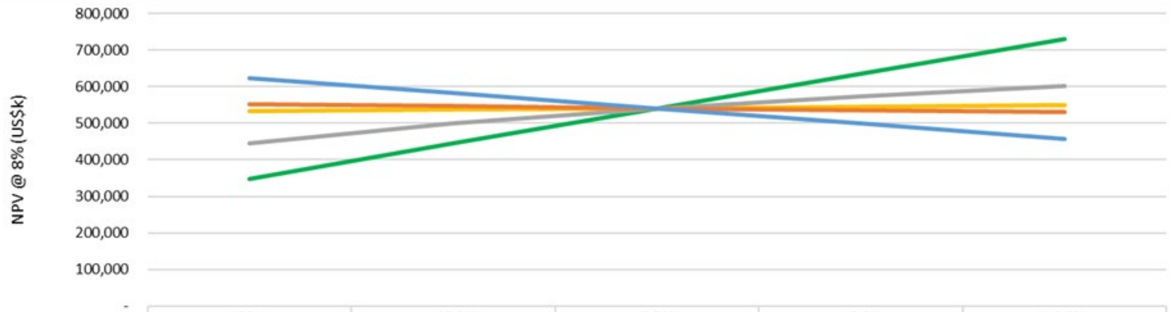
Source: MVV, 2023.

Figure 1-1: LOM Unlevered Free Cash Flow

1.2.4 Sensitivity Analysis

The sensitivity of the Mine to changes in metal prices, exchange rate, sustaining capital costs and operating cost assumptions was tested using a range of 20% above and below the Base Case values.

The sensitivity to NPV is shown in Figure 1-2. The Serrote Project is most sensitive to the copper price, followed by operating costs. Sensitivity to grade is the same as for price because of the relationship between the grade, the product, and the metal price.



	-20%	-10.0%	0.0%	10.0%	20.0%
Copper price	$347,911	$444,760	$540,300	$635,229	$729,840
Gold price	$532,224	$536,463	$540,300	$544,830	$548,948
FX	$445,659	$498,850	$540,300	$574,038	$601,891
Sust. capex	$551,662	$546,155	$540,300	$535,141	$529,617
Opex	$622,733	$581,663	$540,300	$498,993	$457,297

Source: MVV, 2023.

Figure 1-2: Sensitivity Analysis

The sensitivity of the Mine NPV to the cost of capital was tested using discount rates of 5% and 10% (Base Case discount rate, 8%). Table 1-2 shows the impact of these discount rates.

Table 1-2: Discount Rate Sensitivity
ACG Acquisition Company Limited – Serrote Mine

Discount Rate	NPV After Tax (US$M)
Cumulative net cash flow	781
5% discount rate	614
8% discount rate (base case)	**540**
10% discount rate	500

Note: Base case is bolded.

1.3 Technical Summary

1.3.1 Property Description and Location

The Serrote Mine is located in the municipalities of Craíbas and Arapiraca, in the central region of the State of Alagoas, known as the Agreste meso-region. The Mine is situated 12 km from the city of Arapiraca and 5 km from the city of Craíbas, which is located approximately 140 km by road from Maceió, the local capital, and accessed via paved highways AL-220, or BR-316 and BR-101 from Craíbas. Port facilities and a regional airport with scheduled services are located at Maceió. The process plant is in the Craíbas municipality.

Arapiraca (population 214,006) is the second-largest city in the state of Alagoas and is the major source of commercial and industrial support services for the region. Craíbas has 22,641 inhabitants. Skilled and semi-skilled labour can be obtained from these two cities and surrounding rural areas.

The open pit mine is centred at 9°39’59” S latitude and 36°44’19” W longitude using the UTM SAD1969 datum, Zone 24S.

The Caboclo exploration target is located 15 km from the city of Craíbas, 35 km from the city of Arapiraca, and 20 km from the Serrote process plant site. It is centred at 9°32’22” S latitude and 36°46’9” W longitude, using the UTM SAD1969, Zone 24S.

1.3.2 Land Tenure

The Serrote Project is owned by Mineração Vale Verde Ltda., a wholly indirectly-owned subsidiary of Serrote Participações S.A. Serrote Participações is controlled by a Brazilian investment fund whose shares are held by a foreign legal entity which is ultimately controlled by Appian Capital Advisory.

All mineral tenure is held by Mineração Vale Verde Ltda. (MVV), a wholly indirectly-owned subsidiary of Serrote Participações S.A. MVV holds three groups of mineral rights covering a total of 11,504,52 ha, which include one mining concession, two applications for mining concessions, and five exploration licences.

The Serrote de Laje concession area is subject to the Mineral Rights Pledge Agreement, but the pledge had not been formally instituted by the ANM as of effective date of the CPR.

All of the licences and licence applications, other than the Pereira Velho concession group are subject to, or will be subject to on grant, the Mineral Rights Pledge Agreement.

The surface rights holdings comprise twelve land properties that cover a total area of 995.32 ha. The land properties owned by MVV are subject to fiduciary lien in favor of Citibank as collateral to the Financial Instruments. The fiduciary lien is valid until the debt under the Credit Agreement is fully paid by MVV. In case of default, Citibank will be entitled to enforce the guarantee.

The Financial Compensation for Mineral Exploitation (CFEM in the Brazilian acronym) is payable by MVV on production, and varies depending on the mineral product. Fourteen of the possession rights are associated with royalty payments, consisting of a contractual royalty equal to 50% of the statutory royalty due to Federal Government (i.e., the CFEM).

MVV has four granted water rights, covering the dam at Salgado Stream (the Serrote Dam), an allowance for effluent discharge into a tributary of the Salgado Stream, and an allowance for effluent discharge into the Serrote Dam.

1.3.3 Geology and Mineralisation

The Serrote deposit and Caboclo exploration target are examples of mafic–ultramafic magmatic copper sulphide deposits.

The Serrote deposit and Caboclo prospect are within the Sergipano fold belt, which consists of five separate domains of metavolcanic and metasedimentary rocks deposited around Archean/Paleoproterozoic basement gneiss in the south and partially migmatized paragneisses, metasedimentary rocks, and granitoids. The Rio Coruripe domain includes the Jaramataia Group, a rift-related volcano-sedimentary sequence consisting of quartz-feldspathic (pink gneiss) and garnet–biotite gneisses (garnet gneiss), marbles, calcsilicate rocks, iron formation, and mafic– ultramafic layered intrusive rocks of the Serrote da Laje suite. The Serrote da Laje suite is a tectonically disrupted layered intrusion comprising hypersthenite, norite, gabbronorite, gabbro and anorthosite. Magnetitite bodies are associated with hypersthenite and norite. The intrusion is typically concordant with the host paragneiss. The mafic–ultramafic units are locally intruded by granite and granitic pegmatite dikes. Metamorphism reached granulite facies, with some areas of retrograde metamorphism at amphibolite facies.

Mineralisation at Serrote consists of multiple, stacked pancake-like layers with approximate dimensions of 2 km north–south, 1 km east–west, 5 m to 250 m thick, and a maximum depth of mineralisation of 200 m. Pink and garnet gneisses host the Serrote da Laje suite, which is a north–

northwest-elongated intrusion approximately 2 km long that dips to the east at about 40° to 50°. The partially disrupted mafic–ultramafic bodies are as much as 140 m thick, with variable widths of 100 m to 1,000 m, and lengths of as much as 800 m. Two northeast-trending faults divide the intrusion into three domains, with the northernmost domain having larger and thicker mafic– ultramafic units. The Serrote da Laje suite includes ilmenite–magnetite, orthopyroxenite, and norite. The primary sulphide mineralisation is stratiform and follows the magnetite-rich layers. Some primary sulphide mineralisation is remobilized into northeast-trending faults forming a secondary stringer vein-type mineralisation.

Copper minerals in primary mineralisation include chalcopyrite and bornite with lesser chalcocite. Pyrite and pyrrhotite occur locally and are common in gabbro. Gold occurs as 0.1 mm or smaller grains in fracture fillings with chalcocite and bornite associated with chalcopyrite. Chalcopyrite, and to a lesser degree bornite, occur as disseminations and fracture fillings. The secondary mineralisation is associated with hydrothermally-altered gabbroic rocks and occurs as sulphide veins adjacent to the primary mineralisation. Copper occurs mainly as chalcopyrite with pyrrhotite and pyrite in veinlets.

The Serrote da Laje suite at Caboclo is hosted by pink and garnet gneisses, and calc-silicate rocks, all of which are commonly migmatized. The Serrote da Laje suite consists of three major units, magnetite, magnetite norite, and gabbro. The deposit is divided into five areas (zones): Rogério, Zezé, Petrúcio, Maninho, and Adriano, which are separated by shear zones. The thickest of the ultramafic units is in the Rogério area, and has a strike length of 800 m and a thickness of as much as 60 m. Two types of mineralisation occur; magmatic mineralisation in the ultramafic rocks, consisting of disseminated sulphides in the intercumulate magnetite, hercynite and pyroxene; and epigenetic hydrothermal mineralisation characterized by remobilized chalcopyrite/bornite in fractures and breccias in ultramafic/mafic rocks.

Chalcopyrite, and to a lesser degree bornite, occur as disseminations and fracture fillings. Pyrite and pyrrhotite occur locally and are more common in the hydrothermal zones. Examination of polished sections revealed that gold occurs as discrete grains 0.10 mm or less in size or as discrete grains enclosed in fracture filling in chalcocite and bornite associated with chalcopyrite.

1.3.4 Exploration Status

As of December 31, 2022, the Serrote project drill hole database consists of a total of 9,610 drill holes totalling 205,271 m drilled, considering reverse circulation (RC), diamond drill holes, blast holes, auger, penetration, and geotechnical holes (mixed), and piezometers. Another 21 trenches (totalling 1,960 m) were opened and properly surveyed to support resource estimation.

Mineralisation at Serrote and Caboclo is interpreted to be magmatic, stratiform, structurally modified sulphide mineralisation accumulated largely near the lower portions of the magnetite norite associated with magnetite concentrations. Additional local concentrations of copper sulphide minerals occur as local hydrothermal concentrations around the peripheries of the primary mineralisation likely due to remobilization of primary sulphide minerals.

Exploration completed to date is appropriate and has been adapted to the local regolith development. The programs identified the Serrote and Caboclo deposits and most of the exploration results have been followed up with drilling.

Drilling was completed at regularly-spaced intervals over the mineralisation and is considered representative of the deposits.

The sample preparation and analysis are developed following the industry best practices and the quality of the copper and gold analytical data is sufficiently reliable to support Mineral Resource estimation without limitations on Mineral Resource confidence categories.

1.3.5 Mineral Resources

The Mineral Resource estimate for the Serrote deposit, as of December 31, 2022, was completed by MVV staff, recently reviewed by WSP, and considered all data available through May 10, 2021. GeoEstima reviewed all the works developed by MVV and all procedures and parameters used by WSP to estimate the Mineral Resources.

The Mineral Resource estimate was completed using Vulcan software. Wireframes for mineralisation were constructed in Leapfrog Geo based on geology sections, assay results and lithological information. Assays were capped to various levels based on exploratory data analysis and then composited to 5.0 m lengths. Wireframes were filled with blocks at wireframe boundaries. Block model was interpolated to copper and gold grades using the ordinary kriging (OK) based on 5.0 m capped composite values. Hard boundaries were used for the main mineralized zones.

Block estimates were validated using industry standard validation techniques. The classification parameters consider the proximity and number of composite data, as well as the continuity of the mineralisation. The Mineral Resource estimate was reported using all the material within a Whittle pit shell, satisfying the minimum mining size, continuity criteria, and using a cut-off grade of 0.15% Cu. Mineral Resources are estimated using metal prices of US$3.20/lb Cu and US$1,300/oz Au. Metallurgical recoveries of 86% for copper and 67% for gold were used.

The CP reviewed the Mineral Resource assumptions, input parameters, geological interpretation, and block modelling and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of mineralisation and that the block model is reasonable and acceptable to support the December 31, 2022, Mineral Resource estimate.

The Mineral Resource estimate for Serrote Mine, as of December 31, 2022, is summarized in Table 1-3. The Mineral Resource estimate is prepared in accordance with CIM (2014) definitions.

The CP is not aware of any factors that could materially impact the estimate of the Mineral Resources for Serrote that are not presented in this CPR.

Table 1-3: Summary of the Mineral Resource Estimate - December 31, 2022
ACG Acquisition Company Limited – Serrote Mine

Category	Method	Tonnage (kt)	Grade		Contained Metal	
			Cu (%)	Au (g/t)	Cu (kt)	Au (koz)
Measured	Oxide	8,744	0.48	0.11	42	30
	Sulphide	51,091	0.56	0.10	285	168
	Stockpile	1,580	0.61	0.10	10	5
	Sub-total	61,415	0.55	0.10	336	203
Indicated	Oxide	2,198	0.45	0.13	10	9
	Sulphide	33,056	0.53	0.08	175	87
	Stockpile	0	0.00	0.00	0	0
	Sub-total	35,254	0.53	0.08	185	96
Measured + Indicated	**Oxide**	**10,941**	**0.47**	**0.11**	**52**	**39**
	Sulphide	**84,148**	**0.55**	**0.09**	**460**	**255**
	Stockpile	**1,580**	**0.61**	**0.10**	**10**	**5**
	Sub-total	**96,669**	**0.54**	**0.10**	**521**	**299**

Category	Method	Tonnage (kt)	Grade		Contained Metal	
			Cu (%)	Au (g/t)	Cu (kt)	Au (koz)
Inferred	Oxide	360	0.36	0.08	1	1
	Sulphide	4,524	0.53	0.07	24	11
	Stockpile	0	0.00	0.00	0	0
	Sub-total	4,883	0.52	0.07	25	12

Notes:

1. CIM (2014) definitions were followed for Mineral Resources.
2. The Competent Person for the Mineral Resources estimate is Orlando Rojas, B.Geo., AIG (nº5543), a GeoEstima SpA employee.
3. The Mineral Resource estimates have an effective date of December 31, 2022.
4. Mineral Resources are estimated at a 0.15% Cu cut-off grade.
5. Mineral Resources are estimated using metal prices of US$3.20/lb Cu and US$1,300/oz Au.
6. Open pit Mineral Resources are reporting within a conceptual open pit shell.
7. Minimum width is 5 m.
8. The metallurgical recoveries used are 86% for Cu and 67% for Au.
9. Bulk density varies depending on mineralisation domain.
10. Mineral Resources are reported inclusive of those Mineral Resources converted to Mineral Reserves.
11. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
12. Numbers may not add due to rounding.

1.3.6 Mineral Reserves

Measured and Indicated Mineral Resources that were classified by material type as sulphide were converted to Mineral Reserves. Only copper and gold economic values were considered. Inferred Mineral Resources in sulphide and material classified as oxide were considered as waste. Oxide material is stockpiled separately as a potential heap leach opportunity. Magnetite value was considered to be zero for the purposes of the pit limit design and Mineral Reserve estimates.

The copper-only cut-off grade was determined to be 0.22% Cu and considers zero gold credit. The gold credit is estimated on a block-by-block basis for the purpose of the pit limit analysis. The resulting average gold credit over the remaining life of the mine is estimated at US$3.14/t ore.

The Mineral Reserve estimates are based on detailed pit limit designs, which were validated by a LOM mine plan. The mining cost for the purposes of the pit limit design was set by MVV at US$2.47/t.

The slopes used for the final pit limit and some of the intermediate phase wall inter-ramp slope angles range from 42° to 55° in the fresh rock zones and 31° to 37° in the fractured and altered zones. The geotechnical study recommends the use of a double bench configuration in the fresh rock and a single bench configuration in rock for all other geomechanical classes. Ramp placement on the final pit limit and phase walls generally does not exceed the recommended uninterrupted inter-ramp wall height. The pit limit design considers ramps with a total nominal ramp width of 15 m and a gradient of 10%.

The design criteria include metal prices of US$3.50/lb Cu and US$1,550/Au oz, and processing recovery of 84.6% Cu for Mano mineralisation, 86.8% Cu for Gabbro mineralisation, and 65% Au. The Proven and Probable Mineral Reserves are estimated using the in-pit Measured and Indicated Mineral Resources, respectively and the cut-off grade from a contained in-situ mineralisation value (NSR) of US$11.85/t.

The Mineral Reserve estimate for Serrote is provided in Table 1-4, and are reported with an effective date of December 31, 2022. The estimate is reported using the CIM (2014) definitions and 2019 CIM Best Practices. The CP for the estimate is Mr. Andrew Bradfield, P.Eng., of P&E.

Copper and gold grades estimates are based on the diluted grades of the orebody block model for the material classified as sulphide. In addition to the internal dilution inherent in the block modelling process (estimated at approximately 10%), MVV introduced a block edge contact dilution in the block model and generated diluted copper, gold, and a diluted bulk density. The block edge contact dilution broadly represents 0.875 m of each 10 m x 10 m x 5 m block shifted to the neighbouring block horizontally at each block edge and 0.25 m vertically to the top and bottom benches. This methodology results in a reduction of 0.8% of the Measured and Indicated fraction of the in-pit Mineral Resource tonnage and a reduction of 3.4% and 2.7% in the copper and gold contained metals, respectively, compared with the quantities estimated on the basis of the block model prior to dilution.

The mine plan includes an estimate of 76.1 Mt of waste rock to be mined. Inferred Mineral Resources were set as waste in the pit optimizations and mine plans. The waste rock tonnage includes an estimate of 6.3 Mt of oxide material that contains mineralisation. This material is currently not planned to be processed and is stockpiled separately as a potential future heap leach opportunity. As of the effective date of this CPR, a stockpile of approximately 7.7 Mt of oxide material exists at the Serrote Mine.

A sensitivity analysis established that the Serrote open pit limit geometry is robust in the north, east and west parts of the open pit for a wide variation of the design parameters, due to the orebody geometry. This part of the orebody is higher grade and has a lower stripping ratio than the south part. The geometry of the south part of the pit is more sensitive to changes in the design parameters. MVV elected to set the south part of the final pit limit using a revenue factor of 0.9. This broadly corresponds to a copper price of US$2.70/lb Cu and also introduces a measurable level of robustness in the pit limit in the south part of the pit. The final pit limit design is considered conservative, and it will potentially remain valid for substantial adverse changes in the design parameters. The pit limit can be reviewed in future studies, particularly the south part, to determine if it should be adjusted according to updated economic parameters, such as metal prices and mining costs.

Information that affects the cut-off grades used for estimating the Mineral Reserves include the copper and gold metal prices, exchange rates, overall mine and process variable and fixed costs, and copper concentrate transport, smelting, refining and processing costs.

The CP considers that the open pit methodologies, design criteria and parameters used are appropriate. The CP is not aware of any other factors that could materially impact the estimate of the Mineral Reserves for Serrote that are not presented in this CPR.

Table 1-4: Summary of the Mineral Reserve Estimate - December 31, 2022
ACG Acquisition Company Limited – Serrote Mine

Classification	Quantity (Mt)	Diluted Grades		Contained Metals		
		Cu (%)	Au (g/t)	Cu (kt)	Cu (Mlb)	Au (koz)
Proven	41.17	0.59	0.10	243.8	537.5	134.9
Probable	5.56	0.54	0.08	29.9	65.8	13.8
Total Mineral Reserves	**46.73**	**0.58**	**0.10**	**273.7**	**603.3**	**148.6**

Notes to the Mineral Reserve Estimate:

1. The Competent Person for the Mineral Reserve Estimate is Mr. Andrew Bradfield, P.Eng., of P&E Mining Consultants Inc.
2. Mineral Reserves are reported using the 2014 CIM Definition Standards, 2019 CIM Best Practices, and have an effective date of December 31, 2022.

3. The Mineral Reserve is estimated at metal prices of US$3.50/lb Cu and US$1,550/Au oz and an 85% Cu processing recovery in Mano mineralisation and 87% Cu processing recovery in Gabbro mineralisation, and 65% Au processing recovery.
4. The estimates were carried out using an NSR cut-off value of US$11.85/t.
5. Proven Reserves include stockpiled ore of 1.58 Mt at 0.61% Cu and 0.10 g/t Au.
6. Totals may not add due to rounding.

1.3.7 Mining Method

The Serrote Mine has been developed as a conventional open pit operation using hydraulic excavators in backhoe configuration, rigid body trucks and top hammer drills as the primary mining equipment. The mine plan is based on a peak total ore and waste rock production rate of 12.7 Mt/a and an operating life of 12 years. Ore will be delivered to the crusher pad adjacent to the process plant site at an average rate of 11,390 t/d or 4.1 Mt/a.

The final pit will have a top elevation of 325 masl and a pit bottom elevation of 75 masl, a total depth of 250 m.

Mining is carried out by a contractor that supplies its own equipment fleet, equipment maintenance, and personnel, including a subcontract for explosives services. MVV plan to purchase its own mining equipment and become an Owner-operated mine in 2025.

Geotechnical evaluations were used as the basis of the geotechnical and geometrical design of the final pit, and included consideration of structural domains, discontinuity families, identification of possible failure modes (planar, wedge, toppling or circular), and stability analyses. The pit slope recommendations were based on 10–20 m bench heights, 6.5–8.5 m berm widths, 15 m safety benches, and 30–300 m inter-ramp heights, and resulted in recommended bench slope angles that ranged from 45–80º, and inter-ramp angles that ranged from 31–55º.

The inflow of ground water into the pit is not anticipated to be significant. The mine dewatering system was designed for 200 m^3/h of water with a small amount of suspended solids. Actual dewatering has been on average 50 m^3/h, which is in line with a recent detailed hydrogeological study. The dewatering pumps currently operate six to eight hours/day. MVV intends to investigate further and possibly install water wells to confirm long term flows.

The Serrote pit will be developed in five phases (0 to 4). Phases are feasible mining shapes, which are used as guides for the generation of long-term mine plans at varying level of detail, typically in annual increments. The rate of maximum vertical advance per phase was limited to 50 m/a.

Sulphide ore is sent directly to the primary crusher whenever possible. Sulphide ore and oxide material are also stockpiled in separate stockpiles:

- The sulphide stockpile, located to the northwest of the pit, is divided into two parts depending on the ore grade. This is a temporary structure; the stockpiled ore will be re-handled and processed during the life of the mine.
- The oxide stockpile, located to the southwest of the pit; currently this material is not processed, but could potentially be heap leached in the future.

Mining activities generate four types of overburden/waste materials: topsoil, saprolite (overburden), transitional weathered rock and waste rock. Topsoil is stored separately from the other materials, and when possible is delivered to reclamation areas. The other three materials extracted from the mine are sent to the WRSF, which is located along the southeast, east, and northeastern areas of the open pit.

It is planned that a mining contractor will supply and operate a fleet of mining equipment up to the end of 2024, and from 2025 onwards MVV will own and operate a new fleet. The equipment type and size selection were carried out by MVV, and both the contractor and MVV fleets will be of compatible sizes. The primary loading and hauling equipment are 3.7 m^3 hydraulic excavators supported by 4.0 m^3 front-end loaders and 8x4, 35 t rigid body trucks. The selected support equipment includes track and wheel dozers, graders, water trucks, and general utility vehicles such as lube trucks, a forklift, a flatbed truck and a general-purpose truck. The drill fleet consists of top hammer drilling units. Emulsion explosives are utilized at powder factors of 0.51 kg/t for ore, 0.24 kg/t for waste rock and 0.20 kg/t for oxide material.

1.3.8 Metallurgical Testwork

Metallurgical testwork was conducted from 1985 to 2022 and further work is continuing. The primary laboratories involved in the testwork that supported the plant design and subsequent improvements included SGS Lakefield in Canada (SGS Lakefield), the ALS Metallurgy laboratory in Kamloops, Canada (ALS Kamloops), Pocock Laboratories in Salt Lake City, USA (Pocock) and SGS Geosol (Brazil).

Early testwork included detailed mineralogical analysis, comminution, flotation, sulphide copper recovery, oxide copper recovery, magnetite recovery, assessment of gold, nickel and gallium recovery and mineralogical examinations.

MVV performed in-house due diligence in 2018 on the previous metallurgical testwork data. The resulting new testwork programs completed in 2018 included grind size versus rougher recovery tests, mineralogical studies on the rougher concentrate, evaluation of alternative non-sulphide gangue depressant reagents, examination of rougher flotation kinetics and assessment of potential flowsheet optimizations.

During 2019 metallurgical testwork focused on variability work, particularly on material for Year 5 onwards in the mine plan.

In 2020 tests were conducted to provide more confidence in the selected flowsheet and to provide additional mineralogical data. This work included head assays, comminution testing, mineralogical examination using bulk mineral analysis, batch rougher tests, estimation of energy requirements for the target regrind discharge sizing, open circuit rougher/cleaner and locked-cycle tests.

Pilot plant testing of a Woodgrove direct flotation reactor (DFR) pilot flotation cell and a pilot scale Outotec high intensity grinding (HIG) mill was carried out between September and November 2020, at Atlantic Nickel's pilot plant in Itagibá, Bahia, Brazil.

The main outcomes of the 2019 and 2020 testwork were:

- Copper recovery: a model was developed to estimate copper recovery as a function of the head grade and lithology. Overall copper recovery (average LOM) was 84.7%.
- Gold recovery: recovery was confirmed by LCT results at 65%.
- Copper grade in concentrate: a model was developed to estimate the copper concentrate grade based on the copper/sulphur ratio (Cu/S) of each lithology. The current block model lacks extended sulphur assays to support a sound estimate of the Cu/S ratio, hence a decision was made to use the same values obtained in the LCT results for PH0 (Year 1 = 40% Cu), PH1 (Years 2 and 3 = 42% Cu) and Year 4 on (40% Cu in concentrate). Sulphur assays are now being carried out on samples to support further development of the short-term recovery/concentrate grade model.
- Copper concentrate specification: a model was developed to estimate the MgO and SiO_2 contents, supported by a full suite analysis of the concentrate produced in the PH0 and PH1 LCTs. The results showed a clean concentrate with low levels of deleterious elements and minimal expected penalties.

The 2022 work at SGS Geosol and the work carried out using the Woodgrove pilot cell were aimed at understanding and improving the flotation plant performance.

Design flotation concentrate grades have still not been achieved in the plant although significant improvements have been made. After 6 months of operation copper recovery was in the range between 54% and 58% with concentrate grades between 20% and 25% Cu. From August 2022 to December 2022 recoveries were between 81% and 84.5% with concentrate grades between 22% and 25% Cu.

The flowsheet changes implemented in July 2022 resulted in an increase in recovery to the design levels; however, the concentrate grades continue to be lower than design (MVV prioritised recovery over grade).

The 2022 work using the Woodgrove pilot cell comprised tests using various plant product streams. It was found that increasing the impeller tip speed and changing the gangue depressant improved recoveries by 2% to 13% depending on the stream but only minor concentrate grade improvements were achieved.

The 2022 program conducted at SGS Geosol was carried on plant stream samples using conventional laboratory cells and targeted regrinding. It was found that significant copper losses occurred in the size ranges >40 µm and <10 µm. LCTs were carried out using cells with high impeller tip speeds on cleaner-scavenger tailings and rougher concentrate from plant cells 2 to 6. The cleaner-scavenger test gave 82.7% recovery at a concentrate grade of 32.4% Cu; the test on rougher concentrate yielded 95.2% recovery at a grade of 45.5% Cu.

SGS Lakefield performed initial testwork on behalf of Aura Minerals on selected samples from the Caboclo deposit in 2011. Samples were sourced from drill core from the Rogério zone. Tests included three open circuit cleaner tests and one LCT. The LCT gave 83.7% Cu recovery at a grade of 27.4% Cu and 7.5 g/t Au. The results of this work should be limited to the support of Inferred Mineral Resources only.

In 2022 ALS Kamloops carried out a program using seven reverse circulation drill samples and one quarter drill core sample. The program comprised comminution testing on the drill core, QEMSCAN mineralogical analysis on eight samples, rougher and cleaner flotation tests on 8 samples and 2 LCTs on composites representing the Upper and Lower zone samples. The LCTs used the Serrote 2020 flowsheet. The test on the Upper composite gave 91.1% recovery at a concentrate grade of 26.7% Cu. The Lower composite gave 86.2% recovery at a concentrate grade of 30.6% Cu.

1.3.9 Recovery Methods

The plant design was based on metallurgical testwork results, experience from the design, construction and operation of similar process plants, and information from similar operations in Brazil and worldwide.

At a feed rate of 4.1 Mt/y, average grades of 0.59% Cu and 0.1 g/t Au, 84% copper recovery, 65% gold recovery and plant utilization of 91.7%, the plant was expected to have an average production rate of copper concentrate of approximately 46,000 t/y at a minimum grade of 40.5% Cu. The mine life was estimated to be 14 years.

The plant construction was completed in May 2021 and plant operations started in June 2021. Ramp-up was completed in Q4 2022 when steady state operations were achieved at the design throughput.

Both the copper recovery and concentrate grades were low over the first 6 months of operation (54% to 58% recovery at concentrate grades of 20% to 25% Cu). Improvements have been made and in November 2022 the plant achieved the design recovery of 84.5% although the concentrate grades remained between 22% and 25% Cu (MVV prioritised recovery over grade).

In July 2022 the flowsheet was changed as summarised below. This flowsheet was being used at the time of this CPR in December 2022.

Comminution is carried out in three crushing stages as in the original flowsheet (no changes have been made to the crushing circuit). There is a single stage of ball milling and two regrinding stages within the cleaner and cleaner-scavenger flotation circuits. Rougher flotation is carried out in conventional tank cells, and the two stages of cleaning and a cleaner-scavenger stage are carried out in Woodgrove DFR cells. In July 2022 the flotation flowsheet was changed. The flotation conditioner tank was converted to a flotation cell and final concentrate is taken from this cell and original cell 1. Concentrate from the next 3 cells (now cells 3 to 5) is sent to the first regrind/classification/cleaner circuit and this concentrate is passed to the second cleaner circuit to produce final concentrate. Tailings from the first and second cleaner circuits are pumped to the cleaner-scavenger flotation/classification/ regrind circuit. Tailings from this circuit are returned to rougher cell 4 and the concentrate passes to the first cleaner circuit. These changes reduce copper losses from the original cleaner-scavenger open circuit and produce an overall final concentrate at 22% to 25% Cu.

Flotation tailings are directed to the TSF. Final concentrate, planned to be at around 1.3% mass recovery, is currently around 2.1% mass recovery. This is thickened and then filtered in a vertical press filter for shipment to smelters.

MVV has stated that they are planning more changes to the flowsheet in 2023 to improve plant performance, particularly the concentrate grade.

1.3.10 Project Infrastructure

The Serrote Mine is accessed via paved roads from the cities of Craíbas and Arapiraca. Road access is used for the supply of materials and equipment to the mine site and for transporting concentrate to the port of Maceió which is located within the city of Maceió, approximately 140 km from the Mine site. Concentrate has been transported to the port of Maceió since the first shipment in Q4 2021.

No on-site accommodation is available. Employees and contractors reside in Arapiraca, Craíbas and surrounding communities.

Existing infrastructure includes the gatehouse, trucker support building, change house, administration offices, workshop offices, first aid post, kitchen/canteens, process plant with workshop, laboratory, process control room, main workshop building, tire shop, welding area, drilling maintenance bay, fuel station, wash bay, and power sub-station. All infrastructure construction necessary for the Serrote Mine operations was completed by the end of 2021.

Electrical power is supplied via a 21 km long powerline that connects the Serrote sub-station with the national grid at the Arapiraca III substation.

Plant emergency electrical power is provided by a 480 V packaged diesel generator located in the thickening and filtration substation. Emergency power supports critical loads only and does not maintain production.

The plant estimated electrical power load consists of:

- Total installed: 36 MW
- Maximum demand: 24 MW
- Average demand: 20 MW
- Annual consumption: 155,000 MWh

The Arapiraca water supply is provided by the state water utility company CASAL. This water is sourced from the São Francisco River via a pipeline to the CASAL reservoir. MVV tied into the CASAL pipeline via a 7 km long pipeline to connect to MVV's freshwater reservoir on site.

The overall water balance included the process plant and TSF, based on an operational throughput rate of 8,760 h/a. The total average freshwater demand is estimated to be approximately 112 m³/h.

The total process plant water demand is estimated at 1,700 m^3/h, including 1,397 m^3/h recirculated from the thickeners, 167 m^3/h of water reclaimed from the TSF, 112 m^3/h of fresh water and 25 m^3/h of water contained in the run-of-mine (ROM) material. Two water reservoirs have been provided to supply process water demand.

Water management infrastructure is designed to Brazilian standards. The standards prescribe the 24-hour 500-year return period storm for the design of peripheral channels used to collect and convey surface drainage. Structures specifically requiring diversion drainage management are the sulphide and oxide stockpiles, the WRSF, and the open pit.

1.3.11 Environmental, Permitting and Social Considerations

The environmental impacts of the Serrote mining operations were identified and evaluated for the construction, operation, and closure stages, along with proposals for control, mitigation, monitoring, and environmental compensation actions.

The communities neighbouring the Serrote mining operations area have economic, cultural, technical and structural dynamics typical of rural areas, with activities primarily related to the cultivation and preparation of tobacco. In 2019, MVV identified a Quilombola community called Carrasco located 4.5 km from Serrote, and set about developing a comprehensive and dedicated stakeholder engagement process with this community. see “- Environmental Social and Governance (ESG) - Human Rights and Indigenous Engagement”.

The Serrote mining operations brought changes to the routine of the communities, such as relocation of residents within the Serrote mining operations footprint and alterations to the landscape. One significant residual physical impact post-closure will be alteration of the landscape due to the construction of the WRSF, tailings storage facility (TSF), and open pit. Design and operational practices along with surveillance programs are fundamental in controlling, mitigating, and monitoring the effects of the Serrote mining operation to ensure that the environmental standards set out in the laws, licences, and permits are met and respected.

Positive changes can be expected, particularly for the Craíbas municipality, from the increase in income generated by taxes collected during LOM. The Serrote mining operations have created and diversified employment and training opportunities for the residents of the local municipalities. Direct job opportunities are an important positive effect, particularly those jobs generated by operations; these are considered to be of higher quality than those generated during the construction phase because they are long-term and require higher vocational qualifications.

1.3.11.1 Environmental

The Serrote mine’s Environmental Control Plans (PCAs) for construction and operation licensing were submitted to the state environmental agency and are based on an environmental impact assessment completed in 2009. MVV commissioned the consulting firm Ferreira Rocha to update the ESIA in 2020. The updated ESIA did not uncover any major additional impacts beyond what had already been in the initial studies developed during the previous licensing process. During the development of the ESIA, gaps were identified in meeting compliance with International Finance Corporation (IFC) Performance Standards. As part of the ESIA process, an Environmental and Social Management Plan was prepared and included in the ESIA. This plan addresses the measures needed to manage impacts in accordance with international standards and guidance documents and through the adoption of the best international industry practices.

Mine rock and tailings geochemistry studies to date indicate low potential for generation of net acidity from the WRSF and TSF. Drainage quality from the WRSF could be sensitive to the presence of rock containing sulphide, metal oxide constituents, and other similar materials. Metal loadings in the TSF will be governed by metal leaching processes occurring at neutral pH.

Additional geochemical characterization is underway to augment the existing understanding, characterise metal solubilization aspects of the mine rock, pit walls, and tailings, and inform management strategies. This work is part of a comprehensive water quality effects assessment for the Serrote mining operation directed by Lorax Environmental Services of Vancouver, Canada, with final results expected in the beginning of 2024. Supplementary water quality monitoring is being conducted at additional stations downstream from the Serrote mining operations to establish a wider base of characterization of the receiving environment. Aquatic biota assessments to supplement the existing baseline data are also carried on annual basis.

MVV is subject to legal requirements for monitoring air quality, climate, ambient noise and vibration, water quality, and flora and fauna. The monitoring programs are stipulated in the Serrote Mine's PCAs. MVV and designated subcontractors are responsible for monitoring, reporting, and implementing corrective measures as required.

MVV updated its Mine Closure Plan in January 2023, including aspects to conform to International Finance Corporation standards. The Serrote Mine's operations licence, issued on May 27, 2021, states that updates to the Degraded Area Recovery Plan and the Mine and Plant Closure Plan are required to be submitted at the time of licence renewal in early 2025. The permit and environment team has been active in overseeing vegetation removal, plant salvage and transplanting, seedling production, and fauna management as required.

The Serrote mining operations have undergone an independent Environment and Social Due Diligence review process against national legislation and international standards (including IFC Performance Standards, Equator Principles, and Good International Industry Practice). MVV implemented an action plan to address the findings.

1.3.11.2 Permits

The Operating Licences for the Operations Phase of the Mine and for Mineral Processing and Tailings Management were issued by the state environmental agency on May 27, 2021, and all ancillary required permits have been obtained.

1.3.11.3 Closure

The most recent site-wide update of the Serrote mining operations conceptual closure plan and associated cost estimate was developed in January 2023. Per the closure plan schedule, the next update to the conceptual closure plan is in five years (2028). The post-closure phase is expected to see maintenance and monitoring carried out over a five-year period.

A total of US$18.8 million (R$98.1 million at an exchange rate of R$5.21 per US$1) is assumed in the cost model for closure, including US$0.6 million for pre-closure updates and studies and preparation of the detailed mine closure plan, US$17.5 million for closure activities, and US$0.7 million for monitoring, inspections, and maintenances during post-closure. No contingency is considered in the estimate nor potential salvage value of components. There are no specific legislated requirements in Brazil for reclamation or closure bonding for mining projects.

1.3.11.4 Social

There are 14 communities within the area of direct influence of the Serrote mining operations. MVV is in regular communication with the residents, including conducting regular community meetings, as part of its Social Dialogue Initiative. Topics that have been raised in the community forums includes job opportunities, social projects, and mining-related items such as blasting and TSF operations. The forums are intended to be flexible, with topics discussed as they are raised. The meetings are held in public spaces on a monthly basis to ensure that each attendee has the opportunity to provide comment.

At the end of each meeting, MVV requests that attendees participate in a confidential satisfaction survey, and responses are placed into a suggestions box. MVV reviews these documents and incorporates the comments and suggestions into future meeting agendas to ensure community concerns and comments are, and are seen to be, addressed.

MVV uses different communication channels to support the dialogue with the neighbouring communities including social dialogue meetings, monthly newsletters, and the WhatsApp messaging application. MVV uses the WhatsApp messaging application as the main tool to support communications between the communities and MVV's community relations team. Additionally, MVV maintains a grievance mechanism operating in accordance with Equator Principal 6.

A resettlement program was conducted from 2012 to 2020, under which 213 families residing in the area needed for the Serrote mining operations were resettled. MVV has no record of complaints and or complaints lodged using the Grievance Mechanism in relation to the resettlement process. MVV maintains an ongoing social dialogue with the resettled families including regular meetings.

MVV has a Stakeholder Engagement Plan in place that set out its guidelines for addressing stakeholder concerns, stakeholder communications, and stakeholder relationships. The plan is constantly updated to reflect the Serrote mining operations development stage, scenario changes, stakeholder profiles, and the type and nature of stakeholder feedback.

MVV instituted, after Covid-19 restrictions ceased, an "Open Doors" (*portas abertas*) program which consists of personal guided tours of the Serrote mining operations that provided external stakeholders with project-specific information, in particular, on aspects of the environmental and engineering disciplines. A particular focus of the Open Doors program is communication around the TSF. The Social and Community team maintains a constant schedule of door-to-door technical visits to all stakeholders within the designated TSF Self-Rescue Zone. The teams explain the TSF construction process and outline how the TSF is to be operated during the LOM.

MVV also maintains regular communication to external stakeholders by way of general community-related information updates on the Serrote mining operations, weekly information emails, and monthly newsletters on social and environmental actions. MVV is also active in the press and social media spheres.

MVV has developed a portfolio of social projects in conjunction with communities in the area of influence, which focus on the areas of social entrepreneurship, environmental education, science, and technology. In 2022, a total of six projects were supported, and in 2023, another seven projects will be supported.

1.3.11.5 Tailings Storage Facility

Tailings from the process plant are conveyed via a slurry pipeline to a conventional cross-valley TSF. During the first phase of operations, the TSF consists of a zoned earthfill embankment comprising an upstream low permeability compacted earthfill shell, a central chimney drain, and a downstream compacted earthfill embankment underlain by a blanket drain and associated filter zones. The planned Phase 2 downstream raise will consist of an upstream core and filter zones, and a downstream rockfill zone overlying the Phase 1 embankment.

Both phases of the TSF will include a spillway system on the left abutment capable of discharging the routed probable maximum flood (PMF).

The tailings are classified as Class II-A, i.e., non-hazardous and non-inert waste, based on the Associação Brasileira de Normas Técnicas (ABNT) NBR 10004/2004 technical standard. The dam reservoir area is therefore unlined.

The Project will produce approximately 51 Mt of ore over the 14-year mine life, and the TSF was designed to contain the LOM tailings volume. However, it is anticipated that additional reserves will be discovered that will significantly extend the LOM, which will require additional tailings storage capacity. The tailings are thickened to a solids content of approximately 50% before being deposited in the TSF. Water released from the slurry following tailings deposition is reclaimed and returned to the process plant.

Construction of the TSF was competed in January 2021, and operation of the TSF began in mid-June 2021. Production through the first year of operations slowly ramped up from initial production rates averaging approximately 4,000 t/d, to an average of 12,000 t/d at the end of December 2022. Phase 2 of the TSF was originally intended to be to be a single seven metre raise to an elevation of 251 masl. It has since been split into two additional raises (4 m followed by 3 m) to achieve the same final crest elevation of 251 masl. Detailed designs for Phase 2 are anticipated to be completed in mid-2023 for the initial Phase 2 (4 m) downstream TSF raise.

The Brazilian Standards for Mining Tailings Dams and Canadian Dam Association recommendations were used to define acceptable factors of safety for the TSF embankment. Pseudo-static conditions were modelled using a horizontal ground acceleration of 0.2 g, corresponding to an event having a 10,000-year return interval. All factors of safety obtained from the slope stability analyses for Phases 1 and 2 significantly exceeded the values required by the Brazilian and Canadian standards/recommendations.

1.3.12 Market and Contracts

MVV has a single contract in place with a large global trader covering 100% of the copper concentrate production. The contract is effective until December 312025 or until 160,000 dry metric tonnes of concentrate have been delivered, whichever is later. The contract can be extended.

At projected 24% to 40% Cu, the Serrote concentrate is considered a high-grade concentrate and has attracted good terms from the off-taker. At a projected 2.5 g/t to 5.75 g/t Au, the gold content in the Serrote concentrates is relatively low and is suitable for all smelters/refineries.

MVV's base case metal price assumptions are considered to be in line with the periodic forecasts of future copper and gold prices prepared by several banking institutions and research analysts. The forecasts used vary for the period 2023–2026, reverting to long-term pricing in 2027. The long-term prices include US$3.59/lb Cu and US$1,615/oz Au. The long-term Brazilian reais to US$ exchange rate forecast used in the economic analysis is 5.55.

The open pit mining contract is with Fagundes Construção e Mineração S/A.

1.3.13 Capital and Operating Cost Estimates

1.3.13.1 Capital Costs

The Serrote Mine was built from 2019 to the end of 2021 at an estimated capital cost of US$194.5 million with all taxes included. The cost accounts for all infrastructure necessary to begin operations such as the processing plant, initial tailings dam facility, mining pre-production, administration buildings and warehouse, plus Owner's costs and commissioning. Process plant capacity was designed at 4.1 Mt/a.

MVV declared commercial production on December 27, 2021, and the Mine has been operating continuously since then. This CPR considers a mine plan with a start date of January 1, 2023. All capital costs in the LOM plan are considered as sustaining capital.

All cost estimates in this section of the CPR are expressed in Q1 2023 US dollars. Unless otherwise indicated, all costs are expressed without allowance for escalation or interest rates. The currency exchange rates used in the estimate are based on forecast rates of R$5.39 per US$1.00 for 2023, and a long-term rate of R$5.55 per US$1.00.

Sustaining capital costs over the open pit LOM are estimated at US$132 million (Table 1-5). The accuracy of the sustaining capital cost estimate is supported by the design and engineering carried out by MVV and Appian Capital Advisory for the process plant, mine and mining equipment, and capitalized deferred waste stripping; WSP for the tailings dam; and Arcadis for the closure cost. Input to the sustaining capital cost estimate is appropriate to a feasibility study level. Given the detailed design level and pricing basis, the overall estimated accuracy is expected to be ±15% of the final sustaining capital costs.

Table 1-5: LOM Sustaining Capital Cost Estimate
ACG Acquisition Company Limited – Serrote Mine

Item	Sustaining Capital (US$M)
Tailings dam	24.4
Mine and mining equipment	33.7
Process plant	18.6
Capitalized deferred waste stripping	37.2
Closure cost	17.7
Total	**131.6**

1.3.13.2 Operating Costs

The all-in sustaining operating cost (AISC) for the Serrote Mine is estimated to average $19.74/t processed over the open pit LOM, equivalent to $1.85/lb Cu payable. Table 1-6 summarizes the operating cost breakdown by activity and Table 1-7 presents the LOM plan.

Table 1-6: Base Case Operating Cost Summary
ACG Acquisition Company Limited – Serrote Mine

Item	Units (US$/t)	Unit Cost (US$/t)	LOM Total (IS$M)
Open pit mining costs	$/t mined	1.84	
Open pit mining costs	$/t processed	4.77	223
Processing costs	$/t processed	7.01	328
Site G&A	$/t processed	2.69	126
Smelting and freight	$/t processed	3.23	151
Au By-product credits	$/t processed	(3.10)	(145)
***C1 cost* [1]**	***$/t processed***	**14.60**	**682**
Royalties	$/t processed	2.33	109

Item	Units (US$/t)	Unit Cost (US$/t)	LOM Total (IS$M)
Sustaining capital costs	$/t processed	2.82	132
All-In Sustaining Cost [2]	***$/t processed***	**19.74**	**923**

Note:

1. C1 cost is cash operating costs less net by-product credits.
2. All-in sustaining cost (AISC) is C1 cost plus royalties and sustaining capital expenditures.

Table 1-7: Serrote Annual Production
ACG Acquisition Company Limited – Serrote Mine

Parameter/Year	Unit	LOM	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Waste rock mined	Mt	**76.1**	7.7	8.0	8.7	8.5	8.7	8.6	8.6	8.7	2.7	3.5	1.8	0.6
Ore mined	Mt	**45.2**	3.7	4.1	4.1	4.0	4.0	4.1	4.1	4.0	4.1	4.1	4.1	0.7
Strip ratio	w:o	**1.69**	2.07	1.94	2.12	2.13	2.18	2.10	2.10	2.15	0.67	0.87	0.44	0.77
Mine movement	Mt	**121.2**	11.5	12.1	12.7	12.5	12.7	12.7	12.7	12.7	6.8	7.6	5.9	1.3
Ore processed	Mt	**46.7**	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	1.6
Concentrate	dmt kt	**638.8**	97.4	60.1	61.0	52.7	47.7	49.3	47.7	51.6	52.3	52.3	47.7	18.8
Cu production	Mlb	**510.9**	54.9	42.4	43.1	46.5	42.1	43.5	42.1	45.5	46.1	46.1	42.1	16.6
Cu production	kt	**231.8**	24.9	19.2	19.5	21.1	19.1	19.7	19.1	20.6	20.9	20.9	19.1	7.5
Cu payable	Mlb	**498.0**	51.6	43.7	44.2	45.0	37.2	45.6	37.2	46.5	45.7	37.2	46.5	17.7
Cu payable	kt	**225.9**	23.4	19.8	20.0	20.4	16.9	20.7	16.9	21.1	20.7	16.9	21.1	8.0
Au production	koz	**94.9**	9.1	8.4	8.8	8.8	8.1	8.6	8.1	7.4	8.8	7.2	8.0	3.5
Au payable	koz	**88.5**	8.1	8.2	8.6	8.2	6.9	8.7	6.9	7.3	8.3	5.6	8.3	3.5

1.4 Risks and Opportunities

1.4.1 Risks

The CPs have assessed critical areas of the Mine and identified risks associated with the technical and cost assumptions used. These are summarized in Table 1-8.

Table 1-8: Risk Analysis Summary
ACG Acquisition Company Limited – Serrote Mine

Project Element	Issue	Mitigation
Geology and Mineral Resources	Tonnage and grade variation	Improve the mineralized wireframes, and knowledge of the structural geology and include major features in the 3D geological model
Mining	Lower grades or tonnages mined	Expert mining contractor; backup equipment; time usage models; dispatch monitoring; experienced management team

Project Element	Issue	Mitigation
Processing	The proposed flowsheet changes do not provide the expected improvements in copper recovery and increased concentrate grades.	Continue laboratory and in-plant testwork. Consider future replacement of the Woodgrove cells with conventional tank cells
TSF	Failure / Instability	Expert third-party design engineer of record appointed; downstream construction method; instrumentation in place; inspection/monitoring routines; seismology controls
	Uncontrolled release of contact water during wet years due to emergency spillway capacity	Phase 2 TSF expansion design currently under way - emergency spillway capacity design is based on conservative assumptions to account for the unusual wet years plus very large storm events
	Stopped production due to insufficient storage capacity	Phase 2 expansion design to be completed in Q3 2023. Completion of Phase 2-A (to crest elev. 248 masl) construction expected in Q2 2024. Construction of Phase 2B (to crest elev. 251 masl) is expected to be completed in 2027 and it will be able to store the expected LOM production of 54Mt.
	Compliance with new regulations and industry standards, including Global Industry Standard on Tailings Management (GISTM)	Early planning in future designs; currently working toward compliance with GISTM.

1.4.2 Opportunities

A summary of the Mine related opportunities identified by the CPs in their review is shown in Table 1-9.

Table 1-9: Opportunities
ACG Acquisition Company Limited – Serrote Mine

Area	Opportunity	Comment
Geology and Mineral Resources	Update metal prices	The metal prices used to constrain Mineral Resources could be updated with higher prices which could enlarge the resource pit-shell.
	Caboclo	This project is in the advanced exploration stage, and future Mineral Resources estimates should add resources.
Mining and Mineral Reserves	Pit layback	Potential exists to capture additional mineralisation, currently outside the Mineral Reserves pit boundary by reviewing the mine design to incorporate additional pit laybacks.
	Oxide material	Oxide mineralisation is estimated as part of the Mineral Resources but is not included in the current mine plan. This material has potential to be included in the mine plan if studies support that oxide

Area	Opportunity	Comment
		leaching and solvent extraction/electrowin cathode production on-site is economic.
Metallurgy and Processing	Caboclo	Mineralisation at the Caboclo exploration target is not included in the current mine plan. There is potential, with additional metallurgical testwork and technical studies to incorporate this mineralisation into mine planning.
	Magnetite recovery	Magnetite within the tailings represents a potentially saleable product that should be investigated with testwork and technical studies.
	Accelerate program of flowsheet improvements to bring earlier copper recovery and concentrate grade improvements.	This will require a more aggressive testwork and capital expenditure program.

2.0 INTRODUCTION

SLR Consulting (Canada) Ltd. (SLR) was retained by ACG Acquisition Company Limited (ACG) to prepare a Competent Person's Report (CPR) on the Serrote Mine (the Mine or Serrote), located in Alagoas, Brazil.

Mr. Orlando Rojas, GeoEstima SpA (GeoEstima), Mr. Anthony Maycock, MM Consultores SpA (MM Consultores), Mr. Andrew Bradfield, P&E Mining Consultants Inc. (P&E), Mr. Daniel Servigna, WSP USA Environmental & Infrastructure Inc. (WSP), and Mr. David JF Smith, SLR are collectively the Competent Persons (CPs) for this CPR.

The purpose of this CPR is to support a listing on the London Stock Exchange (LSE). The CPR conforms to Financial Conduct Authority (FCA) Primary Market Technical Note 619.1.

The Serrote copper-gold mine is located in Alagoas in northeast Brazil and is owned and operated by Mineração Vale Verde Ltda (MVV), a subsidiary owned by ANRH Cooperatief U.A. (ANRH). The operation is a conventional, low-strip open pit operation targeted to produce 20,000 tonnes of copper equivalent per year over a mine life of 14 years.

2.1 Sources of Information

The following serve as the Competent Persons (CPs) for this CPR:

- Mr. Orlando Rojas, AIG, GeoEstima
- Mr. Andrew Bradfield, P.Eng., P&E
- Mr. Anthony Maycock, P.Eng., MM Consultores
- Daniel Servigna, P.E., WSP
- David J.F. Smith, CEng., FIMMM, SLR

Mr. Rojas visited the Serrote and Caboclo Project on November 14 to 16, 2022. During the site visit, Mr. Rojas reviewed plans and sections, visited the core shack, examined drill core and mineralized exposures at the open pit mine, reviewed core logging, quality assurance and quality control (QA/QC) procedures, and database management system, and held discussions with MVV personnel.

Mr. Bradfield visited the Serrote site on February 16, 2023. The purpose of the visit was to inspect open pit mining activities, the process plant, tailings storage facility (TSF), and other site infrastructure, then hold discussions with mine management on items such as the Mineral Reserve estimates, mine production plan, costs, and financial model inputs.

Mr. Maycock visited the Serrote site on June 28, 2018, and February 5, 2020. The purpose of the first visit was to gain an understanding of the potential availability and costs of key infrastructure (power, water, site access and options for concentrate transport). The purpose of the second visit was to review construction progress, discuss issues and solutions with the Project team, review the execution strategy and the planning and control methodology, and assess potential risks to the control budget and schedule.

Mr. Servigna visited the site from August 31 to September 1, 2022, to help conduct the engineer of record (EOR) TSF dam safety inspections. During his visit he visited the TSF embankment, spillway, seepage collection pond and borrow areas.

Mr. Smith did not visit the site, however, Renan Lopes, Consultant Geologist, SLR, visited the property on January 4, 2023. During the site visit, an introduction of the mine, geological context, and TSF operation was made by the site personnel, including the CFO of Appian Capital Brazil. In addition, field inspections in the TSF and plant were also carried out, followed by a session of questions and answers for many of the subjects involving a mine operation, legal permissions, exploration plan and current results, and TSF capacity and management.

Table 2-1 presents the CPs and the sections for which they are responsible.

Table 2-1: Competent Persons and Responsibilities
ACG Acquisition Company Limited – Serrote Mine

CP, Designation, Title	Company	Responsible for Sections
David J.F. Smith, CEng., FIMMM, Global Technical Director – Mining and Mining Advisory Group	SLR Consulting (Canada) Ltd.	Overall responsibility, including Sections 2, 3, 23, and 24
Orlando Rojas, AIG, Principal Consultant	GeoEstima SpA	1.1.1.1, 1.1.2.1, 1.3.1 to 1.3.5, 4.1 to 4.8, 4.10, 5 to 12, 14, 25.1, 26.1
Andrew Bradfield, P.Eng., Chief Operating Officer	P&E Mining Consultants Inc.	1.1.1.2, 1.1.1.4, 1.1.1.6, 1.1.1.7, 1.1.2.2, 1.1.2.4, 1.2, 1.3.6, 1.3.7, 1.3.10, 1.3.12, 1.3.13, 15, 16, 18, 19, 21, 22, 25.2, 25.4, 25.6, 25.7, 26.2, 26.4
Anthony Maycock, P.Eng., Principal	MM Consultores SpA	1.1.1.3, 1.1.2.3, 1.3.8, 1.3.9, 13, 17, 25.3, 26.3
Daniel Servigna, PE, MBA, Principal Geotechnical Engineer, Mine Waste	WSP USA Environment & Infrastructure Inc.	1.1.1.5, 1.1.2.5, 1.3.11, 4.9, 20, 25.5, 26.5
All		1.4, 25.8, 27

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

2.2 List of Abbreviations

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

µ	micron	kt/a	kilotonnes per annum
µg	microgram	kVA	kilovolt-amperes
µm	micrometre	kW	kilowatt
a	annum	kWh	kilowatt-hour
A	ampere	L	litre
bbl	barrels	lb	pound
Btu	British thermal units	L/s	litres per second
°C	degree Celsius	m	metre
C$	Canadian dollars	M	mega (million); molar
cal	calorie	m^2	square metre
cfm	cubic feet per minute	m^3	cubic metre
cm	centimetre	MASL	metres above sea level
cm^2	square centimetre	m^3/h	cubic metres per hour
d	day	mbs	metres below surface
dia	diameter	mg/L	milligrams per litre
dmt	dry metric tonne	mi	mile
dwt	dead-weight ton	min	minute
°F	degree Fahrenheit	mm	millimetre
ft	foot	mph	miles per hour
ft^2	square foot	Mt/a	million tonnes per annum
ft^3	cubic foot	MVA	megavolt-amperes
ft/s	foot per second	MW	megawatt
g	gram	MWh	megawatt-hour
G	giga (billion)	oz	Troy ounce (31.1035g)
Gal	Imperial gallon	P_{80}	80% passing
g/L	gram per litre	ppb	part per billion
Gpm	Imperial gallons per minute	ppm	part per million
g/t	gram per tonne	psia	pound per square inch absolute
		psig	pound per square inch gauge
gr/ft^3	grain per cubic foot	R$	Brazilian Real
gr/m^3	grain per cubic metre	RL	relative elevation
ha	hectare	s	second
hp	horsepower	t	metric tonne
hr	hour	t/a	metric tonne per year
Hz	hertz	t/d	metric tonne per day
in.	inch	t/h	tonnes per hour
in^2	square inch	US$	United States dollar
J	joule	USg	United States gallon
k	kilo (thousand)	USgpm	US gallon per minute
kcal	kilocalorie	V	volt
kg	kilogram	W	watt
km	kilometre	wmt	wet metric tonne
km^2	square kilometre	wt%	weight percent
km/h	kilometre per hour	yd^3	cubic yard
kPa	kilopascal	yr	year

3.0 RELIANCE ON OTHER EXPERTS

3.1 Introduction

This CPR has been prepared by SLR for ACG. The information, conclusions, opinions, and estimates contained herein are based on:

- Information available to SLR at the time of preparation of this CPR.
- Assumptions, conditions, and qualifications as set forth in this CPR.

3.2 Mineral Tenure, Surface Rights and Royalties

Sections 4 to Section 11 and Section 14 from this CPR were prepared by GeoEstima CPs. The information, conclusions opinions, and estimates contained herein are based on:

- Information available to GeoEstima at the time of preparation of this report, and
- Assumptions, conditions, and qualifications as set forth in this report.

For the purposes of the Summary and Section 4 of this CPR, GeoEstima has relied on ownership information provided from MVV by Bichara Advogados: Legal Opinion – NI 43-101 dated March 7, 2023 (MVV, 2023a). GeoEstima has not independently reviewed property title, mineral rights, or ownership pf the project area expresses no opinion as to the ownership status of the property.

3.3 Permitting, Environmental and Community Impacts

The CPs have fully relied upon, and disclaim responsibility for, information supplied by MVV staff and experts retained by MVV for information related to environmental (including tailings and water management), permitting, and social and community impacts as follows:

- ERM Consultants Canada Ltd, 2019: Serrote da Laje Copper Project, ESDD Report: report prepared by ERM for Endeavour Financial, dated 5 March 2019, 81 p.
- ERM Consultants Canada Ltd, 2020: Serrote da Laje Copper Project, ESDD Report: report prepared by ERM for Endeavour Financial, dated 15 Nov 2020, 91 p.
- Ferreira Rocha, 2022: Environmental and Social Impact Assessment (ESIA) and Social Management Plan (ESMP): report prepared by Ferreira Rocha for MVV, dated June 2022, 6th edition, 1193 p.
- Manefau: Inventario Florestal Da Mine Serrote: Report prepared by MVV by Manefau, 22 p.
- Documents provided to Diane Lister by Mário Henrique da Silva Lima, Communication and Community Relations Coordinator, Mineração Vale Verde do Brasil Ltda:
    - "A discussion of any potential social or community related requirements and plans for the Project and the status of any negotiations or agreements with local communities", 12 p., emailed to Diane Lister 14 May 2021
    - Untitled document describing the family resettlement status, 1 page, emailed to Diane Lister 15 May 2021

This information is used in Section 20 of the CPR. This information is also used in support of the Mineral Resource estimate in Section 14, the Mineral Reserve estimate in Section 15, and the economic analysis in Section 22.

3.4 Taxation

The CPs have fully relied upon, and disclaim responsibility for, information supplied by experts retained by MVV for information related to taxation matters. The tax recovery rates are specified in a report by KPMG Assessores Ltda. (2020). This information is used in Section 22 of the CPR.

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

4.0 PROPERTY DESCRIPTION AND LOCATION

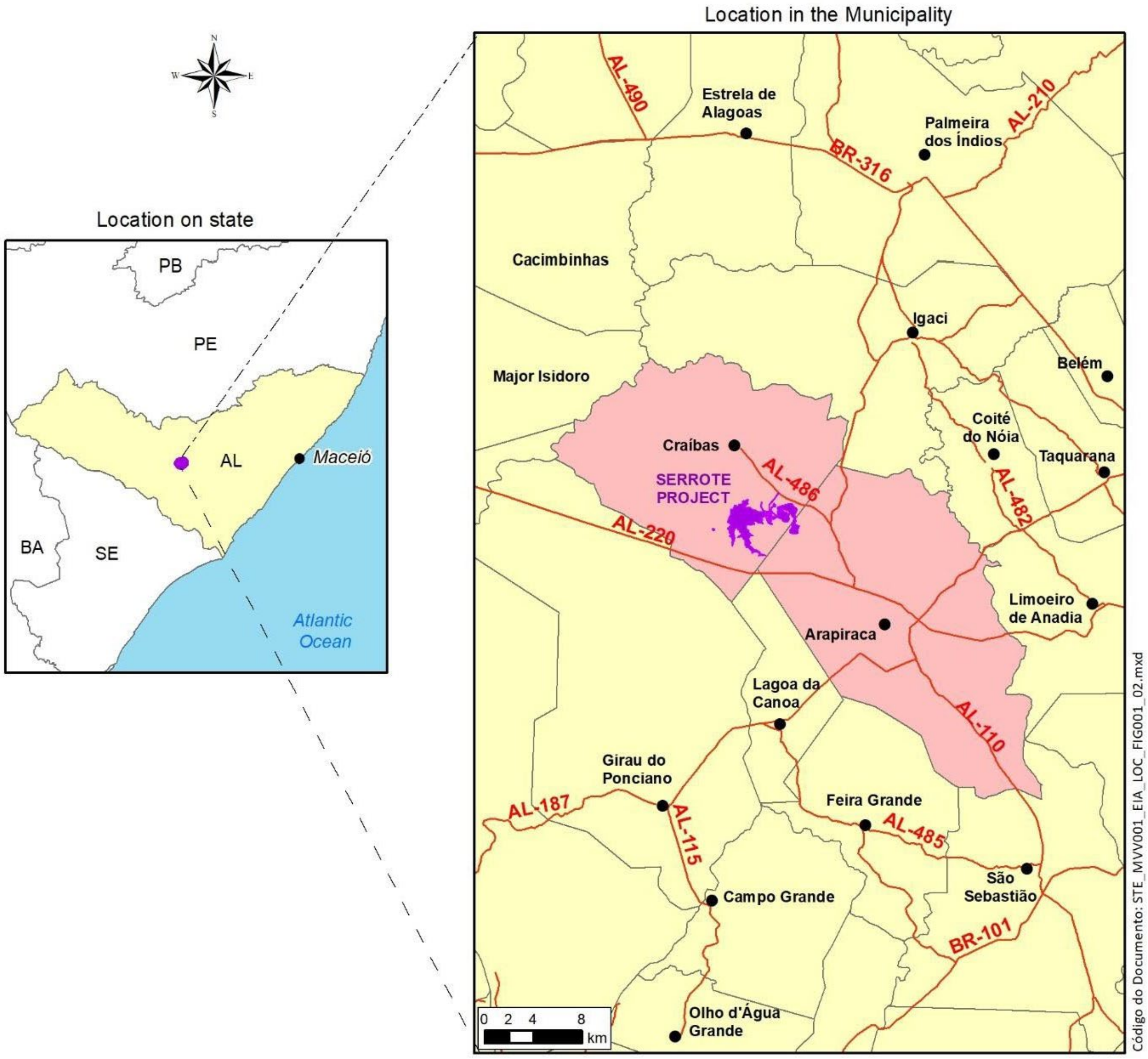
4.1 Location

The Serrote Mine is located in the municipalities of Craíbas and Arapiraca, in the central region of the State of Alagoas, Brazil, known as the Agreste meso-region. Serrote is situated 12 km from the city of Arapiraca and five kilometres from the city of Craíbas, which is located approximately 200 km by road from Maceió, the local capital (Figure 4-1).

The process plant, currently under construction, is located in the Craíbas municipality.

The open pit mine is centred at 9°39’59” S latitude and 36°44’19 ” W longitude using the UTM SAD1969 datum, Zone 24S.

The Caboclo exploration target is located 15 km from the city of Craíbas, 35 km from the city of Arapiraca, and 20 km from the Serrote process plant site. It is centred at 9°32’22” S latitude and 36°46’9” W longitude, using UTM SAD1969, Zone 24S.



Source: Figure prepared by Atlantic Nickel, 2020, and provided by MVV, 2021.

Figure 4-1: Location Map for the Serrote Mine

4.2 Land Tenure

4.2.1 Introduction

Mining activities in Brazil are governed by the Brazilian Federal Constitution of 1988 (the Brazilian Federal Constitution), the Brazilian Mining Code (Federal Decree-Law 227/1967), and various other decrees, laws, ordinances, and regulations such as the Decree number 9.406/2018 which renews the regulation of the Mining Code. Brazil also has legislation and legal guarantees related to the exploitation and use of water rights.

Under the Brazilian Federal Constitution, all mineral deposits (jazidas) belong to the Federal Government, whether or not the mineral deposits are in active production. Mineral rights are distinct from surface rights.

The Ministry of Mines and Energy (MME) and the Agência Nacional de Mineração (ANM) regulate mining activities in Brazil. The ANM is responsible for monitoring, analysing, and promoting the performance of the Brazilian mineral industry by administering and granting rights related to the exploration and exploitation of mineral resources and other related activities in Brazil.

4.2.2 Mineral Title

In Brazil, there are four levels of mineral tenure: exploration licences (Autorizações de Pesquisa), mining concessions (Concessões de Lavra), mining concession applications (Requerimento de Lavra), and exploration licence applications (Requerimentos de Pesquisa), which are together broadly referred to as mineral rights.

Exploration licences can be granted for a period of one to three years and can be extended by request of the holder. Exploration licences provide the licence holders with the right to access the licence area and undertake exploration activities. Such licences typically list specific commodities to be explored for. The licence holder must have an agreement in place with any surface owners before exploration work commences. The exploration licence is a preliminary stage granted to discover a mineral deposit that can support mineral reserves and the grant of a mining concession by the ANM.

The exploration licence holder must comply with the following obligations:

- Start exploration within 60 days, counted from the date of publication of the licence or from the date access to the relevant properties is obtained
- Inform and notify the ANM of any discoveries of mineralisation that were not included in the titleholder's list of authorised commodities
- Not interrupt the exploration activities without reason for more than three consecutive months or for more than 120 non-consecutive days during the licence term
- Pay all relevant fees
- Request approval from the ANM (i.e., an extraction permit) before removing any substances from the licence area for analysis or testwork
- Pay any required compensation to the surface owner or possessor
- Prepare and present a final exploration report to the ANM, within the timeframe determined by the ANM

Once a positive exploration report is approved by the ANM, the licence holder has a year to apply for a mining concession.

Applications for mining concessions require documentary support, including the commodities that are to be explored for, a description and location of the area applied for, a map showing the area, any easements, an "Economic Development Plan", and evidence of sufficient funds to complete the mine plan. Mining concessions are considered granted when an ordinance (is published in the Official Gazette.

Within 90 days of the publication of the ordinance, the holder must apply for possession (imissão de posse) of the surface area that is required to enact the Economic Development Plan. The ANM will then draft an "Access Term" that must be signed by all stakeholders. The owner of the surface area is entitled to royalties that are equivalent to 50% of the amount paid as the Compensation for the Exploitation of Mineral Resources (Compensação Financeira pela Exploração de Recursos Minerais or CFEM).

Work must commence within six months of the mining concession grant. Annual production reports must be filed. Assuming all other conditions are met, mining concessions remain valid until the deposit is depleted.

The holder can conduct mining activities only in the area covered under the lease agreement after the agreement has been registered with the ANM, and the appropriate operation licence (Licença de Operação - LO) is issued. If additional minerals are discovered, the mining concession must be amended to include the new list of minerals.

4.2.3 Surface Rights

Surface rights in Brazil are separate from mineral rights. Under the mining law, mining rights holders have the right to use and access areas that are planned for exploration or exploitation. Rights of way and easements can be granted to mining rights holders over public and private lands.

Typically, the mining rights holder enters into an agreement with the affected surface rights holder in return for a compensation fee for the land use. Where disputes arise, a mining rights holder may apply for a local court order to allow a judge to establish the appropriate compensation fee to be paid to the surface rights holder.

4.2.4 Water Rights

All waters are considered to be in the public domain, and are separated into:

- Federal waters: lakes, rivers and any water courses on lands under Federal authority; those that flow through more than one State; those that serve as a frontier with another country, or flow into or originate in another country; as well as marginal lands and riparian beaches.
- State waters: Groundwater and rivers located entirely within the territory of a single State, unless otherwise classified as a Federal water.

Law 9,433/1997 established the National Water Resources Policy (NWRP), created the National Water Resources Management System (NWRMS), and defined a catchment (river) basin as the unit for water resource planning. The law includes the principle of multiple water uses, thereby putting all user categories on an equal footing for access to water resources.

The organizational framework administering water includes the National Water Resources Council (NWRC), State Water Resources Councils (SWRCs), River Basin Committees (RBCs), State Water Resources Management Institutions (SWRIs) and Water Agencies (WAs).

In 2003, to facilitate the management of Brazilian water resources, the country was divided into 12 hydrographic regions which do not coincide with the 27 state political divisions. The NWRC is responsible for resolving disputes over use of water for basins at the Federal level, and for establishing guidelines necessary to implement the institutional framework and instruments contained in the NWRP. The SWRCs are responsible for basins at the State level. The SWRIs are responsible for implementing the guidelines set by the SWRCs. The RBCs and WAs cover the actual water regions, which may be part of more than one State.

4.2.5 Royalties and other Encumbrances

Revenues from mining activities at Serrote are subject to the CFEM royalty that is paid to the ANM and varies depending on the mineral product:

- 1% for rocks, sand, gravel, clay and other mining substances for immediate use in civil works, as well as for mineral and thermal water
- 1.5% for gold
- 2% for diamond and other unspecified mining substances (includes nickel, copper and cobalt)
- 3% for bauxite, manganese, niobium, and rock salt
- 3.5% for iron ore

4.3 Project Ownership

The Serrote Mine is owned by Mineração Vale Verde Ltda. (MVV), a wholly indirectly-owned subsidiary of Serrote Participações S.A., which is controlled by Appian Capital Advisory LLC (Appian Capital).

Legal opinion supports that MVV is a limited liability company that has been duly incorporated under Brazilian laws, is currently active, and has not had its enrolment suspended.

4.3.1 Ownership History

The Serrote project area was owned by Rio Doce Geologia e Mineração (DOCEGEO), the former exploration arm of Companhia Vale do Rio Doce (CVRD), the precursor to Vale from 19822006. In 2006–2007, CVRD negotiated the transfer of the mineral rights to Mineração Barra Bonita (Barra Bonita). In 2007, Aura Minerals acquired the Clearwater Holdings Fund, LLC (Clearwater) which, through its subsidiary, Mineração Vale Verde (MVV), had been assigned the property rights from Barra Bonita. On 21 March 2018, Serrote Participações completed the acquisition of MVV from Aura Minerals.

4.4 Property Agreements

The following security documents, dated 23 December 2020, were entered into by MVV and Banco Citibank S.A. (Citibank), as security agent, as collateral to obligations assumed under a credit agreement dated 23 December 2020 (the Credit Agreement), as well as under hedge and swap agreements (together with the Credit Agreement, the Financial Instruments):

- Mineral Rights Pledge Agreement registered before the Registry of Deeds and Documents of the City of Craíbas, State of Alagoas
- Ore Pledge Agreement registered before the Registry of Deeds and Documents of the City of Craíbas, State of Alagoas
- Receivables Fiduciary Assignment Agreement registered before the Registry of Deeds and Documents of the City of Craíbas, State of Alagoas
- Contractual Rights Conditional Assignment Agreement registered before the Registry of Deeds and Documents of the City of Craíbas, State of Alagoas
- Quota Fiduciary Lien Agreement dated 23 December 2020 registered before the Registry of Deeds and Documents of the City of Craíbas, State of Alagoas
- Real Properties Fiduciary Lien Agreement registered before the Land Registry Office of the City of Craíbas, State of Alagoas
- Equipment Fiduciary Lien Agreement registered before the Registry of Deeds and Documents of the City of Craíbas, State of Alagoas

As a result, equipment, contracts, receivables, ore production, and real properties over which MVV has property rights are subject to fiduciary assignments or liens (as the case may be) in favour of Citibank as collateral to the Financial Instruments. The fiduciary lien is valid until the debt under the Credit Agreement is fully paid by MVV. In case of default, the quotas (shares) are subject to enforcement procedures.

4.5 Mineral Tenure

MVV holds three groups of mineral rights, covering a total of 11,504,52 ha:

- One mining concession for gold, copper, and iron ore. An application for silver to be included in the minerals that can be extracted has been lodged with the applicable authorities.

- Two applications for mining concessions for copper
- Five exploration licences for gold, copper, and iron ore, as applicable

Tenures are summarized in Table 4-1, and locations in relation to regional infrastructure are shown in Figure 4-2. The location of the Serrote Mine and the mining concession are shown in relation to the local geology in Figure 4-3.

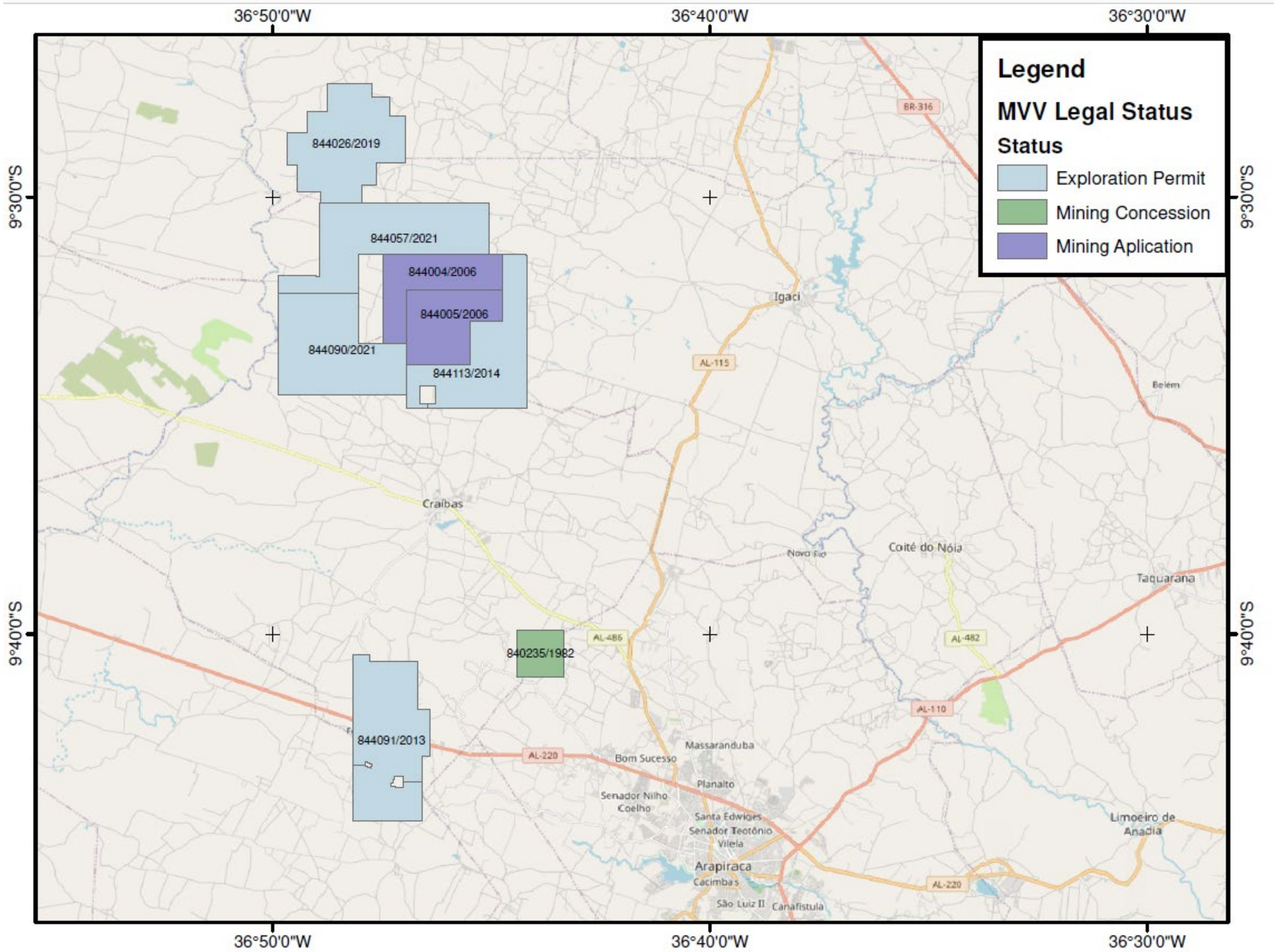
As at the effective date of the CPR (December 31, 2022, or the Effective Date), all required payments and reporting had been completed to have the mineral tenures in good standing.

The Serrote de Laje concession area is subject to the Mineral Rights Pledge Agreement, but the pledge had not been formally instituted by the ANM as of the Effective Date.

All of the licences and licence applications, other than the Pereira Velho concession group, are subject to, or will be subject to on grant, the Mineral Rights Pledge Agreement.

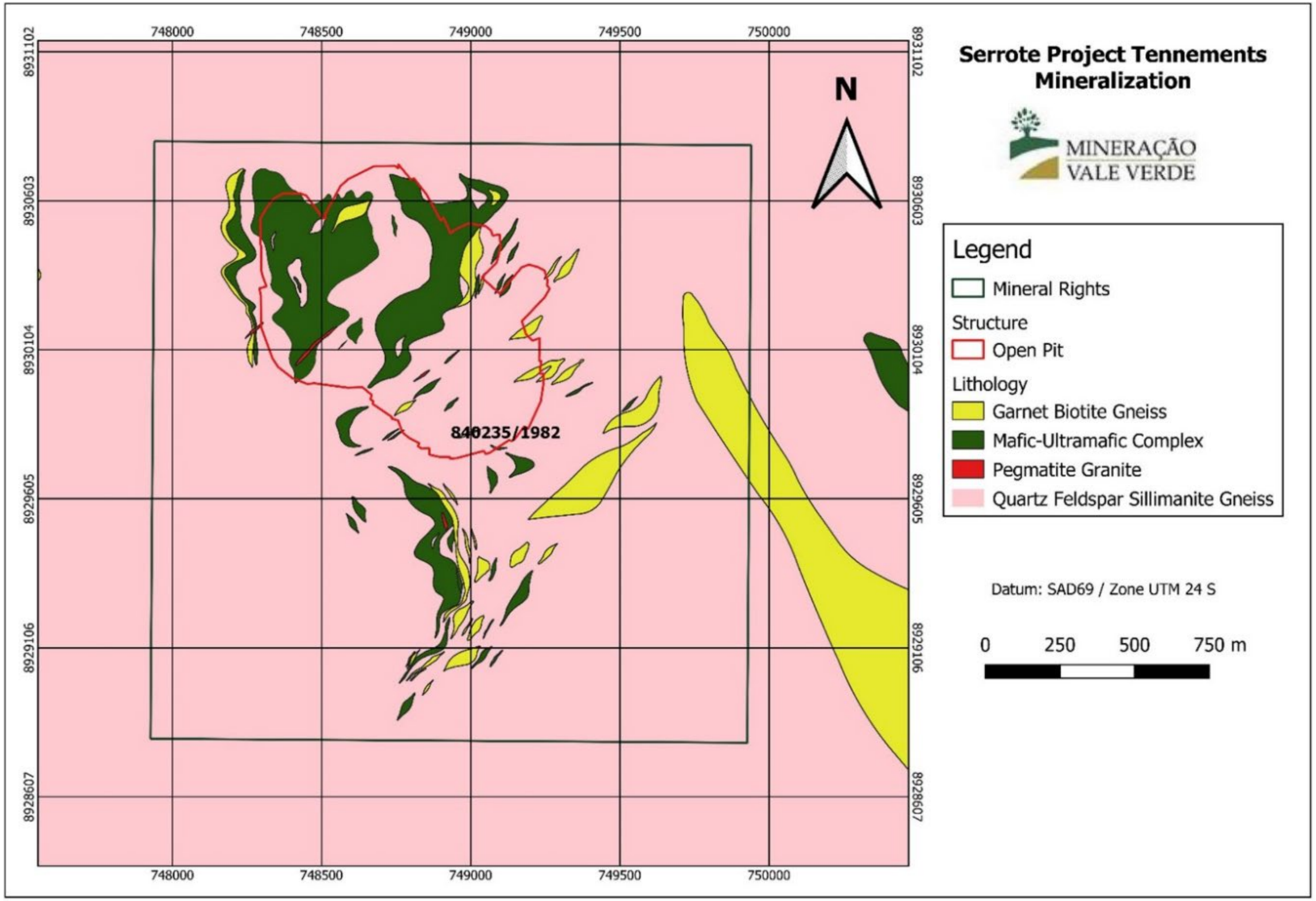
Table 4-1: Mineral Rights Summary
ACG Acquisition Company Limited – Serrote Mine

Name	ANM No.	Area (ha)	Stage
Serrote da Laje	840.235/1982	400.00	Mining Concession
	844.091/2013	1,976.21	Exploration Permit
Caboclo	844.004/2006	977.31	Application for Mining Concession
	844.005/2006	1,020.69	Application for Mining Concession
	844.113/2014	1,586.72	Exploration Permit
Queimada Bonita	844.026/2019	1,723.13	Exploration Permit
	844.057/2021	1,932.39	Exploration Permit
	844.090/2021	1,888.07	Exploration Permit



Source: MVV, 2022.

Figure 4-2: Mineral Tenure Location Map



Source: MTS et al., 2021.

Figure 4-3: Serrote Open Pit in Relation to Mining Concession 840.235/1982 (Serrote da Laje)

4.6 Surface Rights

The surface rights holdings comprise twelve land properties that cover a total area of 1,012.29 ha (Table 4-2). The land properties owned by MVV are subject to fiduciary lien in favour of Citibank as collateral to the Financial Instruments. The fiduciary lien is valid until the debt under the Credit Agreement is fully paid by MVV. In case of default, Citibank will be entitled to enforce the guarantee.

Furthermore, other 13 possessions agreement with landowners to acquire possession rights over the respective land properties, pursuant to 14 of such possessions agreements, MVV has undertaken to pay contractual royalty equal to 50% of the statutory royalty due to Federal Government (CFEM).

A plan showing the surface rights subject to royalties is presented in Figure 4-4 and these properties are listed in Table 4-4.

Table 4-2: Surface Rights Summary (MVV Ownership)
ACG Acquisition Company Limited – Serrote Mine

File	Land	Date of Acquisition of the Land Property	Area (ha)
Registry record Nº 124	Fazenda Uruçu	2011	147.00
Registry record Nº 125	Fazenda Uruçu	2009	85.60
Registry record Nº. 388	Fazenda Lagoa da Cruz	2013	243.00
Registry record Nº. 488	Sitio Melancia	2008	32.40
Registry record Nº. 489	Sitio Melancia	2008	33.70
Registry record Nº. 490	Sitio Melancia	2008	43.32
Registry record Nº. 491	Sitio Melancia	2008	92.81
Registry record Nº. 492	Sitio Melancia	2008	11.95
Registry record Nº. 493	Sitio Melancia	2008	97.24
Registry record Nº. 494	Sitio Melancia	2008	59.41
Registry record Nº. 495	Sitio Melancia	2008	88.54
Registry record Nº. 496	Sitio Melancia	2008	60.36

4.7 Water Rights

MVV holds the water rights outlined in Table 4-3. The rights are sufficient for the life-of-mine (LOM) and can be renewed at the end of their term.

Table 4-3: Water Extraction Permits
ACG Acquisition Company Limited – Serrote Mine

Permit No.	Object	Key Conditions	Issuance Date	Expiry Date
49/2020	Authorises construction of a dam at Salgado Stream.	1) Obtain permit for effluent discharge; 2) Present a qualitative-quantitative water resources monitoring plan;	January 21, 2020	January 21, 2024

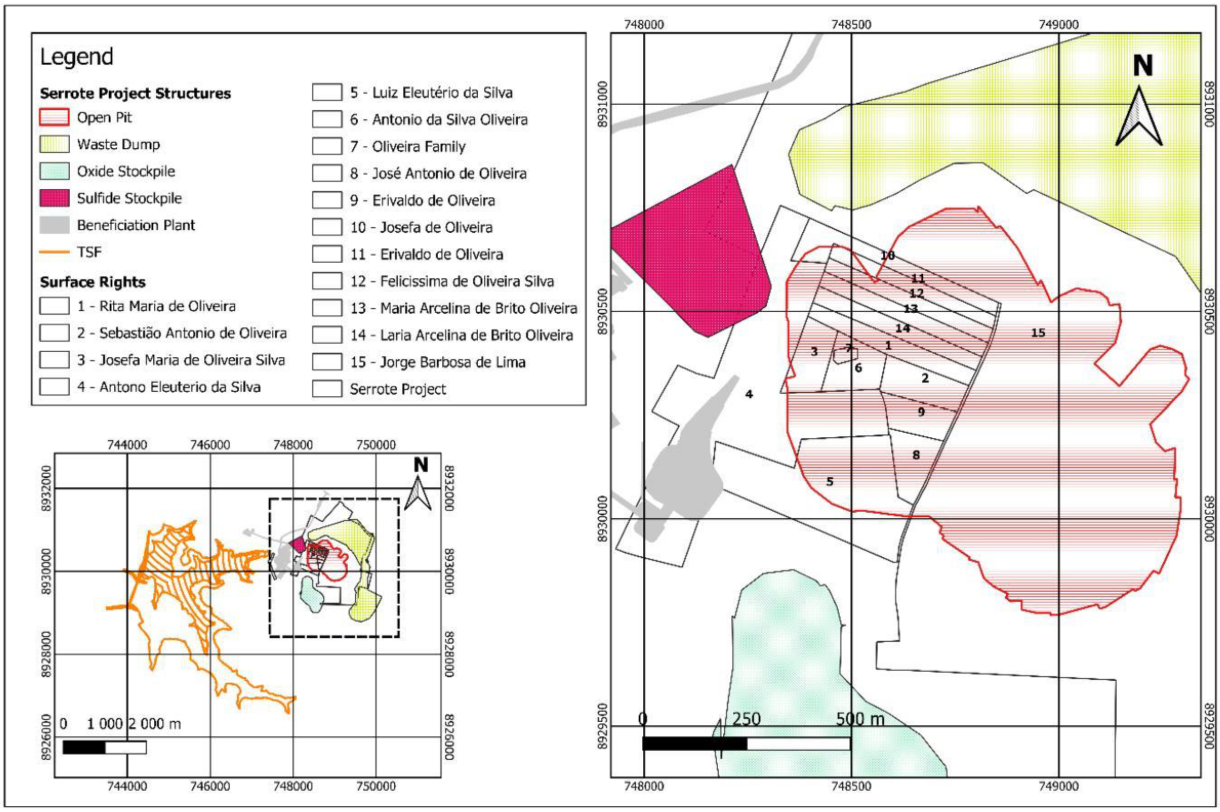
Permit No.	Object	Key Conditions	Issuance Date	Expiry Date
		3) Present all technical documentation on dam safety, approved by the ANM.		
750/2020	Authorises effluent discharge into a tributary of the Salgado Stream – 49.25 m³/day	Regularly monitor water quality	November 9, 2020	November 9, 2028
0557/2022	Authorizes effluent discharge into the Serrote Dam – 25,0000 m³/day	Regularly monitor water quality	April 1, 2022	March 31, 2026
0079/2021	Authorizes for capture 7.200 m³/day water the Serrote Dam for plant	01) Submit authorization for the release of effluents, before the start of dam operations; 02) Submit a Quali-Quantitative Monitoring Program for Water Resources approved by SEMARH/AL, before starting the dam operation; 03) The user cannot exceed the collection of 300 m³/h, for a period of 24 hours/day, during the months of January-December.	April 12, 2021	March 31, 2025

4.8 Royalties and Encumbrances

4.8.1 CFEM

All of the concessions are subject to the CFEM (see Section 4.2.5).

Thirteen of the possession agreements are subject to royalty agreements, consisting of a contractual royalty equal to 50% of the statutory royalty due to Federal Government (i.e., the CFEM). These concessions are listed in Table 4-4 and shown in Figure 4-4.



Source: MVV, 2023.

Figure 4-4: Possession Agreements with Royalty Provision

Table 4-4: Surface Rights with Royalties
ACG Acquisition Company Limited – Serrote Mine

Figure 4-4 Map Reference	Agreement	Land	Date of Acquisition of the Possession Right	Area (ha)	Royalty Provision
1	Purchase and Sale Commitment Agreement	MVV.1.01.0001	January 14, 2013	1.79	Clause 5 – 50% of the amount due as statutory royalty – CFEM
2	Purchase and Sale Commitment Agreement	MVV.1.01.0002	January 31, 2013	1.60	Clause 5 – 50% of the amount due as statutory royalty – CFEM
3	Purchase and Sale Commitment Agreement	MVV.1.02.0001	January 14, 2013	1.49	Clause 5 – 50% of the amount due as statutory royalty – CFEM
4	Purchase and Sale Commitment Agreement	MVV.1.02.0002	March 6, 2013	17.88	Clause 5 – 50% of the amount due as statutory royalty – CFEM
5	Purchase and Sale Commitment Agreement	Terra Nua 52	December 17, 2012	1.55	Clause 5 – 50% of the amount due as statutory royalty – CFEM)
6	Purchase and Sale Commitment Agreement	Terra Nua 61	January 28, 2013	1.41	Clause 5 – 50% of the amount due as statutory royalty – CFEM
7	Purchase and Sale Commitment Agreement	Terra Nua 62	February 18, 2013	1.33	Clause 5 – 50% of the amount due as statutory royalty – CFEM
8	Purchase and Sale Commitment Agreement	Terra Nua 63	February 7, 2013	2.13	Clause 5 – 50% of the amount due as statutory royalty – CFEM
9	Purchase and Sale Commitment Agreement	Terra Nua 64	February 18, 2013	1.47	Clause 5 – 50% of the amount due as statutory royalty – CFEM
10	Purchase and Sale Commitment Agreement	Terra Nua 65	January 30, 2013	1.51	Clause 5 – 50% of the amount due as statutory royalty – CFEM

Figure 4-4 Map Reference	Agreement	Land	Date of Acquisition of the Possession Right	Area (ha)	Royalty Provision
11	Purchase and Sale Commitment Agreement	Terra Nua 66	December 17, 2012	1.59	Clause 5 – 50% of the amount due as statutory royalty – CFEM
12	Purchase and Sale Commitment Agreement	Terra Nua 67	December 17, 2012	1.66	Clause 5 – 50% of the amount due as statutory royalty – CFEM
13	Purchase and Sale Commitment and Mineral Servitude Agreement	Terra Nua 68 Various lands located in the Municipalities of Craíbas and Arapiraca	January 10, 2020	232.06	Clause 7.4 – 50% of the amount due as statutory royalty – CFEM on ANM Proceeding 840.235/1982

4.9 Environmental, Permitting and Social Considerations

Permitting, environmental and closure, and social licence considerations for operations are discussed in Section 20.

4.10 CP Comments on "Item 4: Property Description and Location"

GeoEstima is not aware of any environmental liabilities on the property. There are no environmental liabilities associated with the exploration licences other than those typically associated with exploration drilling activities, such as the required permits for clearing of vegetation where gridlines are opened in forested areas, the required approvals for clearing vegetation to conduct drilling operations, and licences for pumping and utilisation of surface water. MVV has all of the required permits to conduct work on the property.

5.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

The closest major city to the Mine is Arapiraca, approximately 12 km southeast of the Mine. The city of Craíbas is approximately five kilometres from the Mine site. The Project can be accessed by passenger car from Arapiraca via paved road with no seasonal constraints.

Maceió, the capital of Alagoas State, is approximately 149 km from the Mine site via paved highways AL-220, or BR-316 and BR-101 from Craíbas.

Port facilities and a regional airport with scheduled services are located at Maceió.

5.2 Climate

Serrote is located in the tropics, in an area classified as tropical savanna.

An average annual rainfall of 670 mm was recommended for Project designs, based on a detailed precipitation study completed by Walm Engenharia e Tecnologia Ambiental (Walm) in 2018. Walm recommended an annual evaporation rate of 1,700 mm for design purposes. May, June, and July are typically the wettest months, October, November, and December the driest.

Arapiraca and Craíbas, the closest towns to the Mine, have annual temperatures in the 23– 25ºC range.

Mining activities are conducted year-round.

5.3 Local Resources and Infrastructure

Arapiraca has a population of about 214,000 and is the second-largest city in the state of Alagoas. Arapiraca is the major source of commercial and industrial support services for the region. Craíbas has approximately 22,600 inhabitants. Skilled and semi-skilled labour can be obtained from these two cities and surrounding rural areas.

The electric power distribution service for the municipalities of Arapiraca and Craíbas is provided by Eletrobrás - Centrais Elétricas Brasileiras S.A.

Infrastructure required to support mining activities is discussed in Section 18.

The primary industries in the Mine and surrounding areas are agriculture, livestock, forestry, fisheries, and aquaculture.

5.4 Physiography

The physiography consists of generally flat topography with a few low hills, ranging in elevation from 24 m to 41 m. The terrain slopes gently toward the Salgado stream in the southwest of the Mine area.

There is limited outcrop; the few outcrops are typically exposed in drainage cuts.

Nearly all the local drainages are intermittent, flowing only in the wet season. Ephemeral swamps and marshes form in low-lying areas during the rains. Water is scarce in the Mine area during the dry season.

5.5 Seismicity

Seismic evaluations that included the Mine area indicate that the risk from seismicity is low (Berrocal et al., 1984). The maximum earthquake has a magnitude of 3.4 mb. The closest known earthquake epicentre to the Mine area was 3.3 km away. This event, registered by the USP Centre for Seismology in 2016, had a magnitude of 2.0 mb.

Project installations were designed to meet applicable seismic code.

6.0 HISTORY

6.1 Exploration History

A summary of the exploration and development history is provided in Table 6-1.

The exploration history of Serrote area was dated from 1960 with occurrence of magnetite mention by DNPM-CPRM. In 1979, Silva Filho et al. completed the first description of the magnetite in the area.

The exploration and development work carried out on the property to date has focused on the location and delineation of the known mineralized areas and improving confidence in mineral resources. Exploration has included basic geologic mapping activities, geochemical and geophysical surveys, and various drilling programs along the years.

Table 6-1: Exploration and Development History
ACG Acquisition Company Limited – Serrote Mine

Year	Operator	Comment
-	-	Intermittent, small scale iron ore mining. Iron concession cancelled in August 2007.
1982	DOCEGEO	Initiated a regional study and evaluation of several exploration reports in northeastern Brazil prepared by government organizations. Companhia de Pesquisa de Recursos Minerais (CPRM), had visited the current Project area and reported anomalous copper and nickel values associated with mafic complexes. The area covered the Serrote da Laje hill, a magnetite outcrop.
1982–1986	DOCEGEO	Geochemical and geophysical surveys, drill programs (37 drill holes for 10,818 m), mineral resource estimate
1998–2002	DOCEGEO	Re-assessment of the area; additional exploration and drilling (52 drill holes for 15,348 m), updated mineral resource estimates. Results did not meet internal DOCEGEO criteria for project size
2006	DOCEGEO, CVRD (subsequently Vale)	Transferred mineral rights to Barra Bonita
2006	Barra Bonita	Reviewed data and previous resource estimates
2007	Aura Minerals	Acquired Clearwater Holdings Fund, LLC (Clearwater) which, through its subsidiary, MVV, had been assigned the property rights from Barra Bonita
2007–2010	Aura Minerals	291 drill holes totalling 62,686 m
2008	Aura Minerals	Initiated feasibility study, but was not completed
2009	Aura Minerals	Completed a preliminary economic assessment, estimated mineral resources. Awarded an Installation Licence (LI) by the State of Alagoas environmental agency (IMA-AL) to develop the Serrote Project as described in the PEA
2010	Aura Minerals	Submitted an Economic Exploitation Plan (PAE) to the National Department of Mineral Production (DNPM)
2011	Aura Minerals	Portaria de Lavra, a federal government licence to mine the project, awarded in October 2011
2012	Aura Minerals	Metallurgical testwork, preliminary design criteria, flowsheets and layout. Completed feasibility study in September 2012

Year	Operator	Comment
2018	Serrote Participações	Acquired MVV from Aura Minerals. A side agreement to purchase all royalty rights owned by Barra Bonita was concluded. Commissioned a feasibility study.
2019	Serrote Participações/MVV	Approved detailed engineering and began construction. 10,241 m of RC drilling completed to provide details for first three years of production.
2020	Serrote Participações/MVV	Completed infill drilling; began pre-stripping; pilot-scale metallurgical testing completed; updated Mineral Resource estimate
2021	Serrote Participações/MVV	Pre-strip was completed and essentially all construction complete at the end of May 2021. Drilled 31 drill holes (3,124 m) at regional targets and 3,984 reverse circulation (RC) holes (34,797 m) drilled at Serrote.
2022	Serrote Participações/MVV	Drilled 24 diamond holes (7,248 m) and 3,037 RC holes (47,058 m) drilled at Serrote, totalling 54,306 m.

6.2 Production

Open pit mining operations of Serrote commenced in 2021. Production through December 2022, including pre-stripping activities, is discussed in Section 17.6.

7.0 GEOLOGICAL SETTING AND MINERALISATION

7.1 Regional Geology

The Serrote deposit and Caboclo exploration target are within the Borborema structural province, a mosaic of Paleoproterozoic to Neoproterozoic (0.63 to 2.5 Ga) meta-sedimentary fold belts and massifs separated by a complex system of continent-scale strike-slip shear zones. The Borborema structural province is bounded to the south by the São Francisco craton and includes the Sergipano fold belt that hosts the deposits (Figure 7-1).

The Sergipano fold belt consists of metavolcanic and metasedimentary rocks deposited around Archean/Paleoproterozoic basement gneiss in the south and paragneisses (partially migmatized), metasedimentary rocks, and granitoids. The Sergipano fold belt is divided into five domains, the Macururé, Vaza Barris, Estância, Rio Coruripe and Viçosa domains. The Rio Coruripe domain includes the Jaramataia Group, a rift-related volcano-sedimentary sequence consisting of quartz- feldspathic and garnet–biotite gneisses, marbles, calcsilicate rocks, iron formation, and mafic– ultramafic layered intrusive rocks of the Serrote da Laje suite. A map of the local geology of the Serrote da Laje suite is in Figure 7-2.

The Serrote da Laje suite mafic–ultramafic rocks that host the copper–gold mineralisation are interpreted as a tectonic slice of a larger layered mafic–ultramafic complex that resulted from crystallization of a fractionated parental magma that intruded clastic metasedimentary rocks. Less fractionated rock types, such as peridotites, do not occur in close association with the fractionated cumulates hosting sulphide mineralisation, suggesting that a more fractionated parental magma exists somewhere.

7.2 Local Geology

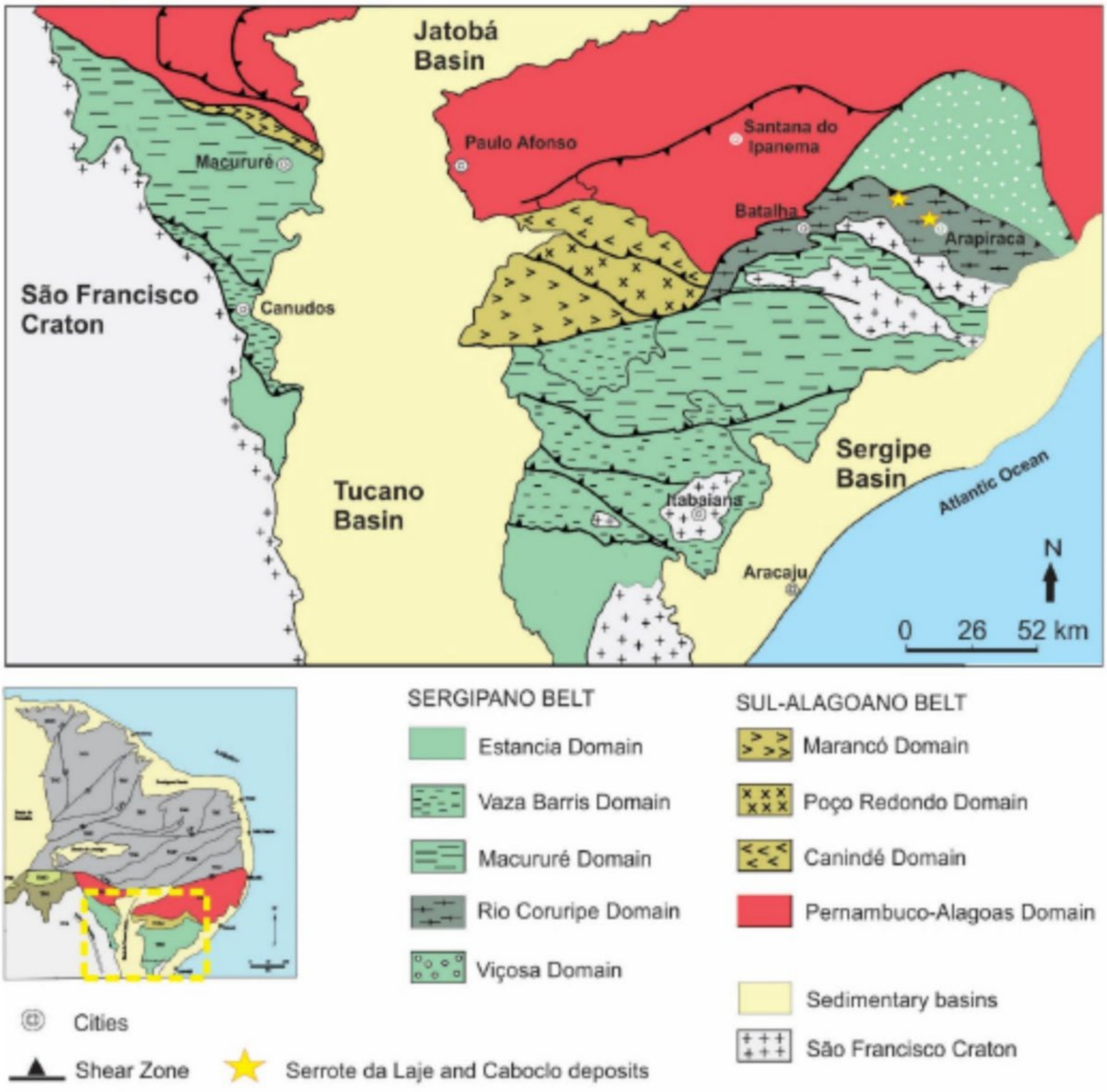
In the Mine area, Jaramataia Group rocks include:

- Pink banded quartz–feldspar–sillimanite gneiss (pink gneiss, QFSG)
- Quartz–feldspar–garnet–biotite gneiss (garnet gneiss; DBN)
- Calc-silicate rocks as well as limestone, marble, and iron formation

There are two known mineralisation centres: Serrote and Caboclo. Serrote is a copper–gold occurrence in mafic–ultramafic rocks formed as a tectonically disrupted layered intrusion comprising hypersthenite, norite, gabbronorite, gabbro, and anorthosite. Magnetitite bodies are associated with hypersthenite and norite. The intrusion is typically concordant with the host paragneiss. Caboclo is an exploration project northwest of Serrote hosted by similar mafic- ultramafic rocks.

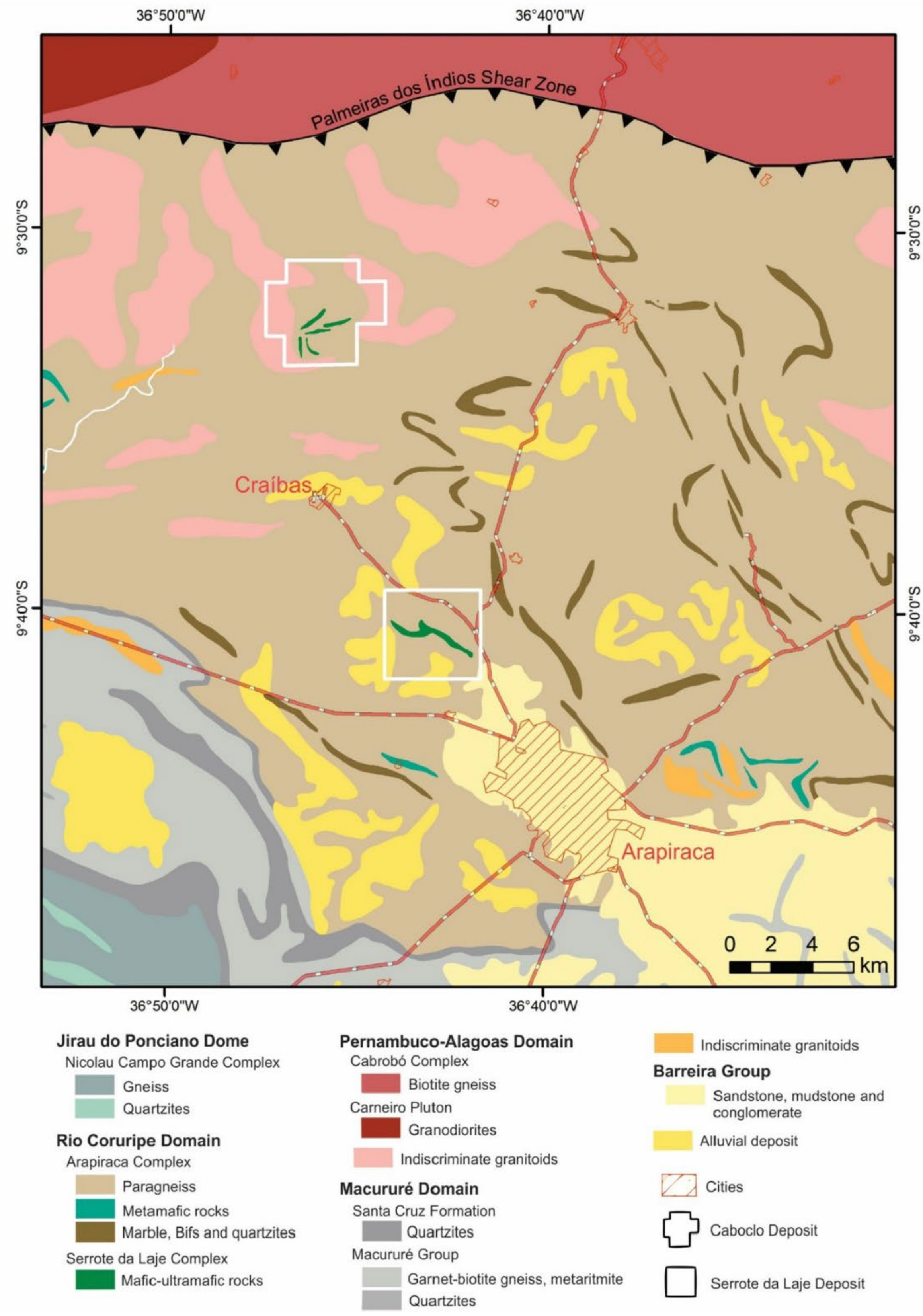
The mafic–ultramafic units are locally intruded by granite and granitic pegmatite dikes.

Metamorphism reached granulite facies, with some areas of retrograde metamorphism at amphibolite facies.



Source: Silva Filho et al., 2003.

Figure 7-1: Regional Geology Plan



Source: Ferreira, 2016.

Note. Map north is to top of figure.

Figure 7-2: Sergipano Fold Belt Geology

7.3 Deposit Descriptions

7.3.1 Serrote

Mineralisation at Serrote consists of multiple, stacked pancake-like layers with approximate dimensions of two kilometres north–south, one kilometre east–west, 5 m to 250 m thick, and a maximum depth of mineralisation of -200 m.

Pink and garnet gneisses host the Serrote da Laje suite, which is a north–northwest-elongated intrusion approximately two kilometres long that dips to the east at about 40–50º. The partially disrupted mafic–ultramafic bodies are as thick as 140 m, with variable widths of 100 m to 1,000 m, and lengths of as much as 800 m. Two northeast-trending faults divide the intrusion into three domains, with the northernmost domain having larger and thicker mafic–ultramafic units (refer to Figure 4-3).

The Serrote da Laje suite includes ilmenite–magnetitite, orthopyroxenite and norite. These rock types occur in cyclic inter-layered units with different thickness (from meters to centimetres). Contacts between different rock types are sharp or are characterized by intermediate rock types. These include orthopyroxenite-bearing magnetitite, magnetite-bearing orthopyroxenite, plagioclase-bearing orthopyroxenite and magnetite-bearing melanorite.

Primary sulphide mineralisation follows the magnetite-rich layers. Some remobilization of the primary sulphide mineralisation into the secondary stringer-type mineralisation is associated with the northeast-trending faults.

For the current geological model, the mafic–ultramafic unit was separated into two units:

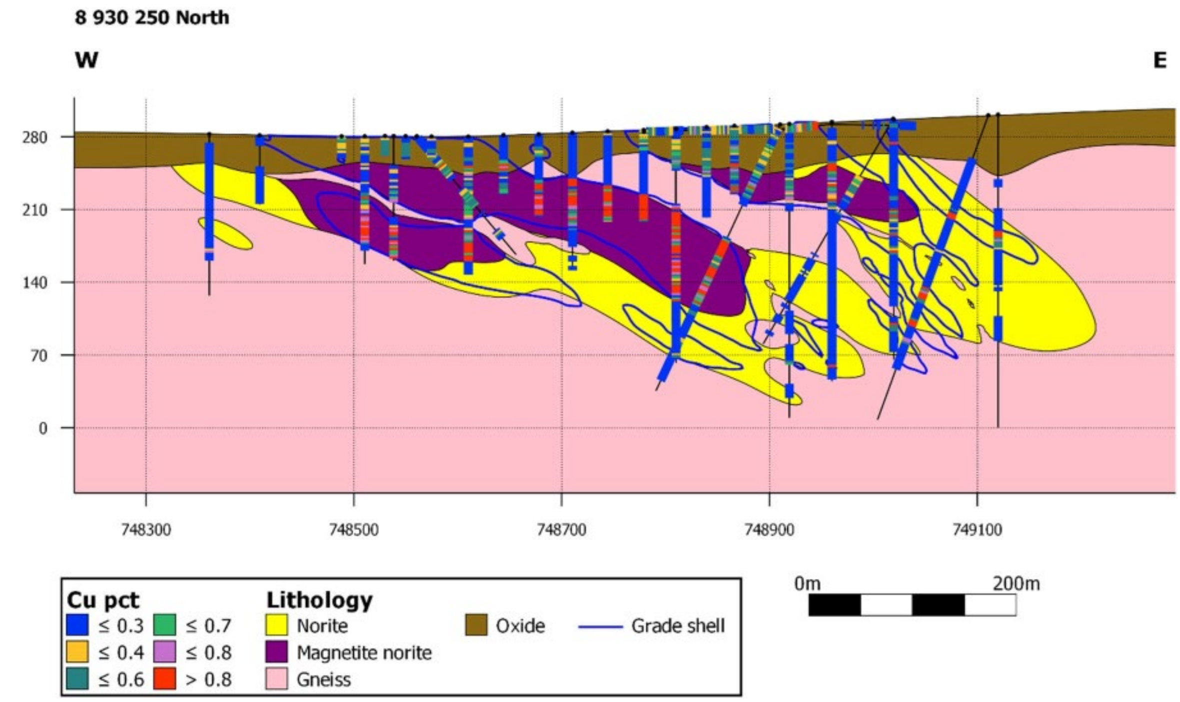
- Magnetite norite (Mano) includes orthopyroxenite, magnetite norite, magnetitite and norite which are magmatic units that are cyclically layered on centimetre to tens of metres scale. Two units that occur locally are biotite and amphibolite, which are randomly distributed and possibly related to the hydrothermal event that locally affected the deposit.
- Gabbro (GB)

Primary mafic–ultramafic rocks are metamorphosed to high grades (granulite facies) with some hydrothermal alteration. Primary igneous mineralogy and texture are preserved locally but the original magmatic stratigraphy is not preserved. The deposit consists of what appear to be a number of tectonic slices of a larger, layered intrusive (Figure 7-3).

The main copper–gold and nickel sulphide mineralisation is associated with magnetite, orthopyroxene and magnetite norite. This mineralisation is stratiform. Gangue mineralogy is largely magnetite, ilmenite, orthopyroxene and hercynite (an iron–aluminium spinel). Magnetite is by far the most abundant gangue mineral in the chalcopyrite-rich bands, and there is a strong correlation of copper grade with magnetite-rich bands, i.e., magnetitite and magnetite-bearing norites. Primary copper minerals are chalcopyrite and bornite with lesser chalcocite. Pyrite and pyrrhotite occur locally and are common in gabbro. Gold occurs as 0.1 mm or smaller grains in fracture fillings with chalcocite and bornite associated with chalcopyrite. Chalcopyrite, and to a lesser degree bornite, occur as disseminations and fracture fillings.

Secondary mineralisation is associated with hydrothermally-altered gabbroic rocks and occurs as sulphide veins adjacent to the main mineralisation. Copper occurs mainly as chalcopyrite with pyrrhotite and pyrite in veinlets.

Other elements associated with the mineralisation such as nickel, gallium, vanadium, and zinc occur in trace amounts or at the detection limits.



Source: MTS, 2021.

Note. Section looks north.

Figure 7-3: Geological Cross-Section, Serrote (Section 8,930,250N)

7.3.2 Caboclo

Lithologically, the Caboclo region can be compared to the Serrote da Laje deposit region, because the rocks present are paragneisses from the Jaramataia Group and mafic-ultramafic rocks from the Serrote da Laje Suite. It is possible to determine three large units identified in the area: paragneisses, mafic-ultramafic complex and granitic intrusives. The gneisses are paralleled with the mafic-ultramafic rocks due to the accentuated deformation. The two units were submitted to a high degree of metamorphism (granulite) with superimposed hydrothermal paragenesis.

The paragneisses are the oldest rocks and have been simplified into three units: quartz feldspar sillimanite gneiss, garnet biotite gneiss and calc-silicate rocks. Some indications that this region suffered greater deformation than the Serrote da Laje area are the migmatized units that are observed. The deposit is divided into a number of areas (zones): Rogério, Zezé, Petrúcio, Maninho, Adriano, and Calcossilicáta (Rogério West), separated by shear zones (Figure 7-4).

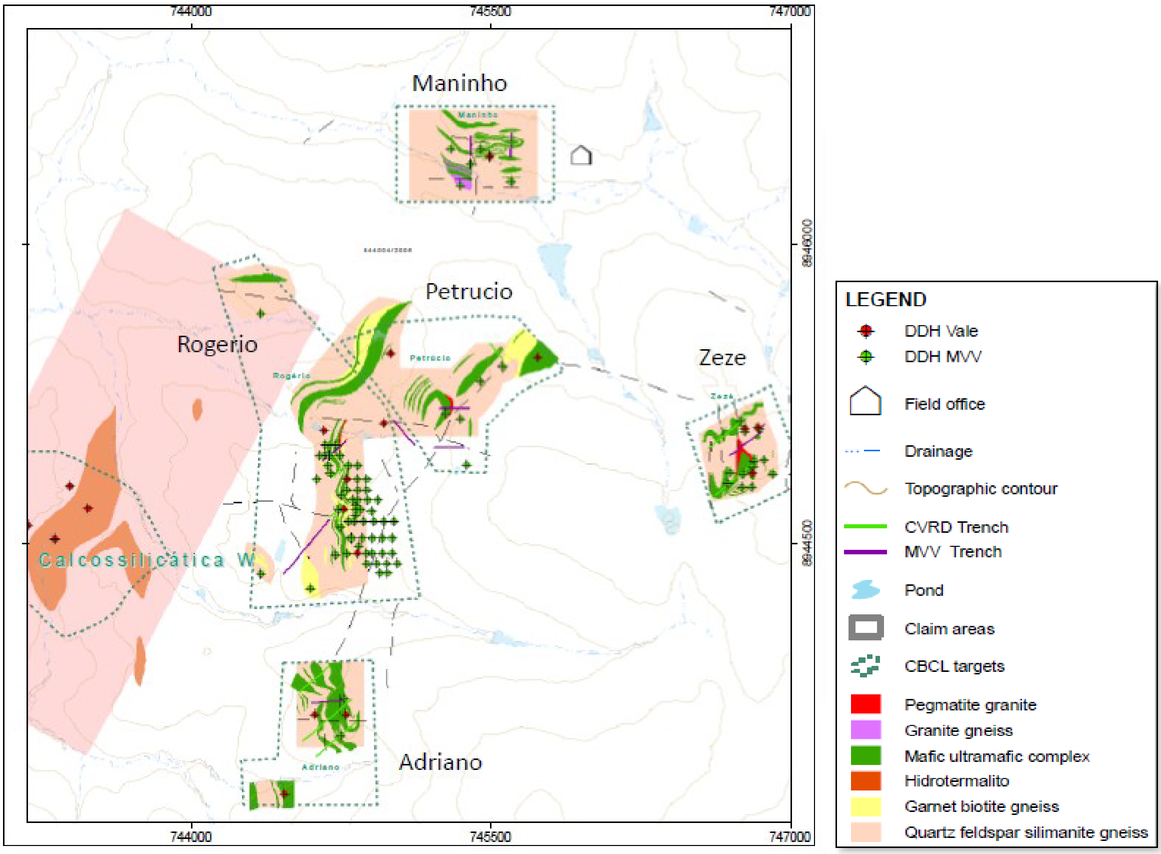
The thickest ultramafic unit is in the Rogério area with a strike length of 800 m and a thickness of as much as 60 m. An example cross-section through the Rogério area is included as Figure 7-5.

The lithological units of the Caboclo target are arranged spatially so that they reflect contacts controlled by structural lineaments, preferably north-south, present mainly in the Adriano, Rogério, and Petrúcio sub-targets, and suffering structural inflections to northwest-southeast and east-west in the Zezé and Maninho sub-targets. These features are evidenced by the foliations measured in outcrops and may possibly reflect a large, transposed fold with stretched flanks, which were then displaced by faults.

Such structures are observed both in outcrops and in drill cores where the rocks present intense mylonitic foliation, parallel to subparallel to the banding, indicating transposition of the original structures.

The rocks most commonly hosting mineralisation are magnetitite and magnetite norite. Chalcopyrite and bornite are the usual sulphide minerals. Malachite is present in the oxidized zone. Two types of mineralisation occur; magmatic mineralisation in the ultramafic rocks, consisting of disseminated sulphides in the intercumulate magnetite, hercynite and pyroxene; and epigenetic hydrothermal mineralisation characterized by remobilized chalcopyrite/bornite in fractures and breccias in ultramafic/mafic rocks. The hydrothermal mineralisation is often associated with biotite and amphibole alteration.

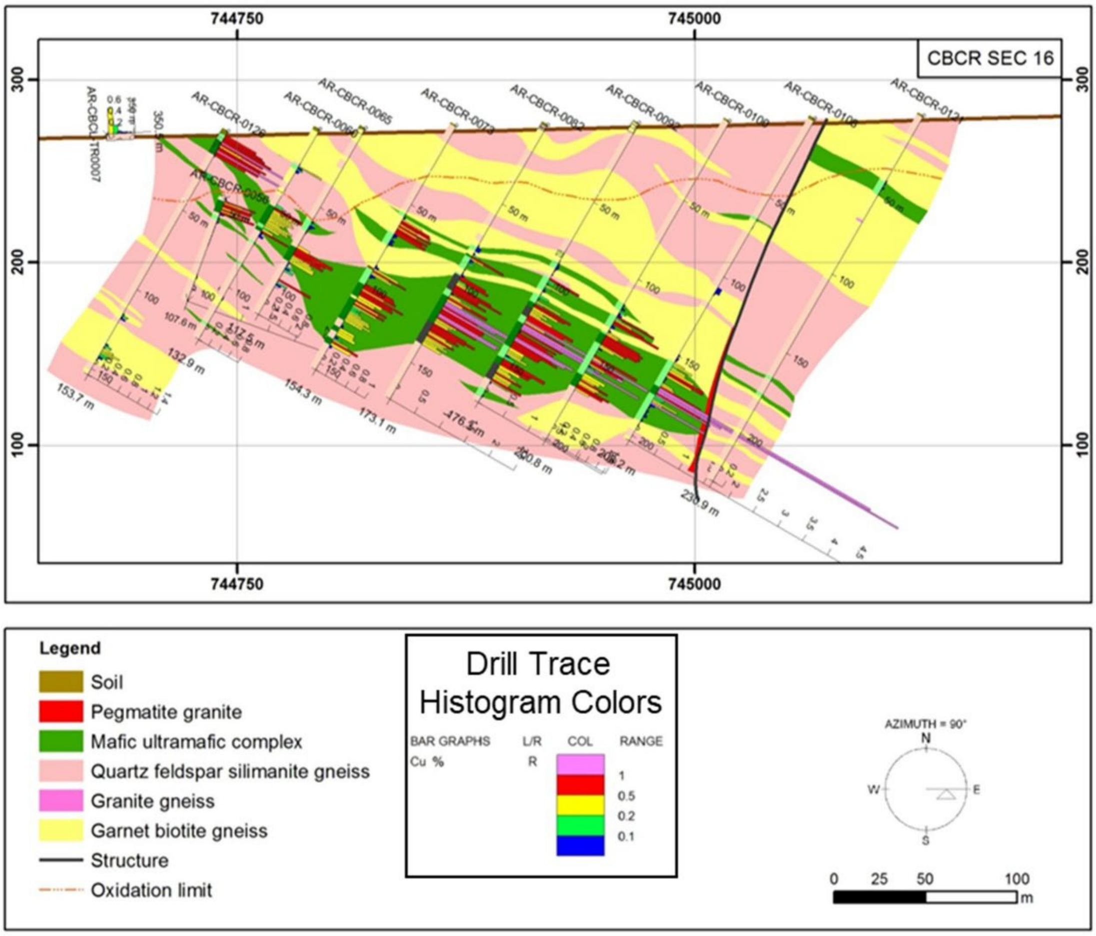
Chalcopyrite, and to a lesser degree bornite, occur as disseminations and fracture fillings. Pyrite and pyrrhotite occur locally and are more common in the hydrothermal zones. Examination of polished sections revealed that gold occurs as discrete grains 0.10 mm or less in size or as discrete grains enclosed in fracture filling in chalcocite and bornite associated with chalcopyrite. Other elements associated with the mineralisation such as nickel, gallium, vanadium, and zinc occur in trace amounts or at the detection limits. And it was possible to identify in the examination of polished sections the gold occurs as discrete grains 0.10 mm or less in size or as discrete grains enclosed in fracture filling in chalcocite and bornite associated with chalcopyrite.



Source: Aura Minerals, 2010.

Notes: Drilling shown on figure does not include recent drilling by MVV. Map north to top of figure. Hidrotermalito = hydrothermal.

Figure 7-4: Geological Map, Caboclo



Source: Ferreira, 2016.

Notes: Section looks north.

Figure 7-5: Geological Cross-Section, Caboclo–Rogério (Section 8,944,600N)

8.0 DEPOSIT TYPES

The deposit types at both Serrote and Caboclo are mafic–ultramafic magmatic copper sulphide deposits. Such deposits are well known around the world and are the principal source of nickel sulphide concentrates with copper and platinum by-products. The magmatic model described below is summarized from.

Nickel–copper sulphide deposits are associated with concentrations of sulphide minerals in mafic–ultramafic intrusions and related rocks (Ecstrand and Hulbert, 2007). Host bodies are classified based on the nature of the confining magmatic environment:

- Meteorite-impact
- Rift and continental flood basalts
- Komatiites
- Other related mafic/ultramafic bodies

Magmatic nickel–copper sulphide mineralisation forms in magmas originating in the upper mantle. As the magmas rise through the crust and begin to cool, immiscible sulphide droplets form. The sulfur originates from the magma itself and/or from the wall rocks. The sulphide droplets attract metals such as nickel, copper, iron, and platinum group elements (PGEs). These metal-rich sulphur droplets have a high density and, therefore, settle by means of gravity towards the bottom of the magma chamber. As the melt cools, the sulphide liquid crystallizes to form a concentration of pyrrhotite, pentlandite, and chalcopyrite near the bottom of the chamber.

Copper-dominated deposits of this type are rare. There are only two other known similar deposits, Caraíba in Brazil and Okiep in South Africa, and both have been mined in the past (Maier and Barnes, 1999; Oliveira and Tarney, 1995; Cawthorn and Mayer, 1993).

8.1 CP Comments on "Item 8 – Deposit Types"

Mineralisation at Serrote and Caboclo is interpreted to be magmatic, stratiform, structurally-modified sulphide mineralisation accumulated largely near the lower portions of the magnetite norite associated with magnetite concentrations. Additional local concentrations of copper sulphide minerals occur as local hydrothermal concentrations around the peripheries of the primary mineralisation likely due to remobilization of primary sulphide minerals.

In the CP's opinion an exploration model that uses a magmatic nickel–copper sulphide deposit model is reasonable as a regional targeting tool.

9.0 EXPLORATION

9.1 Grids and Topography Surveys

Surveying was done using UTM Zone 24S coordinates based on the SAD69 datum, and the IMBITUBA-SC vertical datum.

Prior to 2009, the Mine area was covered by high-resolution IKONOS satellite stereo images (Simpson, 2009). The images were geo-referenced by PhotoSat Information Ltd. in Vancouver, Canada, using recognizable points on the image with known accurate coordinates provided by MVV surveyors using the SUTM24/SAD69 projection/datum. This allowed the generation of 2.0 m contour maps that are used for field work.

9.2 Geological Mapping

There is only one significant outcrop in the project area, hence, geological mapping was largely based on interpretation of drill hole and trench data. Today, geological mapping is performed by the mine geology team in the pit and surrounding areas for grade control and check possible extensions.

9.3 Geochemical Sampling

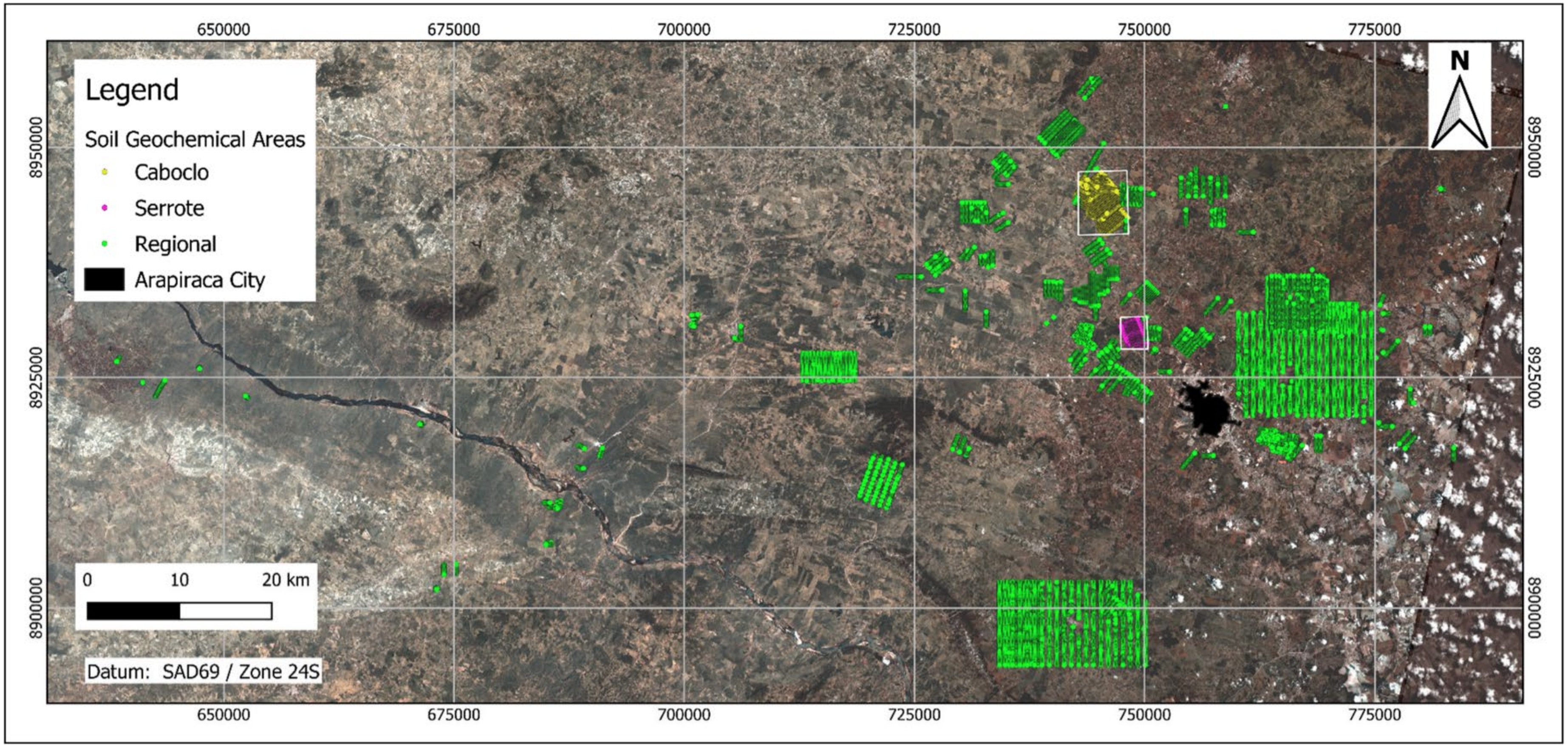
DOCEGEO have completed geochemical exploration activities at Serrote and Caboclo (Table 9-1 and Figure 9-1); however, this work was part of a much larger project comprising 21,206 soil samples analysed for copper, gold, iron, and nickel. Well-defined copper geochemical soil anomalies were outlined in these campaigns (Figure 9-2 and Figure 9-3). Those anomalies were followed up with geophysical surveys and/or drilling.

From 2020 to 2021 a new sampling campaign with a grid of 100 m by 50 m was carried out by MVV, collecting 878 samples to try to better delineate the identified copper anomalies identified in and around Calcossilicática, Adriano, Zezé, and Rogério areas. The results were considered to guide geophysical surveys and the 2021/2022 drilling campaigns (Figure 9-4).

Table 9-1: Exploration Summary
ACG Acquisition Company Limited – Serrote Mine

Area	Item	Units	DOCEGEO			Aura Minerals	MVV	Total
			1982–1986	1998–2002	Total	2007	2021	
Serrote	Topography	km	95	200	295		295	590
	Soil samples	#	1,150	1,343	2,493		2493	4,986
	Gravity measurements	#	93		93		93	186
	Magnetics	km	185	177	362	34	396	792
	Gamma ray spectrometry	km		98	98		98	196
	Induced polarization	km		101	101		101	202
	Electromagnetic	km		98	98		98	196
	Geological mapping	km	65	75	140		140	280
Caboclo	Rock samples	#	34		34		34	68
	Soil samples	#	3,408		3,408		878	4,286
	Sediment samples	#	9		9		9	18

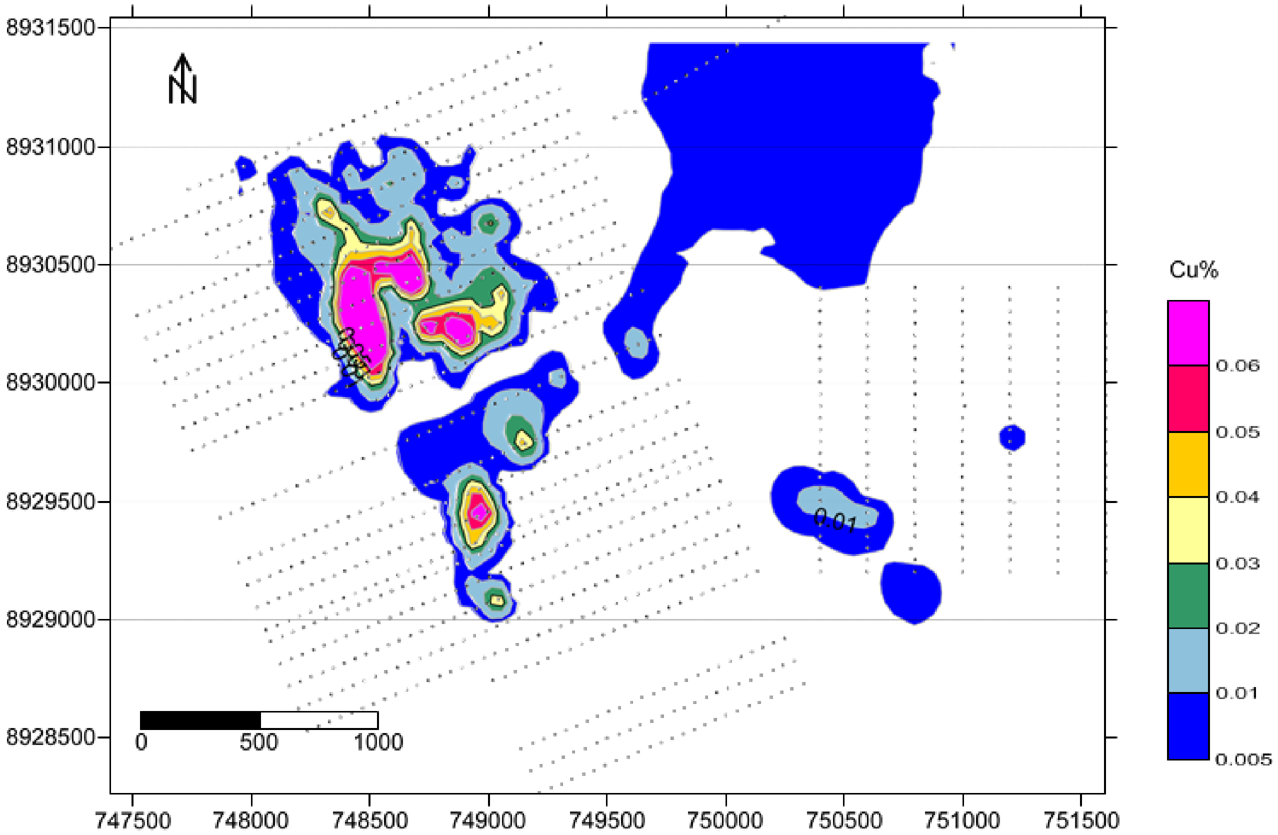
Area	Item	Units	DOCEGEO			Aura Minerals	MVV	Total
			1982–1986	1998–2002	Total	2007	2021	
	Gravity	km	23		23		23	46
	Magnetics	km	415		415	220	635	1,270
	Rock samples	#					15	15
	Soil samples	#					2427	2,427
Regional	Sediment samples	#						
	Gravity	km						
	Magnetics	km						



Source: MTS et al., 2021.

Notes: Sample locations shown as dots.

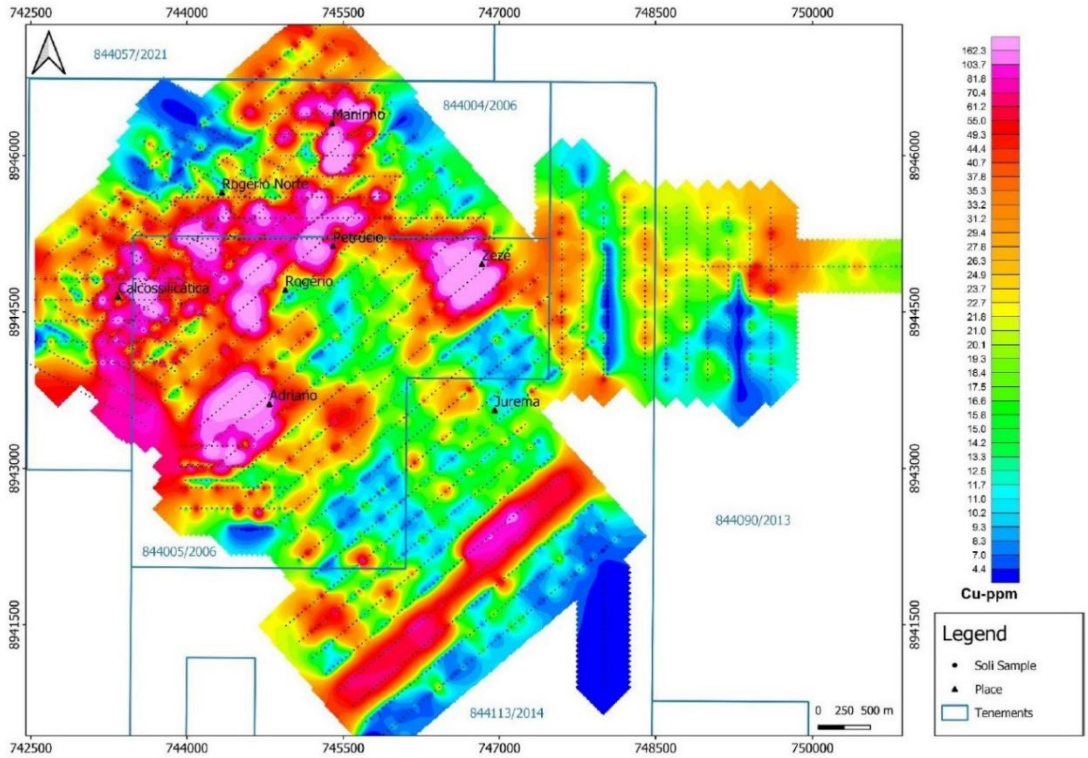
Figure 9-1: DOCEGEO Regional Soil Geochemical Sampling Program



Source: MTS et al., 2021.

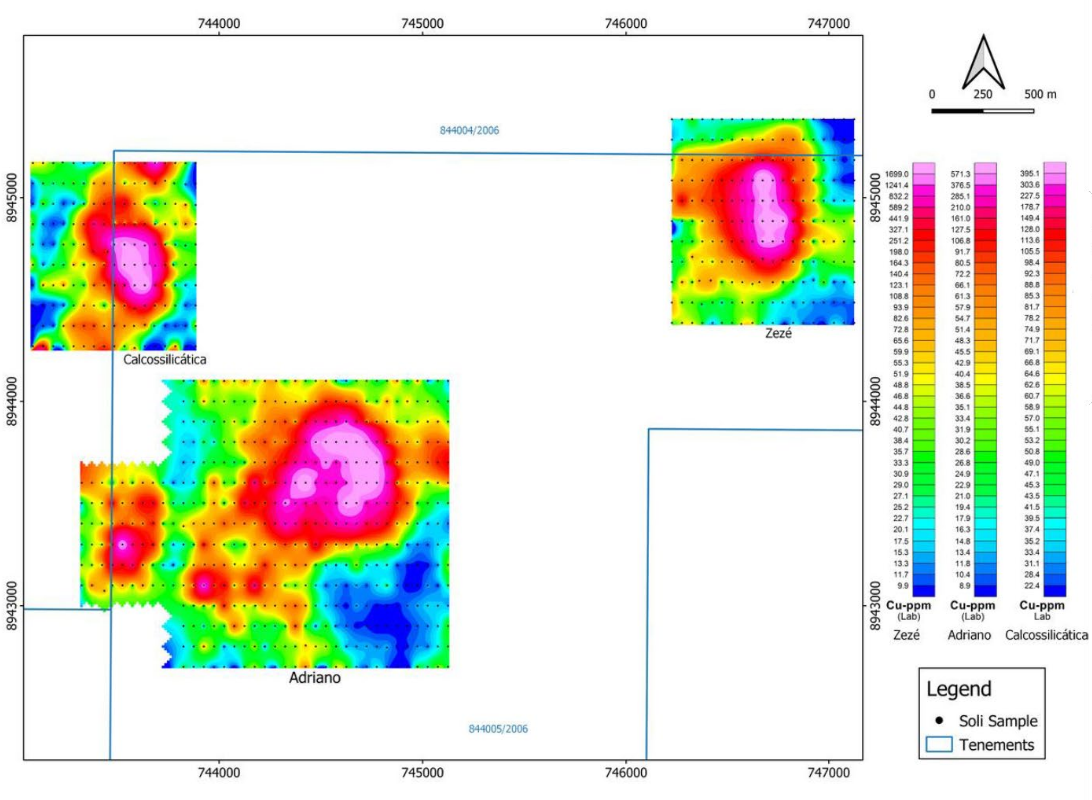
Notes: Sample locations shown as dots.

Figure 9-2: DOCEGEO (CVRD) Soil Copper Anomalies at Serrote



Source: MVV, 2022

Figure 9-3: DOCEGEO (CVRD) Soil Copper Anomalies at Caboclo



Source: MVV, 2022.

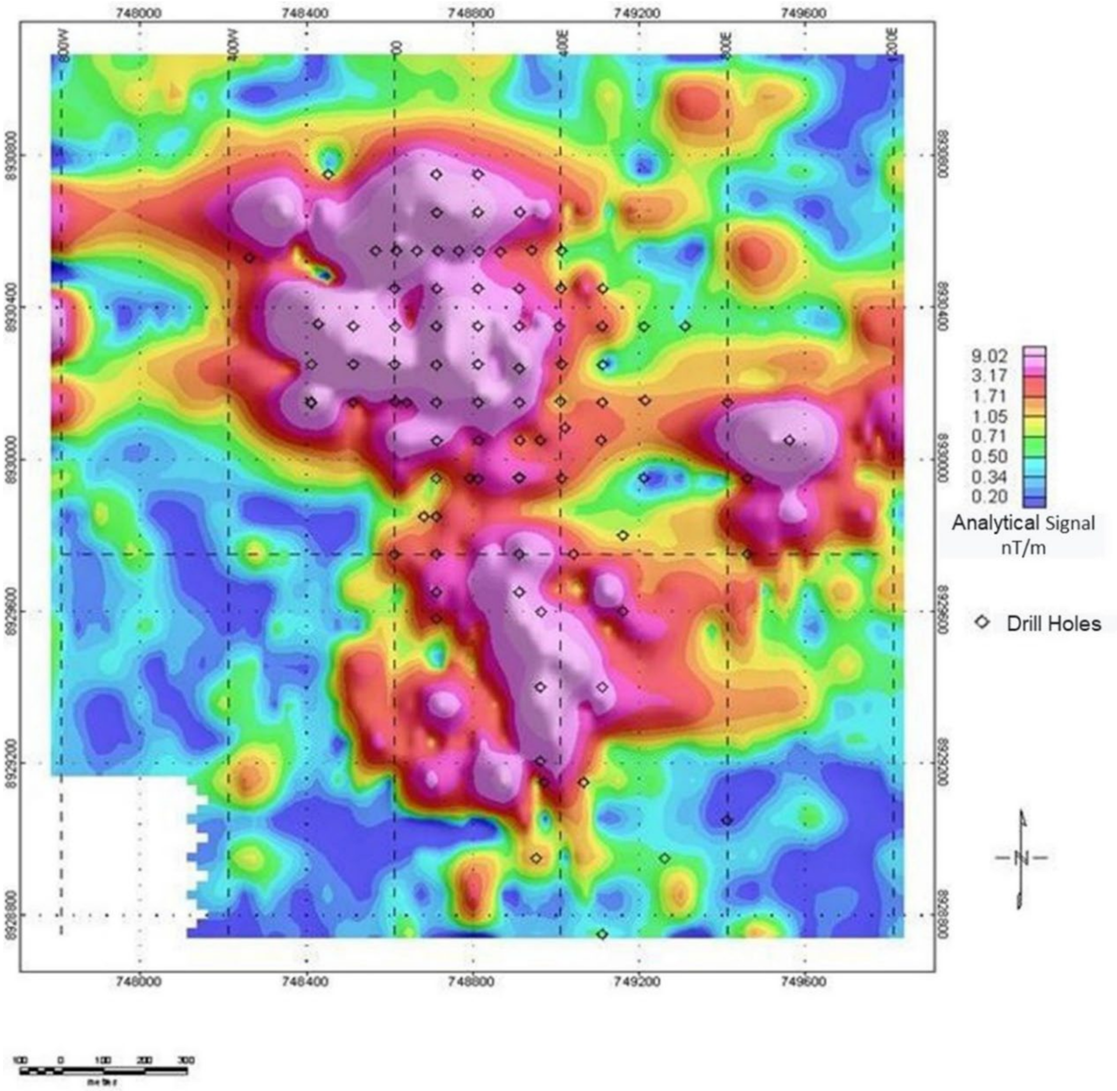
Figure 9-4: MVV Soil Copper Anomalies at Caboclo

9.4 Geophysics

Significant geophysical works were conducted at Caboclo and Serrote areas by Reconsult, Geoconsult and other companies since 2001. Most of the original data, as the original outcomes, need to be retrieved from historical files for their integration and analysis.

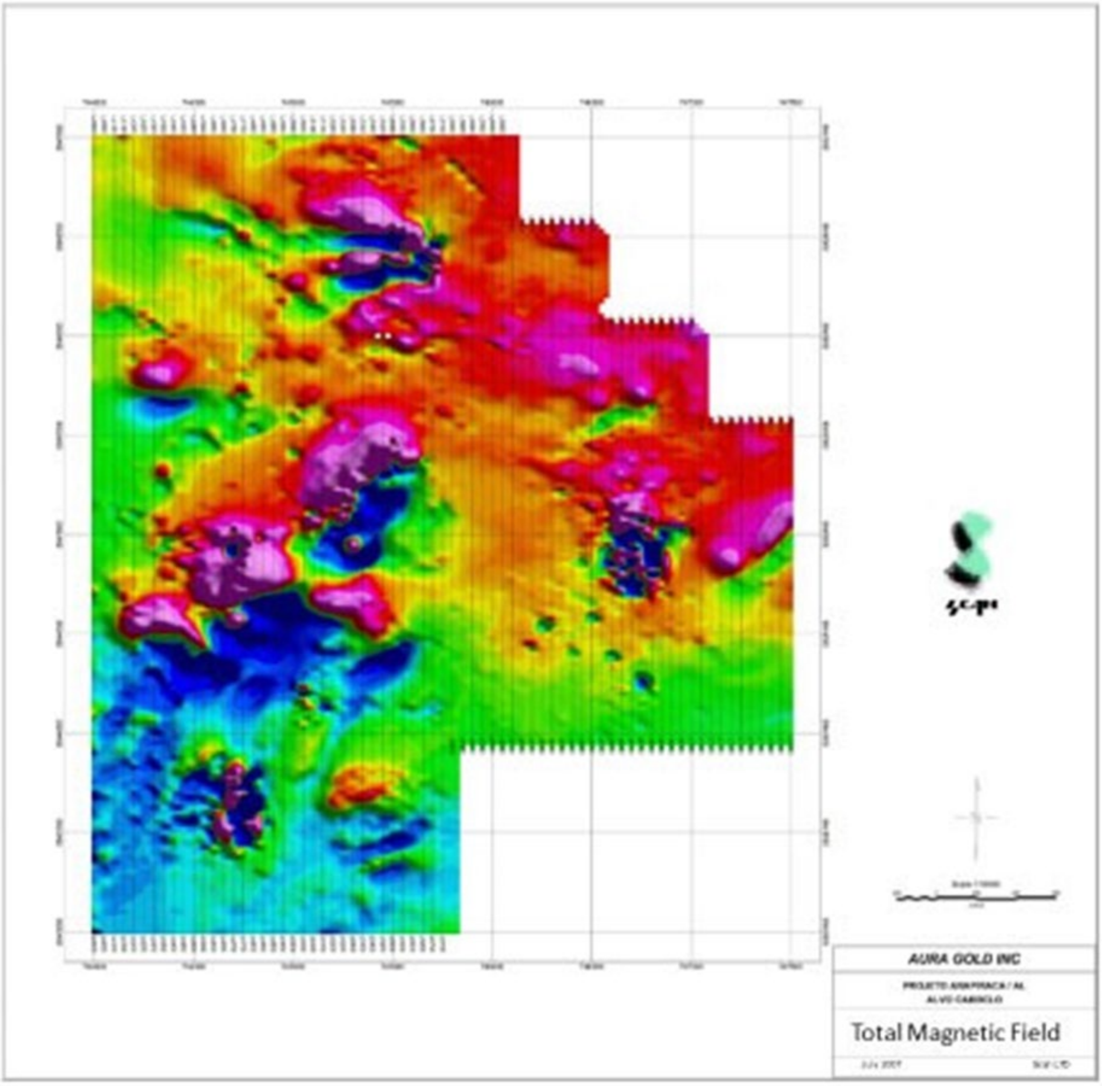
DOCEGEO completed ground magnetic and gravity geophysical surveys during initial reconnaissance and exploration programs; however, there is no information on those programs available.

Aura Minerals completed several detailed (50 m spacing) square grids of ground magnetometer surveys in the Serrote and Caboclo areas (Figure 9-5 and Figure 9-6); there are indications in the record that additional work was done that is not preserved in the current record. One report suggests that Aura Mineral surveyed 477 linear km with a ground magnetometer in the Serrote and Caboclo areas, but the record preserves information for 254 km of ground magnetics (refer to Table 9-1). The defined copper-in-soil anomalies were found to be co-incident with magnetic and gravity highs.



Source: MVV, 2018

Figure 9-5: Serrote Ground Magnetometer Data and DOCEGEO Drill Hole Locations



Source: SCAN, 2007.

Figure 9-6: Aura Minerals Ground Magnetometer Data at Caboclo

9.5 Trenches

Aura Minerals excavated 21 trenches (1,959.73 m; Figure 9-7) on the Serrote deposit to expose rocks for sampling. Trenches were excavated with a backhoe and cleaned by hand to expose bedrock or saprock. The trenches were sited to cross-cut various geological contacts and to allow the measurement and sampling of the mineralized zones on a horizontal plane.

One wall and the floor of each trench were geologically mapped.

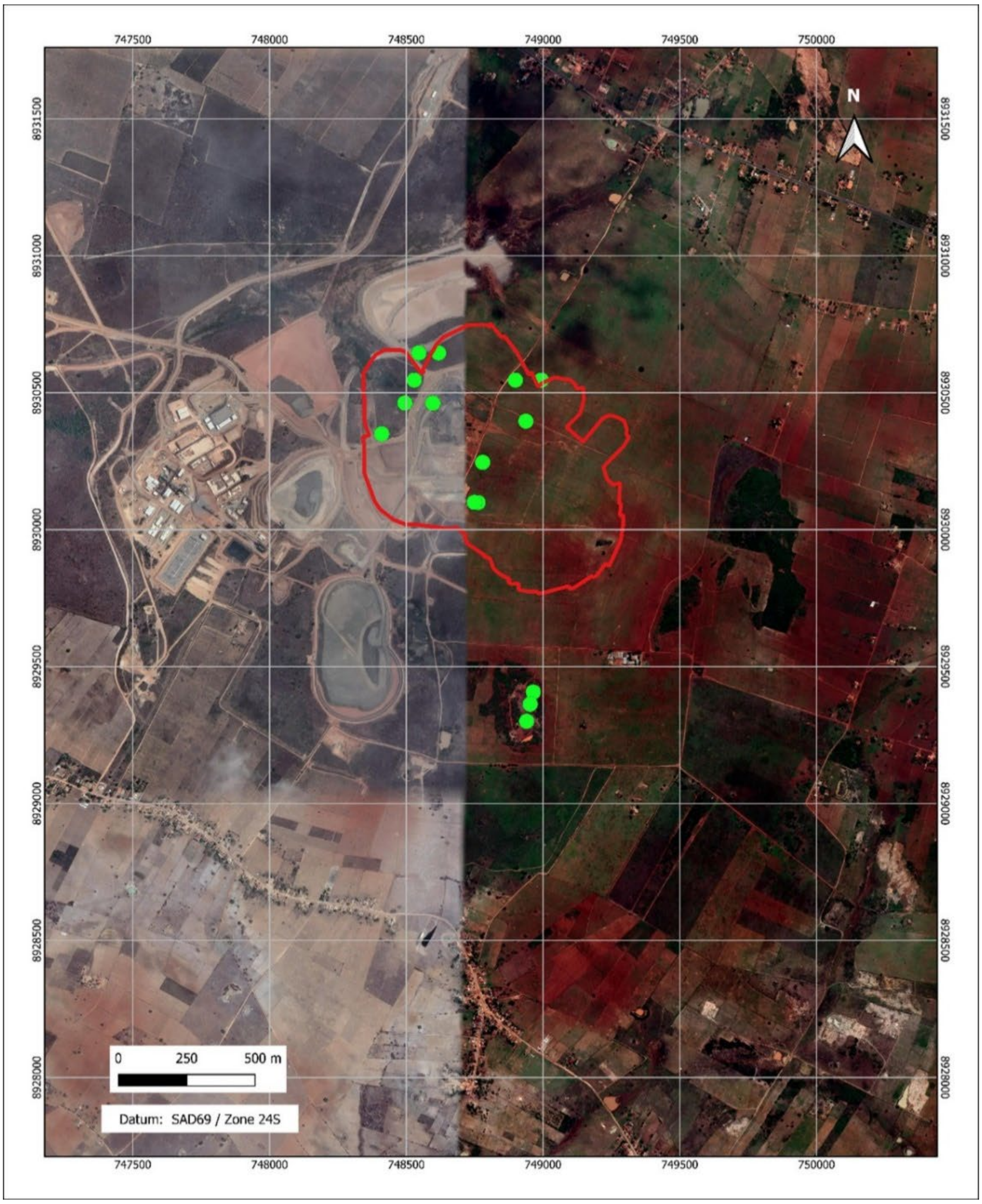
One end of each trench was considered a drill collar and surveyed with a total station instrument. From this point, the trenches were surveyed and marked every meter, and a profile was prepared. In a few cases, trenches were more pit-like, and each sample is identified as a location in the collar database.

Trenches are considered to be horizontal drill holes and are used in the Mineral Resource estimates.

In Caboclo area sampling was carried out on the floor of the trenches, at 2 m intervals, while some samples were taken in vertical channels, to cut the horizontal structures. The walls of the north to northwest quadrant were mapped at 1:200 scale and the floor focused on the structural pattern of rock deformation.

DOCEGEO opened nine trenches with 1,782 channel samples, while Aura Minerals excavated 10 trenches in 2007/2008, totalling 1,620 linear m with 518 floor samples and 75 vertical channel samples.

At Caboclo, a total of 87 trenches and 1,658 m were also executed to check anomalies (Figure 9-8) but data was surveyed with hand-held GPS and cannot be used for mineral resource estimation purposes.



Source: MTS et al., 2021.

Notes: Green circles are trench locations; red outline is the limits of the open pit.

Figure 9-7: Serrote Trench Location Plan

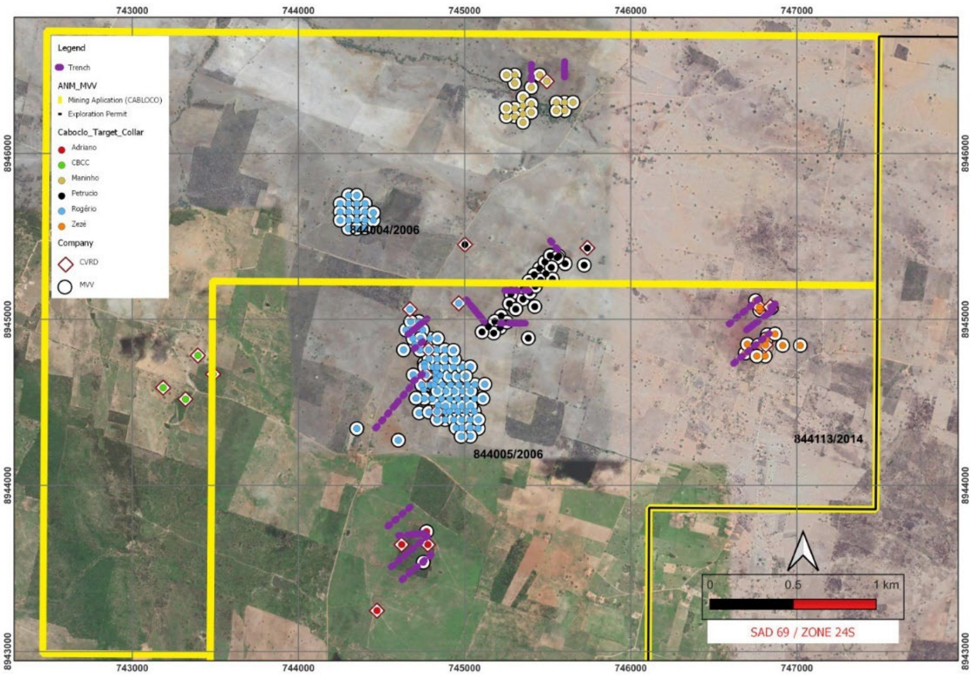


Figure 9-8: Caboclo Trench Location Plan

9.6 Petrology, Mineralogy, and Research Studies

Gaspar (2008) discusses the mineral chemistry of the deposit. Minerals present in products from process assays were analysed by electron microprobe to determine the characterization and nickel contents. The copper distribution in sulphides, silicates and oxides are very important for the understanding of copper recovery. Nickel bearing sulphides were also analysed.

Ferreira (2008) discusses the metallogenetic model of the Serrote deposits and Canedo (2016) submitted an unpublished M.Sc. thesis on the Serrote deposit geology and mineralisation at the University of Brasilia.

To identify the lithotypes at Caboclo target twelve samples from drill core were selected for petrographic analysis. Four samples were selected for reflected light microscopy of sulphide minerals. Petrographic analyses were performed by MOTTA de LAFÕES consulting.

Table 9-2 lists the classification after petrographic analysis.

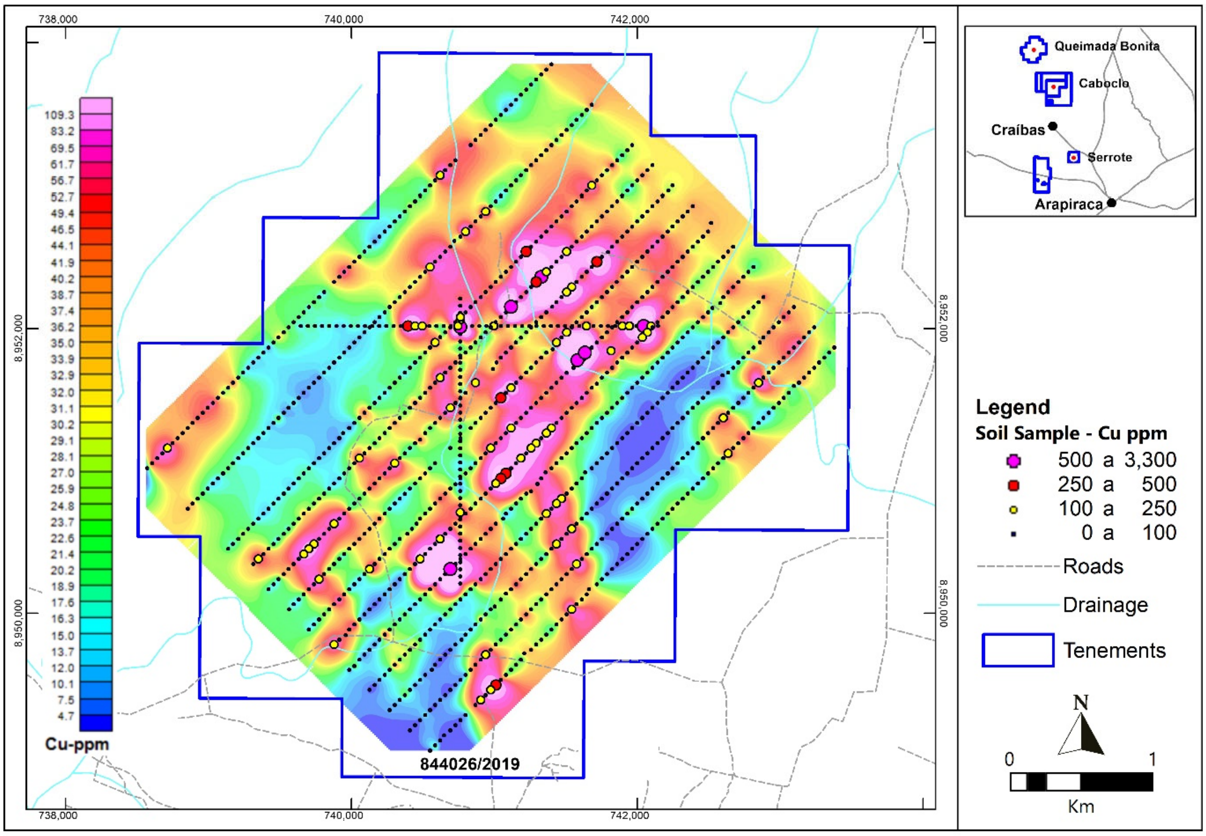
Table 9-2: Summary of Petrographic Samples at Caboclo
ACG Acquisition Company Limited – Serrote Mine

Hole	Sample	From	To	Previous Name	Rock Name Reclassification
CBC-123	CBC-123-01	126.74	126.89	Mano	garnet-plagioclase biotite sulphide schist sheared
CBC-193	CBC-193-01	23.28	23.49	BIT	garnet-plagioclase-cyanite biotite schist shear
CBC-193	CBC-193-02	43.14	43.3	Mano	plagioclase biotite sulphide schist sheared
CBC-193	CBC-193-03	99.59	99.75	QFSG	hornblende-biotite garnet gneiss
CBC-203	CBC-203-01	46.85	47	DBN	garnet-sillimanite-biotite schist
CBC-203	CBC-203-02	140.14	140.3	MGTT/GB	hydrothermalized layered metagabronorite
CBC-203	CBC-203-03	167.19	167.34	QFSG	biotite gneiss with hydrothermalized titanite
CBC-203	CBC-203-04	122.43	122.53	GB	biotite-sillimanite-plagioclase schist sulphide and shear
CBC-208	CBC-208-01	69.9	70.01	GB	hydrothermalized metagabronorite
CBC-208	CBC-208-02	89.51	89.64	MGTT	magnetite in contact with sheared and hydrothermalized metagabbro
CBC-225	CBC-225-01	152.15	152.3	BIT	garnet biotite shear sulphide schist
CBC-227	CBC-227-01	48.89	49	MGTT	magnetite in contact with sheared and hydrothermalized metagabbro

9.7 Exploration Potential

9.7.1 Queimada Bonita

Queimada Bonita is a prospect based on a 2,500 m to 3,000 m long copper–gold–nickel-in-soil anomaly, associated with magnetite–norite–gabbro and amphibolite (Figure 9-9). Gravity and surface magnetometer surveys were completed over the geochemical anomaly. No drilling has been completed to date.



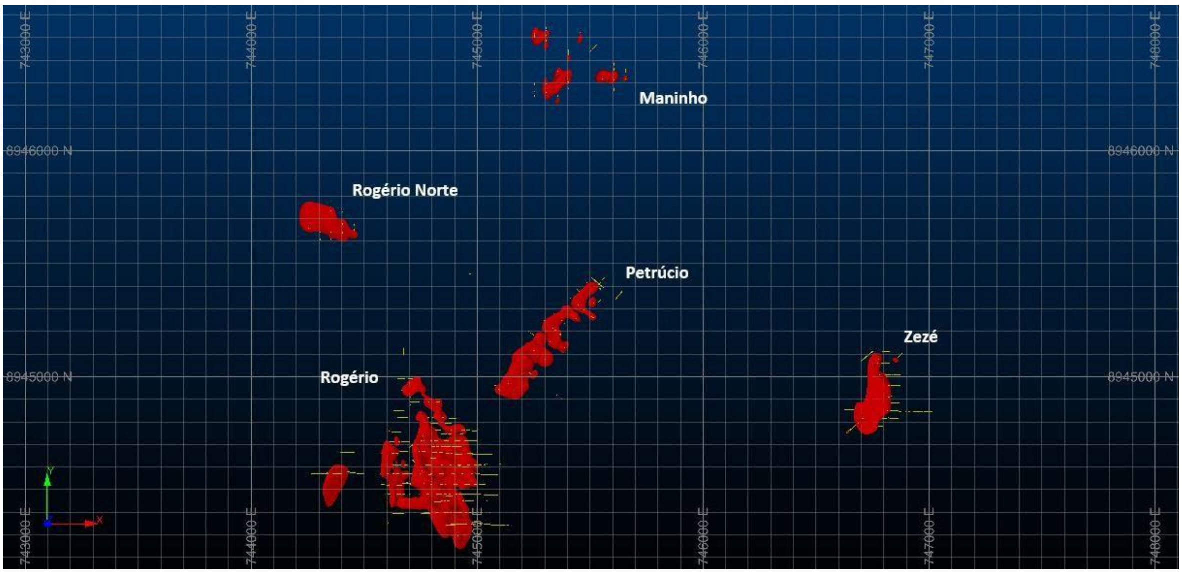
Source: MTS et al., 2021.

Figure 9-9: Queimada Bonita Cu Soil Sample Results

9.7.2 Caboclo

Based on a review of the drilling in the Caboclo mineralized zone, and other exploration work on the property such as geophysical surveys, geological mapping, soil geochemistry, and drill testing of other targets, GeoEstima estimates that the potential tonnage and grade of mineralisation at the Caboclo area could be from 10 Mt to 25 Mt grading from 0.3% Cu to 0.7% Cu, and from 0.1 g/t Au to 0.2 g/t Au. The CP cautions that the potential quantity and grade is conceptual in nature as there has been insufficient exploration to define a Mineral Resource, and it is uncertain if further exploration will result in the target being delineated as a Mineral Resource.

The upper and lower values of the above grade ranges are based on the existing drill hole information, with consideration given from the surrounding areas. The estimated tonnage range is based on the dimensions of the mineralized bodies tested by drilling that have intercepted mineralized bodies distributed in five main targets: Rogério (Rogério and Rogério Norte), Adriano, Petrúcio, Maninho, and Zezé (Figure 9-10).



Source: MVV, 2022.

Notes: Red shows the grade-shell outlines for potential targets.

Figure 9-10: Targets in Caboclo Area for Further Exploration

9.8 CP Comments on "Item 9 – Exploration"

Exploration completed to date is appropriate and has been adapted to the local regolith development. The exploration programs identified the Serrote deposit and Caboclo exploration target; most of the exploration results have been followed up with drilling. The Queimada Bonita prospect has anomalous copper, gold, and nickel values that warrant additional investigation.

10.0 DRILLING

10.1 Introduction

As of December 31, 2022, the Serrote project drill hole database consists of a total of 9,631 drill holes totalling 207,231 m drilled, including RC, DDH, bast holes, auger, penetration and geotechnical holes (mixed), and piezometers. In addition, 21 trenches (1,960 m) were opened and properly surveyed to support mineral resource estimation.

Three companies completed drill campaigns at Serrote and Caboclo (DOCEGEO, Aura Minerals, and MVV) in the following years:

- DOCEGEO (1986–2007)
- Aura Minerals (2007–2018)
- MVV (2018– December 31, 2022)

Drilling at both Serrote and Caboclo is summarized in Table 10-1 and Table 10-2, and the drill collars are shown in Figure 10-1 (Serrote) and Figure 10-2 (Caboclo). Drilling included core, reverse circulation (RC), and auger methods.

The Serrote Mineral Resource estimates are supported by approximately 701 core and RC drill holes and trenches (97,467.3 m) with a data cut-off date of May 10, 2021. Since this data cut-off date, an additional 214 drill holes have been completed in the Serrote area.

A selection of the core holes completed by Aura Minerals was used to generate a metallurgical composite for metallurgical testwork as shown in Figure 10-3.

Table 10-1: Serrote Drill Hole Summary as of December 31, 2022
ACG Acquisition Company Limited – Serrote Mine

Year	Operator	Drilling Company	Drill Type	Number of Drill Holes	Metreage (m)
pre-1985	DOCEGEO	DOCEGEO	Mixed	61	306.7
1985	DOCEGEO	DOCEGEO	Core	11	2,081.44
	DOCEGEO	GEOSOL	Core	26	6,423.43
1999	DOCEGEO	GEOSOL	Core	11	1,301.15
2000	DOCEGEO	GEOSERV	Core	13	3,272.05
2001	DOCEGEO	GEOSOL	Core	28	3,821.04
2007	Aura Minerals	GEOSOL	Core	104	18,334.38
2008	Aura Minerals	GEOSOL	Core	162	39,810.16
	Aura Minerals	VOG	Core	8	1,238.24
	Aura Minerals	VOG	Mixed	57	696.41
	Aura Minerals	GEOSEDNA	RC	66	9,105.00
	Aura Minerals	MVV	Trench	18	1,817.83
	Aura Minerals	GEOAKT	Mixed	9	8.95
	Aura Minerals	GEOAKT	Piezometer	5	8.7
2009	Aura Minerals	MVV	Auger	20	42.1

Year	Operator	Drilling Company	Drill Type	Number of Drill Holes	Metreage (m)
	Aura Minerals	GEOSOL	Core	22	3,695.62
	Aura Minerals	MVV	Trench	3	141.9
2010	Aura Minerals	GEOSOL	Core	7	1,546.55
2011	Aura Minerals	MVV	Auger	30	92.5
2018	MVV	GEOAGRO	Core	8	1,375.75
2019	MVV	SERVITEC	RC	252	10,242.00
	MVV	GEOAGRO	Core	21	825.05
2020	MVV	FAGUNDES	RC	644	11,941.00
2021	MVV	FAGUNDES	RC	3,984	34,796.64
	MVV	FAGUNDES	RC	3,800	38,139.48
2022	MVV	SERVITEC	RC	237	8,919.00
	MVV	GEOSOL	Core	24	7,247.90
			Total Serrote	**9,631**	**207,230.97**

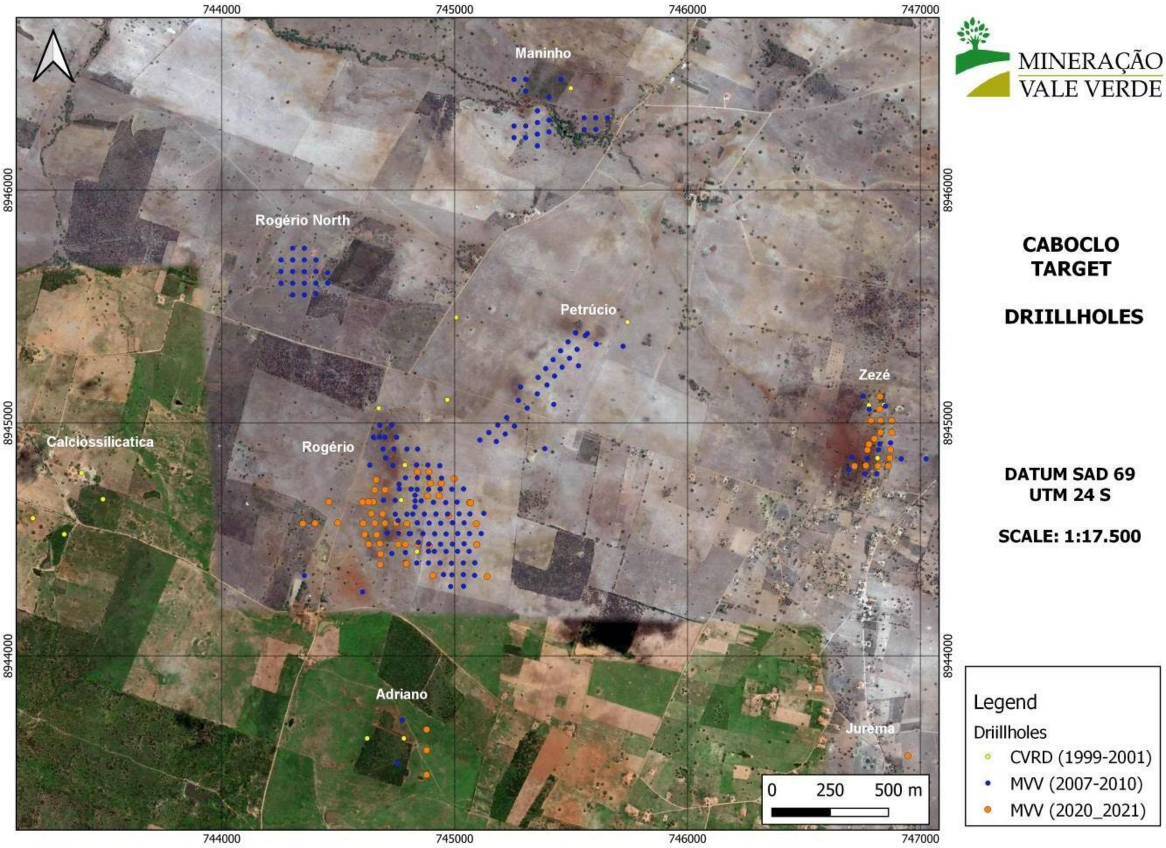
Note: Mixed = mixed drilling (penetration and core geotechnical hole)

Table 10-2: Caboclo Drill Hole Summary as of December 31, 2022
ACG Acquisition Company Limited – Serrote Mine

Area	Year	Operator	Drill Type	Number of Drill Holes	Metreage (m)
Adriano	2001	DOCEGEO	Core	3	374.12
	2007	Aura Minerals	Core	2	347.44
	2007	Aura Minerals	Trench	1	155.1
Maninho	2001	DOCEGEO	Core	1	159.9
	2007	Aura Minerals	Core	5	709.59
		Aura Minerals	Trench	6	224.6
	2008	Aura Minerals	Trench	15	9.9
	2010	Aura Minerals	Core	15	1,625.27
Petrúcio	2000	DOCEGEO	Core	1	97.95
	2001	DOCEGEO	Core	1	149.4
	2007	Aura Minerals	Core	4	577.24
	2007	Aura Minerals	Trench	2	375.85
	2008	Aura Minerals	Core	1	162.63
		Aura Minerals	Trench	16	161.3
	2010	Aura Minerals	Core	26	3,301.77
Rogério	2000	DOCEGEO	Core	2	195.8
	2001	DOCEGEO	Core	3	442.7
	2007	Aura Minerals	Core	8	1,338.06
		Aura Minerals	Trench	2	151.5
	2008	Aura Minerals	Core	20	2,667.66
		Aura Minerals	Trench	28	369.3
	2009	Aura Minerals	Core	29	4,358.05
	2010	Aura Minerals	Core	51	8,067.23
	2020	MVV	Core	31	4,046.80
	2021	MVV	Core	15	1812.41
Zezé	1999	DOCEGEO	Core	2	188.5
	2001	DOCEGEO	Core	1	122.85
	2007	Aura Minerals	Core	4	614.07
		Aura Minerals	Trench	5	36.21
	2008	Aura Minerals	Core	9	1,181.63
		Aura Minerals	Trench	12	208.7
	2021	MVV	Core	16	1311.51
Calcossilicática W	2001	DOCEGEO	Core	4	617.95
Exploration	2020	MVV	Core	1	168.45
			Total Caboclo	**342**	**36,331.44**

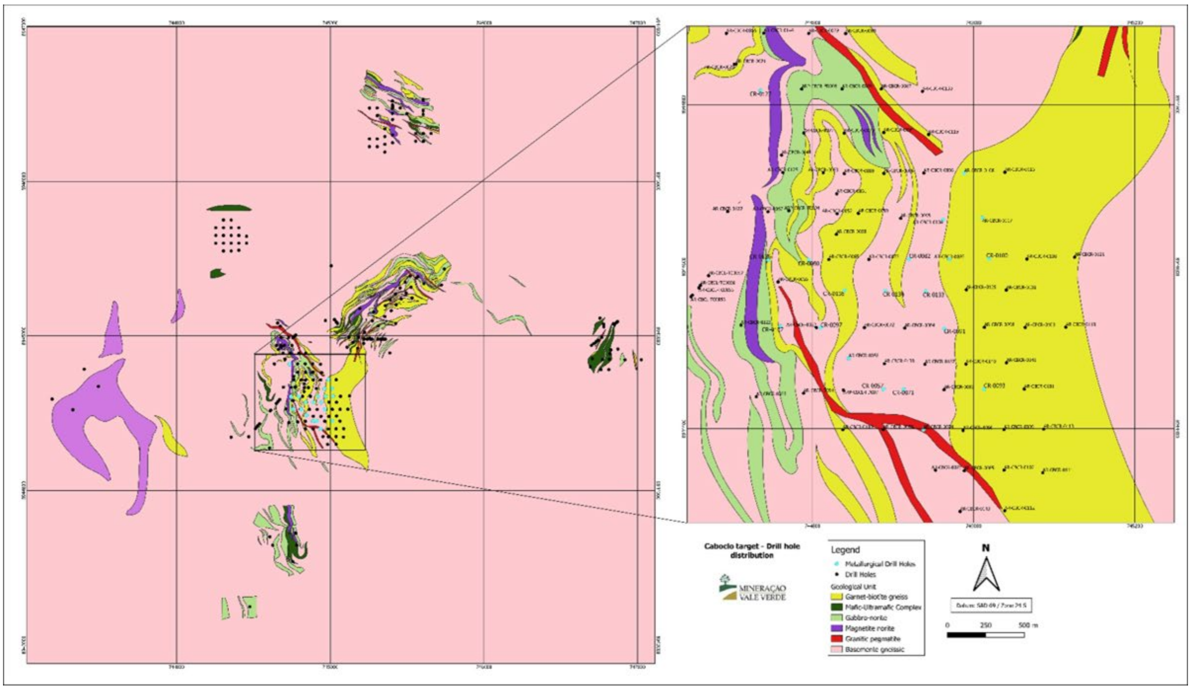
Source: MVV, 2022.

Figure 10-1: Serrote Drill Collar Location Plan



Source: MVV, 2022.

Figure 10-2: Caboclo Drill Hole Location Map



Source: MTS et al., 2021.

Notes: No drill holes on this figure were completed by MVV.

Figure 10-3: Drilling Supporting Caboclo Metallurgical Testwork

10.2 Drill Methods

10.2.1 DOCEGEO

There is no information on the drill rig types or operators for the early drilling at Serrote and Caboclo performed by DOCEGO. DOCEGEO used BQ (46.1 mm core diameter) and NQ (60.3 mm) diamond-tipped core tools. The database indicates that DOCEGEO used Geosol Geologia e Sondagens Ltda. (Geosol) and GEOSERV as drilling contractors as well as their own drills and drillers (RIODOCE), but that is unverified. No drill equipment details are in the database.

10.2.2 Aura Minerals

All core drilling completed by Aura Minerals at the Serrote deposit and Caboclo exploration target was done by Geosol Geologia e Sondagens Ltda. (Geosol) based in Belo Horizonte. Geosol used modified JKS Boyes 1500 drill rigs mounted on skids and moved by trucks with Munck lifts. As many as five rigs were used simultaneously. Aura Minerals used HQ (77.8 mm) and NQ diameter diamond tipped core tools.

RC drilling was performed by Geosedna Perfurações Especiais Ltda. (Geosedna) from Belo Horizonte, using a truck-mounted INGERSOL RAND rig, model TH 10 LM, equipped with a 900 CFM x 350 PSI compressor and drills 4½" to 5 1/5" diameter holes with tricone bits and/or downhole pneumatic hammers.

Trenches at Serrote and Caboclo were excavated using track-mounted excavators.

10.2.3 MVV

The core drilling contractors were Geo-Agro using skid-mounted Longyear 44-type drills with H-sized core (63.5 mm), reduced to N-size (47.6 mm) when necessary and Geosol using skid-mounted Mach 1200 type drills using HQ-size (63.5 mm) until 200 m depth and reduced to NQ-size (47.6 mm) to the end of the hole. Table 10-3 summarises the previous contractors used in Serrote drilling activities.

RC drilling was completed by Servitec-Foraco using Atlas Copco Explorac 50 drills and 150 mm drill bits. Grade control used a Sandvik DX800 (Direct circulation) blasthole drill with a pattern of 6.5 x 12.5 m, with a 3" bit. Grade control drill holes are typically no deeper than 20 m.

Table 10-3: Drill Contractor Summary Table
ACG Acquisition Company Limited – Serrote Mine

Year	Drilling Company	Number of Drill Holes	Metreage (m)
pre-1985	DOCEGEO	61	306.7
1985	DOCEGEO	11	2081.44
1985	GEOSOL	26	6423.43
1999	DOCEGEO	2	188.5
1999	GEOSOL	11	1,301.15
2000	GEOSERV	16	3,565.8
2007	GEOSOL	127	21,920.78
2007	MVV	16	943.85
2008	GEOSOL	192	43,822.08
2008	MVV	84	2,566.44

Year	Drilling Company	Number of Drill Holes	Metreage (m)
2008	GEOAKT	19	17.65
2008	GEOSEDNA	66	9,105
2008	VOG	65	1,934.65
2009	GEOSOL	51	8,053.67
2009	MVV	23	184
2010	GEOSOL	99	14,540.82
2011	MVV	30	92.5
2018	GEOAGRO	8	1,375.75
2019	GEOAGRO	21	825.05
2019	SERVITEC	252	10,242
2020	FAGUNDES	644	11,941
2020	SERVIDRILL	32	4,215.25
2021	FAGUNDES	3,984	34,796.64
2021	SERVIDRILL	3	471.6
2021	SIGMA	28	2,652.32
2021	GEOSOL	41	5,687.96
2022	FAGUNDES	3,800	38,139.48
2022	SERVITEC	237	8,919
2022	GEOSOL	24	7,247.9
	TOTAL	**9,973**	**243,562**

10.3 Logging Procedures

10.3.1 DOCEGEO

During the DOCEGEO campaigns, core was put in boxes, labelled, logged and the core recovery noted; however, there is no record of the procedures followed. Existing logs consist of descriptions of lithology, colour, grain size, rock hardness, structures, oxide and sulphide percentages, and oxidation state. Those data were captured in the current database.

No rock quality designation (RQD) measurements were taken, nor was the core photographed during these campaigns.

10.3.2 Aura Minerals

Aura Minerals drilling protocols required a geological technician on site during drilling operations to note any problems, perform rod counts, measure core recoveries in real time, and ensure that metal tags were inserted and properly labelled after each drill run. Boxes of drill core were delivered to the core handling/logging facility on a daily basis. Magnetic susceptibility measurements (three discreet measurements per metre and averaged) and geotechnical and geological logging were then completed.

Core was cleaned and geotechnical logs prepared that included recovery, joint density and fill, and RQD. After geotechnical logging, core was logged for lithology, alteration, oxidation state, structure and mineralisation. After geotechnical and geological logging were complete, the core was photographed with the marked samples and cut line. Geologists were responsible for logging and marking samples and applying the cut lines to be followed by the core-cutting technicians.

Samples were selected for density determinations after being photographed. After density was determined, the material was returned to the core box and became part of the sample. The core was then sent to be split with a rock saw.

RC cuttings were logged using a binocular microscope. Lithology, alteration, oxidation state and mineralisation were routinely logged.

10.3.3 MVV

Core logging is covered by a number of standard operating procedures dating from 2008 that discuss requirements for photography and lithological and geotechnical logging. Lithology, structure, texture, grain size, alteration, types and amounts of mineralisation, base of oxidation, and structural measurements on oriented core are covered by the standard operating procedures. These standard operating procedures also describe sampling and QC measures for analysis.

After the core boxes were checked for accuracy, geologists recorded the geological log directly on a palmtop. Two worksheets (lithological description and structural description) were filled in using drop down menus so that the possibility of extraneous data was very small. Lithological intervals were limited to a minimum of 1 m.

Representative RC cuttings were placed in tray boxes and logged for lithology, mineralogy, alteration, and oxidation state.

10.4 Recovery

10.4.1 DOCEGEO

Core recovery at Serrote and Caboclo was reported to be generally excellent (+95%) in the DOCEGEO programs; however, those data are not in the current database.

10.4.2 Aura Minerals

From 2007 to 2010 Aura Minerals drilling programs reported as average core recovery of 97.8%.

10.4.3 MVV

The holes drilled by MVV in Serrote area do not present recovery information, both for DDH and RC.

The DDH holes drilled by MVV in Serrote area in 2022 shows an average recovery of 99% and RC drilling 79%.

For Caboclo area, from 2020 to 2021, it was reported an average of 93% of recovery for all drillholes.

10.5 Collar Surveys

10.5.1 DOCEGEO

There is no record of how DOCEGEO collar surveys were performed.

10.5.2 Aura Minerals

Core and RC collars at both Serrote and Caboclo were initially spotted by a surveyor and located in local grid coordinates. Final collar surveys were performed with total station instruments using UTM Zone 24S coordinates based on the SAD69 datum.

Trench locations were surveyed with total station instruments using UTM Zone 24S coordinates based on the SAD69 datum.

10.5.3 MVV

MVV surveyed collars with a differential GPS (DGPS) using a base and roving station. The South American Datum, 1969 – IBGE – Brasil (SAD 69; UTM Zone 24S coordinates) was used for the horizontal datum. The vertical datum was Marégrafo de IMBITUBA-SC. Particulars of the instrumentation are not recorded in the geological data.

10.6 Downhole Surveys

10.6.1 DOCEGEO

The record indicates that the DOCEGEO holes had no downhole surveys. Most holes at Serrote were vertical; however, 11 of the 89 core holes recorded in the database had inclinations of -80o to -65o. Those with <100 m depth are unlikely to have deviated significantly; however, there are a number of holes in the 150 m to 410 m range that should have restricted use. Any block that relies more than 50% on holes more than 150 m deep should be restricted to Inferred Mineral Resources at best.

At Caboclo, DOCEGEO drilled 18 holes, 16 of which were angled at -60o to -70o and two of which were vertical holes. No downhole surveys were performed. Six of those holes were <100 m in length and unlikely to have been subject to significant deviations. The holes longer than 100 m should be used with caution as they may deviate significantly and should have restricted use. Any block that relies more than 50% on holes more than 150 m deep should be restricted to Inferred Mineral Resources at best.

10.6.2 Aura Minerals

At Serrote, vertical drill holes and a small number of angle holes deeper than 300 m were surveyed using a gyroscopic instrument, with readings every 4 m or 30 m down-hole depending on the instrument. Most inclined holes were surveyed using a Maxibor instrument, which provides azimuth and dip measurements every 3 m; however, some Maxibor data are on 4 m centres. Some vertical and inclined holes were surveyed using a Reviflex instrument on 4 m stations. Deviations are fairly constant and rarely vary more than a few degrees over the length of the drill hole.

Few holes less than 300 m deep were downhole surveyed. Blocks in the block model that rely more than 50% on the results of assays more than 100 m deep without downhole surveys should be restricted to Inferred Mineral Resources because deviation is not known and can be significant.

No downhole surveys were performed at Caboclo. Blocks relying on samples more than 100 m downhole should be restricted to Inferred Mineral Resources.

10.6.3 MVV

Core holes drilled to collect metallurgical samples were surveyed with a Maxibor on 3 m intervals. Downhole surveys were not performed on RC holes whose average depth is about 40 m, and none were needed as deviations are unlikely to be material to Mineral Resource estimation.

The downhole surveys for exploration drill holes were completed by MVV using a non-magnetic down hole equipment to measure the deviation of the GYRO PATH and was performed by DipCore on 3-m intervals.

For 2022 drilling program, the downhole survey was done using a Reflex Gyro north seeker equipment.

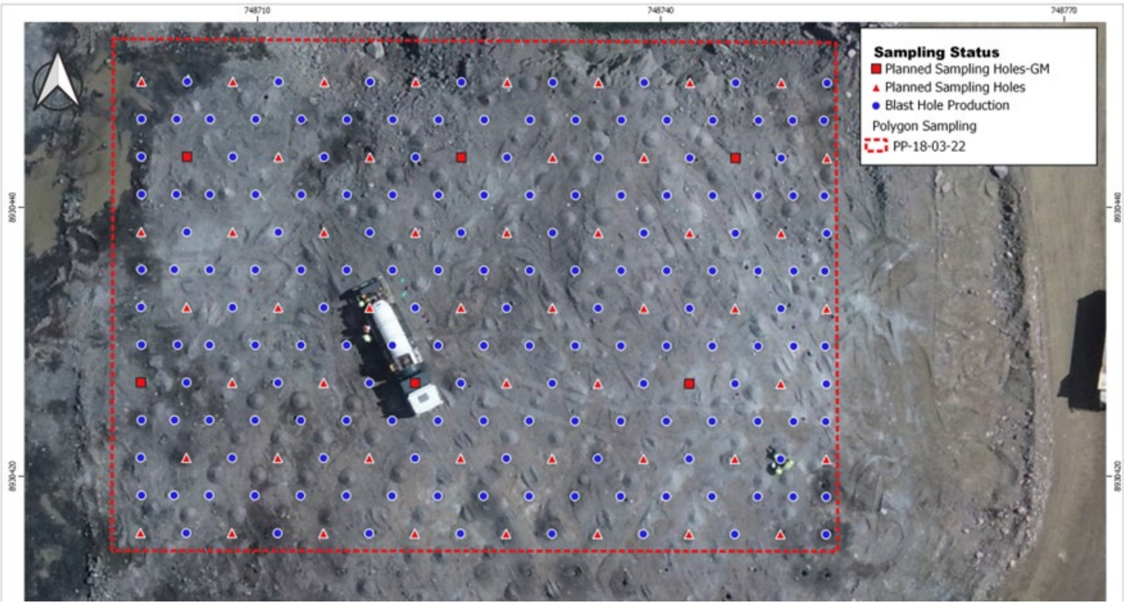
10.7 Grade Control

MVV uses blast holes for grade control and the drilling is performed by MVV personnel. The collars are surveyed by MVV staff (Figure 10-4).

The blast hole grid is approximately 5 m by 6 m and the blast hole depths average 10 m. Sample length intervals are controlled by lithology.

The holes sampled are sent to the internal laboratory in batches containing blast hole and control samples. All samples are logged, and the information is inserted into the geological database used in the short-term model.

The short-term geological model is updated weekly with the new blast hole information. Polygon grades are estimated using all available blasthole data and the core and RC data and then classified according to grade ranges to facilitate the ore blending to feed the plant.



Source: MVV, 2022.

Figure 10-4: Example of Blast Hole Sampling for Grade Control Purposes

10.8 Sample Length/True Thickness

Figure 7-3 shows the relationship between drill holes and mineralisation at Serrote. For the most part, the mineralisation is intersected at about 90º with some intersections at 70º. The 70º intersections produce a true thickness that is 94% of the drilled intercept, thus, true thickness is not considered to be a concern at Serrote.

10.9 CP Comments on "Item 10: Drilling"

In the opinion of the CP, the quantity and quality of the logged geological data, collar, and downhole survey data collected in the exploration and infill drill programs are sufficient to support Mineral Resource and Mineral Reserve estimation and mine planning at Serrote:

- Core and RC logging meets industry standards for nickel–copper–gold exploration.
- Collar survey methods for the DOCEGEO drill programs was not recorded. Collar surveys for the Aura Minerals and MVV programs were performed using industry standard instrumentation.
- Downhole surveys were not performed for the DOCEGEO drilling. The actual location of the drill hole traces below approximately 150 m deep is less certain.
- Downhole surveys for the Aura Minerals programs were performed using industry standard instrumentation; however, many 100 m to 300 m deep holes were not surveyed.
- MVV downhole surveys were performed using industry standard instrumentation.
- Recovery data from core programs are acceptable, however it is recommended to record the information collect for new core in the database.
- Drill orientations are generally appropriate for the mineralisation style and the orientation of mineralisation for most of the deposit area.
- Drilling was completed at regularly spaced intervals over the mineralisation and is considered representative of the deposits.

11.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

11.1 Sampling Methods

11.1.1 DOCEGEO

During the DOCEGEO programs, core samples were generally collected at 1 m intervals honouring lithology contacts. Core intervals were clearly marked on the core boxes. Core was sawn in half and half was put into bags and labelled for shipment to the analytical laboratory, which was either the DOCEGEO laboratory in Araci, Bahia or to Santa Luzia, Minas Gerais.

11.1.2 Aura Minerals

Mineralized intervals in trenches were sampled every metre using a diamond saw to cut both edges of the sample, collecting an average of 2 kg of material per meter by removing material between saw cuts with a chisel. Non-mineralized rocks were sampled every 3 m. Care was taken to avoid sample contamination by carefully cleaning the trench walls and floors before sampling. An attempt was made to make the trench sampling as similar to the drill hole sampling as possible.

RC samples were quartered using a Jones splitter and collected every metre.

Core sample intervals were marked and tagged by the geologist during the geological logging procedure. Sample intervals honoured lithological breaks and were a nominal 1 m long with a minimum of 0.5 m and a maximum of 1.5 m.

11.1.3 MVV

11.1.3.1 RC

MVV began sampling RC cuttings were split at the drill and bagged. The final sample shipped to the laboratory was approximately 5 kg.

11.1.3.2 Core

Core sample intervals were marked and tagged by the geologist during the geological logging procedure. Samples were marked at intervals of two metres for non-mineralised core and one metre for mineralised core. The drill core was cut into halves using a diamond saw, and half of the core samples were collected from the right side of the core and sealed into labelled plastic bags.

11.1.3.3 Production Sampling

One in four blast holes were sampled.

11.2 Density Determinations

The database used for mineral resources estimation contains 45,749 density determinations; 4,834 performed by DOCEGEO and 40,915 performed by Aura Minerals. Figure 11-1 summarizes the results.

With the exception of possibly 10 outlier data, all of the data are reasonable and within the range acceptable for this type of mineralisation and weathering conditions.

11.2.1 DOCEGEO

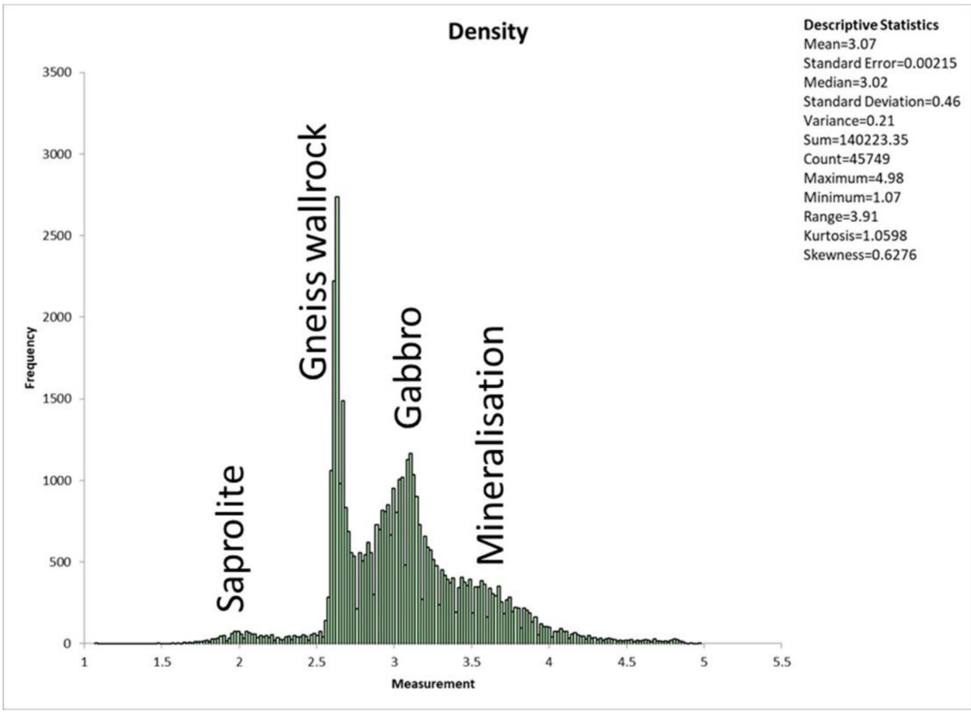
Data in the database indicates that DOCEGEO used an immersion method similar to that used by Aura Minerals to determine density, but the method is not documented. The samples were weighed in air and again while suspended in water. It is unlikely that the samples were dried prior to weighing.

11.2.2 Aura Minerals

After the core is photographed, hand-length samples were removed from the core boxes and measured for density by the Archimedes method where 10–15 cm-long specimens (average 800 g) of dry, unfragmented whole core were weighed on a ±5 g balance and reweighed while suspended in a bath of water. For saprolite and weathered rock, samples were wrapped in cellophane before weighing. In this case, no drying was done so that wet density was measured. In waste rock, density determinations were made every metre and in mineralized intervals determinations were made on average every 10–20 cm. Once completed, the density specimens are returned to their proper location in the core boxes and the entire core is sent to be cut by a rock saw.

11.2.3 MVV

MVV has procedures in place that are much the same as the Aura Minerals procedures outlined in Section 11.2.2.



Source: MTS et al., 2021.

Figure 11-1: Serrote Density Histogram

11.3 Sample Security

Core boxes are transported every day to the core shed by personnel from the drilling company. Analytical samples are transported by company or laboratory personnel using corporately owned vehicles. Core boxes and samples are stored in safe, controlled areas.

Chain-of-custody procedures are followed whenever samples are moved between locations, to and from the laboratory, by filling out sample submittal forms.

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

11.4 Analytical and Test Laboratories

11.4.1 DOCEGEO

DOCEGEO samples were sent to DOCEGEO laboratories in Araci, Bahia or Santa Luzia, Minas Gerais. The Araci laboratory largely supported operations at the Fazenda Brasileiro mine near Araci. The Santa Luzia laboratory was CVRD's central analytical laboratory and metallurgical testwork facility. These laboratories were not independent of DOCEGEO. Neither of the laboratories were accredited at the time they were used for Serrote samples.

11.4.2 Aura Minerals

Drill samples were prepared in an SGS-Geosol (SGS) sample preparation facility either on site or at the laboratory in Belo Horizonte, Brazil (SGS Belo Horizonte). Drill samples were analysed at SGS. Trench samples were prepared and analysed at ALS Chemex in Belo Horizonte (ALS). ALS also analysed duplicate and check samples.

Both SGS Belo Horizonte and ALS were ISO 17025 certified for analytical methods, but it is not known if that certification extended through the entire exploration period. Assay certificates indicate that in 2007–2009, SGS Belo Horizonte was ISO 9001:2000 and ISO 14001:2004 (ABS 32982 and ABS 39911) accredited.

The onsite sample preparation facility managed by SGS was not accredited at the time it operated. In 2007–2009, SGS Belo Horizonte was ISO 9001:2000 and ISO 14001:2004 (ABS 32982 and ABS 39911) accredited. Accreditation of sample preparation facilities at SGS Belo Horizonte and ALS in the 2002–2011 time period is not known.

SGS and ALS were independent of Aura Minerals and are independent of MVV.

11.4.3 MVV

RC samples were prepared and analysed at SGS in Vespasiano, Minas Gerais, Brazil (SGS Vespasiano). Core samples were prepared at SGS Vespasiano. SGS is ISO 9001:2015 and ISO 14001:2015 accredited and is independent of MVV.

Grade control samples were prepared in the on-site sample preparation facility operated by SGS and analysed at SGS Vespasiano.

11.5 Sample Preparation and Analysis

11.5.1 DOCEGEO

Sample preparation, analysis and security protocols used by DOCEGEO are not known. Samples were crushed and pulverized, but the details are not recorded.

The Araci laboratory analysed copper by atomic absorption (AA) after hot aqua regia digestion. Gold was determined initially by AA after concentration of gold from the aqua regia solution using methyl-isobutyl-ketone (MIBK). Later, during the initial drilling campaign, these samples were re- analysed for gold by fire assay.

The Santa Luzia laboratory analysed gold by fire assay and copper by AA after "strong" acid digestion. The nature of the acid is not recorded.

No external QA/QC protocols are recorded for these analytical programs.

11.5.2 Aura Minerals

Sample preparation was performed at SGS Belo Horizonte until 22 October 2007. From 2007 to 2011 an on-site sample preparation laboratory, independently operated and managed by SGS, was in continuous operation during the drilling and sampling programs.

The sample preparation protocol was the same in both locations. Samples were:

- Crushed to >95% passing 2 mm in a jaw crusher;
- Split in a Jones-type riffle splitter;
- Approximately 1 kg was pulverized in a ring and puck pulverizer to >95% passing 150 mesh (106 µm).

Most samples sent to ALS were pulps for check assaying prepared at SGS. Some samples, trench samples, for example, required preparation. The sample preparation procedure was as follows:

- Sample log-in and drying;
- Crush to 70% passing 2 mm;
- Split 1,000 g sample for assay;
- Pulverize to 85% passing 75 µm (200 mesh).

RC samples were quartered with a riffle splitter and collected every metre. Three-metre composites were sent for assay and samples returning with values >0.10% Cu were re-assayed on a metre-by-metre basis.

Aura Minerals samples were subject to several analytical procedures.

All samples went through a four-acid digestion followed by inductively-coupled plasma atomic emission spectroscopy (ICP–AES) analysis. A total of 35 elements were reported by the laboratory including copper, iron and nickel. Samples were also analysed for copper by AA following a four-acid digestion.

Prior to late October 2007 samples with >0.20% Cu were re-analysed for copper by AA; however, after that time, all samples were re-analysed using this method, including samples from the DOCEGEO programs.

Analytical procedures used by SGS are summarized in Table 11-1.

Iron in samples with more than 40% Fe was determined by lithium tetraborate fusion followed by X-ray fluorescence spectrometry (XRF). Approximately one-third of the samples were subjected to this procedure. In February 2008, the cut-off for XRF analysis was lowered to 20% Fe.

Gold, palladium and platinum were determined by 50 g fire assay (FD50) followed by an aqua regia digestion and ICP finish. Originally, only gold was determined (FA50), and an AA finish was used; however, this method cannot provide determinations for either palladium or platinum, and was changed in mid-August 2007.

Samples containing significant iron were analysed by Satmagan, which determines the concentration of magnetite in a sample.

Approximately one sample in 40 was submitted to ALS for check assaying. ALS used essentially the same analytical procedures as were used by SGS.

Table 11-1: Analytical Procedures, SGS – Aura Minerals
ACG Acquisition Company Limited – Serrote Mine

Laboratory Code	Description	Elements	Lower Detection Limit
ICP34As	Determination of 35 elements by four-acid digestion ICP	Ag, Ba, Be, Cd, Cr, Cu, Li, Mo, Ni, Sr, Zn, Zr, Y2.	3 ppm
		Sc	5 ppm
		Co, Pb, V	8 ppm
		As, Sb	10 ppm
		Bi, La, Se, Sn, Th, Tl, U, W	20 ppm
		Al, Ca, Fe, K, Mg, Mn, Na, P, Ti	0.01%
AuPP50	Determination of Au, Pt and Pd by FAA ICP (50 g charge)	Au, Pt, Pd	5 ppb
gAATM	Determination of Cu by four-acid digestion AA	Cu	2 ppm
gXMR	Determination of Fe2O3 by XRF (lithium tetraborate fusion)	Fe_2O_3 (if Fe (ICP) >20%	0.01%

Note: FAA = fire assay; XRF = X-ray fluorescence spectrometry.

11.5.3 MVV

Core, RC, and grade control samples were prepared at SGS. Samples were dried, crushed to 75% passing 3 mm, homogenized, split to 250–300 g in a riffle splitter, and pulverized to 95% passing 150 mesh.

The samples from core, RC and grade control collected by MVV were analysed at SGS using several procedures, which are summarized in Table 11-2.

For Diamond drilling, part of the samples were prepared and analysed by SGS Belo Horizonte (2022), an independent laboratory. The 2020-2021 and drilling program was prepared by ALS Brazil at Vespasiano, Minas Gerais facility, and analysed by ALS Chemex at Peru, Lima.

The SGS preparation protocol consists of drying the received samples, crushing up to 75% passing 3 mm, homogenising, and splitter in a riffle splitter, and pulverising up to 95% passing 150 mesh (106 µm).

The SGS analytical protocols comprise the AAS41B, CSA17v, FA323, GOSQL and ICP40B methods. Under ASS finish the AAS41B and use the four-acid digestion. The CSA17v is the LECO method. The FA323 method uses the Fire Assay followed by AAS. The GOSQL method uses the H2SO4, NaCN and four-acid followed by an AAS finish. The ICP40B method use four-acid digestion and ICP-OES finish.

Table 11-2: Analytical Procedures, SGS – MVV
ACG Acquisition Company Limited – Serrote Mine

Method	Digestion	Finish	Charge	Element	LDL	UDL	Units
AAS41B	4-acid	AAS	0.25 g	Cu	0.001	30	%
				Fe	0.01	30	%
CSA17v	LECO		0.2 g	S	0.01	10	%
FA323	Fire assay	AAS	30 g	-	0.02	10,000	ppm
GOSQL	H_2SO_4	AAS	-	Cu-Sul	0.002	-	%
	NaCN	AAS	-	Cu-CN	0.002	-	%
	4-acid	AAS	-	Cu-RES	0.002	-	%
ICP40B	4-acid	ICP-OES	0.25 g	Ag	3	100	ppm
				Cu	3	10,000	ppm
				Fe	0.01	15	%
				Ni	3	10,000	ppm

Note: LDL = lower detection limit; UDL = upper detection limit; Cu-sul = copper sulphide; Cu-CN = cyanide soluble copper, Cu-RES = residual copper. AAS = atomic absorption spectroscopy; ICP-OES = inductively coupled plasma optical emission spectroscopy.

11.6 Quality Assurance and Quality Control – Serrote

11.6.1 DOCEGEO

Quality control measures for the DOCEGEO analytical programs are not documented.

11.6.2 Aura Minerals

This section has mostly been taken from MVV (2021) that reviewed and validated quality controls and quality assurance from Aura Minerals samples.

Analytical quality control included insertion of standard reference materials (standards), blank samples, and duplicate samples. The protocol called for one standard for every 20 samples and one blank for every 30 samples. One in 40 samples was submitted to ALS for check assaying.

Two blank samples (Rosa and Cinza) were collected from a barren gneiss near the Mine area and prepared by SGS.

Standard samples were collected from materials on site and prepared by SGS. Standards from commercial sources were used to a minor extent.

11.6.2.1 Sieve Checks

Sieve checks were used to check that sample preparation parameters were met. Failure resulted in adjustment of crushing or pulverization equipment and reprocessing of samples. Samples were weighed before and after crushing and pulverizing and the difference in mass was converted to percentage recovery. The rate of testing was 5% and the tolerance was 95% for each step. Any sample with a recovery <95% in either step was considered a failure. Follow up actions included verification of equipment calibration, cleanup and full documentation of results.

11.6.2.2 Blanks

In the 2008–2010 period, the number of failures at SGS is generally acceptable and many of the failed blanks are obviously sample swaps. ALS showed similar results for the same time period. The numbers of failures are slightly higher than normally anticipated, but it appears that both Rosa and Cinza are not truly blank at the ppm level. At a 0.01% level, they are acceptably blank. The data show no evidence of systematic contamination.

11.6.2.3 Standards

Standard samples are analysed to monitor accuracy (bias) of the analytical process and to monitor laboratory control which is essentially a precision exercise. Acceptable accuracy is a bias of <±5%. All results are acceptable, except for those for standard 93 early in the 2008–2010 program. During that period, results were significantly negatively biased. That bias was corrected, and most of the time after that, results for standard 93 were acceptable.

The coefficient of variation is a measure of homogeneity of the sample and, to some extent, process control and is considered to be acceptable at <5% levels. Many of the gold analyses show >5% CVs which is generally due to the nuggety nature of gold and sample preparation that is not optimised for gold.

In general, standard results show acceptable accuracy and precision. Bias, with a few exceptions is within the acceptable ±5% tolerance. CVs for copper are generally 2–4% which is anticipated. Copper results for standards 53P and 93 are outside the acceptable range and may be due to less-than-optimal homogeneity of those samples. Gold CVs are generally >10%, which suggests that gold occurs as small, discrete grains and is an anticipated result.

11.6.2.4 Duplicates

Duplicates appear to have been half or quarter core field duplicates. Precision for gold is more or less as anticipated at SGS. The Cu_ICP_ppm results are concerning in that precision is quite poor. The reason for the poor precision is not known. The Cu_AATM_pct results are acceptable for field duplicates. ALS analysed only a single batch and most of those samples had too little gold or copper contents to make useful estimates of precision. Estimated precision for the Cu_ME-ICP61_ppm results is quite good for field duplicates.

11.6.2.5 Check Assays

The CP compared the check assays performed at ALS to the original analyses at SGS for copper and gold. Copper shows no bias between the two laboratories at any grade level. Below about 0.46 g/t, gold shows no significant bias. Above 0.46 g/t Au, ALS is biased somewhat positively relative to SGS based on six samples in that grade range. There are too few results to reach a reliable conclusion regarding those six samples.

11.6.3 MVV

GeoEstima reviewed the data prior to 2018 for Serrote Project and MVV included insertion of blank, standard and duplicate samples in the sample stream, at an overall insertion rate of 1:18, consisting of:

- Blanks: 1:65
- Standards: 1:83
- Pulp duplicates: 1:60
- Crusher duplicates: 1:90

The quality control and quality assurance samples were analysed by GeoEstima in order to validate the Mineral Resources database. The 2022 database was not included in next items.

11.6.3.1 Blanks

The MVV blank material is pink and grey inert material from a local manufacturer, which used up to 3kg for each prepared sample. Contamination was assessed using blank charts, where the blank values were plotted against the previous-sample values (Figure 11-2 to Figure 11-5). Normally, the samples containing very low grades, close to the detection limit of the elements of interest. During the campaigns from 2018 to 2021 several methods were used and several detection limits considered, and the analysis of contamination performed by GeoEstima considered the highest limit of detection standardized for the construction of graphs and interpretation of results. Overall, no systematic contamination is indicated by the data.

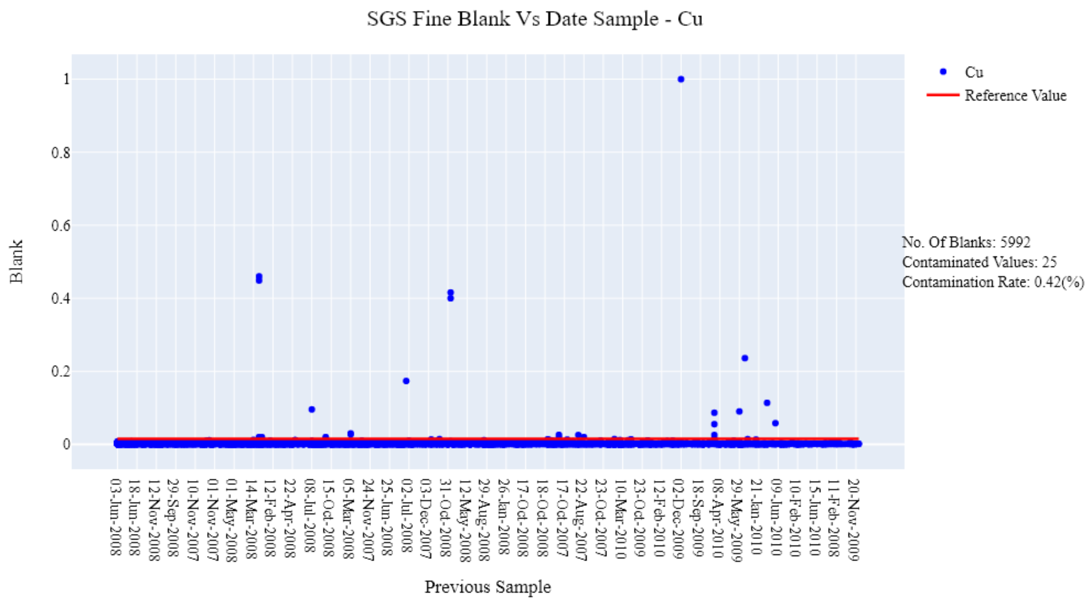


Figure 11-2: Fine Blank Charts – Cu (%) – Serrote Project – SGS

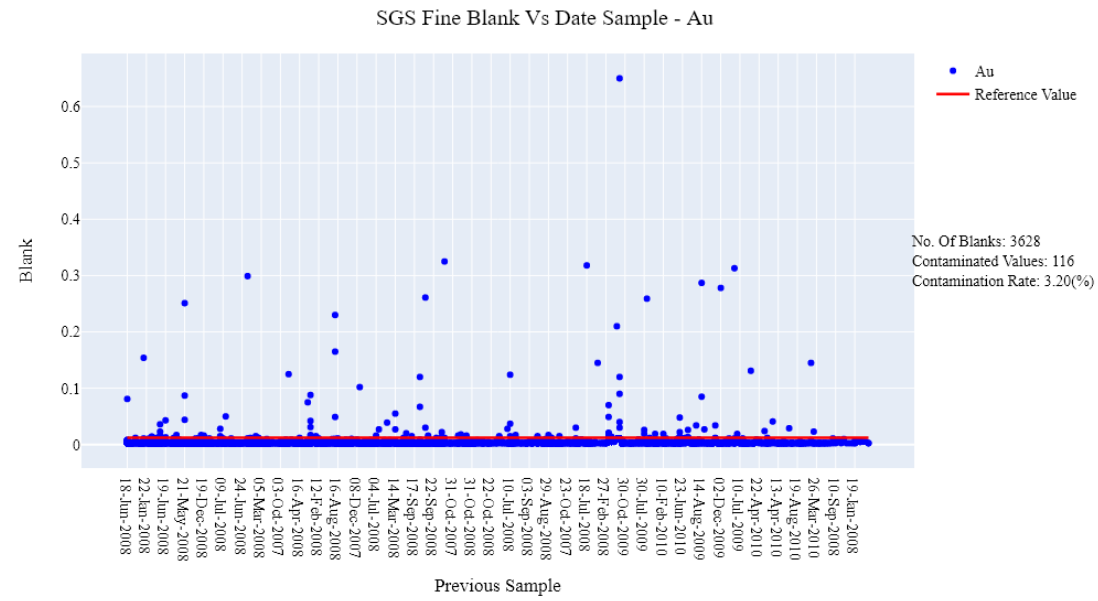


Figure 11-3: Fine Blank Charts – Au (ppm) – Serrote Project – SGS

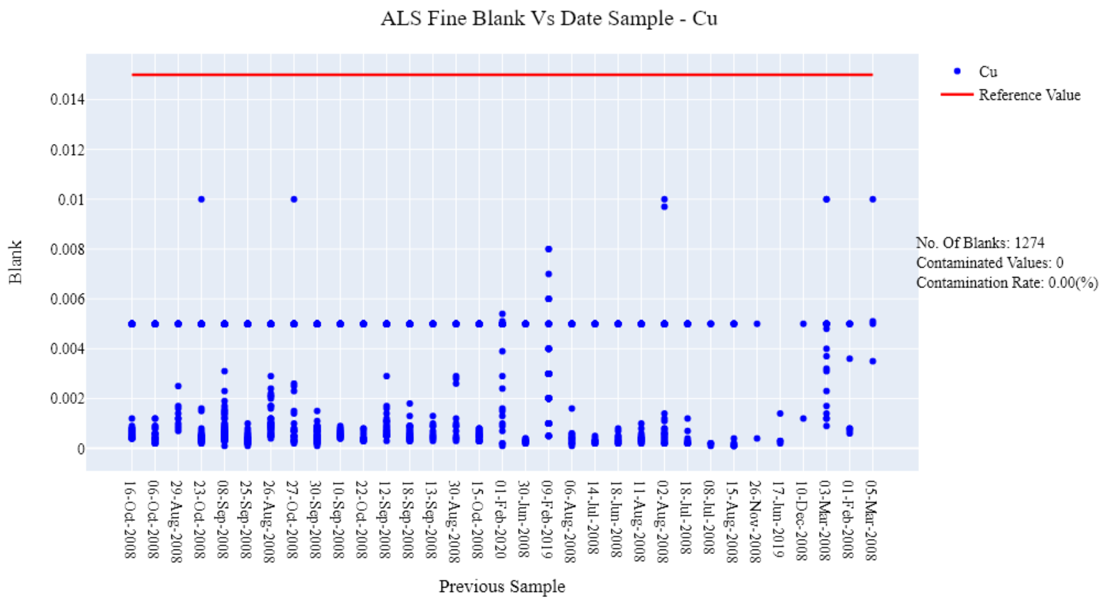


Figure 11-4: Fine Blank Charts – Cu (%) – Serrote Project – ALS

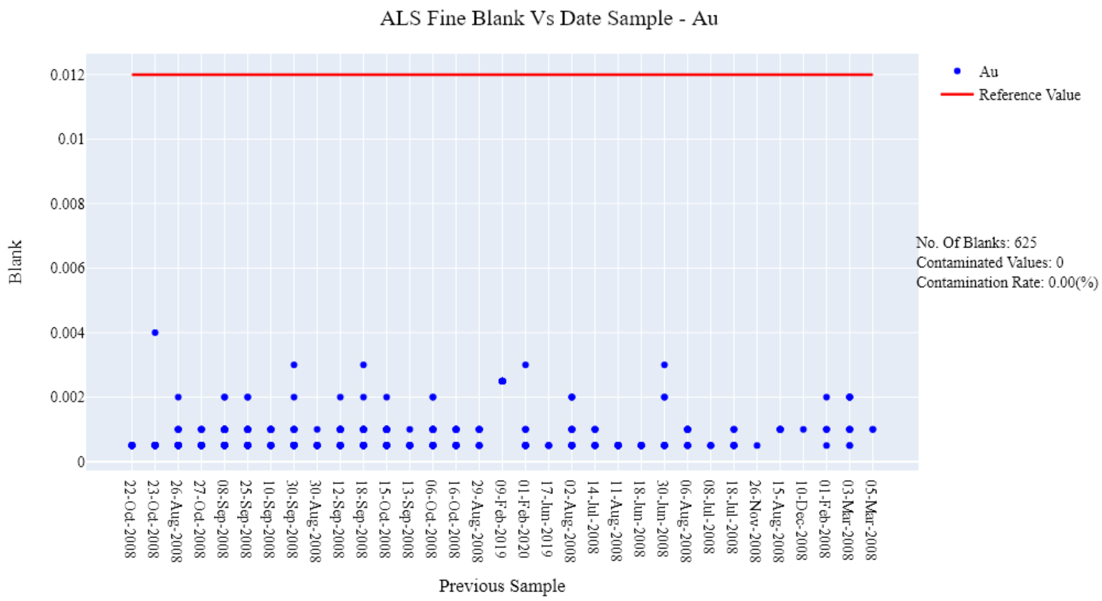


Figure 11-5: Fine Blank Charts – Au (ppm) – Serrote Project – ALS

11.6.3.2 Field, Coarse Reject and Pulp Duplicates

Duplicate sample results for the 2018–2020 drill programs at SGS show that most copper methods exhibit less than 6% of error with is totally acceptable for the industry standards. Gold precision is very low (less than 2 ppm) which is consistent with expectations. The results for duplicate analysis are summarized in Table 11-3 and illustrated in Figure 11-6 to Figure 11-9. Considering the RC samples control results, the CP is that the opinion that precision is adequate to support Mineral Resource estimation and mine planning.

Table 11-3: Serrote Duplicated Performance
ACG Acquisition Company Limited – Serrote Mine

Element	Type of Duplicate	No. of Results	No. of Errors	Error Rate	Laboratory
Cu (%)	Coarse	4	0	0.00%	ALS
Cu (%)	Field	189	7	3.70%	ALS
Cu (%)	Pulp	491	33	6.72%	ALS
Au (ppm)	Field	189	2	1.06%	ALS
Au (ppm)	Pulp	491	9	1.83%	ALS
Cu (%)	Coarse	553	1	0.18%	SGS
Cu (%)	Field	1210	40	3.31%	SGS
Cu (%)	Pulp	407	6	1.47%	SGS
Au (ppm)	Field	1210	23	1.90%	SGS
Au (ppm)	Pulp	407	0	0.00%	SGS

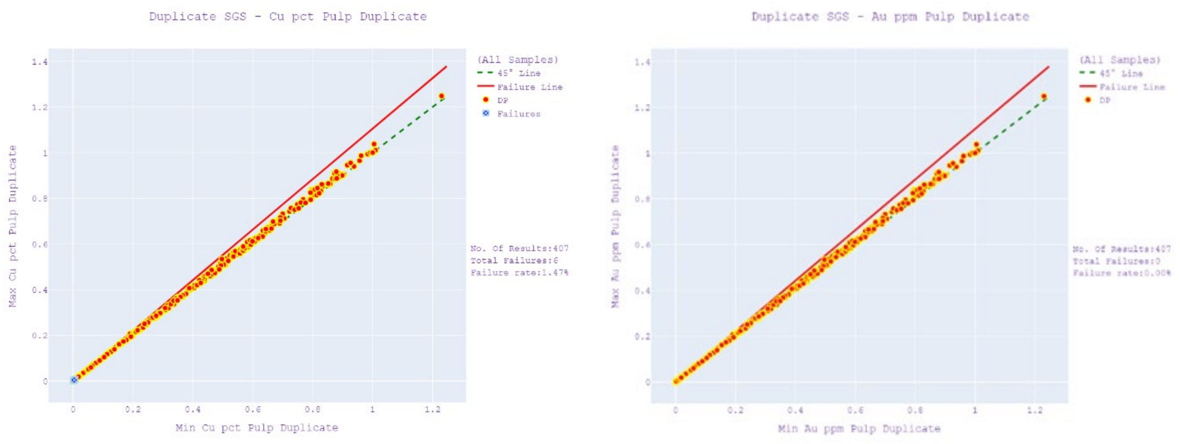


Figure 11-6: Serrote Pulp Duplicates for Cu and Au Assays – SGS

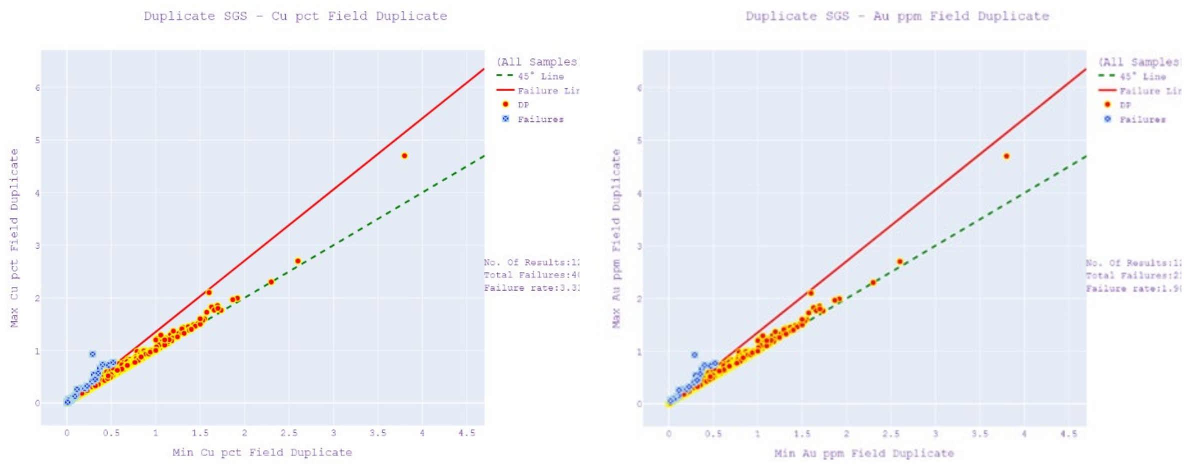


Figure 11-7: Serrote Field Duplicates for Cu and Au Assays – SGS

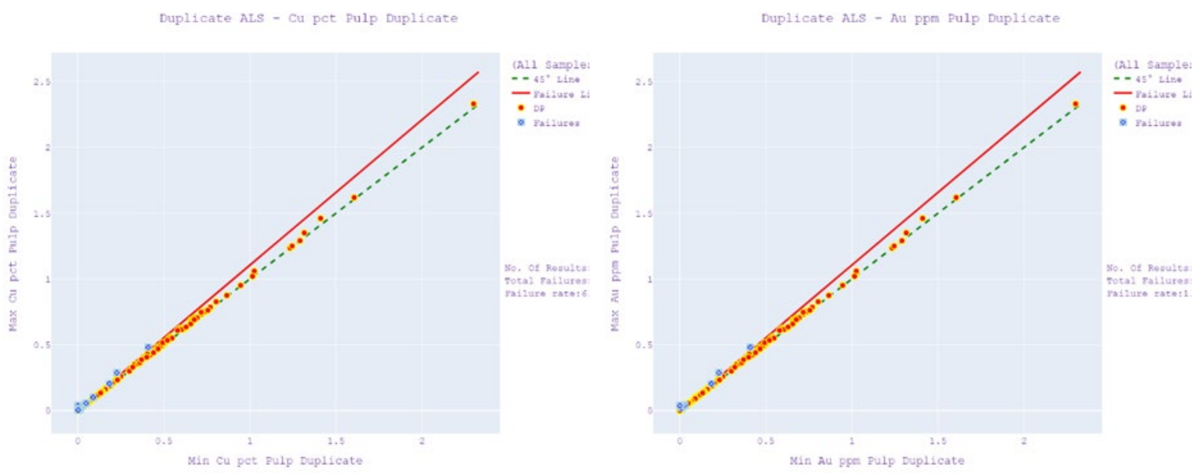


Figure 11-8: Serrote Pulp Duplicates for Cu and Au Assays – ALS

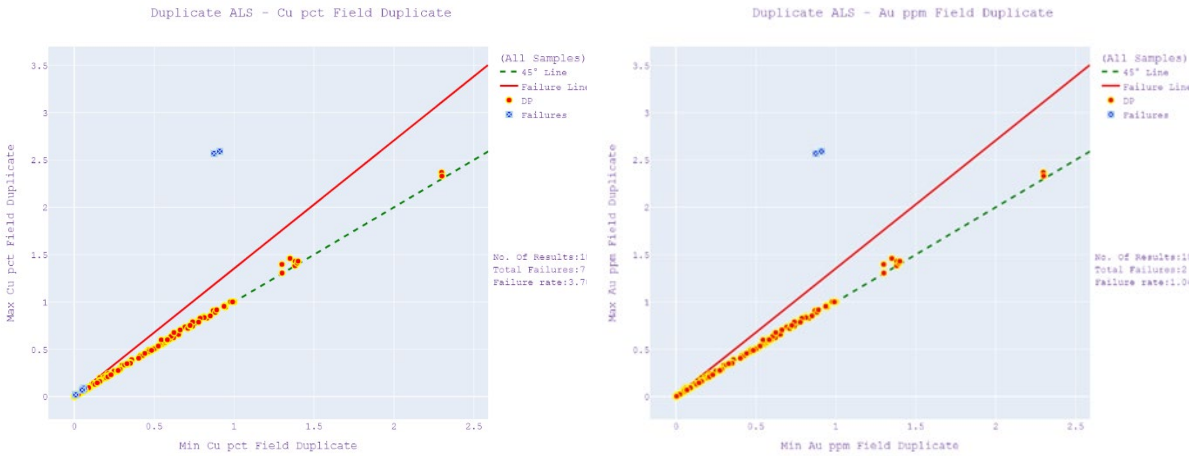


Figure 11-9: Serrote Field Duplicates for Cu and Au Assays – ALS

11.6.3.3 Standards

The certified reference material (CRMs) used for MVV samples was produced by African Minerals Standards (AMIS). From the 2019-2021 drilling campaign only three CRMs were considered: SL-1, SL-2 and SL-3 (Figure 11-10 to Figure 11-17). Bias estimates from the SGS data indicate that accuracy is acceptable for all elements in all standards and all methods. CVs for copper are generally below 8%, with the exception of one sample that showed a CV equal to 14% which may be correlated to the low number of samples, which is acceptable. CVs for gold are in the 10% to 50% range, which is expected given different methods and low density of samples. Results for ALS are similar. In several samples from SL-3, copper analysis showed a bias of greater than 44% in three different methods (Cu_ICP61, Cu_ICP and Cu_ICP40B). GeoEstima considers that a possible error in data input may have generated such variation and chose not to consider this information for validation.

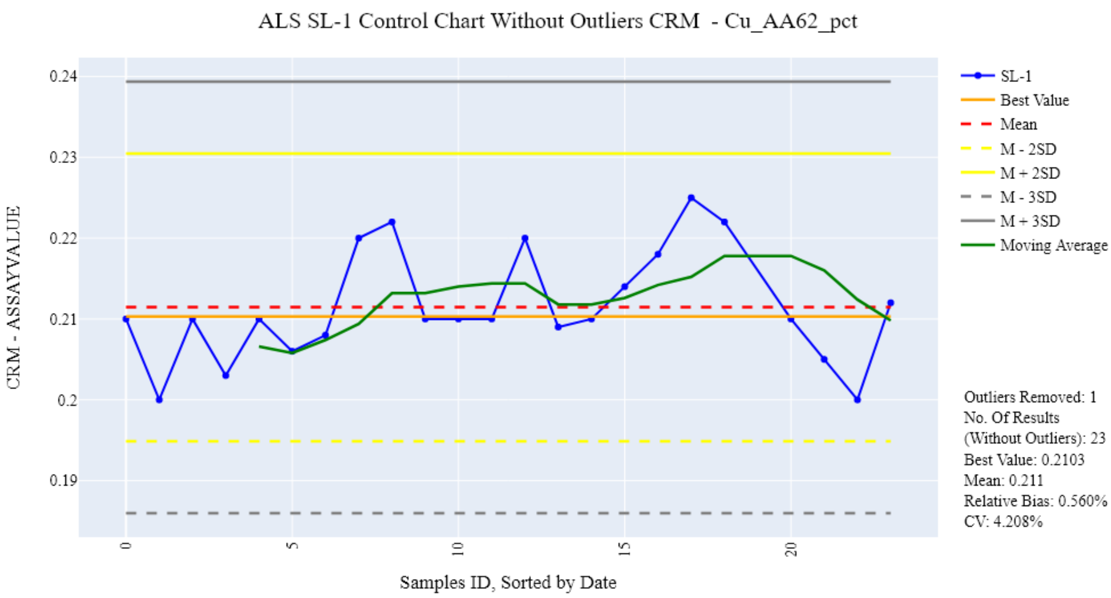


Figure 11-10: Serrote Control Chart – Cu (%) – SL-1 – ALS

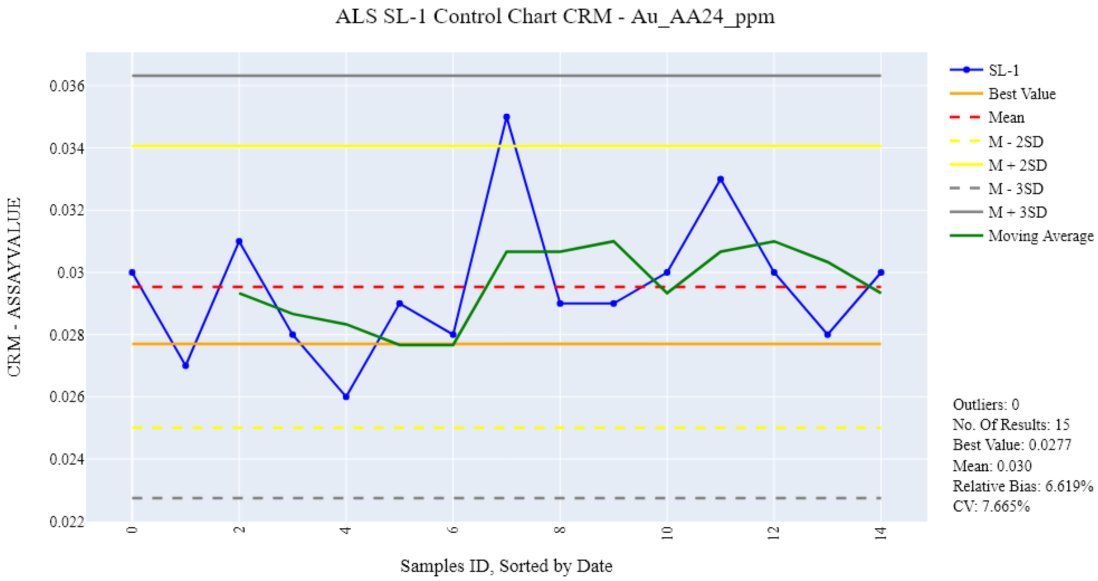


Figure 11-11: Serrote Control Chart – Au (ppm) – SL-1 – ALS

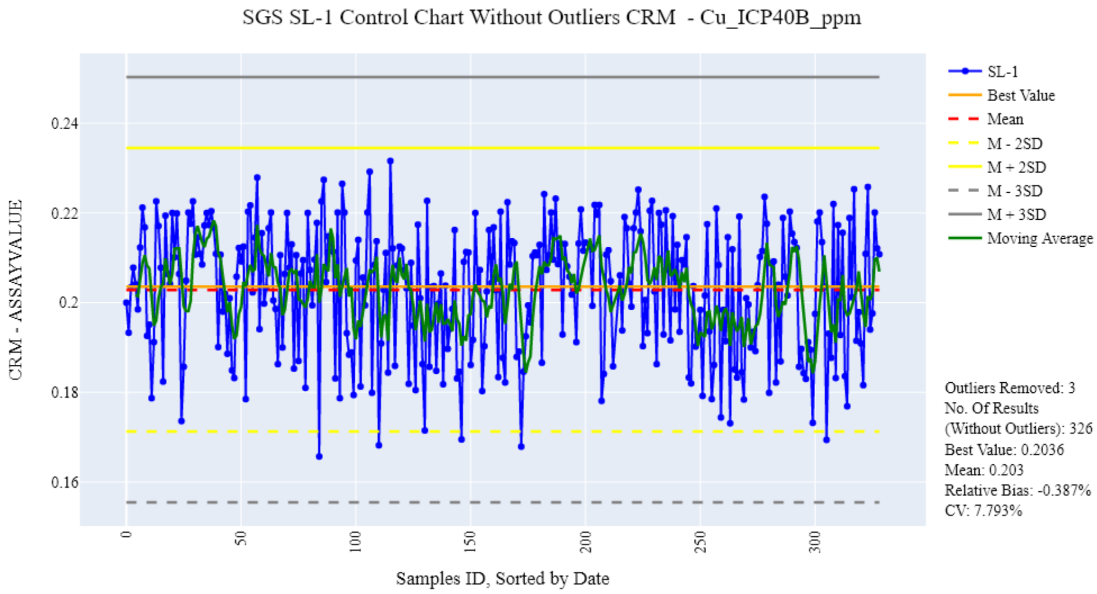


Figure 11-12: Serrote Control Chart – Cu (ppm) – SL-1 – SGS

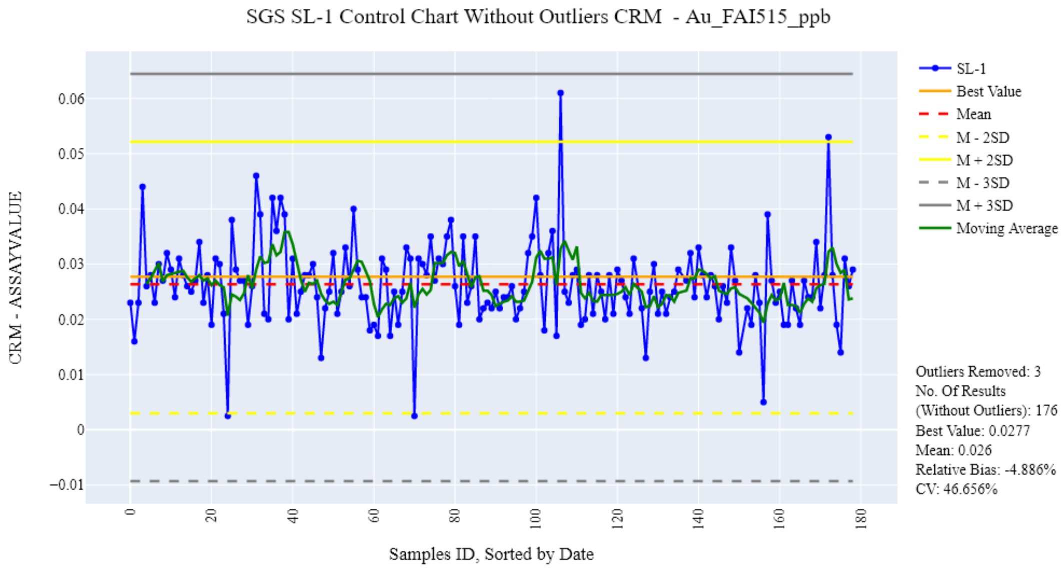


Figure 11-13: Serrote Control Chart – Au (ppb) – SL-1 – SGS

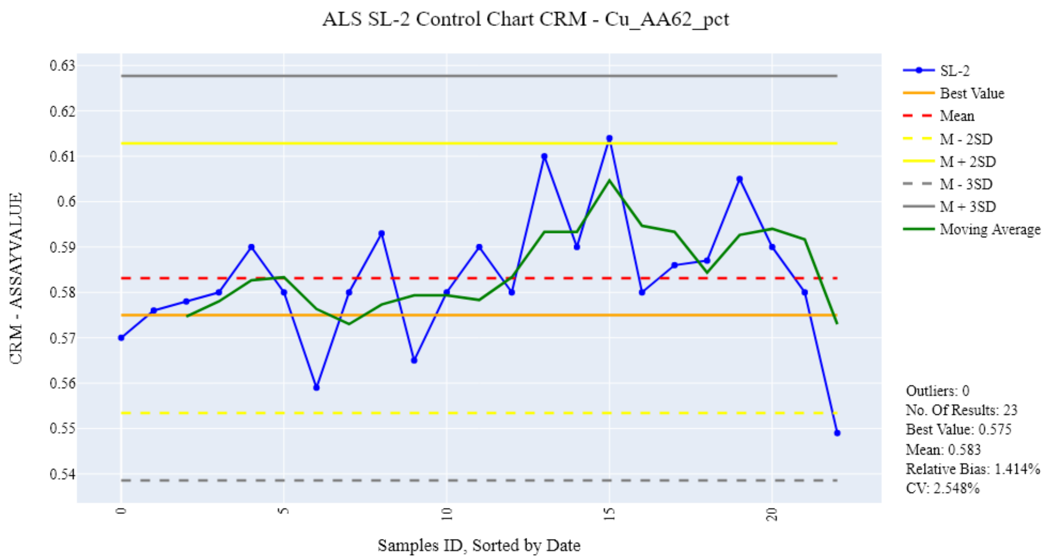


Figure 11-14: Serrote Control Chart – Cu (%) – SL-2 – ALS

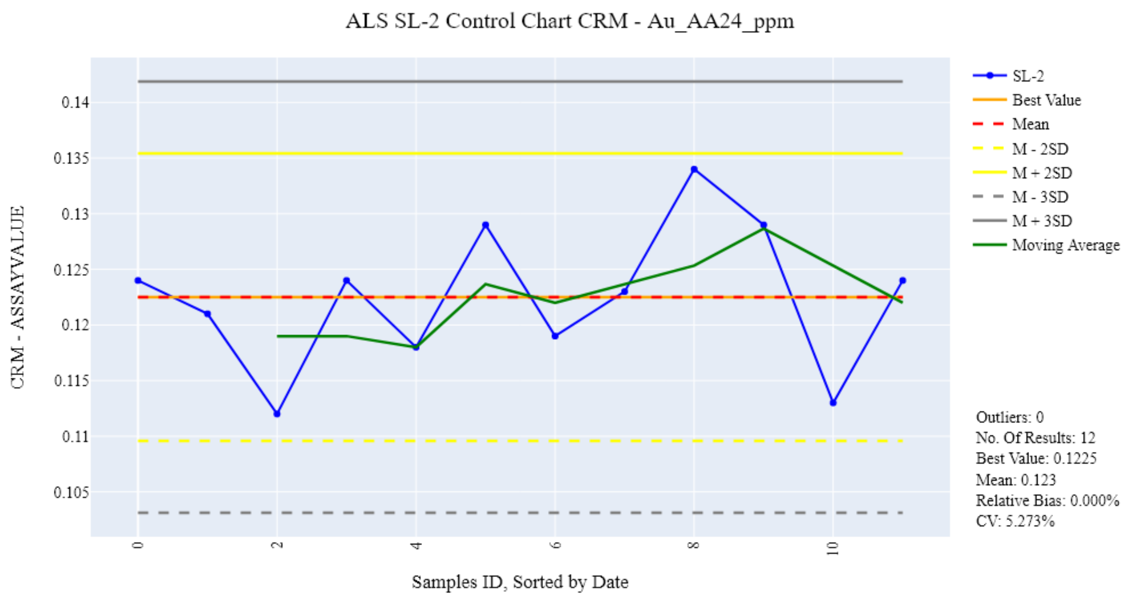


Figure 11-15: Serrote Control Chart – Au (%) – SL-2 – ALS

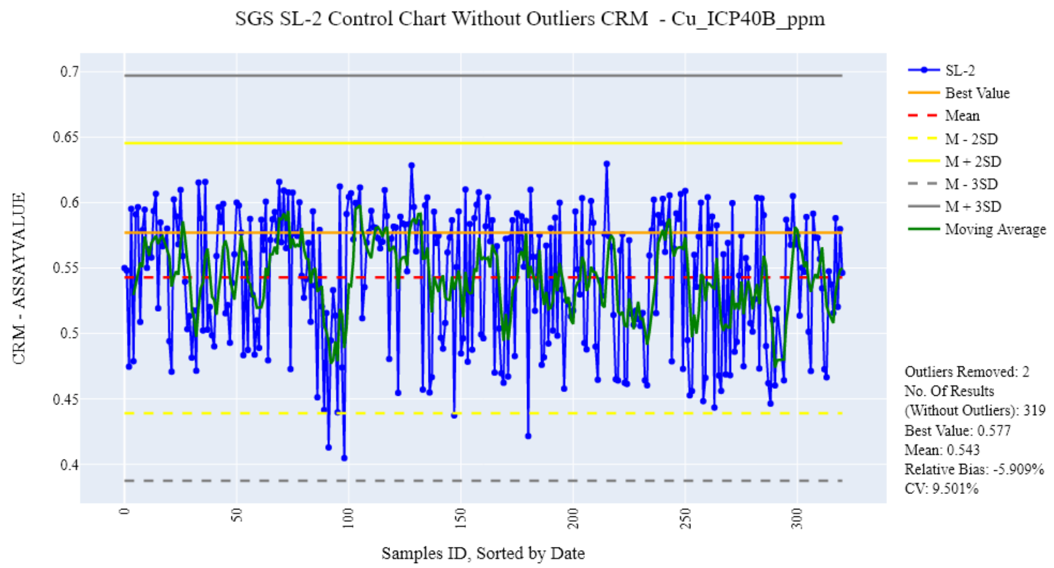


Figure 11-16: Serrote Control Chart – Cu (%) – SL-2 – SGS

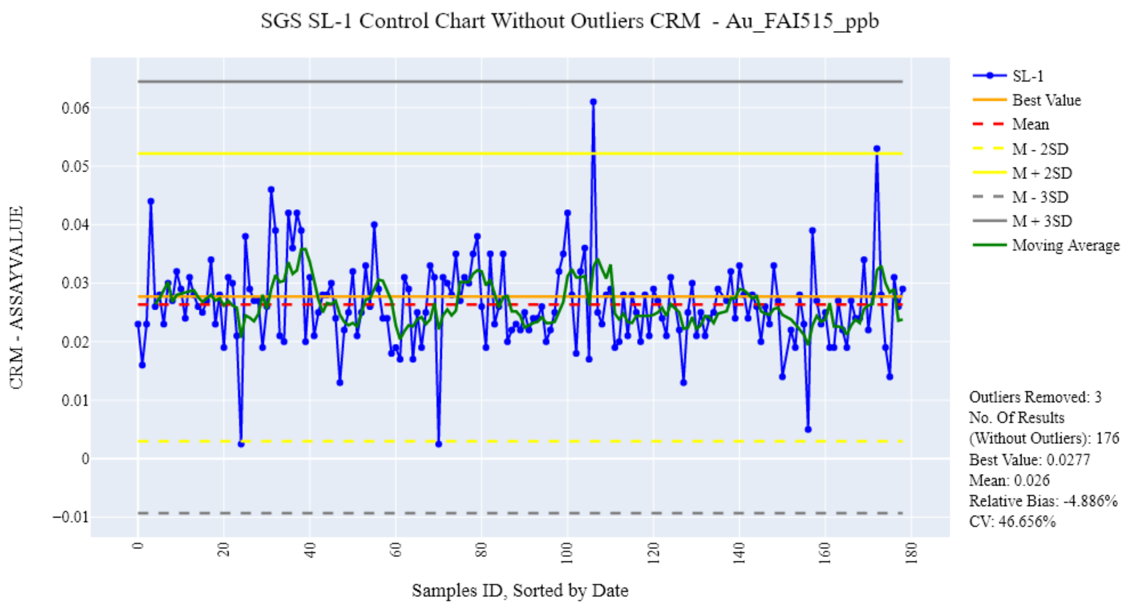


Figure 11-17: Serrote Control Chart – Au (ppb) – SL-2 – SGS

11.7 Caboclo Quality Assurance and Quality Control

11.7.1 DOCEGEO

During the DOCEGEO programs, there is no record in the database of the QA/QC protocols.

11.7.2 Aura Minerals

Foo et al. (2012) described the Aura Minerals QA/QC protocols including insertion of the CRM (certified reference material), blank samples and duplicate samples. The insertion rate comprises a rate of one CRM for every 20 samples and one blank for every 30 samples.

Until the end of 2008, Aura Minerals used the commercial certified reference material manufactured by Ore Research and Exploration Pty. The CRMs consist of 44P, 93P, 53Pb, 13 and 52Pb. At the beginning of 2009, SGS prepared three on-site standards materials for Aura Minerals. These standards were divided by high, medium, and low grade, and have been prepared from the coarse and pulp rejects of the mineralisation from Serrote da Laje Project.

The approval protocols of the results consist of controlling the mean +/- 2*Std and mean +/- 3*std. The tolerance of the pass-fail samples was +/- 15%, and the QA/QC protocols include the re-submittal of the failed samples to the laboratory.

The blank protocol includes the insertion of the inertial material collected from the local manufacturer and was called Pink and Grey. The blank samples were inserted to monitor the analytical contamination in the preparation step for every 30 samples in the batches. The failure criteria consist of copper grades analysed by the ICP method which are 100 ppm due this represents the detection limit of the AA method, and the average results are ~15 ppm. The values higher than 100 ppm were considered non-compliant and have been re- submitted to the laboratory. According to Foo et. Al 2012, 3,192 blanks were inserted and analysed, and the failures were re-submitted for re-analysis.

11.7.3 MVV

The MVV adopted QA/QC protocols insertion rate was approximately 3.20% for the blank samples, 3.50% for the CRMs, and 3.30% for the duplicate samples (Table 11-4); with a total QA/QC insertion rate of 10%.

Table 11-4: Insertion Rate Samples for Caboclo Area
ACG Acquisition Company Limited – Serrote Mine

Type	Insertion Ratio
Blank	3.20%
Standard	3.50%
Duplicate	3.30%

11.7.3.1 Standards

The CRMs used by MVV consist of the on-site standards prepared from Serrote da Laje material and analysed and certified by SGS in 2009. These standards consist of the SL-01 (low grade: ~ 2,036 ppm), SL-02 (medium grade: ~5,770 ppm), and SL-03 (high grade: ~ 17,990 ppm) materials, which were used for monitoring the accuracy of the Cu, Fe, Ni, Au, Pt, and Pd grades. In the 2021 drilling program, the Appian Exploration team introduced the ITAK CRMs due to the stock out of the SGS CRMs. The standards provided by the ITAK manufacturer were ITAK-809 (medium grade: ~3.580 ppm), ITAK-821 (medium grade: ~ 3.622 ppm), ITAK-824 (high grade: ~ 26,780 ppm), and ITAK-837 (low grade: ~1.941 ppm).

Table 11-5: Standards Results for Caboclo Area
ACG Acquisition Company Limited – Serrote Mine

Standard	Analyte	Best Value	Mean	SD1	Min (3SD)	Max (3SD)	Samples	Relative Bias	Coeff Var.
SL-01	Cu_ppm	2036	2,133.49	68.00	1,929.49	2,337.49	76	4.79%	3.19%
	Ni_ppm	313.7	340.22	12.56	302.56	377.89		8.46%	3.69%
	Fe_pct	11.535	11.46	0.37	10.36	12.57		-0.64%	3.22%
	Au_ppm	0.0277	0.03	0.00	0.02	0.04		2.27%	8.84%
	Pt_ppm	0.0098	0.01	0.00	0.00	0.02		-6.15%	21.31%
	Pd_ppm	0.011	0.01	0.00	0.01	0.01		6.94%	8.98%
SL-02	Cu_ppm	5770	5,949.25	189.01	5,382.20	6,516.29	53	3.11%	3.18%
	Ni_ppm	883	966.00	36.59	856.22	1,075.78		9.40%	3.79%
	Fe_pct	21.64	21.48	0.76	19.18	23.77		-0.76%	3.56%
	Au_ppm	0.1125	0.12	0.01	0.10	0.14		6.01%	5.11%
	Pt_ppm	0.016	0.02	0.00	0.01	0.02		6.37%	9.67%
	Pd_ppm	0.0294	0.03	0.00	0.02	0.03		-11.56%	4.20%
SL-03	Cu_ppm	17990	18,270.59	463.70	16,879.49	19,661.69	34	1.56%	2.54%
	Ni_ppm	1492	1,622.06	56.88	1,451.43	1,792.69		8.72%	3.51%
	Fe_pct	26.46	26.66	0.83	24.16	29.17		0.77%	3.13%
	Au_ppm	0.2412	0.24	0.01	0.21	0.28		1.12%	4.97%
	Pt_ppm	0.0359	0.04	0.01	0.01	0.06		1.75%	23.19%
	Pd_ppm	0.067	0.07	0.00	0.06	0.08		1.45%	4.31%

Standard	Analyte	Best Value	Mean	SD1	Min (3SD)	Max (3SD)	Samples	Relative Bias	Coeff Var.
ITAK-809	Cu_ppm	3580	3,532.94	84.76	3,278.66	3,787.23	17	-1.31%	2.40%
	Fe_pct	4.84	4.66	0.11	4.33	5.00		-3.69%	2.39%
	Au_ppm	0.276	0.26	0.01	0.24	0.29		-5.39%	3.14%
	S_pct	0.714	0.72	0.02	0.66	0.79		1.33%	3.05%
ITAK-821	Cu_ppm	3622	3,620.95	121.63	3,256.06	3,985.85	42	-0.03%	3.36%
	Ni_ppm	22.7	15.62	1.41	11.38	19.86		-31.19%	9.05%
	Fe_pct	6.24	6.66	0.25	5.90	7.41		6.68%	3.79%
	Au_ppm	0.318	0.31	0.02	0.24	0.38		-2.73%	7.52%
	S_pct	2.526	2.66	0.09	2.38	2.94		5.31%	3.50%
ITAK-824	Cu_ppm	26780	26,581.82	505.60	25,065.00	28,098.63	11	-0.74%	1.90%
	Ni_ppm	1268	1,307.27	49.87	1,157.67	1,456.88		3.10%	3.81%
	Au_ppm	0.25	0.23	0.02	0.15	0.30		-9.55%	10.70%
	S_pct	2.122	1.91	0.07	1.69	2.13		-9.90%	3.87%
ITAK-837	Cu_ppm	1941	1,928.24	60.28	1,747.38	2,109.09	17	-0.66%	3.13%
	Ni_ppm	81	88.47	3.87	76.85	100.10		9.22%	4.38%
	Fe_pct	4.96	5.10	0.20	4.50	5.70		2.83%	3.95%
	S_pct	0.216	0.25	0.01	0.22	0.28		16.29%	4.42%

Notes:

1. SD (Standard Deviation)

11.7.3.2 Blanks

The blank samples were introduced into the batches for every 20 to 30 samples respecting an insertion rate of 3.30%. The blank was used to control the contamination of the samples at the preparation step of the laboratory. The monitoring of the inter-sample contamination was applied by the criteria of up to 50 ppm of the Cu in the blank samples, and the samples higher than 50 ppm were considered non-compliant with the QA/QC protocols. The MVV QA/QC protocol includes the re-submittal of the failed samples to the laboratory.

A summary of the results is listed in Table 11-6, which presents the blanks used for the evaluation of the contamination monitoring. A total of 262 blank samples were introduced into MVV drilling program batches, of which 137 were pink blank and 125 were grey blank.

Table 11-6: Blank Sample Summary for Caboclo Area
ACG Acquisition Company Limited – Serrote Mine

Analyte	Mean	Min	Max	Samples
Cu_ppm	8.664	1.000	217.000	262
Ni_ppm	4.168	0.500	32.000	262
Fe_pct	1.420	0.610	2.480	262
Au_ppm	0.001	0.001	0.005	262
Pt_ppm	0.003	0.003	0.003	262
Pd_ppm	0.001	0.001	0.002	262
S_pct	0.009	0.005	0.050	262

11.7.3.3 Field, Coarse Reject and Pulp Duplicates

The duplicate samples were sent to monitor the procedures of the laboratory. During the MVV program, a total of 128 samples were sent to the laboratory to control the homogenization process.

The CRM from Serrote da Laje and certified by SGS have one failure and six warnings, as well as no failures and six warnings from the CRMs from the ITAK manufacturer during the MVV program.

The SL-1 standard presents five warnings and no failures, and the observed mean was 2,133.49 ppm, relative bias of 4.79% and coefficient variation of 3.19%.

No warnings and one failure were observed with the SL-2 standard. The mean was 5,949.25 ppm, relative bias of 3.11% and a coefficient variation of 3.18%.

One warning was observed with the SL-3 standard. The mean was 18,270.59 ppm of Cu, 1.56% of relative bias and 2.54% of variation coefficient.

The ITAK-809 have one warning and a mean of 3,532.94 ppm, a relative bias of -1.31%, as well as 2.40% of the coefficient variation.

Three warnings were observed with the ITAK-821 standard. The mean was 3,620.95 ppm of Cu, with a relative bias of -0.03% and a coefficient variation of 3.36%.

The ITAK-824 and ITAK-837 present one warning and no failure. The ITAK-824 mean was 26,581.82 ppm, relative bias of 0.74%six and 1.90% of the coefficient variation. The ITAK- 837 mean was 1,925.24 ppm, relative bias of 0.66% and a variation coefficient of 3.13%.

Although the certified reference material presents some warnings and one failure, the failed sample was re-submitted to the laboratory and the results do not indicate systematic inaccuracy for all samples. All relative biases were in the 5% range, indicating good results of the batch analysis.

The blank samples used for systemic contamination monitoring of the MVV program present some failures. A total of six samples were reproved during the MVV program and re-submitted to the laboratory for checking the impact of the surrounding samples of the batches. The checked samples indicate no significant contamination of the nearest samples into the batches, and the re-analysed samples were considered.

A total of 128 duplicate samples were sent and analysed to monitor the homogenisation process of the laboratory, of which seven samples failed to cross the tolerance of the 20% of the absolute difference. The duplicate samples were ranging from 0 up to 76% of the absolute difference and a mean of 7.30%. The failed samples were submitted to the laboratory.

11.8 Databases

During much of the exploration effort, data were stored in various spreadsheets and other non-database computer programs. Prior to 2018, all data were migrated to acQuire which is a proper database management software package designed to securely store geological and other data for exploration and mining enterprises.

The database up to May 2021 is stored in acQuire and access to the data is restricted by a password, hence, data security is acceptable. A review of the database indicates that data were properly stored. WSP (2021) and MVV retrieved data from the system successfully, indicating that the database was functioning properly.

Since 2022, all new information has been stored in a Fusion Datamine system and the acQuire database is being migrated to the new system.

Data were subject to automatic validation during import to the database, which includes checks on surveys, collar co-ordinates, lithology data, and assay data. Gaps and overlaps in intervals are checked. These checks are appropriate, and consistent with industry standards.

11.9 Sample Security

DOCEGEO core and sample transport and security measures are not recorded. Due to the major element of interest is copper, sample security is not critical because it is very difficult to significantly alter grades of samples by adding mineralized material without being immediately detected.

Core and RC samples from the Aura Minerals programs were transported from the drill rigs to the on-site logging facility by either the drilling contractor or company personnel. At the logging facility, the core and RC chips were stored indoors with access limited to the geologists and technicians responsible for logging and sampling. Once the core/RC chips were sampled, samples were sent to SGS for sample preparation in either Belo Horizonte or at the on-site sample preparation facility. Strict chain-of-custody procedures and signoffs were observed during any sample transfer.

MVV sample handling and security was essentially identical to that by Aura Minerals.

11.10 CP Comments on "Item 11: Sample Preparation, Analyses, and Security"

In the opinion of the CP:

- Sample collection, preparation, analysis, and security for RC and core drill programs are in line with industry-standard methods for copper–gold deposits.
- The use of wet samples for density measures is acceptable because the Mine rock types typically have <1% porosity when fresh, thus the wet and dry densities are very much the same.
- Drill programs included insertion of blank, duplicate, and standard reference material samples.
- QA/QC program as designated and implemented by Serrote is adequate and the assays values are suitable for use in Mineral Resources estimate.
- QA/QC programs should be extended to Caboclo samples to ensure that the results are suitable for mineral resources estimation.
- Database construction and security were adequate.
- Data are subject to validation, and numerous checks that are appropriate and consistent with industry standards.

The CP is of the opinion that the sample preparation, analyses, and security is sufficiently reliable to support Mineral Resource estimation without limitations on Mineral Resource confidence categories.

12.0 DATA VERIFICATION

12.1 Initial Verification

In 2021, the geologic database had recently been migrated from spreadsheets and Access files to an acQuire database. This process was managed, validated, and signed off to be accurate and error and bias free by the manager of resource and geology. WSP (2021) reviewed this migration process and certified that the data were found to be in a good and error-free format.

The geologic database is in a Fusion Datamine system and all the old records will be migrated during 2023. This migration process will be developed by Datamine and followed by MVV personnel. Once completed, the database should be validated by a competent person.

12.2 External Data Verification

12.2.1 Legacy Data Verification

In 2007 Watts, Griffis and McOuat audited the Serrote deposit database and geological interpretations including spot validation of the GEMCOM database supplied by Aura Minerals. Recommended changes were implemented.

In 2008 Charles Beaudry, M.Sc., P.Geo. (Beaudry, 2008) audited QA/QC procedures and controls on the Mine and designed new internal standards and supervised the implementation. The recommendations made during this audit were implemented, providing adequate control and quality of all data presented.

Micon International (Micon) personnel visited the site in July 2010 and reviewed core logging, sampling and assaying procedures and techniques as well as reviews of general exploration, drilling, QA/QC and development programs. During the site visit, collar locations for a number of drill holes were verified. Most of the collar monuments have been lost to agricultural activities, hence, these verifications are important. During the site visit Micon also independently collected nine samples of core from the deposit and had those analysed at TSL Laboratories Inc. in Saskatoon, Saskatchewan. Those samples confirmed the presence of copper, gold, nickel, and iron mineralisation.

Micon audited mineral resource estimates prepared for the Serrote and Caboclo–Rogério deposits in September 2010. Micon audited the database prior to the mineral resource estimate audit and found that the database was relatively free of errors and generally acceptable to support Mineral Resource estimation and mine planning. Micon also commented that the Mineral Resource estimates were acceptable.

12.2.2 WSP Data Review (2018 and 2021)

Shortly after Project acquisition, MVV commissioned WSP to audit the database and review quality control data.

The CP (Mr. Ian Crundwell, P.Geo.) performed high-level reviews of the collars, downhole surveys, density and lithology tables and an extensive audit of the assay data. The audit compared data in the acQuire database to data compiled from original assay and survey certificates and, to the extent possible, original geological logs. High-level reviews included:

- Collar locations were compared to topography. No discrepancies were noted. During the 2018 site visit the CP verified the location of hole SLJE-MTO-369. No other collar monuments remained because of agricultural activity.

- Downhole surveys were plotted as depth versus azimuth and inclination, to investigate anomalous survey points. A small number of anomalous points were discovered, but none that would significantly impact the Mineral Resource estimation or mine planning. The CP investigated the possibility of excess deviation (kinks) between survey points. A total of 11 points with likely excess deviation were identified. The CP recommended that those surveys be investigated but commented that even if the surveys were incorrect, they would have no significant impact on the Mineral Resource estimate.
- Density data were recalculated from the original data. No discrepancies were noted. Density measurement procedures were reviewed on site and found to be acceptable. Histograms were prepared to investigate possible outlier values.
- Lithology data were spot checked by comparing core to lithological logs. The CP concluded that the geological logs were adequate to support the Mineral Resource estimation and mine planning.

The CP audited the assay data by compiling a new database from the original assay certificates. A total of 12,476 SGS assay intervals and 4,265 ALS assay intervals were compiled. The ALS data included trench data and some check assay data.

When the data were matched, a total of 9,260 of 55,453 copper assays (16.7%) were represented. The CP found a very small number of errors that were corrected, and flagged a number of results that did not match. The CP notes that, even if the discrepancies are errors, the errors are almost the same as the values in the certificates; hence, there will be no significant impact on the Mineral Resource estimate.

A total of 8,024 gold assays (14.5% of the data) were matched. Of those, there were 12 failures (0.15%). Of the gold assays, 1,129 were from ALS with no errors, and 6,894 were from SGS with the 12 errors. The small number of errors will have no significant impact on the Mineral Resource estimate.

The CP matched 7,759 iron assays (14% of the data) (6,875 SGS data with 105 failures (1.4%) and 885 ALS data with no failures). The CP recommends that these assays all be checked; however, the impact on the Mineral Resource estimate will not be significant.

In 2021 review the CP performed high-level reviews of collar locations, downhole surveys, assays, and lithology data.

Collar locations were all within the limits of the known Serrote deposit.

Downhole surveys were performed on three core holes. Four core holes have no downhole surveys. RC holes (252) were not downhole surveyed because the deepest hole is 92 m, and the average hole depth is about 40 m. Deviation in those holes is too small to adversely impact Mineral Resource estimation. The CP plotted downhole traces and calculated deviations between points. Two core holes exhibit excess deviations in a few intervals, but those deviations are not sufficient to adversely impact Mineral Resource estimation. The CP recommended that those deviations be investigated.

The CP prepared histograms of 2018–2019 data for the elements important for estimation and observed no significant anomalies.

The CP found six of 26 lithology codes in the 1986–2020 database that had a single entry in the database. These are generally typographical errors. For additional evaluation, CP combined those codes with adjacent codes. The CP loaded the lithological wireframes and lithology data into Datamine Studio EM and compared the shapes to the original data. The shapes correlate well with the data.

12.2.3 GeoEstima Review

As part of the data verification process, GeoEstima carried out a site visit and inspected the drill holes in section and plan view to review geological interpretation related to the drill hole and blast holes database and found good correlation. GeoEstima also reviewed QA/QC data collected by MVV for Serrote Mine and did not identify any significant discrepancies.

12.2.3.1 Database Checks

GeoEstima completed the following checks on the database with an emphasis on the more recent drilling from 2018 to 2022:

- Collars for obvious problems with locations;
- Downhole surveys for excess deviations;
- Assays for out of bounds values, duplicate sample numbers, etc.;
- Lithology tables for missing data, lithologies with <10 occurrences in the database (lithology that needed to combine with other codes to be modelled);
- Recalculated density values from raw data and checked for out of bounds data.

The CP verified the Serrote database that was used for the Mineral Resource estimate completed in May 2021. The CP also checked the data for the additional drill holes that were drilled after the end-date for Mineral Resources evaluation. No issues were encountered that precluded the use of the drill data in estimation.

The CP checked the data used in support of the Caboclo target for exploration, and identified no issues that precluded the use of the drill data in supporting range of exploration target potential, however, the drill holes carried out after May 2021 should be included in a mineral resource estimate.

For Caboclo, deviation measurements were not taken in the historic holes as these were not deep.

Downhole surveys were completed by MVV using a non-magnetic Down Hole equipment to measure the deviation of the GYRO PATH and was performed by DipCore. The stations were performed with three metres of spacing between each reading.

It is worth mentioning that for Caboclo, the measurements of the downhole surveys were made relative to the collar azimuth and dip measured in the field with a Brunton-type compass, so an accurate survey of collar casing azimuths and dips is recommended. After correcting the azimuth and dip measurements of the holes, the DipCore company will be asked to re-treat the downhole surveys measurements.

12.3 CP Comments on “Item 12: Data Verification”

In the opinion of the CP:

- The database is suitable for the purposes of Mineral Resource estimation.

13.0 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

This section provides a summary of the testwork programs previously carried out on Serrote mineralisation and the latest testwork programs conducted by MVV in 2019 and 2020 at the ALS facilities in Kamloops, Canada (ALS Kamloops), and in 2022 at SGS Geosol in Belo Horizonte, Brazil. Also in 2022, Woodgrove Technologies carried out pilot scale testing at Serrote. The 2022 work was commissioned because the early plant performance did not meet the production targets established from the developmental laboratory testwork.

The 2019 and 2020 testwork provided confirmation of design criteria, improved understanding of ore variability, and allowed optimization of the flotation flowsheet. After assessing the results of the 2019 testwork, MVV carried out a flowsheet development program in 2020 and adopted the flotation circuit described in Section 17 for the detailed design. The metallurgical performance parameters from testwork and recent plant results used in the LOM mine plan are provided in Table 13-1.

The main outcomes of the 2019 and 2020 testwork are summarized in Table 13-2. These indicate the following:

- Copper recovery: A model was developed to estimate copper recovery as a function of the head grade and lithology. Overall copper recovery (average LOM) is 84.7%.
- Gold recovery: Recovery was confirmed by locked cycle tests (LCT) results at 65%.
- Copper grade in concentrate: A model was developed to estimate the copper concentrate grade based on the copper/sulphur ratio (Cu/S) of each lithology. The current block model lacks extended sulphur assays to support a sound estimate of the Cu/S ratio, hence a decision was made to use the same values obtained in the LCT results for PH0 (Year 1 = 40% Cu), PH1 (Years 2 and 3 = 42% Cu) and Year 4 on (40% Cu in concentrate). Sulphur assays will be carried out on future samples to support further development of the short-term recovery/concentrate grade model.
- Copper concentrate specification: A model was developed to estimate the MgO and SiO2 contents, supported by a full suite analysis of the concentrate produced in the PH0 and PH1 LCTs. The results showed a clean concentrate with low levels of deleterious elements and minimal expected penalties.

The 2022 work at SGS Geosol and the work carried out by Woodgrove were aimed at understanding and improving the flotation plant performance. Flowsheet changes were made in the first half of 2022 and resulted in significant improvements in the metallurgical results. The plant performance data from start-up (June 2021) to December 2022 is shown in Section 17, Table 17-3.

Table 13-1: Main Metallurgical Performance Parameters by Phase
ACG Acquisition Company Limited – Serrote Mine

Parameter	Unit	PH0 Composite Year 1	PH1 Composite Year 2 and 3	PH2 to PH4 Composites Year 4 to 14
Cu recovery (based on lithology, ramp-up not included)	%	84.7	85.8	84.5
Au recovery (fixed)	%	65	65	65
Ag recovery (fixed)	%	44.6	—	—

Parameter	Unit	PH0 Composite Year 1	PH1 Composite Year 2 and 3	PH2 to PH4 Composites Year 4 to 14
Cu concentrate grade (calculated)	%	40	42	40
Au concentrate grade (calculated)	g/t	4.9	5.7	5.8

Table 13-2: 2019 and 2020 Testwork Results Summary
ACG Acquisition Company Limited – Serrote Mine

Testwork	Results
Mineralogy	Deposit CuS mineralogy has a bimodal distribution. Bornite and chalcopyrite are the two most common CuS minerals. Bornite is consistently coarser (16 µm) in all the PH composites, chalcopyrite is significantly finer (12 µm). Bornite is well liberated at less than 20 µm, chalcopyrite is well liberated at less than 12 µm. The first minute of concentrate from rougher flotation has a high grade, it is well liberated bornite concentrate. Rougher concentrate from 1–8 min contains fine and poorly liberated CuS minerals and liberated gangue.
Primary grind size	A range of rougher tests were conducted on the PH0 composite with primary grind sizes from 79–142 µm with no impact on the mass-copper recovery curve. At a nominal primary grind K_{80} of 106 µm the copper sulphide mineral liberation ranged from approximately 44% to 64%, averaging 53%. A copper sulphide liberation above 50% is considered sufficient for good copper rougher recovery. The non-liberated copper sulphide particles were mostly in binary form with non-sulphide gangue.
Rougher pH	It may be possible to run the roughers at natural pH without an adverse effect on performance. Tests would need to be conducted with mild steel grinding media to evaluate if this is a viable change.
Cleaner 1 kinetic test	A regrind of 19 µm shows significant improvement in the grade-recovery curve compared to 27 µm.
Non-sulphide gangue depressant screening	PE26 [a CMC (carboxymethyl cellulose)] is the most successful non-sulphide gangue depressant (compared to dextrin and guar gum). The grade-recovery curve was improved slightly with a higher pH (10.5 vs 9.5) in the cleaner circuit.
Regrinding	It was confirmed that a rougher concentrate regrind of 20 µm is needed to successfully liberate the bornite material, a second regrind of approximately 12 µm is needed to liberate the chalcopyrite. Regrinding to 38 µm, or even 30 µm, showed lower copper recovery at the target concentrate grade. Mineralogical examinations of the concentrates produced showed very high copper sulphide liberation values, suggesting that slightly coarser regrind targets may be possible.
Flotation flowsheet	A split regrind circuit within the cleaner circuit to separately liberate the bornite and chalcopyrite material shows improved recovery versus a bulk single regrind stage — likely due to slimes and fine bornite material reporting to cleaner-scavenger tailings. A high grade 'bornite' concentrate can be produced (42–55% Cu) and a lower grade 'chalcopyrite' concentrate can be produced downstream (30% Cu). Two separate cleaning circuits for these two minerals, followed by combination of the two

Testwork	Results
Optimized flowsheet testing	concentrates (approximately 40% Cu), shows superior results to producing a single concentrate. Between 12% and 21% of the copper sulphide particles had less than 10% surface exposure; these will be difficult to recover in conventional flotation. The copper recovery improves by approximately 4.5% on the gabbronorite (GB) sample when using 50 g/t vs 100 g/t PE26, likely due to non-sulphide gangue–copper binary material being depressed. Talc content varies significantly, a set dosage of PE26 may not be the optimal method to depress talc in flotation. Samples with little to no talc may require no PE26 and samples with higher talc content may benefit from increased dosage. Tests using potassium amyl xanthate (PAX) produced the same metallurgical performance as those that included Aero 4037 as well, despite almost no PAX dosage optimization.
Variability testwork	Most testwork was performed on variability samples within PH0, but included all major lithologies. Two variability tests performed poorly due to low rougher recoveries, likely a result of finely disseminated copper and increased proportions of copper oxide minerals. Some tests performed poorly due to inability to achieve the target 20 µm regrind size in the laboratory mill. Other variability tests showed grades of 25% Cu at acceptable recoveries using an open circuit flowsheet. Further testwork with the selected circuit, to address the issues noted above (laboratory mill), was completed in 2020.
Locked cycle tests (LCT)	LCTs were performed on the PH0 and PH1 composites, based on the split regrind flowsheet. PH0 showed that concentrates of approximately 40% Cu at 83.1% recovery could be achieved. PH1 achieved approximately 42% Cu concentrate grades at 88.2% recovery. Both LCTs achieved superior Au recoveries and concentrate grades (>70% Au and approximately 6 g/t, respectively). Ag concentrate grades were >30 g/t in both LCTs, moving this into the payable window for many off-takers. PH0 with one regrind stage achieved approximately 30% Cu concentrate grade at 80.2% recovery. This test proved the necessity for the second regrind stage to increase both concentrate grade and recovery. LCTs on the PH2+3 and PH4 composites showed a copper recovery of 89.7% at a combined concentrate grade of 38.0% Cu for PH 2+3 and 87.8% recovery at 39.6% Cu for PH 4

13.2 Historical Testwork

Metallurgical testwork started in 1985 and continued through various stages of exploration and project evaluation until 2001. The focus was to identify the mineralisation in 40 drill core samples that were considered representative of the various rock types with different copper sulphide contents.

In 2009 a proof-of-concept metallurgical testwork program was carried out by SGS Lakefield in Canada (SGS Lakefield) under the supervision of COGECO (consultant Mr. Mike Ounpuu). In 2010 and 2011 a more detailed program was completed at SGS Lakefield with samples from five metallurgical drill holes. Head sample analyses, quantitative evaluation of materials by scanning electron microscopy (QEMSCAN) analysis, liberation by lithology examinations, grindability tests, flotation tests and concentrate analysis were carried out. Product samples from the SGS Lakefield testwork program were sent to Pocock Laboratories in Salt Lake City, USA (Pocock), for solid–liquid separation testing.

In 2011 a detailed metallurgical study was conducted to evaluate the metallurgical variability and finalize the plant flowsheet. Metallurgical testwork was conducted at SGS Lakefield in 2012. The results from this detailed testwork formed the basis of process plant design inputs and the plant design developed for the 2012 feasibility study. Metallurgical studies were completed including comminution testing, flotation (open circuit and locked cycle tests) and dewatering. The main testwork was completed on a Master Composite that was made up of material from five metallurgical drill holes located mainly in the north of the pit (first four years of mine life). The composite was made up of a LOM blend of the three main lithologies.

Aura Minerals completed a feasibility study in 2012 and carried out basic engineering in 2012–2013 for a production rate of 7 Mt/a. After acquisition, in an effort to improve project economics, MVV evaluated a 4.1 Mt/a plant with lower capacity, with possibilities for future expansion or for an extension of mine life.

In 2019 and 2020 additional testwork was carried out to confirm design criteria, improve understanding of ore variability, and optimize the flotation flowsheet.

13.3 Testwork Prior to 2018

The 1985–2006 exploratory campaigns performed by Vale included detailed mineralogical analysis, comminution, flotation, and magnetite recovery testwork. Limited testwork was also completed on the recovery of gallium and vanadium as saleable metals. This work indicated that there are two distinct ore types. From a metallurgical perspective, the primary difference was the concentration of magnetite in the material.

The 2007 and 2009 metallurgical testwork programs performed by Aura Minerals were intended to cover all aspects of metallurgy including comminution, sulphide copper recovery, oxide copper recovery, magnetite recovery, assessment of gold, nickel and gallium recovery, and mineralogical examinations.

The 2010–2011 testwork program was performed by Aura Minerals at SGS Lakefield and Pocock. The main outcomes were:

- Crushing work index (Cwi) 20.6 kWh/t (range from 18.6 kWh/t to 24.1 kWh/t)
- Bond ball mill work index (Bwi) 16.9 kWh/t (75th percentile) and abrasion index (Ai) 0.386 (75th percentile)
- Flotation feed size F80 100 µm
- Use of a simple flotation circuit with two stages of column cleaning and a mechanical first cleaner-scavenger stage
- Concentrate grade 24.5% Cu with a metallurgical recovery 84%

These criteria were selected to design for higher mass pulls, although higher grades can be achieved with lower recoveries.

The flotation batch testing focused on:

- Effect of grind on recovery
- Cleaner circuit configuration

The batch testing generally confirmed most of the conditions developed in the Proof-of-Concept program:

- Copper recovery is grind-size sensitive.

- Cytec 4037 (dithiophosphate, thionocarbamate blend) is a good collector and adding PAX is not warranted.
- The process does not require lime, in fact higher pH can be detrimental.
- CMC is required to make a saleable concentrate grade; CMC addition to the roughers does not appear to be warranted.
- Regrinding is required, but the level of regrind and at what stage in the flowsheet was not clearly demonstrated.

The copper recovery predictions versus the flotation feed F_{80} size, based on the flotation testwork, were as follows:

- 82% Cu recovery at 130 µm
- 84% Cu recovery at 100 µm (factored)
- 85% Cu recovery at 80 µm

Based on an internal trade-off study prepared in August 2010 by Aura Minerals, the optimum grind size (P_{80}) was determined to be 100 µm. This value was adopted for design purposes.

13.4 2018 Testwork

13.4.1 2018 Testwork Objectives

In 2018 MVV performed in-house due diligence on the previous metallurgical testwork data. The biggest challenges with processing this material that were identified during this due diligence are listed:

- The low grade of the final copper concentrate produced (compared to the expected grade based on secondary copper sulphide mineralogy), mainly due to contamination with non-sulphide gangue minerals.
- The economic impact of the penalties associated with the flotation of the non-sulphide gangue (mainly MgO and Al_2O_3).
- Non-optimized rougher recovery; although detailed metallurgical flotation testing had been completed, there were some gaps in the screening and testing of non-sulphide gangue depressant reagents and in the flotation reagent procedure.

MVV also decided to repeat the grind versus rougher recovery tests to optimise the economics of the mill size and capital cost using updated 2017 mill cost estimates and copper prices.

Early on in the in-house due diligence, MVV identified that some copper sulphides exhibit very fast flotation kinetics and that this could be exploited to maximise recovery and concentrate grade.

13.4.2 2018 Testwork

There was approximately 60 kg of Master Composite sample left at SGS Lakefield. Confirmatory testwork showed that the material was in good condition (unoxidized). MVV conducted another round of metallurgical testwork. The testwork program was completed at SGS Lakefield, managed by MVV in-house experts in conjunction with SGS Lakefield testwork managers. This sample was used for reagent dosage type and addition point optimizations and mineralogical examinations. Open circuit cleaning tests were also performed using this sample.

A testwork plan was prepared to:

- Complete further grind size versus rougher recovery tests to determine the optimum P80 grind size based on updated mill costs and copper prices.

- Perform mineralogical studies on the rougher concentrate to understand the nature and liberation of the copper minerals and the non-sulphide gangue material that causes the final concentrate contamination.
- Screen alternative non-sulphide gangue depressant reagents to increase final copper concentrate grade and reduce non-sulphide gangue penalty costs.
- Improve rougher flotation kinetics.
- Look for any potential flowsheet optimizations.

13.4.2.1 Grind Size versus Rougher Recovery Test

A new data set of grind vs recovery information was produced to establish the most economical grind size. Three grind sizes were chosen: 80 µm, 100 µm and 120 µm. It was immediately apparent that the P_{80} vs grind time was atypical of most copper deposits. This was due to the higher amount of flakey mica material in this ultramafic deposit compared to other porphyry deposits. This material can result in misleading grind results using the standard laboratory grinding procedure. Obtaining the targeted grind sizes proved difficult for this reason, with extremely long grind times needed to achieve a P_{80} less than 90 µm.

This long grinding time was thought to be potentially over-grinding the valuable copper sulphide minerals, which could result in copper recovery losses. The over-grinding of flakey mica material is unlikely to be as severe in practice due to the use of hydrocyclones within the grinding circuit, which will remove most of the mica material prior to further grinding.

Based on the results and an analysis of past grind vs recovery testwork data, 100 µm was selected as the target P_{80}. The results also indicated that there may be opportunities to increase grind size without loss of recovery.

In all tests it was noticed that there was a very fast floating copper sulphide component. Approximately 80% of the total copper was recovered into a concentrate stream with a grade of 18% to 20% Cu in the first minute of flotation. It was postulated that the bornite fraction floats quickly into a high-grade concentrate and that the chalcopyrite is slower floating and is recovered in the remaining rougher capacity.

13.4.2.2 Rougher Concentrate Mineralogy

Mineralogy and liberation analysis were completed on the rougher concentrate to better understand copper liberation and the minerals contaminating the copper concentrate.

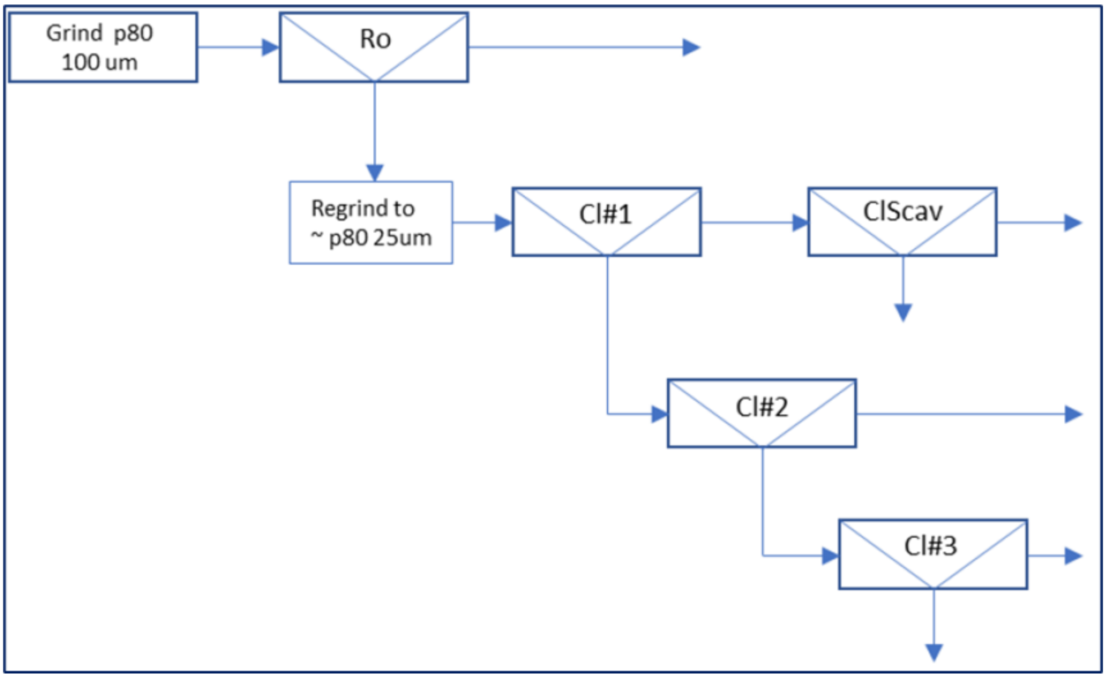
A flotation test performed at 100 µm primary grind without any non-sulphide gangue depressants was completed to produce a concentrate for QEMSCAN and liberation analyses. The first three rougher concentrates were combined to make the sample, even though five rougher concentrates were taken in total. This was because 94% of the total copper reported to the first three concentrates. The results showed that chalcopyrite (7.2% mineral mass) and bornite (4% mineral mass) were the main copper sulphide minerals reporting to the rougher concentrate. The main contaminants in the rougher concentrate were non-sulphide gangue. Of the non-sulphide gangue, plagioclase and calcium–magnesium–iron silicates were each approximately 15% of the mineral mass. The main mineral contaminant was mica at 19%. Chlorites/clays (9.3%) and quartz (6%) were also significant contaminants.

Liberation analysis showed that free copper sulphide (100% liberation) was approximately 75% of total copper sulphide present. Liberated (>80% surface exposed) was another 10% of the total copper sulphide mass. Approximately 80% is sufficient to produce an adequate rougher concentrate. The remaining copper sulphide was made up of particles locked with silicates, Fe-oxides, and feldspars. For the non-sulphide gangue, the majority was free (90%) or liberated. There was very little sign of locked copper sulphide-silicate particles. This analysis showed that the main silicate contaminants are naturally floating minerals reporting to the concentrate, or minerals that are entrained with the concentrate.

Due to the high level of liberation, it may be possible to reduce this material with correct depressant usage, or if entrained, by using a froth washing mechanism (column/Jameson/direct flotation reactor (DFR) cells).

13.4.2.3 Open Circuit Cleaner Tests

Open circuit cleaning flotation tests were performed using a standard flowsheet that replicated the flowsheet for Serrote at that time (Figure 13-1). A number of variations were made to the flowsheet based on the metallurgical testwork results and the concentrate mineralogy to identify the optimal conditions.



Source: MVV, 2018.

Figure 13-1: Open Circuit Cleaner Test Flowsheet

The grade versus recovery curves for the tests were plotted for both copper and gold. The best performing tests fell on the same grade–recovery curve, indicating similar performance.

With respect to the copper recovery in the rougher circuit the following observations were made:

- Approximately 94% of the total copper can be recovered into the rougher concentrate at a concentrate grade of approximately 5% Cu to 6% Cu and a mass pull of 9% to 10% in approximately 7 min flotation time. This is much improved from the testwork completed in 2012, which recovered approximately 94% total copper at 2.6% Cu grade and 18.4% mass pull in approximately 15 to 17 min.
- The use of soda ash as a pH modifier had a negative effect on copper grade and recovery in the rougher circuit.
- There was little difference in non-sulphide gangue recovery to the rougher concentrate when operating at a lower rougher feed density. Low density rougher flotation is therefore not necessary.

- The use of sodium silicate and CMC depressants had little impact on grade vs recovery of the copper.
- A coarser primary grind of 120 µm did not significantly impact the grade-recovery curve of the rougher circuit. This may provide an opportunity to operate the mill at a slightly coarser grind than design (100 µm).

With respect to the three-stage cleaning circuit, there were a number of observations:

- The use of soda ash as a pH modifier in the cleaner circuit had the same negative effect on copper grade and recovery as observed in the rougher circuit. The use of soda ash in the rougher circuit also had a negative effect on the cleaner circuit.
- A higher pH (11.5) in the cleaner circuit produced one of the highest final copper concentrate grades (approximately 30% Cu); however, this was at the expense of copper recovery. The grade-recovery curve of this test was poorer than many of the other tests.
- The use of high dosage rates of Na-silicate in the cleaners produced similar grade-recovery impacts as lower dosages of CMC; however, the final concentrate grade was only 23% Cu compared to 29.5% Cu using CMC.
- To achieve a final copper concentrate grade above 22% Cu, a regrind to about 25 µm was required.
- The use of a silicate depressant (possibly in combination with CMC) will be needed in the cleaning stages to achieve copper concentrate grades >25% Cu.

Gold grade–recovery curves were more variable than those for copper. The gold grade vs recovery curve followed that of copper; however, it was obvious that the use of soda ash (in both the roughers and the cleaners) was detrimental to gold recovery. The relationship between iron and gold was examined to determine if there was gold associated with pyrite; however, the result was inconclusive.

13.4.2.4 Open Circuit Cleaner Tests – Flowsheet Development

Information obtained from the mineralogy and open circuit cleaning tests was used to design a variation of the existing flowsheet. The very fast flotation kinetics of the copper sulphide minerals in the first minute of rougher flotation, combined with mineralogical data indicated that the rougher concentrate contained fine, liberated non-sulphide gangue material. This led to the development of a split concentrate flowsheet. This flowsheet was investigated in the 2019 testwork.

13.5 2019 Metallurgical Testwork

13.5.1 2019 Samples

Much of the northern pit area (first four years of operation) had been sampled and tested; however, there was less variability testing performed on material for Year 5 onwards in the mine plan. To provide better information about the LOM material and its impact on the metallurgical performance, eight new metallurgical drill holes were completed. The drill hole locations were planned to intersect different mineral types and variations in lithology across areas of the pit not previously tested while also ensuring good spatial coverage over the LOM.

The results from the testwork with these samples were used to test the variability of the existing process flowsheet and provide more information for operations. Testwork using alternative flotation technology (including froth washing) was also completed to determine if any improvements in metallurgical performance could be obtained using other technologies.

13.5.2 2019 Testwork Plan

The 2019 metallurgical testwork was conducted at ALS Kamloops. The 2019 program was initially designed with the following aims:

- To improve understanding of the variability of the deposit, specifically the lithologies within the first three years of the LOM. The three main lithologies were:
  - Mano (magnetite norite)
  - GB (gabbronorite)
  - QFSG (quartz–feldspar–sillimanite gneiss)
- To assess opportunities for improving recovery and concentrate grade by optimising regrinding and use of special non-sulphide gangue depressant reagents.

Samples from the eight new metallurgical diamond drill holes were taken and a mining phase composite (PH0 – first year of operation) was created and the following tests were initially completed:

- Mineralogical studies
- Flotation testwork

During the testwork on this composite, it was observed that there would be issues in obtaining the modelled concentrate grade and recovery using the original flowsheet. The testwork program was modified to focus on regrind and cleaning flowsheet development. This revised program used the following composites:

- PH0 composite (first year of operation)
- PH1 composite (Year 2 to 3)
- PH2 composite (Year 4 to 7)

Head assay, mineralogy, and flotation testwork were performed on these composites in the revised regrind/cleaner flowsheet.

13.5.3 Sample Selection

Several drill core intercepts were provided for the preparation of the phase composites. The composites (PH0, PH1, and PH2) were prepared to provide representativity across several variables for the targeted mining periods. The targets for sample selection were based on:

- Copper feed grade
- Acid soluble copper feed grade
- Gold feed grades
- Lithology blend based on the updated mine plan
- Spatial representativity vertically and across all stages of the pit shell constraining the resource estimate

The average assays of the three composite head samples are shown in Table 13-3.

Table 13-3: Assays for PH0, PH1 and PH2
ACG Acquisition Company Limited – Serrote Mine

Phase	Cu (%)	CuOx (%)	Fe (%)	S (%)	MgO (%)	Si (%)	Ni (%)	Au (g/t)	Ag (g/t)
PH0	0.71	0.066	19.6	0.41	10.1	15.0	0.095	0.13	4

Phase	Cu (%)	CuOx (%)	Fe (%)	S (%)	MgO (%)	Si (%)	Ni (%)	Au (g/t)	Ag (g/t)
PH1	0.84	0.044	19.3	0.39	11.6	15.0	0.110	0.16	1
PH2	0.44	0.010	2.75	0.92	9.25	24.7	0.014	0.02	<1

The composites were analysed using QEMSCAN PMA (particle mineralogical analysis) supplemented by XRD (x-ray diffraction) analysis. The mineral content of the composites is shown in Table 13-4.

Composite PH2 consisted of GB material only, as there were minimal Mano lithology assays available at the time of compositing. PH2 was therefore classed as a GB variability composite for analysis. Further chemical analysis on other drill holes has shown that there is Mano material in PH2 of the mine plan and testwork on this lithology within PH2 was completed as part of the variability testwork completed in 2020.

Table 13-4: Mineral Content for PH0, PH1, and PH2
ACG Acquisition Company Limited – Serrote Mine

Mineral	PH0	PH1	PH2
Copper sulphides	1.1	1.5	1.1
Iron sulphides	0.2	<0.1	1.2
Pyroxene/amphibole	30.6	27.1	46.4
Feldspars	18.5	14.2	31.3
Micas	15.3	22.2	4.7
Iron oxides	13.1	13.6	0.1
Chlorite	6.9	6.3	2.4
Titanium minerals	4.1	4.7	1.1
Garnet	4.9	5.5	2.4
Quartz	1.6	0.4	7.5
Spinel	1.9	3.5	<0.1
Corundum diaspore	0.5	0.2	0.1
Apatite	0.1	0.1	0.4
Carbonates	0.1	0.2	0.7
Talc	0.4	0.3	0.1
Others	0.7	0.3	0.5
Total	**100**	**100**	**100**

13.5.4 Mineralogical Studies

Mineralogical studies were performed on head samples of PH0, PH1, PH2 and Flotation Test T28 streams of interest (bulk concentrate A, 1st cleaner tailings and regrind 2 discharge). The aim of the metallurgical production composite analysis was to establish the mineralogical characteristics of the samples, focusing on the major copper-hosting minerals. Information of interest included the speciation of major copper-hosting minerals, copper mineral grain size and associated phases (i.e., minerals that share a grain boundary contact with the copper minerals).

Bornite was typically the main copper sulphide mineral observed in PH0 and PH1 (average distribution ranging from 0.71%–1.11%), followed by chalcopyrite (average distribution 0.31%–0.35%). Minor amounts of chalcocite and covellite were also found. For PH2 (GB material), the majority of the copper-bearing sulphides was chalcopyrite. The main gangue minerals were pyroxene, feldspars, micas, and chlorites. PH2 contained higher levels of pyroxenes, feldspars and pyrrhotite than the other composites.

The key findings from the particle mineral analysis (PMA) on all composites included:

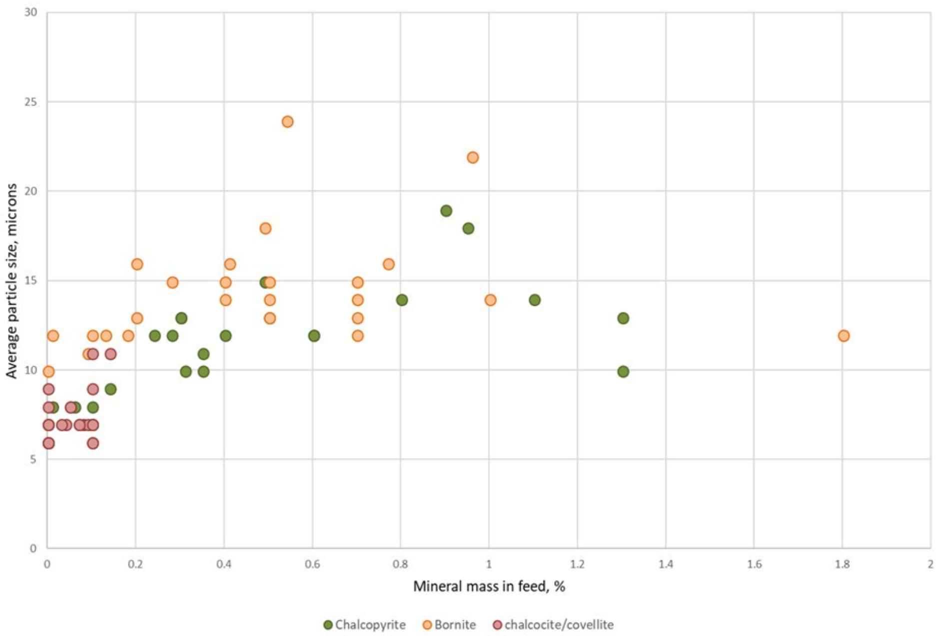
- Extreme difference in the nature of the chalcopyrite in the sample compared to that of the bornite, chalcocite, and covellite.
- The bornite mineral grain size is well liberated below 20 µm.
- The chalcopyrite mineral grain size is well liberated below 12 µm.
- Copper sulphides are predominantly associated with non-sulphide gangue minerals and to a lesser extent with pyrite.

Mineralogical limiting grade vs recovery curves show that based on the fine-grained nature of the chalcopyrite a fine grind of <20 µm is needed to produce a saleable concentrate. The graphs also show that the bornite mineralogy is coarser than the chalcopyrite, thus at a 20 µm grind size very good grades and recoveries can be achieved. The graphs also show the relationship between the copper concentrate grade and copper recovery. Regrinding the copper sulphide minerals to less than 20 µm will be required to achieve a saleable copper concentrate grade (i.e., >24.5% Cu) while achieving a cleaner stage recovery of >95%.

Photomicrographs of the rougher concentrate produced from batch flotation testwork conducted on the PH0 composite sample were taken. The analysis showed that the coarse-grained copper sulphides (mainly bornite) will be recovered in the first rougher concentrate; whereas the copper sulphides recovered in the subsequent concentrates will be very fine grained and poorly liberated. This emphasizes the need for finer regrinding to achieve a saleable copper concentrate grade.

A review of the 27 historical variability samples was conducted to determine the copper sulphide mineral grain size distribution. The copper sulphide mineral grain size for bornite, chalcopyrite and chalcocite/covellite versus distribution in feed are shown in Figure 13-2. This indicates that bornite has an average mineral particle size less than 15 µm, the chalcopyrite has an average mineral particle size less than 12 µm and the chalcocite/covellite has the finest average mineral particle size at less than 7 µm.

Head sample mineralogy was completed for variability testing in 2020 and mineralogy became a prerequisite for all geometallurgical work in order to better understand the copper and mineral distribution.



Source: MTS et al., 2019.

Figure 13-2: CuS Mineral Grain Size vs Distribution in Feed for Variability Samples

13.5.5 Laboratory Testwork Results

Laboratory testwork focussed on optimizing the flotation circuit, specifically the regrind and cleaner circuit to improve copper concentrate grade. This testwork included establishment of grind characteristics, rougher kinetics, regrind optimization and open circuit cleaner tests (Cleaner 1 kinetics and three stage cleaning) to assess reagent screening. The majority of the reagent screening tests were performed on the Cleaner 1 kinetic tests.

13.5.5.1 Cleaner 1 Kinetic Tests and Reagent Screening

Cleaner kinetics tests were conducted to determine the response of the 1st cleaner concentrate to various grind sizes and non-sulphide gangue depressant reagents. All tests were performed on the PH0 composite at a standard primary grind of 107 µm with standard rougher reagents and conditions.

The results show that both dextrin and guar did not assist in depressing non-sulphide gangue minerals. CMC was the preferred non-sulphide gangue depressant at 100 g/t dosage. Increasing the pH on the blended PH0 composite did not result in any significant difference to either grades or recoveries.

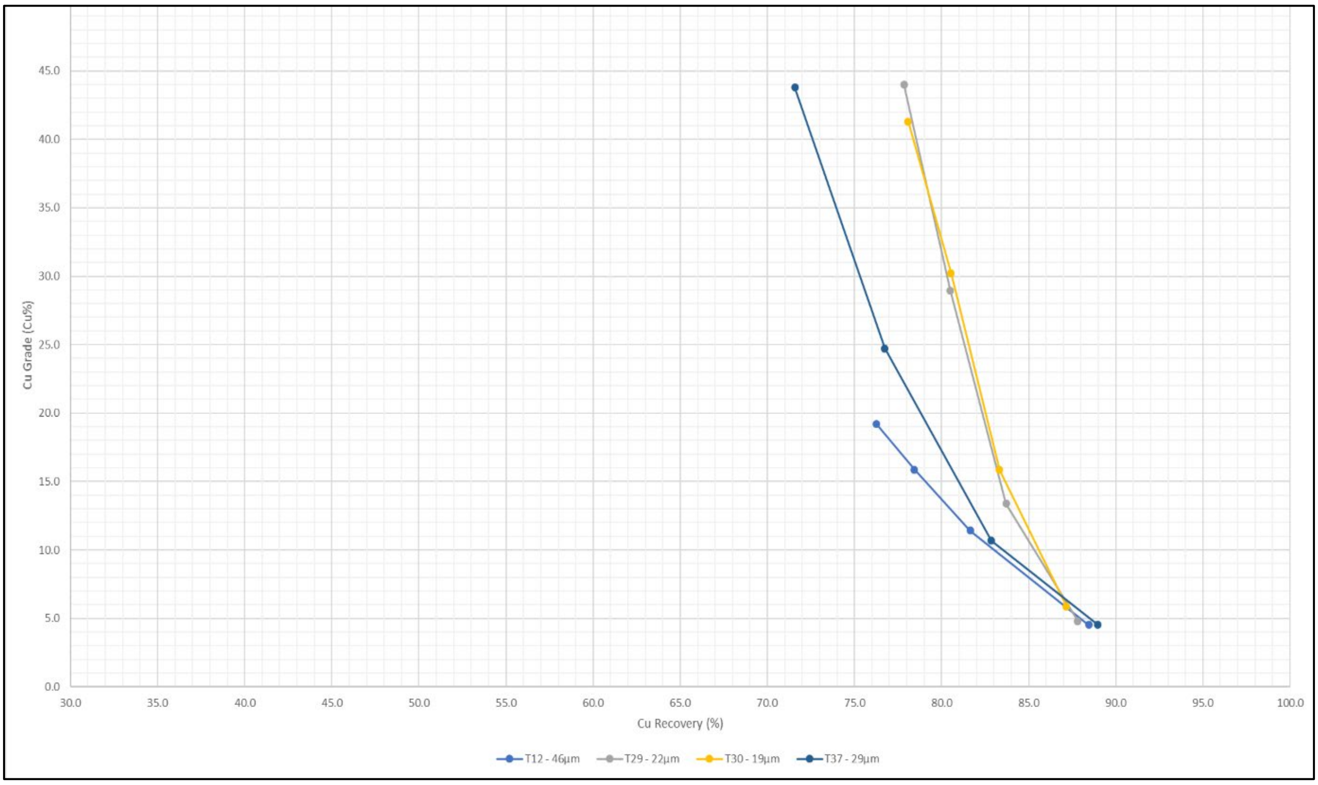
Changing the regrind from 27 µm to 19 µm showed a marked positive shift in the grade-recovery curve, with a 15% increase in recovery at the 25% Cu concentrate grade. These results suggested that a regrind to at least 19 µm is required, with CMC as a specific non-sulphide gangue depressant for future testwork.

13.5.5.2 Regrind Size Optimization

From the mineralogy of the PH0 composite and some of the previous testwork, opportunities were recognized to optimize the regrind size target. There was a need to regrind finer than the 38 µm used in the design criteria. Tests were performed at various regrind sizes to establish the likely recoveries obtained at a concentrate grade of 24.5% Cu.

Figure 13-3 compares coarse regrind (46 µm) and finer regrind targets (19, 22 and 29 µm); it can be seen that a coarse regrind of 46 µm (T12, light blue) will not achieve a 24.5% Cu concentrate grade.

Comparing a regrind size of approximately 30 µm and approximately 20 µm at 24.5% Cu concentrate grade (T37 in dark blue and T29 in grey, respectively) recovery increases from approximately 77% to 83%. The results indicate that a target regrind size of 20 µm (T30 in orange) is optimal for the project. This new target regrind size was used for further testwork.



Source: MTS et al., 2019.

Figure 13-3: Comparison Coarse Regrind (46 µm) vs Fine Regrind (19 µm, 22 µm and 29 µm)

13.5.5.3 Regrind Circuit Flowsheet Development

There is a distinct bimodal distribution to the grain size distribution for copper sulphide minerals. This flagged the possibility of whether a two-stage regrinding process should be implemented because of the following factors:

- Copper sulphide ores that are disseminated and require fine regrinding of the rougher concentrate (approximately 25 µm), result in fine copper minerals that have a slow rate of flotation which may result in losses in recovery.
- When the ore contains secondary copper minerals in addition to chalcopyrite, a two-stage regrinding flotation flowsheet should be used to avoid sliming of bornite and covellite minerals.
- The complexity of the copper–gold material rapidly increases when several copper minerals are present and there are more differences in liberation size. For example, bornite and covellite are brittle and tend to slime during grinding and regrinding of the bulk concentrate.

The split regrind circuit flotation circuit consists of a first regrind mill that regrinds all the rougher concentrate to a particle size P_{80} of 30 µm. The regrind mill discharge is then floated in a cleaner circuit. The tailings from the cleaner circuit are then floated in a bank of cleaner-scavenger cells. The concentrate from the cleaner-scavenger cells is then reground to a particle size P_{80} of 15 µm and floated in an additional cleaner flotation stage.

A program comparing the split regrind circuit vs the conventional bulk regrind circuit was performed. The split regrind circuit had a higher cleaner stage recovery at similar concentrate grades compared with the conventional regrind flowsheet.

The main results from the conventional and split regrind flowsheet include:

- The flotation tests results were normalized at a final concentrate grade of 25% Cu (i.e., to compare like for like recoveries).
- The split circuit achieves a higher cleaner stage recovery compared to the conventional circuit.
- The split circuit increased the overall copper recovery by more than 2% Cu compared to the conventional circuit.

13.5.5.4 Optimized Split Regrind Testwork

Additional testwork on the preferred split regrind flowsheet was performed to identify if any further optimizations could be made. Dosages of half the amount of PE26 (CMC) were tested. Mineralogy suggested that there could be depression of copper minerals associated with non-sulphide gangue due to the CMC. Results showed that for PH0 and PH1 there was negligible difference in results. PH2 (the GB material) showed a 4.5% overall copper recovery improvement.

The results confirmed that there is an opportunity to reduce the CMC to 50 g/t to reduce losses of copper associated with non-sulphide gangue. Further open circuit tests were completed as part of the 2020 program to investigate collector dosage rates and addition points.

Testwork aimed at removing some lower density non-sulphide gangue material prior to the second regrind did not show any benefit and was halted.

13.5.5.5 Variability Testwork

Drill core intercepts were carefully selected to make several variability samples for PH0. These samples were selected to ensure a range of variables were covered including:

- Copper feed grade
- Acid-soluble copper feed grade
- Lithology
- Down-hole to cover the layering effect of the deposit
- Cu/S ratio
- Ni/Cu ratio
- Fe/S ratio
- Spatial representativity vertically and across all stages of the Serrote pit shell

The PH2 composite was included in the list of variability samples even though it consisted only of GB material.

The target first regrind size of 20 µm was not achieved in the laboratory scale regrind mill on several of the variability samples. It is believed that poor liberation in the regrind circuit was the main reason why some of these variability samples provided less than 80% recovery. In practice, a controlled, closed circuit regrind/hydrocyclone circuit would enable good control of the particle size distribution and mitigate these effects. The other variability samples performed well, with over 85% recovery and 25% Cu concentrate grade.

These results were obtained in an open circuit laboratory test. The circuit design used for the initial operation had the second cleaner tailings recycled back to the regrind mill. In other copper flotation operations, this recirculating material typically increases overall recovery by 2%–3% without a decrease in the concentrate grade. This flowsheet with recirculation was selected for Serrote. Locked cycle laboratory tests were carried out to verify these assumptions.

13.5.5.6 Locked Cycle Testwork

After the series of open circuit cleaning tests had been completed, the program moved into the LCT phase. Four 4 kg open circuit tests were performed prior to the LCTs to confirm testwork conditions and regrind times (two tests on PH0 and two tests on PH1). The PH2 composite was omitted because it was not representative of the PH2 mine plan.

Two LCTs were completed on the PH0 composite and one on the PH1 composite. Each LCT used five 4 kg samples. The flowsheet is provided as Figure 13-4.

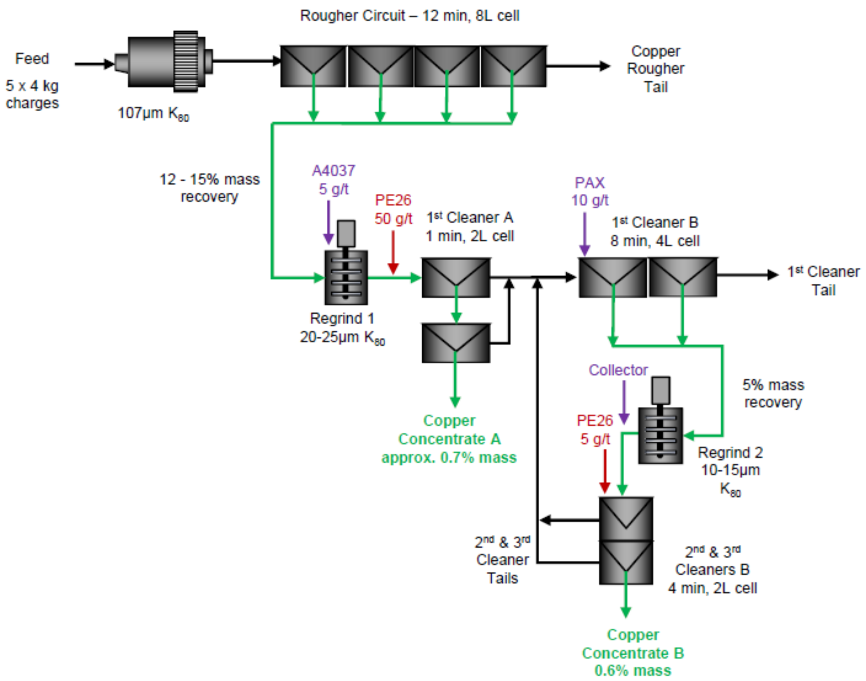
The work on PH0 with two regrind stages had consistent head grades (0.7% Cu similar to the open circuit testwork). Rougher recoveries were slightly lower than expected at 87.5%, primarily due to the lower mass recovery of 11.8% compared to the target 13% to 14%. The Cleaner A concentrate grade was very high at approximately 53% Cu. The stage recovery of this circuit was approximately 61%, slightly lower but in line with the open circuit tests. The Cleaner B concentrate grade was 27.5% Cu at a total copper recovery of approximately 30%. This is higher than the open circuit tests of approximately 23% Cu at 23% total copper recovery.

There was little evidence of large recirculating masses in the cleaner circuit indicating that the regrind size, liberation and subsequent flotation removal is optimal, and no build-up of middling material will occur.

The calculated cleaner circuit recovery was approximately 95%, in line with expectations.

Gold in the copper concentrate was approximately 6 g/t in the LCT, at a gold recovery of approximately 70%. The silver grade was 36 g/t.

The PH0 LCT with two regrinds showed that a high grade of approximately 40% Cu can be achieved at a recovery of 83.1%. This overall recovery would have likely increased by 1%–2% had the target rougher mass pull rates been achieved. The cleaner copper concentrate grade could then be lowered to increase the copper recovery based on the grade–recovery curve.



Source: MTS et al., 2019

Figure 13-4: LCT Flowsheet

The PH1 LCT also performed very well. This sample contained a higher copper head grade than PH0 (0.87% Cu). The overall recovery of this sample was 88.2% at a high concentrate grade of approximately 42% Cu. A cleaner recovery of 96% was achieved in this sample, similar to that of PH0. As for PH0, the gold grade and recovery were approximately 6 g/t and 71%, respectively, and the silver grade was 36 g/t.

The PH0 LCT with one regrind also showed consistent head grades as for the open circuit testwork (0.71% Cu). Rougher recovery of 85.64% was slightly lower than the two-regrind LCT (87.50%). The rougher mass recovery of 14.2% was in line with the target 13%–14%. The final concentrate grade of 30.19% Cu and the recovery of 80.16% were lower than the two-regrind LCT, 39.77% and 83.05%, respectively.

The LCTs with two regrinds performed very well with improved copper recoveries and concentrate grades compared to the open circuit cleaner test results, supporting the flowsheet used for the initial operation and the values used in the financial model.

13.5.5.7 Minor Elements in Concentrate

Selected assays were conducted on the copper concentrates from a range of tests, including the two LCTs with two regrind stages. Results of these assays are provided in Table 13-5. Gold in the concentrates was well above typical payment levels. Higher concentrate copper grades tend to have higher gold grades.

MgO may result in some smelting penalties, with levels above 5% commonly observed for MC-PH0 concentrates. Fluorine may also be high enough to be of concern to some smelters.

Table 13-5: Minor Elements in Concentrate
ACG Acquisition Company Limited – Serrote Mine

Element / Unit / Sample	Ag (g/t)	Al (%)	As (%)	Au (g/t)	Bi (g/t)	Cd (g/t)	Cl (g/t)	Co (g/t)	Cu (%)	F (g/t)	Fe (%)	Hg (g/t)	MgO (%)	Ni (g/t)	Pb (%)	S (%)	Sb (%)	Si (%)	Zn (%)
MC – PH0 Conc.																			
T36 High Grade	32	2.61	<0.002	5.86	<5	6	-	96	37.4	-	11.6	-	5.25	470	0.01	17.1	<0.002	7.0	0.04
T69 Med. Grade	26	3.32	0.002	9.56[1]	<5	6	-	92	27.2	-	10.7	-	7.23	510	0.01	13.1	0.002	10.1	0.06
T66 Low Grade	22	3.28	<0.002	3.83	<5	7	-	87	24.4	-	10.8	-	8.86	530	<0.01	11.3	0.002	11.2	0.03
T76 Con. Comp.	36	1.54	-	5.83	-	-	150	-	39.1	540	10.9	<1	5.84	-	-	17.4	-	7.25	-
MC – PH1 Conc.																			
T77 Con. Comp.	36	1.69	-	6.72	-	-	150	-	42.1	510	12.8	<1	4.51	-	-	18.2	-	5.72	-

Note:

1. Insufficient mass for re-assay

13.6 2020 Metallurgical Testwork

13.6.1 Testwork Summary

Testwork was carried out by ALS Kamloops with reports issued in August, October, and December 2020 to provide further confidence in the selected flowsheet and to provide additional mineralogical data.

13.6.1.1 August 2020

The objective of this work was to determine the metallurgical response of 31 variability samples not previously tested. Testing included:

- Head assays;
- Comminution testing on 13 selected samples through Bond ball mill work index (Bwi) tests;
- Mineralogical examination using bulk mineral analysis (BMA) with full PMA on four samples;
- Flotation response using the split cleaner circuit flowsheet;
- Gold assaying and metallurgical balances for gold;
- Silver assaying of concentrates produced during the program.

13.6.1.2 October 2020

This program was an extension of the August 2020 program. Mineralogical assessments, regrind energy studies and tailings characteristics determination were completed. Testing included:

- BMA using QEMSCAN on 11 samples and PMA on another 11 samples;
- Batch rougher tests to generate rougher concentrate for regrind energy studies and a tailings sample;
- IsaMill signature test plot and Eliason tests to estimate energy requirements for the target regrind discharge sizing.

13.6.1.3 December 2020

- This work was carried out on two composites, a blend of PH2 and PH3, and a PH4 composite. The program comprised an open circuit rougher/cleaner test and an LCT on each composite. The objective was to provide performance data on material to be processed later in the mine plan and, in the case of the LCTs, to provide tailings material for environmental testing.

13.6.2 Samples

13.6.2.1 August and October 2020

The same 31 variability samples were used for the August and October 2020 testwork. The copper content of the samples ranged from about 0.3%–1.2% and averaged about 0.7%. Between 1% and 19% of this copper was soluble in a weak sulphuric acid solution, indicating copper oxide minerals. However, other copper sulphide minerals, particularly secondary copper sulphide minerals, can partially dissolve in this assay as well.

Samples with a higher percentage of oxide copper would have lower copper recoveries in flotation. Between about 3% and 80% of the copper was soluble in a sodium cyanide solution, indicating copper within secondary copper sulphide minerals and bornite. Samples with high percentages of copper in these minerals would produce higher copper grade concentrates as these minerals have a higher copper content.

Gold content ranged from 0.03–0.46 g/t, averaging about 0.13 g/t and silver content ranged from below the detection limit of 1 g/t to about 3 g/t.

Sulphur assayed between about 0.2% and 1.2%. The sulphur content was less than the copper content indicating low levels of other sulphide minerals and chalcopyrite compared to higher grade secondary copper sulphide minerals and bornite. Higher sulphur content than copper content indicates the presence of other sulphide minerals such as pyrite and possibly higher chalcopyrite content; this could result in lower copper grades in the concentrates.

13.6.2.2 December 2020

The lithological composition of the composites was:

- PH2+3; GB 27%, Mano 70%, QFPG 3%;
- PH4; Mano 56%, GB 44%.

The chemical analysis of the PH2+3 and PH4 composites are shown in Table 13-6.

About 9%–11% of the copper was soluble in weak sulphuric acid indicating the presence of oxide copper minerals. Between 47% and 56% of the copper was soluble in sodium cyanide solution indicating the presence of secondary copper minerals. This is supported by the Cu:S ratios of 1.3:1 for PH2+3, and 1.5:1 for PH4.

Table 13-6: Head Assay Summary
ACG Acquisition Company Limited – Serrote Mine

Assay Unit / Composite	Cu (%)	CuOx[1] (%)	CuCN[2] (%)	Fe[3] (%)	Fe(T)[4] (%)	S (%)	MgO (%)	Si (%)	Au g/t	Ag g/t	Cu:S Ratio
PH2+3	0.89	0.08	0.42	16.7	24.9	0.68	7.59	16.0	0.20	2	1.3
PH4	0.54	0.06	0.30	7.3	17.9	0.37	12.2	19.5	0.09	1	1.5

Note:

1. CuOx = Copper soluble in weak sulphuric acid solution
2. CuCN = Copper soluble in sodium cyanide solution
3. Fe = Iron assay using aqua regia digestion
4. Fe (T) = Total iron using 4 acid digestion.

13.6.3 Mineralogical Studies

13.6.3.1 August 2020

Twenty-seven of the variability samples in this program were analysed for mineral content using QEMSCAN BMA and four samples were analysed using the comprehensive PMA.

Copper-bearing minerals in the samples were primarily chalcopyrite and bornite. Traces of covellite and chalcocite were measured but do not contain a significant portion of the copper. In addition to copper sulphides the primary sulphur containing minerals were pyrrhotite and pyrite.

Talc measured between trace levels and about 0.9%. Samples with higher talc could result in dilution of the copper concentrate unless a talc depressant is used.

Micas measured between 1% and 43%. It is believed that in past testing the high mica content resulted in difficulty assessing the regrind discharge size using standard laser sizing due to the platey nature of mica.

13.6.3.2 October 2020

Eleven more variability samples were analysed using BMA, another 11 samples plus 4 samples previously tested were analysed using PMA and a mineralogical analysis using X-ray powder diffraction (XRD) was completed on a sample that contained a high amphibole content.

At a nominal primary grind K_{80} of 106 µm the copper sulphide mineral liberation ranged from approximately 44%–64%, averaging 53%. The non-liberated copper sulphide particles were mostly in binary form with non-sulphide gangue. Between 12% and 21% of the copper sulphide particles had <10% surface exposure; these will be difficult to recover in conventional flotation.

13.6.3.3 December 2020

The two composites were analysed for mineralogical content and liberation characteristics using QEMSCAN PMA. The mineral content is shown in Table 13-7.

Table 13-7: Mineral Content Summary
ACG Acquisition Company Limited – Serrote Mine

Mineral Content / Composite	Chalcopyrite (%)	Bornite (%)	Chalcocite (%)	Covellite (%)	Pyrite (%)	Pyrrhotite (%)	Micas (%)	Talc (%)	Other NSG (%)
PH2+3	1.1	0.7	<0.1	<0.1	<0.1	0.1	8.5	0.3	89.2
PH4	0.4	0.6	<0.1	<0.1	<0.1	<0.1	1.8	0.2	97.0

Note: Other NSG = Other non-sulphide gangue minerals including iron oxides, pyroxene/amphibole, feldspars, chlorite, titanium minerals, garnet, quartz, spinel, corundum, apatite, carbonates, barite, zircon and epidote, along with traces of galena, sphalerite, cuprite and iron nickel sulphide

For the PH2+3 composite chalcopyrite accounted for 59% of the copper and bornite contained 40%. The PH4 results were 42% in chalcopyrite and 58% in bornite. Copper minerals accounted for 90% of the sulphur in both composites with mainly pyrite and pyrrhotite making up the balance.

Micas and talc accounted for 8.5% and 0.3% of the mineral content in PH2+3, and 1.8% and 0.2% in PH4, respectively.

Estimates of copper liberation were carried out at a grind size K_{80} of 100 µm. This showed 47% liberation in the PH2+3 composite and 43% in PH4. A greater portion of the chalcopyrite was measured in binary with NSG compared to bornite. About 13%–14% of the copper sulphides showed <5% surface exposure and a further 15%–7% had exposures between 5% and 10%.

13.6.4 Comminution Test Results

13.6.4.1 August 2020

In the August 2020 testwork, 13 of the 31 variability samples from previous testwork that were not previously tested were subjected to Bond ball mill work index tests. The tests were completed at a 106 µm closing screen size. The Bwi ranged from 13.8 kWh/t to 21.6 kWh/t. This indicates that the sample set ranges from moderately soft material to very hard material for ball milling. The average Bwi from this set of tests was about 16.3 kWh/t with a standard deviation of 2.2 kWh/t. This indicates that the average of this material is moderately hard.

13.6.4.2 December 2020

The Bond ball mill work indices for the PH2+3 composite and PH4 composite were 15.3 kWh/t and 14.9 kWh/t, which puts these materials at the lower end of the range above for the variability samples.

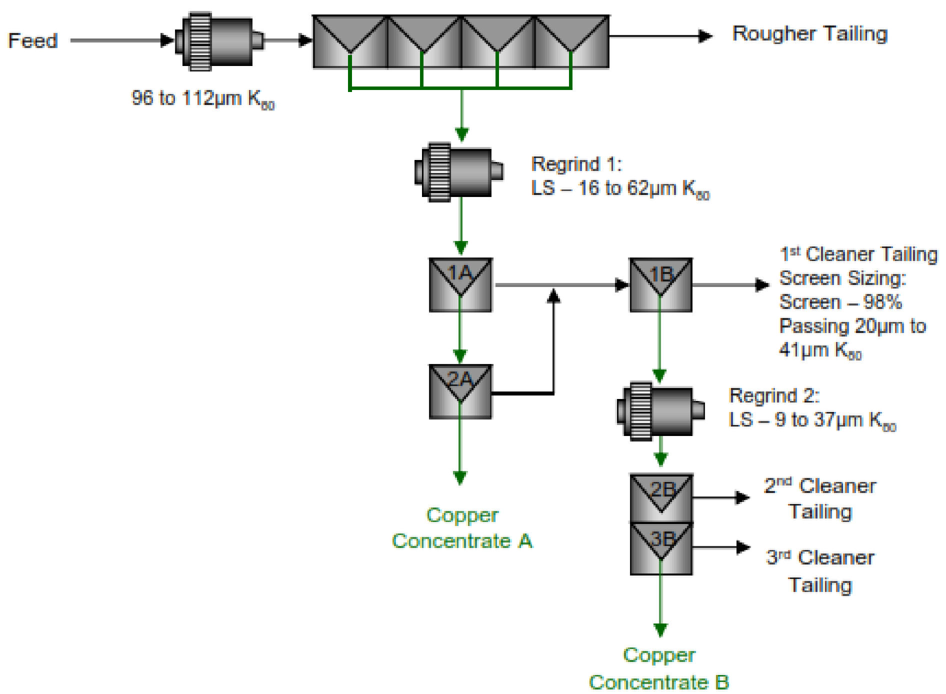
13.6.5 Flotation Test Results

13.6.5.1 August 2020

A single batch cleaner test was conducted on each of the 31 samples using the flowsheet and reagent regime developed in previous test programs (Figure 13-5).

Recovery of copper in the rougher circuit was between 84% and 97% of feed copper, averaging about 92%. Overall recovery of copper to both concentrate A and B ranged from about 66%–89%, averaging about 81%. The combined concentrates graded from about 20% Cu to just over 50% Cu and averaged about 36% Cu. Gold content in the combined concentrates averaged about 6 g/t, ranging from 0.6–16 g/t; recovery of gold to the concentrates was calculated to be between 30% and 85%. The silver content of the concentrates ranged from 13–56 g/t.

Between about 2% and 7% of the copper was lost to the 1st cleaner tailings stream, and between 3% and 13% of the copper was measured to be in the cleaner tailings 2B and 3B. Cleaner tailings 2B and 3B are not exit streams and would circulate to the 1st cleaner B feed. It is possible that some of this copper may be recoverable in a closed circuit. In past locked cycle testing, over two-thirds of the copper that had reported to the Cleaner 2B and 3B in open circuit tests was recovered to concentrate B.



Source: ALS Kamloops, 2020

Figure 13-5: Variability Testing Flowsheet

13.6.5.2 October 2020

A Master Composite weighing approximately 168 kg was prepared as feed for batch rougher tests to generate rougher concentrate for regrind energy studies. The average copper content was 0.74%, CuOx was 0.083%, MgO was 11% and Si was 14%. A bulk concentrate weighing approximately 25 kg was generated, indicating 15% mass recovery, with 89% copper recovery and 91% S recovery and a K_{80} of 95 µm. The tailings were used for environmental testing.

Eliason and IsaMill signature plot tests were completed to achieve a target regrind K_{80} of 20 µm. The results indicated a regrind energy of 33 kWh/t for the Eliason test and 45 kWh/t for the IsaMill signature plot.

13.6.5.3 December 2020

One batch cleaner test was carried on each of the PH2+3 and PH4 composites using the flowsheet and conditions shown in Figure 13-5. These tests were followed by an LCT on each composite using the flowsheet in Figure 13-4. The goal of the LCTs was to produce tailings for environmental testing; hence, it was not possible to weigh the tailings. Metallurgical balances for each test were produced using BILMAT software based on the feed and concentrate weights and the assays.

The results of the cleaner tests are shown in Table 13-8 and Table 13-9. Table 13-8 shows a copper recovery to cleaner concentrates A and B of 86.3% at a combined concentrate grade of 40.8% Cu, even though the cleaner tailings products were not recycled. The combined gold and silver recoveries were 51.8% and 61.1% respectively. The combined MgO content was 1.5%. Table 13-9 shows a copper recovery to cleaner concentrates A and B of 83.6% at a combined concentrate grade of 43.5% Cu. The combined gold and silver recoveries were 55.5% and 54.5% respectively. The combined MgO content was 1.9%.

Table 13-10 shows the results of the LCT on PH2+3 with a copper recovery to cleaner concentrates A and B of 89.7% at a combined concentrate grade of 38.0% Cu. The combined gold and silver recoveries were 65.8% and 69.1%, respectively. The combined MgO content was 0.4%.

Table 13-11 shows the results of the LCT on PH4 with a copper recovery to cleaner concentrates A and B of 87.8% at a combined concentrate grade of 39.6% Cu. The combined gold and silver recoveries were 58.4% and 60.5%, respectively. The combined MgO content was 0.1%.

Table 13-8: Open Circuit Cleaning Test on PH2+3
ACG Acquisition Company Limited – Serrote Mine

Product	Cu (%)	Au (g/t)	Ag (g/t)	Cu Recovery (%)	Au Recovery (%)	Ag Recovery (%)
Feed	0.90	0.22	0.7	100	100	100
Cleaner A conc.	43.4	5.65	24	67.5	36.8	47.0
Cleaner B conc.	33.6	6.40	20	18.8	15.0	14.1
3rd cleaner tailings	5.47	2.52	6	2.6	5.0	3.6
2nd cleaner tailings	1.43	0.63	2	3.2	5.9	5.7
1st cleaner tailings	0.27	0.24	1	3.9	14.4	18.1
Rougher tailings	0.05	0.06	0.1	4.1	23.0	11.6

Table 13-9: Open Circuit Cleaning Test on PH4
ACG Acquisition Company Limited – Serrote Mine

Product	Cu (%)	Au (g/t)	Ag (g/t)	Cu Recovery (%)	Au Recovery (%)	Ag Recovery (%)
Feed	0.53	0.12	0.8	100	100	100
Cleaner A conc.	44.9	6.39	44	67.2	41.1	43.5
Cleaner B conc.	38.5	6.00	44	16.4	12.4	11.0
3rd cleaner tailings	6.40	1.29	12	3.1	2.7	3.8
2nd cleaner tailings	1.31	0.35	10	3.4	3.9	17.2
1st cleaner tailings	0.26	0.25	1	4.8	19.8	12.1
Rougher tailings	0.03	0.03	0.1	5.2	21.5	11.0

Table 13-10: Results of LCT on PH2+3
ACG Acquisition Company Limited – Serrote Mine

Product	Cu (%)	Au (g/t)	Ag (g/t)	Cu Recovery (%)	Au Recovery (%)	Ag Recovery (%)
Feed	0.83	0.23	0.7	100	100	100
Cleaner A conc.	44.4	6.01	28	59.6	29.2	41.7
Cleaner B conc.	27.2	9.12	22	30.1	36.6	27.4
Cleaner tailings	0.31	0.27	1	5.3	16.5	19.3
Rougher tailings	0.05	0.05	0.1	5.1	17.7	11.5

Table 13-11: Results of LCT on PH4
ACG Acquisition Company Limited – Serrote Mine

Product	Cu (%)	Au (g/t)	Ag (g/t)	Cu Recovery (%)	Au Recovery (%)	Ag Recovery (%)
Feed	0.51	0.10	0.8	100	100	100
Cleaner A conc.	45.3	5.94	43	66.2	44.1	40.8
Cleaner B conc.	28.2	3.68	39	21.6	14.3	19.7
Cleaner tailings	0.28	0.16	2	5.7	16.3	28.0
Rougher tailings	0.04	0.03	n/d	6.4	25.3	11.5

13.7 Woodgrove Direct Flotation Reactor (DFR) Pilot Plant Testing

13.7.1 Objectives

Pilot plant testing of a Woodgrove DFR pilot flotation cell and a pilot scale Outotec high intensity grinding (HIG) mill was carried out between September and November 2020, at Atlantic Nickel’s pilot plant in Itagibá, Bahia, Brazil.

The testwork objectives were:

- Test the split flotation/regrind circuit at a larger scale than bench testing;

- Validate the operational parameters of the DFR in the duties of Cleaner 1, Cleaner-Scavenger and Cleaner 2;
- Test the HIG mill to grind the rougher concentrate and the cleaner-scavenger concentrate to the required P80 sizes for the Cleaner 1 and Cleaner 2 flotation;
- Generate material for downstream testing (tailings thickening and concentrate thickening and filtration).

13.7.2 Feed Sample Characterization

The feed material for the tests was taken from a RC infill drilling program carried out in November 2019. The material lithology was reported as 90% Mano and the mineralisation was reported to be 89.7% sulphide (174 samples) and 10.3% mixed oxide/sulphide (17 samples). The grade of the material was 0.7% Cu and 0.3% S indicating significant presence of bornite. A total of 6.3 t was delivered to the pilot plant at a P_{80} size of 3 mm.

13.7.3 Rougher Flotation

The pilot plant was used to grind the material and produce a rougher concentrate. The throughput was 350 kg/h. Several problems were encountered in achieving a stable operation in grinding and flotation. The average P_{80} obtained was 83 µm compared to the target of 100 µm. The average grade of the rougher concentrate was 3.22% Cu compared to the target of 4.7% Cu; the recovery was 81.4% compared to the target of 90%. The P_{80} of the concentrate was 49 µm. The total mass of concentrate for DFR testing was 550 kg.

The rougher tailings averaged 0.16% Cu and 0.082% S. A copper sequential leach on the tailings showed that 53% were floatable sulphides, 23% were copper oxides and 24% were chalcopyrite locked with silicates.

13.7.4 Rougher Concentrate Regrinding

The HIG mill was operated continuously to produce sufficient concentrate at a P_{80} of 20 µm for two Cleaner 1 DFR tests.

13.7.5 Cleaner 1 and Cleaner-Scavenger Testing

The Cleaner 1 tests were carried out in three stages to simulate the three cells in the industrial plant. The tailings were then recycled to the DFR to simulate the five cells in the Cleaner-Scavenger circuit. Twenty-one Cleaner 1 tests were carried out to test variations in the aeration rate, wash water volume, gas hold up level and reagents.

The last three tests gave the best results with an average concentrate grade of 39.7% Cu at a stage recovery (from the rougher concentrate feed) of 65.9%.

A further 21 cleaner-scavenger tests were carried out. The average of the five best tests gave a concentrate grade of 6.3% Cu and 74.5% stage recovery.

13.7.6 Cleaner 2

The cleaner-scavenger concentrate mass was sufficient for four tests and was reground in the HIG mill to a P_{80} of 10 µm. The DFR tests were carried out in four stages to simulate the four cells in the Cleaner 2 circuit. Given the sequential nature of the cleaner-scavenger and Cleaner 2 tests it was not possible to recycle the Cleaner 2 tailings to the cleaner-scavenger feed. The four tests were carried out in one day, which did not allow time to review the results between one test and another to better optimize the parameters. The average concentrate grade was 29.1% Cu at a stage recovery of 77.4%.

13.7.7 Summary Metallurgical Balance

A summary of the mass balance produced by MVV for the above tests is shown in Table 13-12. For comparison, the Mine design values are provided.

Table 13-12: Summary Metallurgical Balance
ACG Acquisition Company Limited – Serrote Mine

Stream	% Cu (Tests)	% Recovery (Tests)	% Cu (Project)	% Recovery (Project)
Feed	0.72	100.0	0.73	100.0
Rougher concentrate	3.27	81.9	4.64	89.7
Rougher tailings	0.16	18.1	0.09	-
Cleaner 1 concentrate	38.44	46.6	39.10	65.5
Cleaner-scavenger concentrate	6.51	27.8	6.50	-
Cleaner-scavenger tailings	0.38	7.4	0.26	-
Cleaner 2 concentrate	29.69	22.6	34.68	19.0
Cleaner 2 tailings	1.50	5.3	1.26	-
Final concentrate	35.07	69.2	37.68	84.7
Final tailings	0.19	25.5	0.11	-

13.7.8 Conclusions

The tests proved the efficacy of the DFR cells and the HIG mill. Although the stage recovery in Cleaner 1 did not meet the project design criteria, the concentration ratio was superior at 11.8 compared to the criterion of 8.4. Cleaner 2 performed well with a concentration ratio of 4.6 compared to the criterion of 5.3, but with a slightly higher recovery. The lower than expected rougher concentrate grade was the main contributor to the lower than expected Cleaner 1 recovery. Insufficient rougher concentrate was available to fully optimize the DFR operation. Valuable information was gathered regarding the variables that impact DFR performance.

The characteristics of the feed material to the pilot plant were a key issue in the rougher performance with lower than expected rougher recovery and concentrate grade. The material contained 10% mixed oxide/sulphide material. The rougher tailings contained 23% oxides and 24% as chalcopyrite locked in silicates. An additional factor was the use of RC material drilled at the end of 2019; surface oxidation may have occurred.

13.8 Plant Performance from June 2021 to December 2022

The performance is shown in Section 17, Table 17-3. The design throughput of 342 kt/m (equivalent to 4.1 Mt/a) was achieved in September 2022 and was maintained through to December 2022 (the cut-off date for this CPR).

Design flotation concentrate grades and recoveries have still not been achieved although significant improvements have been made. After six months of operation, copper recovery was between 54% and 58% with concentrate grades between 20% and 25%. From August 2022 to December 2022, recoveries were between 81% and 84.5% with concentrate grades between 22% and 25%.

The flowsheet changes implemented in July 2022 resulted in an increase in recovery to the design levels; however, the concentrate grades continue to be lower than design (MVV prioritized recovery over grade). The testwork carried out by SGS Geosol in 2022 (Section 13.10) showed the potential for significantly increasing concentrate grade and increasing recovery. The work also showed that an increase in the impeller tip speed in the conventional laboratory cells increased recovery.

13.9 2021/2022 Testwork

13.9.1 Woodgrove Pilot Scale Testing

Woodgrove carried out pilot plant tests in January/February 2022 and in June/July 2022 on several plant streams.

13.9.1.1 January/February 2022 Program

The pilot unit was set up to run in semi-continuous batch mode with four stages. Various conditions were tested including conditioning, frother dosage, and depressants that were applied to the feed of the following streams: cleaner 1, cleaner 1 plus cleaner-scavenger, cleaner-scavenger, cleaner 1 tailings, cleaner 2 tailings.

Woodgrove made the following observations:

- Batch pilot plant results are similar to the plant performance for cleaner 1.
- The chemistry and air rates seem to be the main performance drivers in both the pilot plant and the full-scale plant.
- Regrind has a positive effect on cleaner 2 grade but a P_{80} less than 25 µm reduces cleaner 2 recovery.
- Tests with higher air rates (1.6 L/min) gave better performance in cleaner 1.
- High wash water ratios (WWR) produced better quality concentrates in cleaner 1 tests and it was recommended the WWRs be increased in cleaner 1 and cleaner 2 cells in the full-scale plant.
- Gas hold up (GHU) can be used as an indication of DFR cell performance.
- The use of depressants helps to increase copper recovery and concentrate grade.

13.9.1.2 June/July 2022 Program

Pilot tests were conducted on cleaner 1 feed, cleaner 1 and cleaner-scavenger combined concentrate, cleaner-scavenger feed, cleaner 2 feed (cyclone 2 overflow only), and cleaner-scavenger tailings. The tests were carried out after several flowsheet changes had been made by MVV. The variables tested were impeller tip speed (4.2 m/s and 6.0 m/s) and replacing CMC_SENDEP 30F with PE26, an alternative CMC variant.

Woodgrove's observations were:

- In Cleaner 1, the increase in tip speed resulted in a 3.3% recovery increase and the depressant replacement of CMC_SENDEP 30F with PE26 gave an additional 2.4% recovery.
- For Cleaner 2 feed (cleaner 1 + cleaner-scavenger concentrates), the increase in tip speed gave 9.3% recovery improvement and a further 6.9% increase with the depressant replacement; the concentrate grade was 21% Cu.
- Cleaner 2 feed (cyclone 2 overflow only), the tip speed increase improved the recovery by 7.8%.
- Cleaner-scavenger feed, the tip speed increase gave a 5% recovery improvement, and the depressant replacement gave an additional 1.5% increase.

- For the Cleaner scavenger tailings (cyclone 2 overflow only), the tip speed increase gave a 12.7% recovery improvement but with a 4.9% drop in concentrate grade to 3.9%.

Woodgrove's recommendations were:

- Test increased tip speeds with tank cells on the same streams.
- Adjust the percentage solids of the cleaner 2 feed to 12%; the P_{80} of the cleaner 2 feed was very fine at 5 µm to 10 µm and at 8% solids.
- Carry out tests to optimize the PE26 dosage.
- Conduct a plant trial using PE26.

13.9.2 SGS Geosol Flotation Testwork

Laboratory scale testwork commenced in May 2022 on samples taken from the operating plant. At that time the plant was operating with the flowsheet shown in Figure 17-1. The following samples were sent to SGS Geosol:

- Fresh feed
- Rougher concentrate from cells 2 to 6
- Rougher concentrate from cell 1
- Rougher tailings
- Cleaner 1 concentrate
- Cleaner 1 tailings
- Cleaner-scavenger concentrate
- Cleaner-scavenger tailings
- Cleaner 2 concentrate
- Cleaner 2 tailings
- Final tailings
- Final concentrate

Batch testing and LCTs were carried out on cleaner-scavenger tailings and the concentrate from rougher cells 2 to 6. A summary of the findings is provided below:

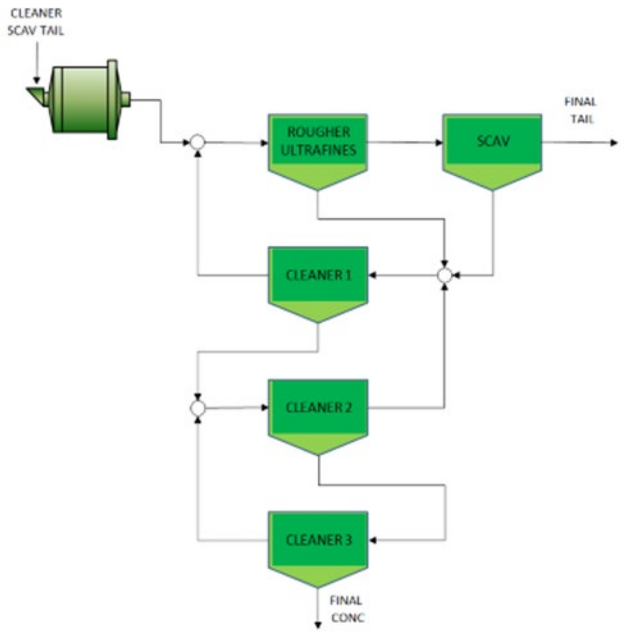
- Mass balancing of the Serrote plant data indicated major copper losses of 18.9% to the rougher tailings. Mineralogical analysis indicated that most of the copper in the rougher tailings was in the form of unliberated particles (complex particles) above 60 µm, as well as fully liberated particles below 10 µm (ultrafines). Both these types of particles may benefit from additional residence time in the rougher circuit.
- Copper losses to the cleaner-scavenger tailings were also very significant, at 11.9% of the copper in the plant feed. The losses were due mainly to ultrafine particles, despite those particles being fully liberated.
- The fully liberated particles exhibited near 100% recovery within the 5 µm to 20 µm range. Outside that range copper recovery dropped to less than 80% for particles finer than 5 µm and less than 40% for particles coarser than 40 µm.
- The main copper bearing minerals in the ore were bornite (0.75% assay in the feed, 27.9% in the final concentrate) and chalcopyrite (0.48% in the feed, 20.3% in the concentrate). Bornite and chalcopyrite recoveries were 67.9% and 76.6%, respectively.
- The predominant gangue minerals in the ore were hornblende (21.0% in feed, 17.8% in final concentrate), chlorite (17.3% in feed, 8.11% in final concentrate); feldspar (16.7% in feed,

5.25% in final concentrate), iron oxides (22.6% in feed, 4.12% in final concentrate) and biotite (14.0% in feed, 3.48% in final concentrate) demonstrating the poor selectivity obtained with the Woodgrove cells.

- Batch flotation tests on the cleaner-scavenger tailings indicated that the best regrind strategy is the one adopted in the plant; this is to regrind only the fraction above 20 µm and then re-combine the ground material with the fines for flotation.
- All column flotation tests using the cleaner-scavenger tailings produced poor results irrespective of testing several reagents schemes and different regrind targets. In contrast, most of the batch flotation tests were successful, providing that regrind was adequate.
- Increasing the flotation cell impeller speed in batch flotation tests yielded the best results on the cleaner-scavenger tailings, with the copper recovery reaching 92.2% with concentrate grades up to 25.5% Cu at 1,900 rpm in a 9 L cell. Increasing the impeller speed in batch tests using the rougher concentrate sample also yielded high copper recoveries, ranging from 86% to 96%, with concentrate grades between 14% Cu and 26% Cu.
- Increasing the impeller speed in a pilot scale mechanical cell yielded copper recoveries from 63% to 87% for the cleaner-scavenger tailing but the copper grade was low, ranging from 3% Cu to 6% Cu. These results were negatively affected by excessive frothing because the feed sample still contained the reagents from the plant.
- A locked cycle test conducted on the cleaner-scavenger tailings using a high impeller speed yielded a copper recovery of 82.7% and a concentrate grade of 32.4% Cu. The flowsheet used for this test is shown in Figure 13-6. A regrind to 20 µm was conducted on the +20 µm fraction of the feed, residence times were 8 minutes in rougher-scavenging and a total of 5 minutes in the three cleaner stages.
- Two locked cycle tests were conducted on the cell 2 to 6 rougher concentrate sample; the first with the regrind P80 at 10 µm and the second with a P80 of 20 µm (regrind carried out only on the coarse fractions). Both tests used a high impeller speed in all stages. The test at a regrind of 10 µm gave a copper recovery of 95.2% and concentrate grade of 45.5% Cu. The test at a regrind of 20 µm gave 95.4% recovery and concentrate grade of 37.3% Cu. The flowsheet used for these tests is shown in Figure 13-7. The residence times were 9 minutes for cleaner 1, 5 minutes for scavenging, 5 minutes for cleaner 2 and 3 minutes for cleaner 3.

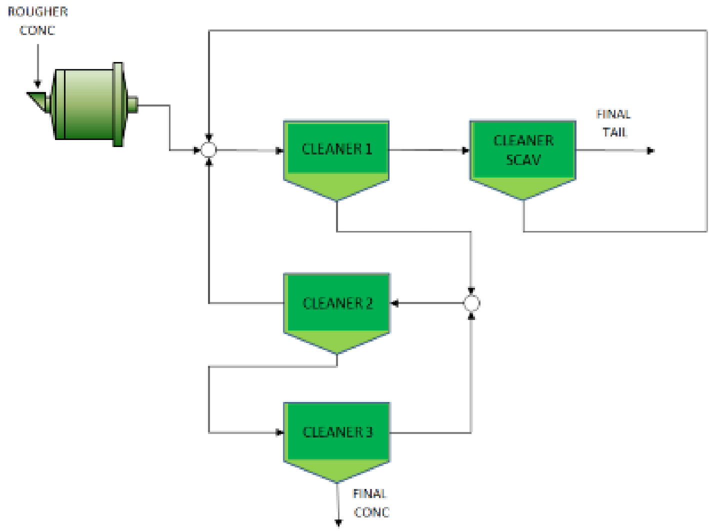
These results show that for cleaner-scavenger tailings a high recovery and concentrate grade can be achieved by regrinding to 20 µm followed by additional flotation residence time in conventional cells. This indicates that an open circuit could be feasible in the plant with additional equipment. Opening this circuit instead of recycling the material to the rougher circuit would provide additional rougher residence time.

The results also show that the cell 2 to 6 rougher concentrate can upgraded at a high recovery.



Source: SGS Geosol, 2022

Figure 13-6: Regrind/Rougher/Cleaner Testing on Cleaner-Scavenger Tailings



Source: SGS Geosol, 2022

Figure 13-7 : Regrind/Cleaner Testing Flowsheet on Rougher Cell 2 to 6 Concentrate

13.10 Future Testwork Plans

Work is continuing at SGS Geosol with LCTs to be carried out using four Serrote feed blends. The results are expected in February 2023.

MVV plans to carry out pilot plant testwork (at the MVV site with ATN equipment) in Q2 2023.

13.11 Caboclo Testwork

13.11.1 SGS 2011

SGS performed initial testwork on behalf of Aura Minerals on selected samples from the Caboclo exploration target in 2011 (SGS, 2011). Samples were sourced from drill core from the Rogério zone.

QEMSCAN results showed the major phases were Fe-oxides, plagioclase, pyroxene, amphibole and biotite. The dominant copper phase was bornite, followed by chalcopyrite. Covellite is also a significant copper phase for the Caboclo target, representing 8.4% of the copper.

A Master Composite of the sulphide mineralisation assaying 0.55% Cu and 0.20 g/t Au was tested along with samples of the gabbro (GB) and magnetitic norite (Mano) lithologies. Rougher and cleaner flotation tests were performed on the Master, GB, and Mano composites. A locked cycled test was performed on the Master Composite.

In terms of grindability, the Caboclo Master Composite had an A x b value of 35.7 and a Bond ball mill work index of 17.8 kWh/t. The A x b and Ta parameters indicate that the Caboclo mineralisation has a medium hardness for coarse grinding (SAG). The Bond BWi value is in the “hard” hardness range for fine grinding.

With a primary grind of 117 µm, the Caboclo Master Composite yielded a 3rd cleaner concentrate grading 27.4% Cu at a copper recovery of 83.7%. The gold assay of the 3rd cleaner concentrate was 7.5 g/t at a recovery of 69.4%.

Testwork was conducted using analogies with an earlier draft of the Serrote plant design and testwork parameters; those analogies are no longer current as the Serrote design and process parameters have been considerably modified since 2011. The Caboclo testwork as described in the 2011 report should be limited to the support of Inferred Mineral Resources only.

13.11.2 ALS 2022

13.11.2.1 Samples

ALS Canada issued a testwork report on 22 April 2022. The work comprised comminution tests, rougher and open circuit cleaning, and two locked cycle tests (LCTs). Eight samples were sent to ALS comprising seven from reverse circulation drilling and one quarter drill core sample. The two lithologies represented were gabbro and Mano. Two master composites were made from the eight samples, one representing the upper portion of the deposit and the other the lower portion. The ranges of the main elements are shown in Table 13-13.

Table 13-13: Sample Assay Ranges
ACG Acquisition Company Limited – Serrote Mine

Cu %	CuOx % of total Cu	CuCN % of total Cu	Ni %	S % total	Au g/t
0.6–1.0	5-10	5-67	0.09–0.13	0.26–4.9	0.05–0.24

13.11.2.2 Work Carried Out

The following work was completed:

- Comminution: the drill core was tested using the Bond protocols for abrasion (Ai) and the Bond ball mill work index (BWi).

- QEMSCAN mineralogical analysis on the eight samples and particle mineral analysis (PMA) on four size fractions from each sample.
- One rougher and one open circuit cleaner test on each sample using the Serrote testwork flowsheet shown in Figure 13-5.
- One LCT on each master composite using the using the LCT flowsheet shown in Figure 13-4.

13.11.2.3 Mineral Content

The mineral content is summarized below:

- Gabbro lithology: chalcopyrite is the main copper mineral with pyrite and pyrrhotite as the other principal sulphide minerals. The main gangue minerals are pyroxene/amphibole and feldspars.
- Mano lithology: there is more bornite than chalcopyrite, as reflected in the CuCN assay in Table 13-13, and only minor pyrite. The gangue minerals include micas (biotite/phlogopite).
- Other gangue minerals: the talc content varies from a trace up to 1.4% and iron oxides vary from 3% to 33%.

13.11.2.4 Mineral Liberation

Two samples showed that the copper minerals were 80% liberated; however, in the other six samples the copper mineral liberation was between 44% and 66%. The unliberated copper sulphides were mainly associated with non-sulphide gangue.

ALS considered that the 80% liberation could be misleading as the samples contained flaky mica and excessive grinding times were required to obtain the target grind size of 106 µm.

13.11.2.5 Comminution

The comminution test results are summarized below:

- The Bond Ai index was 0.08 which indicated low abrasivity.
- The Bond ball mill work index, BWi, was 23 kWh/t which indicates very hard ore for ball milling; however, ALS stated that the mica issue indicated above could have distorted the result.

13.11.2.6 Flotation

The rougher-cleaner tests were carried at a primary grind between 93 µm and 95 µm (see Figure 13-3). PAX and Aero 4037 collectors were used in rougher flotation at a pH of 9.3. The rougher concentrate was ground to between 42 µm to 56 µm, with more reagents added to the regrind mill and the pH raised to 10.5. The reground rougher concentrate was cleaned in two stages to produce bulk rougher concentrate A. The first cleaner tailings were passed to the cleaner-scavenger with the cleaner-scavenger tailings being the final tailings and the scavenger concentrate passing to a second regrind stage. The reground concentrate was cleaned in two stages to produce bulk concentrate B and second and third cleaner tailings.

The locked cycle flowsheet and conditions were similar but with the second and third cleaner tailings returned to the cleaner-scavenger feed (see Figure 13-4).

The rougher flotation tests on three gabbro and five Mano samples gave copper recoveries between 89% and 94% with mass pulls between 9% and 13% for gabbro and between 89% and 96% for Mano with mass pulls of between 12% and 24%. These recoveries are good considering that the copper oxide content in the samples varied between 5% and 10%.

For the gabbro samples, the combined A+B concentrate grades ranged between 23% and 30% Cu at open circuit cleaner recoveries between 73% and 88%.

For the Mano samples, the combined A+B concentrate grades ranged between 24% and 53% Cu at open circuit cleaner recoveries between 71% and 85%.

The LCT test on the composite designated "upper" gave 91.1% Cu recovery at a combined concentrate grade of 26.7% Cu; the "lower" composite gave 86.2% Cu recovery at 30.6% Cu grade.

The combined concentrate indicated payable gold and silver values with the open circuit cleaner concentrates containing between 3.5 g/t and 7.9 g/t gold and between 30 g/t and 70 g/t silver.

The "upper" LCT combined concentrate contained 3.5 g/t gold and 53 g/t silver and the "lower" concentrate contained 5.5 g/t gold and 33 g/t silver.

The LCT results show slightly higher recoveries than the equivalent Serrote LCTs but lower concentrate grades.

13.12 CP Comments on "Item 13: Mineral Processing and Metallurgical Testwork"

13.12.1 Comments

- The process plant has not been able to reproduce the copper recovery or concentrate grades in the metallurgical testwork carried out up to the end of 2020. The main reasons for this are:
  - The Woodgrove flotation cells have not delivered the copper recovery or concentrate grades shown in the Woodgrove pilot testing carried out in 2020.
  - A large proportion of the copper losses occur in liberated copper minerals <5 µm and >40 µm in size, and copper minerals locked in complex gangue particles. Laboratory testwork has shown high recoveries and concentrate grades can be achieved with selective regrinding and additional flotation residence time in conventional cells.
- Pilot scale testwork carried out by Woodgrove in 2022 showed the recovery could be improved by increasing the impeller tip speed and using a different gangue depressant; however, the improvement did not indicate that the design recovery or concentrate grades could be achieved.
- The flowsheet changes implemented in July 2022 resulted in an increase in recovery to the design levels; however, the concentrate grades continue to be lower than design. The testwork carried out by SGS Geosol in 2022 showed the potential for significantly increasing concentrate grade and increasing recovery. The work also showed that an increase in the impeller tip speed in the conventional laboratory cells increased recovery.
- The Caboclo material appears to be similar to the Serrote ore and responded well to the original flowsheet designed for Serrote. Future testwork should take into consideration the lessons learned in the Serrote plant.

13.12.2 Recommendations

The CP is in agreement with the testwork program that MVV proposes to carry out in 2023, including additional LCT testing at SGS Geosol and using the ATN pilot plant at Serrote. The ATN pilot plant should be used to test individual streams and the integrated circuit if regrinding equipment is available to do this. Increases in the cell impeller tip speed should also be tested. All work should be supported by mineralogical analysis.

14.0 MINERAL RESOURCE ESTIMATE

14.1 Introduction

The Mineral Resource estimate for the Serrote deposit, as of December 31, 2022, was completed by MVV. GeoEstima reviewed all the work developed by MVV and all procedures and parameters used for the estimation of the Mineral Resources.

The methodology used for the Serrote model included:

- Construction of a mineralized domain model
- Construction of a weathering surfaces to constrain mineralized domains
- Assign composite data prior to mineralized zones
- Exploratory data analysis by different mineralized zones
- Perform a variography analysis
- Estimate main variables (Cu, Au) according to mineralized zones
- Estimate density by mineralized domain zones
- Perform a block model validation

The geological model was constructed in Leapfrog Geo and the Mineral Resource was estimated using Vulcan software, and both were checked by the CP using Leapfrog Geo/Edge. The models include grade estimates for the three main variables (copper, gold, and density).

The estimate is constrained by an updated resource pit shell model. Mineral Resources are reported inclusive of Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Table 14-1 presents the Mineral Resources, inclusive of Mineral Reserves, for the Serrote deposit.

Table 14-1: Summary of Mineral Resources – December 31, 2022
ACG Acquisition Company Limited – Serrote Mine

Category	Method	Tonnage (kt)	Grade		Contained Metal	
			Cu (%)	Au (g/t)	Cu (kt)	Au (koz)
Measured	Oxide	8,744	0.48	0.11	42	30
	Sulphide	51,091	0.56	0.10	285	168
	Stockpile	1,580	0.61	0.10	10	5
	Sub-total	61,415	0.55	0.10	336	203
Indicated	Oxide	2,198	0.45	0.13	10	9
	Sulphide	33,056	0.53	0.08	175	87
	Stockpile	0	0.00	0.00	0	0
	Sub-total	35,254	0.53	0.08	185	96
Measured + Indicated	**Oxide**	**10,941**	**0.47**	**0.11**	**52**	**39**
	Sulphide	**84,148**	**0.55**	**0.09**	**460**	**255**
	Stockpile	**1,580**	**0.61**	**0.10**	**10**	**5**
	Sub-total	**96,669**	**0.54**	**0.10**	**521**	**299**

Category	Method	Tonnage (kt)	Grade		Contained Metal	
			Cu (%)	Au (g/t)	Cu (kt)	Au (koz)
Inferred	Oxide	360	0.36	0.08	1	1
	Sulphide	4,524	0.53	0.07	24	11
	Stockpile	0	0.00	0.00	0	0
	Sub-total	4,883	0.52	0.07	25	12

Notes:

1. CIM (2014) definitions were followed for Mineral Resources.
2. The Competent Person for the Mineral Resources estimate is Orlando Rojas, B.Geo., AIG (nº5543), a GeoEstima SpA employee.
3. The Mineral Resource estimates have an effective date of December 31, 2022.
4. Mineral Resources are estimated at a copper cut-off above 0.15%.
5. Mineral Resources are estimated using metal prices of US$3.20/lb Cu and US$1,300/oz Au.
6. Open pit Mineral Resources are reported within a conceptual open pit.
7. Minimum width is 5 m.
8. The metallurgical recoveries used are 86% for Cu and 67% for Au.
9. Bulk density varies depending on mineralisation domain.
10. Mineral Resources are reported inclusive of those Mineral Resources converted to Mineral Reserves.
11. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
12. Numbers may not add due to rounding.

The CP reviewed the Mineral Resource assumptions, input parameters, geological interpretation, block modelling, and reporting procedures, and is of the opinion that the Mineral Resource estimate is appropriate for the style of mineralisation and that the block model is reasonable and acceptable to support the December 31, 2022, Mineral Resource estimate.

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

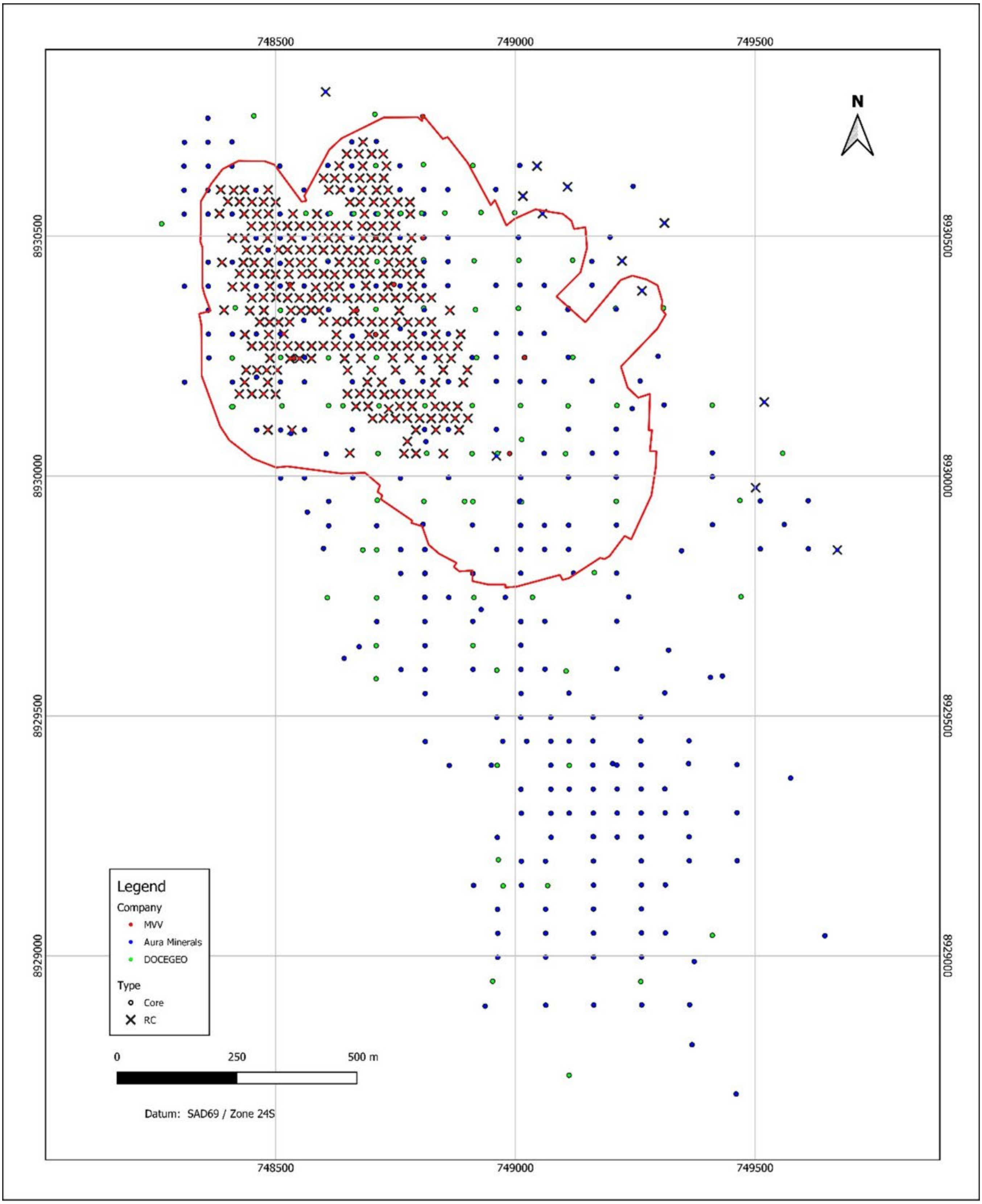
14.2 Resources Database

The resource database contains drilling information and analytical results up to May 10, 2021. Information received after this date was not included in the Mineral Resource estimate. For the purpose of the Mineral Resource estimate, the drill hole data were limited to those assays located inside the mineralisation wireframes. Drilling that supports the Mineral Resource estimate for Serrote is summarized in Table 14-2. Drill hole collar locations are provided in Figure 14-1.

Table 14-2: Drilling Supporting Serrote Mineral Resource Estimate
ACG Acquisition Company Limited – Serrote Mine

Year	Operator	Drill Type	Number of Drill Holes	Metreage (m)
1985	DOCEGEO	Core	37	8,504.90
1999	DOCEGEO	Core	11	1,301.20
2000	DOCEGEO	Core	13	3,272.10
2001	DOCEGEO	Core	28	3,821.00
2007	Aura Minerals	Core	104	18,334.40

Year	Operator	Drill Type	Number of Drill Holes	Metreage (m)
2008	Aura Minerals	Core	156	38,847.70
2008	Aura Minerals	RC	24	3,184.00
2008	Aura Minerals	Mixed	17	1,330.60
2008	Aura Minerals	Trench	18	1,817.80
2009	Aura Minerals	Core	22	3,695.60
2009	Aura Minerals	Mixed	4	700.4
2009	Aura Minerals	Trench	3	141.9
2010	Aura Minerals	Core	4	898
2018	MVV	Core	8	1,375.80
2019	MVV	RC	252	10,242.00
Total			**701**	**97,467.40**



Source: MTS et al., 2021

Figure 14-1: Drill Hole Collars Location

Figure 14-2 illustrates the drill hole locations in relation to the mineralized domains.

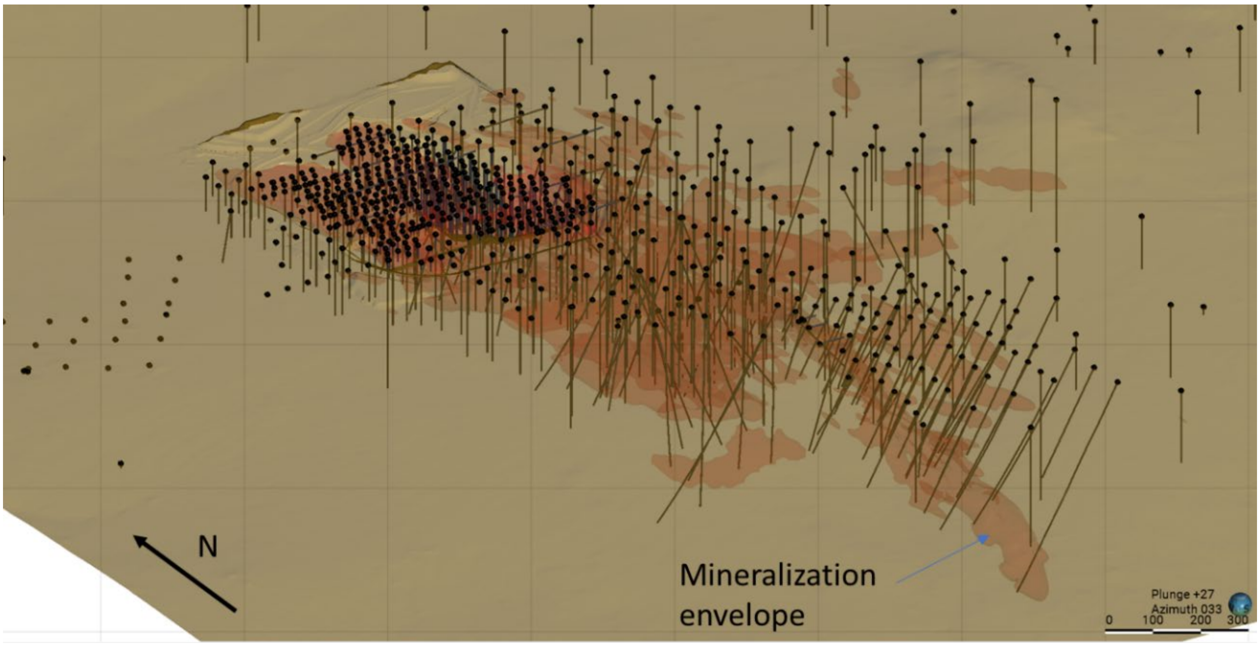


Figure 14-2: 3D View for Mineralized Zone and Drill Holes

GeoEstima received data from MVV in Microsoft Excel format and in CSV format. Data were amalgamated, parsed as required, and imported by GeoEstima into Leapfrog Geo software for review.

The drill hole database comprises coordinate, length, azimuth, dip, lithology, density, and assay data. For grade estimation, unsampled intervals within mineralisation wireframes were replaced with zero grades. Detection limit text values (e.g., "<0.05") were replaced with numerical values that were half of the analytical detection limit.

The CP conducted a number of checks on the Mineral Resource database as discussed in Section 12, Data Verification. The CP is of the opinion that the database is of high quality and in accordance with the industry standards and is appropriate to support Mineral Resource estimation.

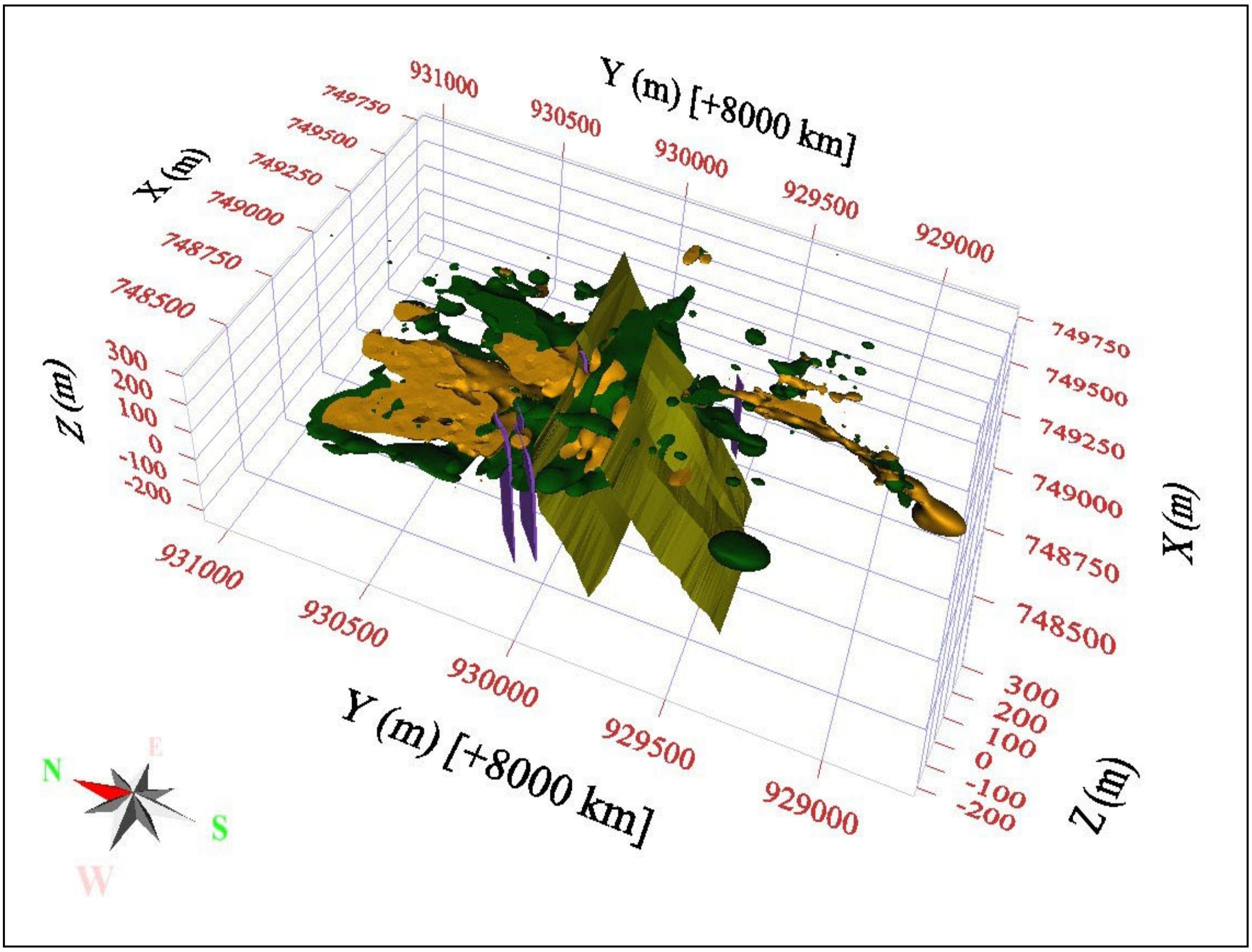
14.3 Geological Modelling

The resource models are constrained using mineralized wireframes. The mineralized wireframes were generated in Leapfrog Geo using lithology, alteration, and grade data as guidance, and then revised to generate 3D wireframe solids.

The lithological interpretation considered the mafic–ultramafic complex (CMU) which consists of the following lithology types: magnetite, magnetite norite, biotite, and gabbro.

The oxide/sulphide boundary was re-modelled incorporating the infill drill program and its associated sequential copper assays. Surfaces were generated using Leapfrog Geo modelling software.

The Serrote sequence is cut by post-mineralisation pegmatite dikes and by two faults which separate the CMU into a north, central, and south zone. Figure 14-3 shows the lithology model separated by the North and South fault, and Figure 14-4 illustrates the resulting mineralisation models. Figure 14-5 shows the interpreted oxide/sulphide boundary.

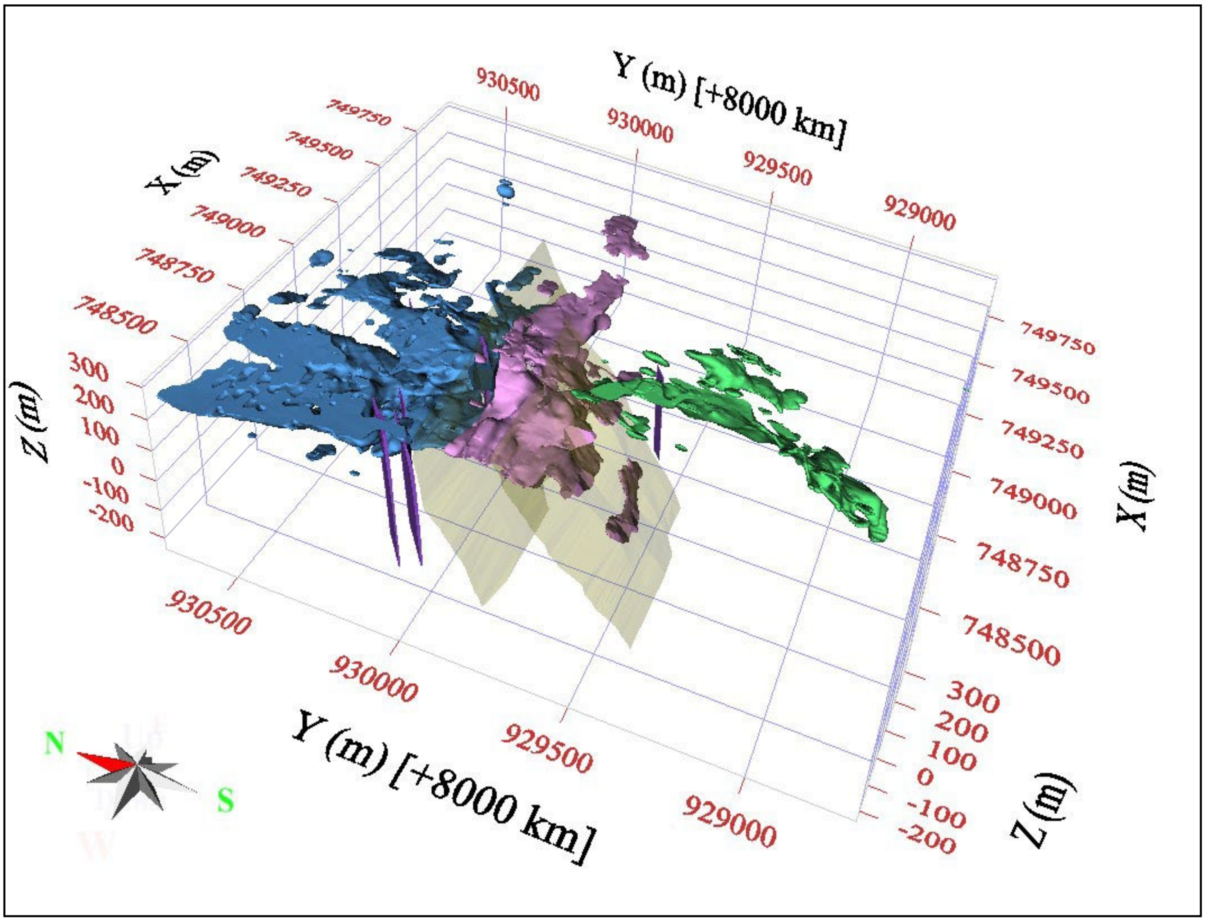


Source: MTS et al., 2021.

Notes: Lithology colour coding is listed:

1. Mano = golden
2. GB = green
3. PEGG (pegmatite dikes) = magenta
4. Faults = olive.

Figure 14-3: Serrote Lithology Model

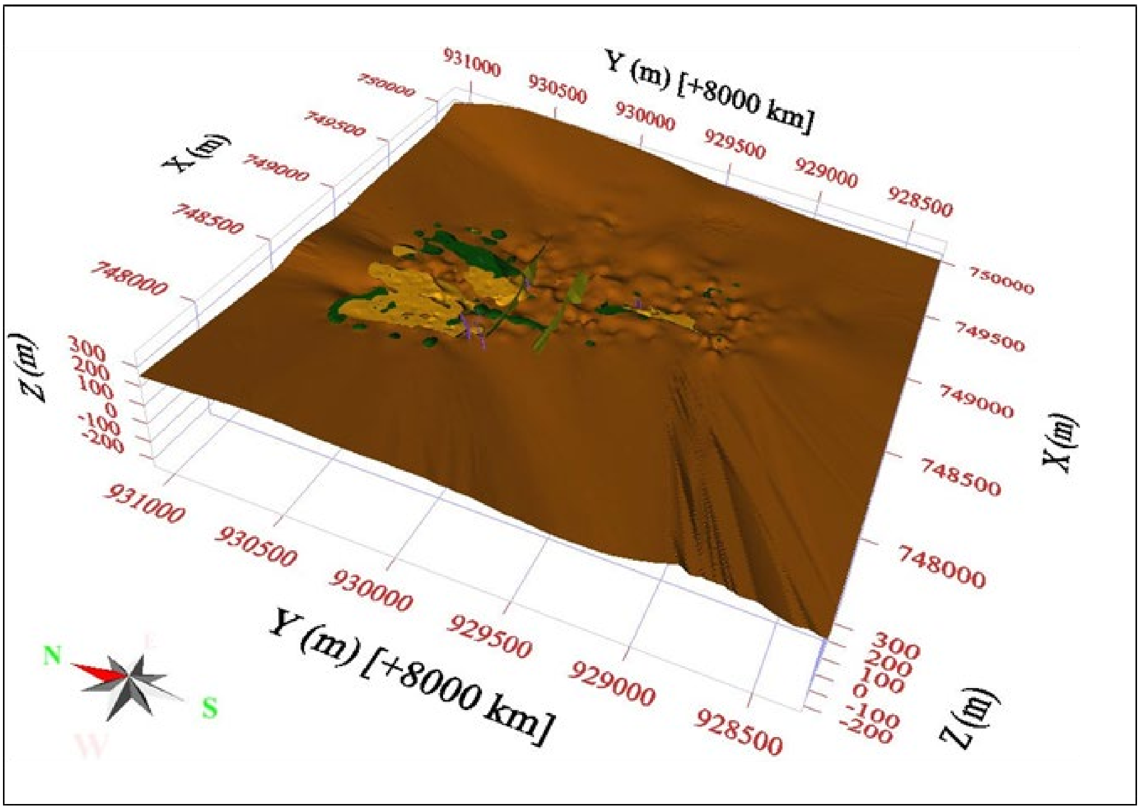


Source: MTS et al., 2021.

Notes: Mineral Domain colour-coding follows:

1. 100 (North) = blue
2. 200 (Central) = pink
3. 300 (South) = green

Figure 14-4: Serrote Mineralisation Model



Source: MTS et al., 2021.

Note: Oxide surface displayed on the Lithology model.

Figure 14-5: Serrote Oxide Surface Model

The mineral domains and associated codes are presented in Table 14-3.

Table 14-3: Summary Mineralized Domains Codes
ACG Acquisition Company Limited – Serrote Mine

Mineral Domains	Code
Dike	100
Gabbro	200
Orthopyroxene	300

14.4 Exploratory Data Analysis

Exploratory data analysis (EDA), in the form of summary statistics, correlation matrices, histograms, cumulative probability plots, and XY plots, were performed on both uncapped and capped samples and composites values for Au, Cu, Fe, density, core recovery, and sample length to determine suitable geological constraints to mineralisation.

Table 14-4 provides the summary statistics of the raw assay data (with backtagged mineral domain coding) for Serrote.

Table 14-4: Assay Statistics by Mineral Domain
ACG Acquisition Company Limited – Serrote Mine

Domain	Metal	Count	Minimum	Maximum	Mean	Std. Dev.	CV
100	Cu (%)	17,013	0	11.6	0.55	0.44	0.81
	Au (g/t)	17,001	0	1.45	0.09	0.082	0.89
	Fe (%)	15,197	0.38	66.55	18.03	8.38	0.46
200	Cu (%)	3,821	0	5.6	0.48	0.51	1.06
	Au (g/t)	3,815	0	20.15	0.082	0.39	4.75
	Fe (%)	3,472	0.07	50	12.96	8.09	0.62
300	Cu (%)	2,518	0.01	4.2	0.38	0.32	0.84
	Au (g/t)	2,489	0	0.97	0.15	0.11	0.73
	Fe (%)	2,382	0.35	57.1	23.82	13.79	0.58

14.5 Density Assignment

The original density database contains 45,749 density determinations as of May 10, 2021. Samples were flagged with the interpreted lithology and the densities were assigned in the block model using inverse distance cubed (ID^3) estimation. Table 14-5 summarizes the density statistics for the Serrote assigned raw samples.

The samples were composited to one metre lengths in order to better match with the geological interpretation. The estimation parameters considered a single search ellipse based on the direction of maximum continuity from the copper variogram. The search required a minimum of three and a maximum of 12 composites, with a maximum of three composites per drill hole. Blocks that were not estimated were assigned the mean of the density value per domain.

Table 14-5: Density Statistics Samples (t/m³)
ACG Acquisition Company Limited – Serrote Mine

Lithology	Nº samples	Minimum	Maximum	Mean	Median	Std. Dev.	CV
GB	12,251	1.069	4.969	3.07	3.06	0.27	0.09
Mano	16,263	1.075	4.979	3.46	3.43	0.42	0.12
QFS	16,740	1.611	4.828	2.72	2.66	0.24	0.09
SOLO	432	1.494	3.444	1.99	1.98	0.18	0.09

14.6 Composites

The predominant sample length is 1.0 m (Figure 14-6). The Serrote drill hole samples were composited to 5.0 m regular length composites that honoured the geological mineralisation boundaries. The composites were then flagged with the CMU zone codes, and the dominant code was assigned to each composite. The statistical analysis was carried out on the composite data separated by the CMU zone codes.

The minimum composite interval length was half the composite length and remnants less than the minimum length, were added to the previous composite.

Composite statistics are provided in Table 14-6.

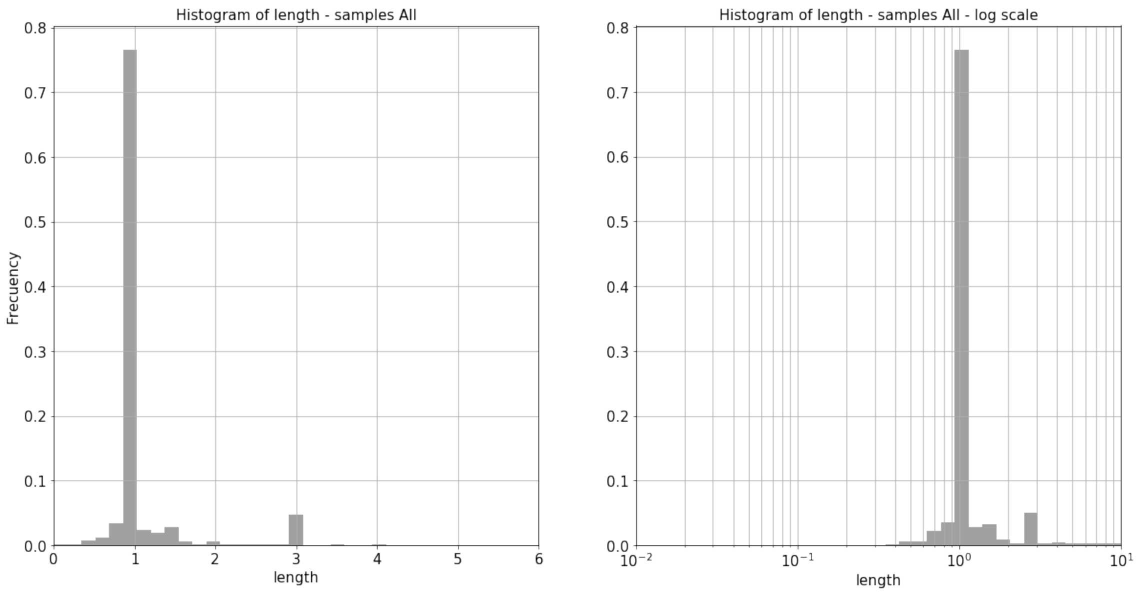


Figure 14-6: Histogram of Raw Data Sample – Length (m)

Table 14-6: Composites Statistics by Mineral Domain
ACG Acquisition Company Limited – Serrote Mine

Domain	Metal	Count	Min	Max	Mean	Std. Dev.	CV
100	Cu (%)	3,489	0.01	7.06	0.55	0.34	0.62
	Au (g/t)	3,489	0.00	0.78	0.09	0.06	0.66
	Fe (%)	3,489	0.68	46.49	17.97	6.71	0.37
200	Cu (%)	768	0.03	4.14	0.48	0.37	0.78
	Au (g/t)	768	0.00	5.74	0.08	0.22	2.73
	Fe (%)	768	1.03	40.86	13.27	6.66	0.50
300	Cu (%)	506	0.01	2.48	0.38	0.23	0.60
	Au (g/t)	506	0.00	0.40	0.15	0.08	0.54
	Fe (%)	506	0.46	54.50	23.18	11.12	0.48

14.7 Top Cut Analysis

Anomalous values were identified by reviewing the statistical and graphical summaries, including histograms, log-probability plots, indicator correlation plots, coefficient of variation plots, and a decile analysis for the 5.0 m composites. Plotting of the potential outliers confirmed a random distribution of these values in the deposit.

Figure 14-7 to Figure 14-9 show the probability plots of copper for the mineralized zones.

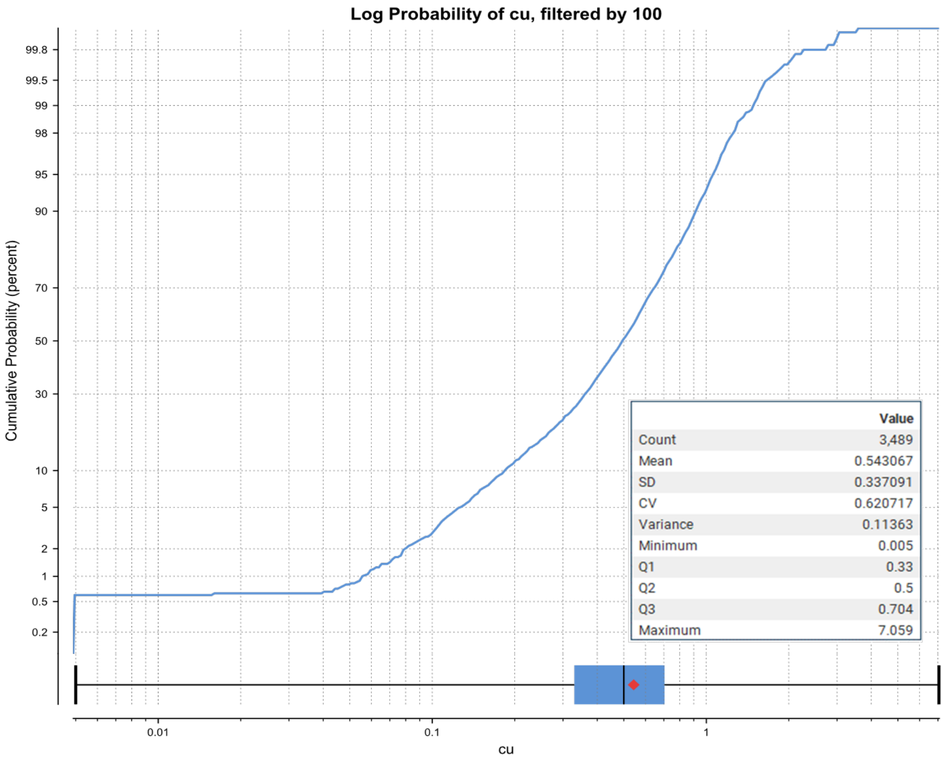


Figure 14-7: Capping Analysis for Cu – Mineralized North Zone

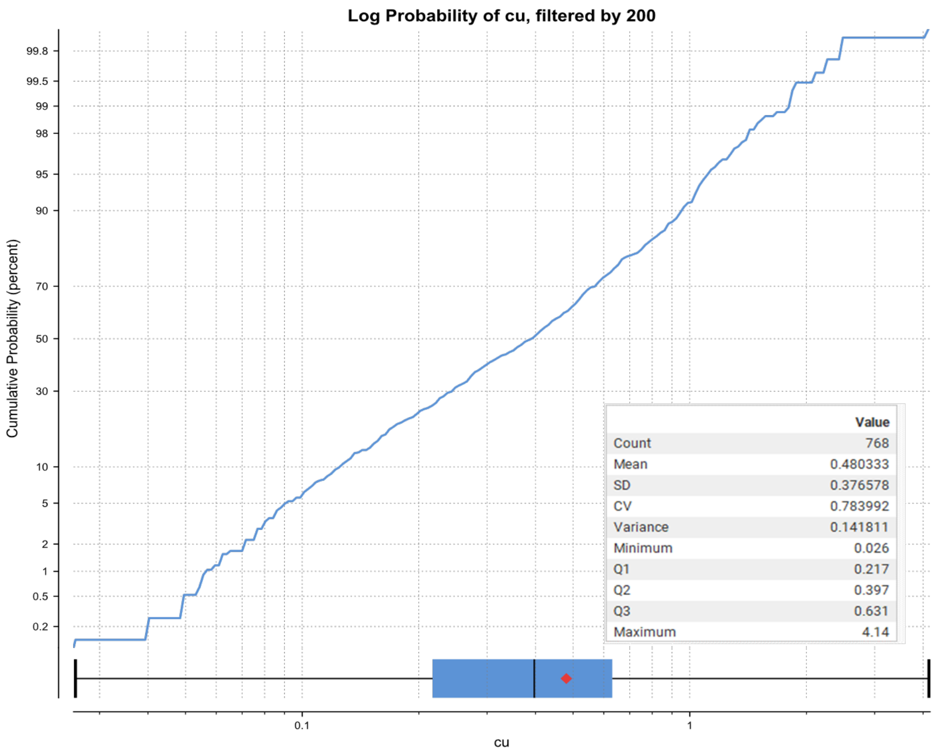


Figure 14-8: Capping Analysis for Cu – Mineralized Central Zone

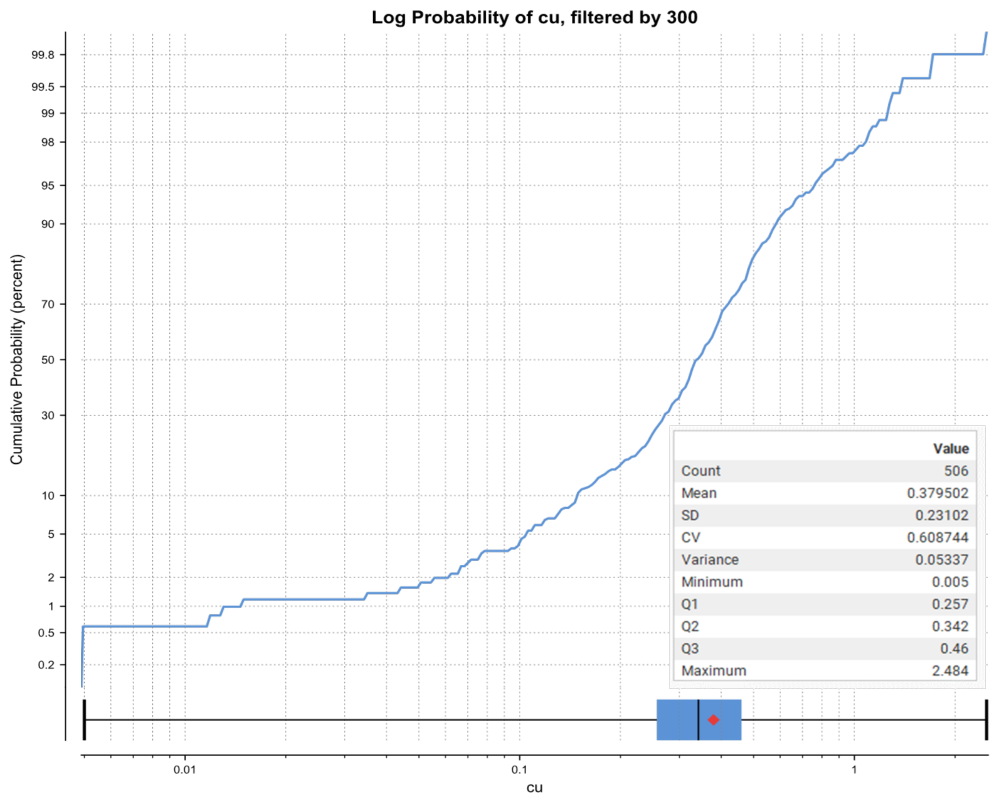


Figure 14-9: Capping Analysis for Cu – Mineralized South Zone

Table 14-7 summarizes the copper outlier values that were applied during the grade interpolation. These cap grades affected six composites. The capping for the mineralized zones is 3.0% Cu for the North Domain (100) and the Central Domain (200); no capping was required for the South Domain (300).

For gold, the analysis identified 11 outlier grades and all of the capped grades are in the un-mineralized CMU zones. That is, there was no capping of gold grades in the main mineralized domains (100, 200, and 300).

Table 14-7: Outlier Analysis for 5.0 m Composites – Copper
ACG Acquisition Company Limited – Serrote Mine

Mineralized Domains	Code	Cap Grade (%)	Mean (%)	CV	Capped Mean	Capped CV	No. of Capped Comps
Mineralized North Domain	100	3	0.54	0.62	0.54	0.58	5
Mineralized Central Domain	200	3	0.48	0.78	0.48	0.76	1
Mineralized South Domain	300	-	0.38	0.61	0.38	0.61	-

14.8 Variography

Correlograms were computed for copper and gold for each of the mineral domains. Down-the-hole correlograms were calculated to determine the nugget effect, and then correlogram maps were computed to determine the principal directions of grade continuity. Finally, directional correlograms were computed in the principal orthogonal directions obtained from the correlogram maps. The resulting experimental correlograms were modelled using a nugget effect and two spherical structures.

The resulting variogram models are summarized in Table 14-8.

Table 14-8: Variogram Models
ACG Acquisition Company Limited – Serrote Mine

Element	Domain	Nugget Effect	Rotation Angles[1] (°)			Sill	Ranges (m)			Sill	Ranges (m)		
			Z	Y	X	C1	X1	Y1	Z1	C2	X2	Y2	Z2
Cu	100	0.08	28	-16	0	0.55	39	48	15	0.37	200	350	93
	200	0.08	28	-16	0	0.55	39	48	15	0.37	200	350	93
	300	0.25	-20	-50	-10	0.4	27	20	8	0.35	100	68	25
Au	100	0.29	4	-24	0	0.45	7	45	11	0.26	215	250	95
	200	0.29	4	-24	0	0.45	7	45	11	0.26	215	250	95
	300	0.3	-20	-32	0	0.5	22	20	8	0.2	150	115	30

Note:

1. Rotations are specified as a left-hand rule about the Z, Y and X axis.

For copper, the nugget effects or random variation component tends to be low, representing 8% to 25% of the total variation or sill. MVV used two spherical structures to fit the experimental correlograms. The anisotropy between the two main directions was minimal. The first structures had a principal range of 39 m to 48 m, while the second structure had principal ranges of 200 m to 350 m. The ranges for copper show the most continuity down the dip of mineralisation, with the second most continuity along strike and the cross-dip direction being the shortest.

14.9 Block Model

The wireframes were filled with blocks in Vulcan. The block model parent cells measure 10 m by 10 m by 5 m and have no sub-cells. The block model set up is shown in Table 14-9.

Table 14-9: Block Model Set Up
ACG Acquisition Company Limited – Serrote Mine

Parameter	X	Y	Z
Origin (m)	747,635	8,928,295	-247.5
Extent (m)	2,560	2,800	620
Block Size (m)	10	10	5
Number of Blocks	256	280	124

14.10 Search Strategy and Grade Estimation Parameters

Copper and gold grades were interpolated in the blocks using the ordinary kriging (OK) based on 5.0 m capped composite values. Hard boundaries were used for the main mineralized zones.

The initial search was oriented along the direction of maximum continuity and the average drill hole spacing. The secondary search radius equates to approximately half the range of the second structure of the variogram model, and a third search equating to the full range of the variogram model. A final (fourth) pass was run to fill the blocks within the mineralized wireframe. The search parameters were equivalent for the three mineral domains and for both copper and gold.

Estimation parameters are summarized in Table 14-10.

Table 14-10: Block Model Estimation Parameters
ACG Acquisition Company Limited – Serrote Mine

Pass	Search Orientation[1]			Distance (m)			Max # per Hole	Min # Comp	Max # Comp
	Z	Y	X	X	Y	Z			
1	-50	-10	-30	40	40	15	3	4	7
2	-50	-10	-30	65	65	20	3	4	7
3	-50	-10	-30	175	175	50	3	4	6
4	-50	-10	-30	240	240	120	3	4	5

Note:

1. Rotations are specified as a left-hand rule about the Z, Y and X axis.
2. No octant constrain was used.

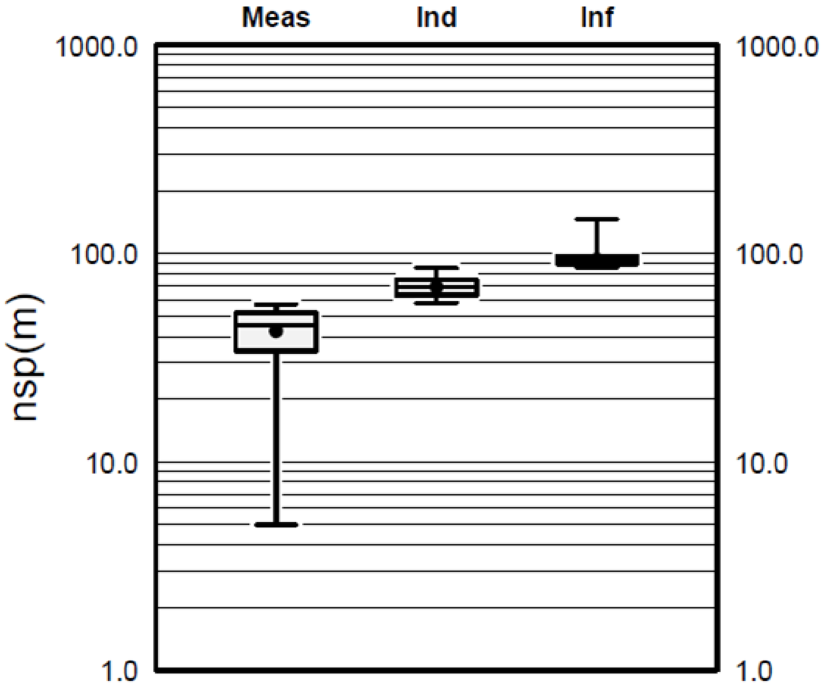
14.11 Mineral Resource Classification

Definitions for resource categories used in this CPR are consistent with those defined by CIM (2014) and adopted by NI 43-101. In the CIM classification, a Mineral Resource is defined as "a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction". Mineral Resources are classified into Measured, Indicated, and Inferred categories. A Mineral Reserve is defined as the "economically mineable part of a Measured and/or Indicated Mineral Resource" demonstrated by studies at Pre-Feasibility or Feasibility level as appropriate. Mineral Reserves are classified into Proven and Probable categories.

The classification parameters consider the proximity and number of composite data, as well as the continuity of the mineralisation.

For Serrote operation, the results of a confidence limit assessment shows that drill hole data for North Domain 100 and South Domain 300 can be extended up to 70 m for Measured material and up to 110 m for Indicated material. Therefore, for a resource block of Domain 100 or 300 to be considered as a Measured block, there must be a drill hole within 70 m, and, for an Indicated resource block, there must be a drill hole within 110 m.

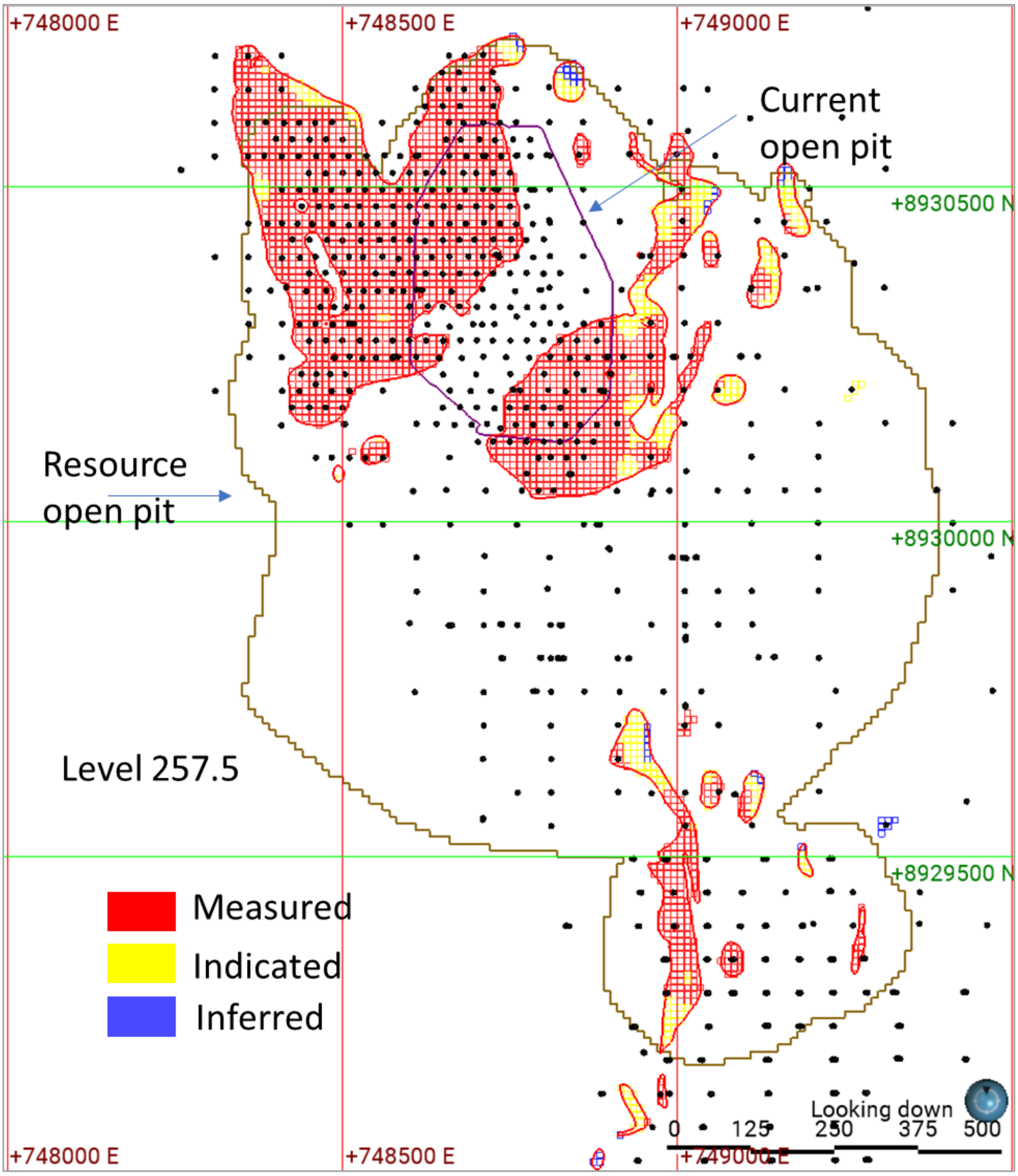
For the Central Domain 200, the confidence limit assessment shows that drill hole data can only be extended up to 35 m for Measured material and up to 80 m for Indicated material. Isolated lenses of mineralisation in the hanging wall or footwall of the main mineralized zones were re-classified as Inferred material. Lastly, block model grade estimates south of 8,928,880 N (block 58) were re-classified as Inferred material due to the limited amount of drilling in this area. Figure 14-10 summarizes the nominal drill spacing by resource classification in the estimated blocks. Figure 14-11 shows the final results for mineral resources classification at Serrote.



	Meas	Ind	Inf	
No. of data	35339	21642	2974	No. of data
Mean	42.5	69.1	93.7	Mean
Maximum	57.0	85.0	146.0	Maximum
U.Quartile	52.0	75.0	97.0	U.Quartile
Median	45.0	69.0	92.0	Median
L.Quartile	34.0	63.0	89.0	L.Quartile
Minimum	5.0	58.0	86.0	Minimum
Variance	113.9	54.4	51.4	Variance
CV	0.3	0.1	0.1	CV
Skewness	-0.5	0.3	2.2	Skewness

Source: MTS et al., 2021.

Figure 14-10: Nominal Drill Spacing by Confidence Category



Source: GeoEstima, 2023.

Figure 14-11: Final Mineral Resources Classification, Serrote Operation

14.12 Block Model Validation

GeoEstima carried out a number of block model validation procedures including:

- Comparison between OK and nearest neighbour (NN) (Table 14-11)
- Swath Plots (Figure 14-12 to Figure 14-14)
- Visual inspection of composite versus block grades (Figure 14-15 and Figure 14-16)

Additionally, MVV previously performed a change-of-support analysis for copper estimates to validate the smoothing in the block estimates (from composite point data) with respect to the grade distribution, the selected mining unit size, and the cut-off of interest.

The summary block statistics for copper, gold, and iron are presented in Table 14-12. Examples of copper swath plots for different mineralized zones are presented in Figure 14-12 to Figure 14-14.

Table 14-11: Comparison between Estimates – OK and NN
ACG Acquisition Company Limited – Serrote Mine

Domain	Metal	OK			NN			Relative bias
		Mean	STD	CV	Mean	STD	CV	
100	Cu (%)	0.52	0.24	0.47	0.51	0.34	0.67	1.9%
	Au (g/t)	0.08	0.05	0.66	0.08	0.07	0.79	-1.9%
200	Cu (%)	0.51	0.27	0.52	0.50	0.38	0.77	2.4%
	Au (g/t)	0.08	0.07	0.90	0.09	0.19	2.17	-13.3%
300	Cu (%)	0.36	0.15	0.41	0.37	0.21	0.58	-1.7%
	Au (g/t)	0.14	0.06	0.40	0.14	0.08	0.57	-0.1%

Table 14-12: Block Model Statistics by Mineral Domain
ACG Acquisition Company Limited – Serrote Mine

Domain	Metal	Count	Min	Max	Mean	Std. Dev.	CV
100	Cu (%)	57,155	0.011	3	0.52	0.24	0.47
	Au (g/t)	57,155	0	0.493	0.08	0.05	0.65
200	Cu (%)	30,413	0.071	2.498	0.51	0.27	0.52
	Au (g/t)	30,413	0.001	0.54	0.08	0.07	0.9
300	Cu (%)	18,848	0.048	1.38	0.36	0.15	0.41
	Au (g/t)	18,848	0.007	0.325	0.14	0.05	0.39

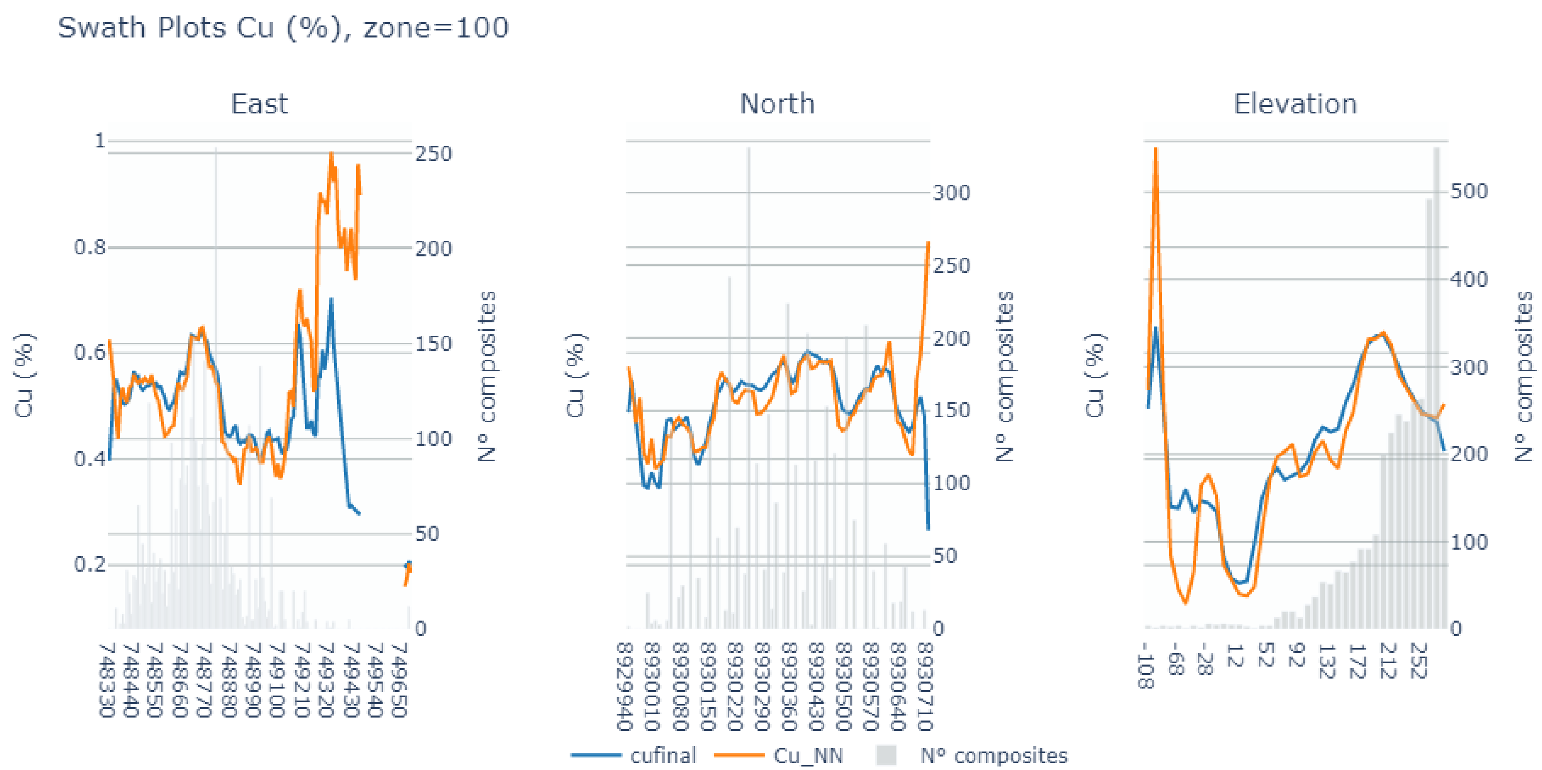


Figure 14-12: Serrote Cu Swath Plot – Domain 100 – X, Y and Z

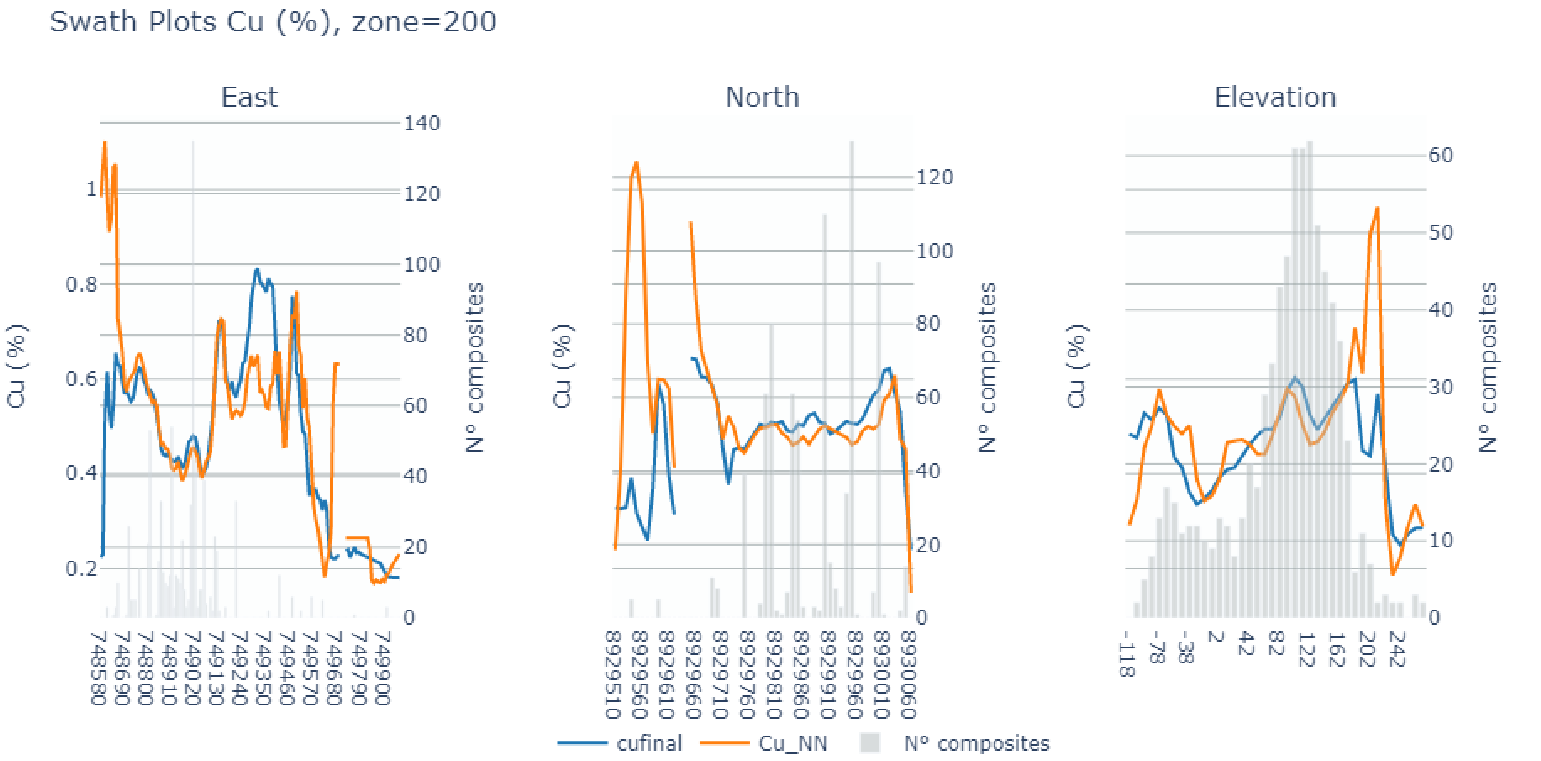


Figure 14-13: Serrote Cu Swath Plot – Domain 200 – X, Y and Z

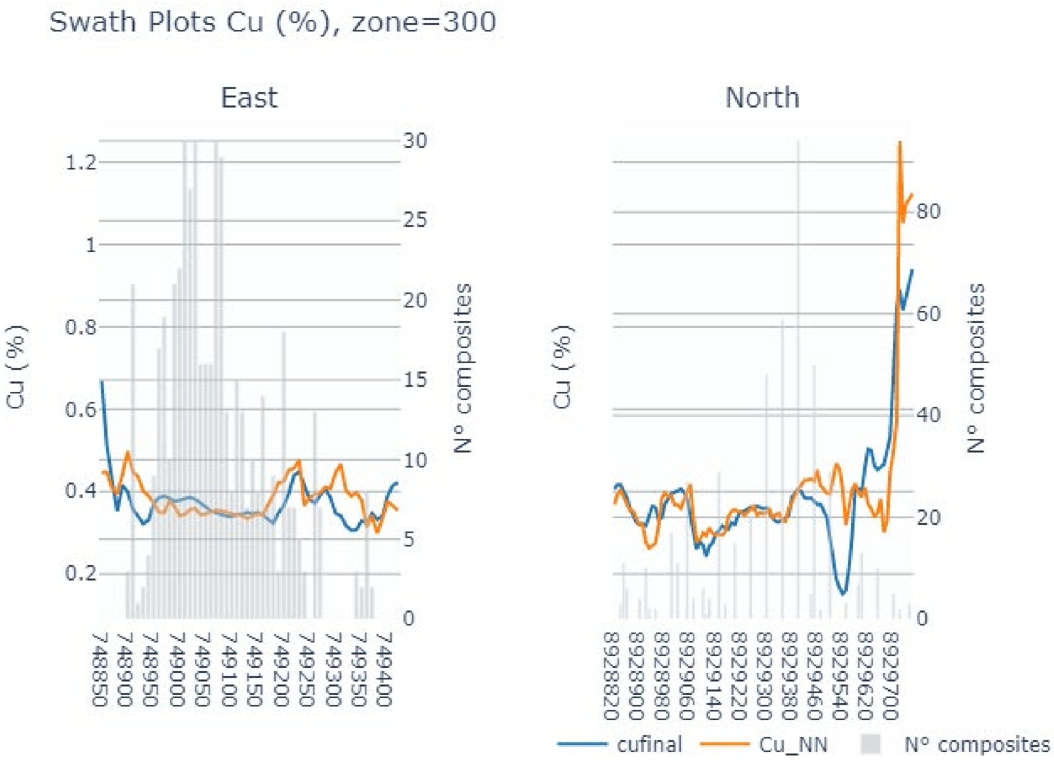


Figure 14-14: Serrote Cu Swath Plot – Domain 300 – X, Y and Z

The overestimation observed in blocks from zones 100 and 200 are located outside of the resource pit shell and were categorized as Inferred Mineral Resources.

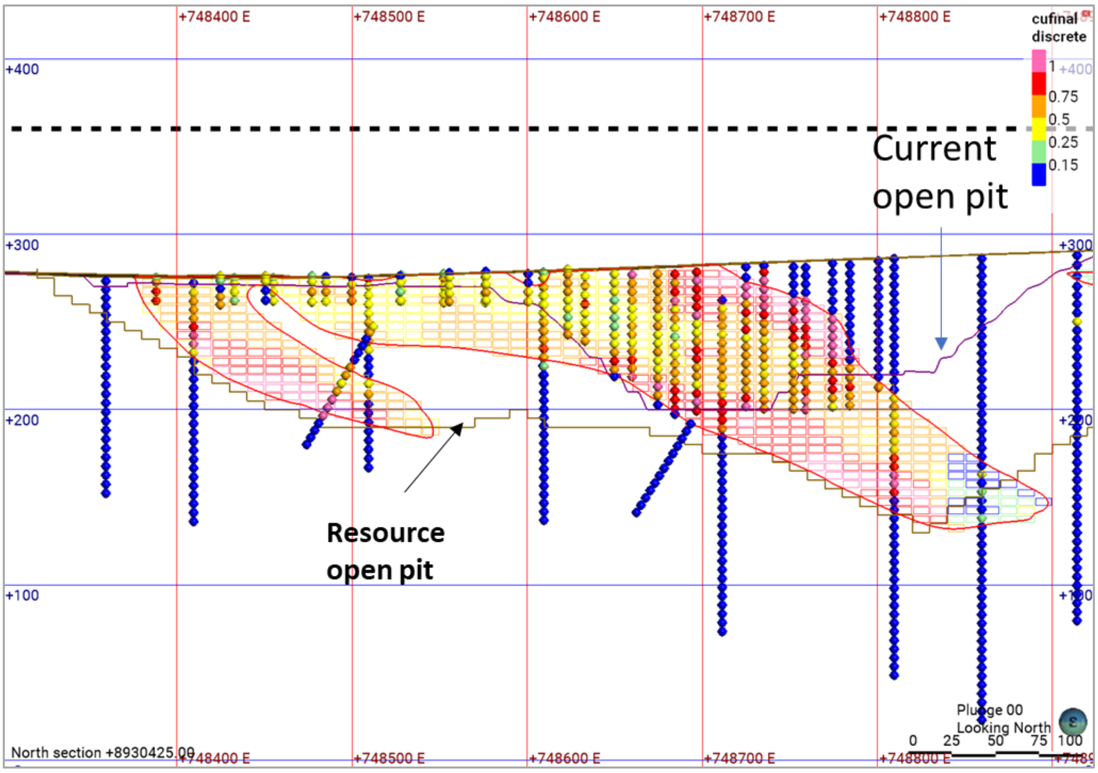


Figure 14-15: Cross-section Showing Cu Blocks *versus* Composite Grades

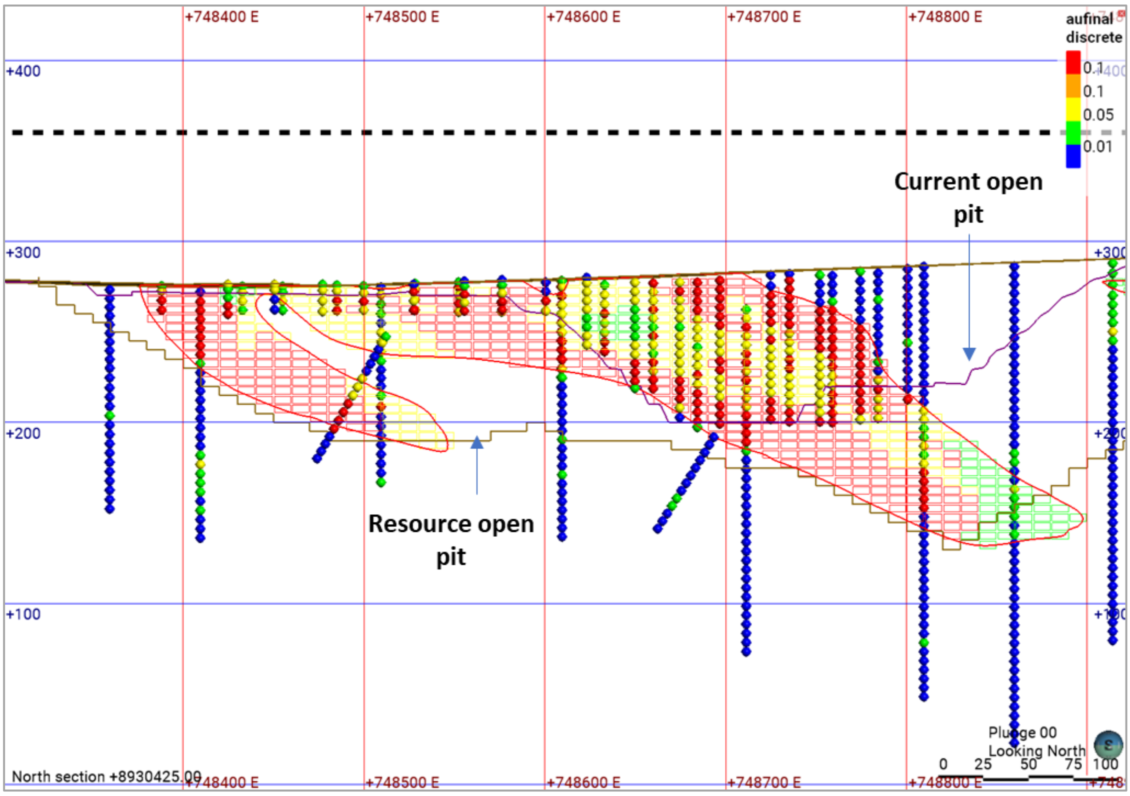


Figure 14-16: Cross-section Showing Au Blocks *versus* Composite Grades

14.13 Reasonable Prospects for Eventual Economic Extraction

The assessment of reasonable prospects for eventual economic extraction was based on the application of a pit shell obtained by Whittle. This pit-shell used metal prices of US$3.20/lb for copper and US$1,300/oz for gold and a metallurgical recovery of 86% for copper and 67% for gold processed, as defined in 2019.

It should be noted that the above resource metal prices and recoveries are different than those used for Mineral Reserves in Chapter 15. The pit optimization parameters for Mineral Reserves (Chapter 15) used metal prices of US$3.50/lb for copper and US$1,550/oz for gold, with process recoveries of 85% for copper and 65% for gold. The net smelter return (NSR) cut-off value was determined to be US$11.85/t.

Given the above differences, the resource pit shell was reviewed with respect to the reserve pit design. It was observed that, despite the different prices used, more than 98% of the Mineral Reserve pit design is situated within the resource pit shell (Figure 14-17).

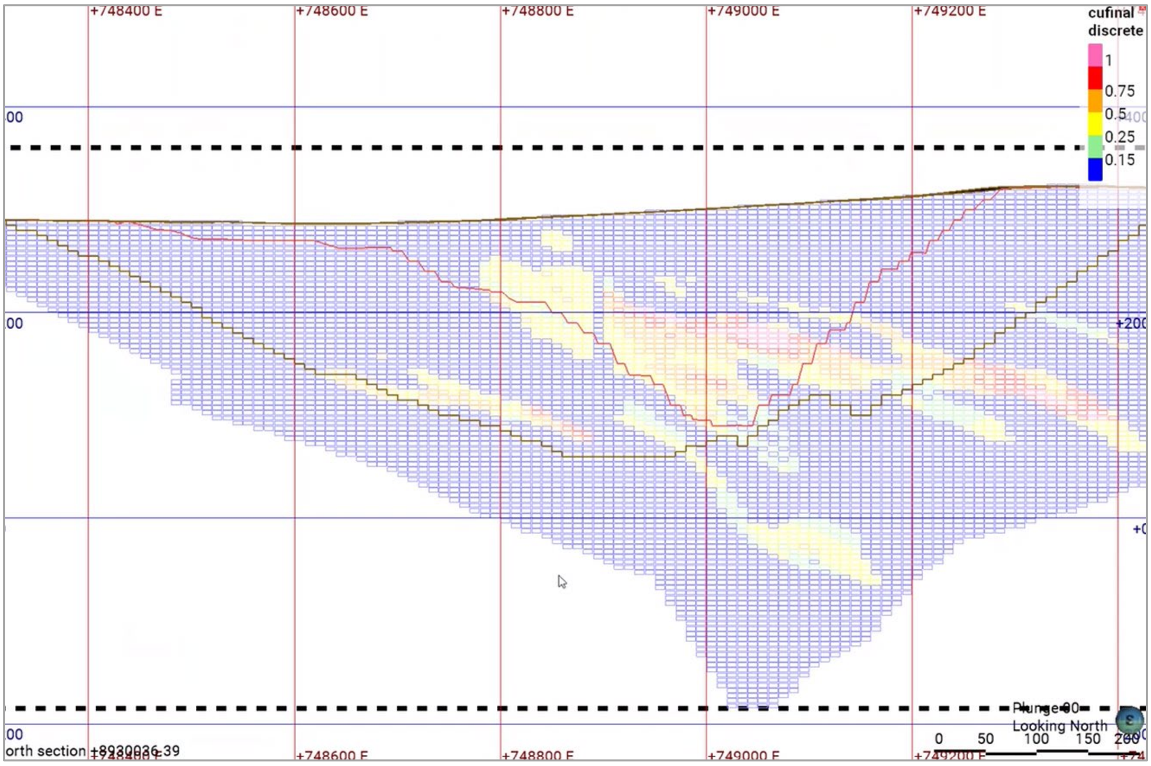


Figure 14-17: Comparison Between 2022 Mineral Reserve Pit Shell and 2019 Mineral Resource Pit Shell

GeoEstima also confirmed that the resource estimates remain essentially the same at higher metal prices and costs. The potential impact of higher prices and recoveries in the resource estimates was assessed by defining the Mineral Resource using the same pit shell as a constraint and applying the updated copper cut-off grade to blocks. The results show insignificant differences, as the higher metal prices and recoveries are offset by higher operating costs.

The detailed parameters used for the Mineral Resources pit shells are as presented in Table 14-13.

Table 14-13: Resource Pit Shell Parameters
ACG Acquisition Company Limited – Serrote Mine

Item	Parameters
Mining cost (US$/t)	2
Process cost (US$/t processed)	6.5
Sustaining capital costs (US$/t processed)	0.31
General and administrative (G&A) cost (US$/t processed)	0.94
Copper price (US$/lb)	3.20
Copper selling cost (US$/lb)	0.45
Copper metallurgical recovery (%)	86
Gold price (US$/oz troy)	1,300
Gold refining cost (US$/oz troy)	6
Gold metallurgical recovery (%)	67
Overall Pit slope angles (varies by rock-mass class)	28° to 40°

14.14 Mineral Resource Reporting

The Mineral Resources for the Serrote operation as of December 31, 2022, are summarized in Table 14-14. The Mineral Resource estimate is based on block models constructed by Aura Minerals and updated by MTS. The estimate is contained within an updated pit shell model run by MTS and depleted by GeoEstima based on topography dated from December 31, 2022. Mineral Resources are reported inclusive of those Mineral Resources converted to Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. Serrote Mineral Resources are in compliance with the CIM (2014) resource definition requirement of "reasonable prospects for eventual economic extraction".

Table 14-14: Mineral Resources Estimate by Mineral Type
ACG Acquisition Company Limited – Serrote Mine

Category	Type	Tonnage (kt)	Grade		Contained Metal	
			Cu (%)	Au (g/t)	Cu (kt)	Au (koz)
Measured	Oxide	8,717	0.48	0.11	42	30
	Sulphide	50,861	0.56	0.10	284	168
	Sub-total	59,578	0.55	0.10	325	198
Indicated	Oxide	2,192	0.45	0.13	10	9
	Sulphide	32,924	0.53	0.08	175	86
	Sub-total	35,116	0.53	0.08	185	95
Measured + Indicated	**Oxide**	**10,909**	**0.47**	**0.11**	**52**	**39**
	Sulphide	**83,784**	**0.55**	**0.09**	**458**	**254**
	Sub-total	**94,693**	**0.54**	**0.10**	**510**	**293**

Category	Type	Tonnage (kt)	Grade		Contained Metal	
			Cu (%)	Au (g/t)	Cu (kt)	Au (koz)
Inferred	Oxide	360	0.36	0.08	1	1
	Sulphide	4,515	0.53	0.07	24	11
	Sub-total	4,875	0.52	0.07	25	12

Notes:

1. CIM (2014) definitions were followed for Mineral Resources.
2. The Competent Person for the Mineral Resources estimate is Orlando Rojas, B.Geo., AIG (nº5543), a GeoEstima SpA employee.
3. The Mineral Resource estimates have an effective date of December 31, 2022.
4. Mineral Resources are estimated at a copper cut-off above 0.15%.
5. Mineral Resources are estimated using metal prices of US$3.20/lb Cu and US$1,300/oz Au.
6. Open pit Mineral Resources are reported within a constraining open pit shell.
7. Minimum width is 5 m.
8. The metallurgical recoveries used are 86% for Cu and 67% for Au.
9. Bulk density varies depending on mineralisation domain.
10. Mineral Resources are reported inclusive of those Mineral Resources converted to Mineral Reserves.
11. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
12. Numbers may not add due to rounding.

14.15 CP Comments on “Item 14: Mineral Resource Estimate”

The CP has the following recommendations:

- Update the Mineral Resource estimate with the results of the ongoing drilling program. The new drilling information may better define the limits of mineralisation, increase the volume of material in the deeper portion of the deposit, and upgrade the resource classification in some areas.
- Improve the modelling and knowledge of the copper oxide zone at Serrote and investigate process options.
- Build a detailed structural model and structural domains in order to customize local search anisotropies and directions.
- Update the Mineral Resource pit shell and cut-off inputs based on current economic parameters.
- Review cut-off input parameters to have a consistent baseline with the Mineral Reserve inputs in future resource updates.

15.0 MINERAL RESERVE ESTIMATE

15.1 Mineral Reserve Block Model

The diluted block model for the Serrote deposit was prepared by MVV using estimates based on a May 2021 update that incorporated an RC infill drilling campaign completed during 2019–2020. The block model, which has individual block size as 10 m x 10 m x 5 m (length x width x height), includes the following items:

- Copper grade (%) (diluted);
- Gold grade (g/t) (diluted);
- Iron grade (%) (diluted);
- Magnetite grade (%) (diluted);
- Mineral Resource classification (Measured, Indicated, Inferred);
- Process method classification code (oxide, sulphide);
- Lithological code;
- Geotechnical zone code, indicating the inter-ramp slope angle;
- In-situ bulk density (t/m³);
- Diluted block bulk density (t/m³).

In addition to the internal dilution inherent in the block modelling process, MVV introduced a block edge contact dilution in the block model and generated diluted copper, gold, iron, and magnetite block grades as well as a diluted bulk density. The block edge contact dilution broadly represents 0.875 m of each 10 m x 10 m x 5 m block shifted to the neighbouring block horizontally at each block edge and 0.25 m vertically to the top and bottom benches. This methodology results in a reduction of 0.8% of the Measured and Indicated (M+I) fraction of the in-pit Mineral Resource tonnage and a reduction of 3.4% and 2.7% in the copper and gold contained metals, respectively, compared with the quantities estimated on the basis of the block model prior to dilution.

15.2 Open Pit Mine Design Criteria

15.2.1 Material In-Situ Value Calculation Parameters

The open pit design and estimates of cut-off grades for the Mineral Reserve estimates are based on the material diluted in-situ value. The material in-situ value was estimated using the information in Table 15-1.

Pit optimization for the current pit design was prepared by mining consultants Q'Pit Inc. which added the following items to the block model:

- Concentrate yield: tonnes of concentrate per tonne ore
- Gold credit (US$/t): block by block gold credit
- Revenue (US$/t): expected revenue from the material, considering process costs and excluding mining costs

For the purposes of the pit limit analysis and design and the Mineral Reserve estimates, only blocks that were classified as Measured or Indicated and coded as sulphide were used. Inferred Mineral Resources coded as sulphide material and all material coded as oxide were considered waste.

Only copper and gold economic values were considered. Magnetite value was considered to be zero for the purposes of the pit limit design and Mineral Reserve estimates.

Table 15-1: 2019 Parameters for Estimating the Value of Material In-Situ
ACG Acquisition Company Limited – Serrote Mine

Parameter	Value	Units	Notes
Mining cost	2.00	US$/t mined	Used for pit limit design only
Mining cost tax credits	(n/a)	US$/t mined	
Processing cost total	7.00	US$/t ore	
Sustaining Capex	1.00	US$/t ore	
G&A cost	1.55	US$/t ore	
Process cost & G&A	9.55	US$/t ore	Used for cut-off grades, reserves, in-situ value calculation, and pit limit design
Process cost & G&A tax credits	(n/a)	US$/t ore	
Process Plant Recovery			
Cu	84.0	%	
Au	65.0	%	
Metal Prices			
Cu	3.00	US$/lb	
Au	1,250	US$/oz troy	
Royalties, % Net Smelter Return (NSR)			
Cu	3.75	% NSR	Government and landowners
Au	4.00	% NSR	Government and landowners
Concentrate Parameters and Costs			
Cu concentrate grade	24.5	%Cu	
Cu concentrate moisture	10.0	%	
Concentrate transport cost	63.84	US$/wmt	
Smelting cost	80.00	US$/dmt	
Smelting extra charges allowance	33	US$/dmt	Expected $0/t to $33/t, conservative
Smelter deduction (minimum)	1.00	Cu% Units	
Cu smelter payable (maximum)	96.52	%	For higher-grade concentrates
Cu smelter payable (typical)	95.92	%	Serrote, using 1% Cu deduction
Resulting from smelting metal unit costs	0.435	US$/lb	Using 95.92% Cu payable
Cu refining	0.08	US$/lb Cu	
Au refining	6.00	US$/oz troy	
Au smelter deduction (minimum)	1.0 g/t	%	
Au smelter payable	95.0	%	After Au deduction
Au payable	65.38	%	LOM average, varies by block

15.2.2 Cut-off Grade Calculation

The copper-only cut-off grade was determined to be 0.22% Cu and considers zero gold credit. The gold credit is estimated on a block-by-block basis for the purpose of the pit limit analysis. The resulting average gold credit over the remaining life of the mine is estimated at US$3.14/t ore.

For the purposes of the pit limit design and the cut-off grade calculations, the mine operating cost at Serrote for ore and waste were considered to be equal. The mining cost for the purposes of the pit limit design was estimated by MVV at US$2.00/t and considers direct tipping of ore to the primary crusher and stockpiled material re-handling costs.

15.2.3 Wall Slope Angles and Bench Configuration

Geotechnical investigations were conducted by Walm in June and October 2018 in preparation for the 2019 feasibility study. The slope angles for the pit limit design were derived as shown in Table 15-2.

Table 15-2: Slope Angles Used for Pit Limit Design
ACG Acquisition Company Limited – Serrote Mine

Geomechanical Class	Inter-Ramp Slope Angle (°)	Inter-Berm Height (m)	Berm Width (m)	Face Slope (°)
Class V	31.2	10	6.5	45
Class IV	36.5	10	6.5	55
Class III	41.9	10	6.5	65
Class I-II	55.3	20	8.5	75

The geotechnical investigation considered a 10 m operating bench height and double benching in fresh rock with a berm every 20 m vertically. The assumption was that drilling and blasting will take place on 10 m benches with a berm every 20 m. Loading operations in areas requiring enhanced selectivity will take place in 5 m flitches (half benches); however, this does not affect the wall configuration or any wall control drilling. The wall slope design parameters used are based on the geotechnical recommendations for inter-ramp slope angles.

The slopes used for the final pit limit and some of the intermediate phase wall inter-ramp slope angles range from 42° to 55° in the fresh rock zones and 31° to 37° in the fractured and altered zones. The rock mass Class IV does not appear to a significant extent in the final or interim pit limit walls. The slope angles were based on the available geotechnical recommendations at the time the pit limit design work was undertaken. A recent update of the geotechnical investigation recommends generally steeper slopes in Sector III with slopes ranging generally from 45° to 47° and minor adjustments to the extent and slope angles of Sector I-II (Geoestrutural, 2022).

Walm used the proposed slopes for final pit limit design as the reference for their latest geotechnical work and reviewed and confirmed conformance of the pit limit design with the geotechnical recommendations, with minor local adjustments recommended. The changes will have no material effect on the final pit limit shape and the overall Mineral Reserves reported within the pit limit. As a result of steepening Sector III in particular, upside can be expected when the final pit limit design is updated during future detail engineering.

The geotechnical study recommends the use of a double bench configuration in the fresh rock for geomechanical Class I - II and a single bench configuration in rock for all other geomechanical classes.

Ramp placement on the final pit limit and phase walls generally does not exceed the recommended uninterrupted inter-ramp wall height.

In 2022 MVV engaged the consulting firm Geoestrutural to perform a geotechnical review and develop a detailed geomechanical model. Findings confirmed that the criteria from the 2019 feasibility study criteria meet the required global safety factors for all sections analysed. Further work (drilling and lab testing) is being performed in 2023 to confirm the opportunity of steepening slope angles in some sections of the open pit.

15.2.4 Mining Cost for the 2019 Pit Limit Design

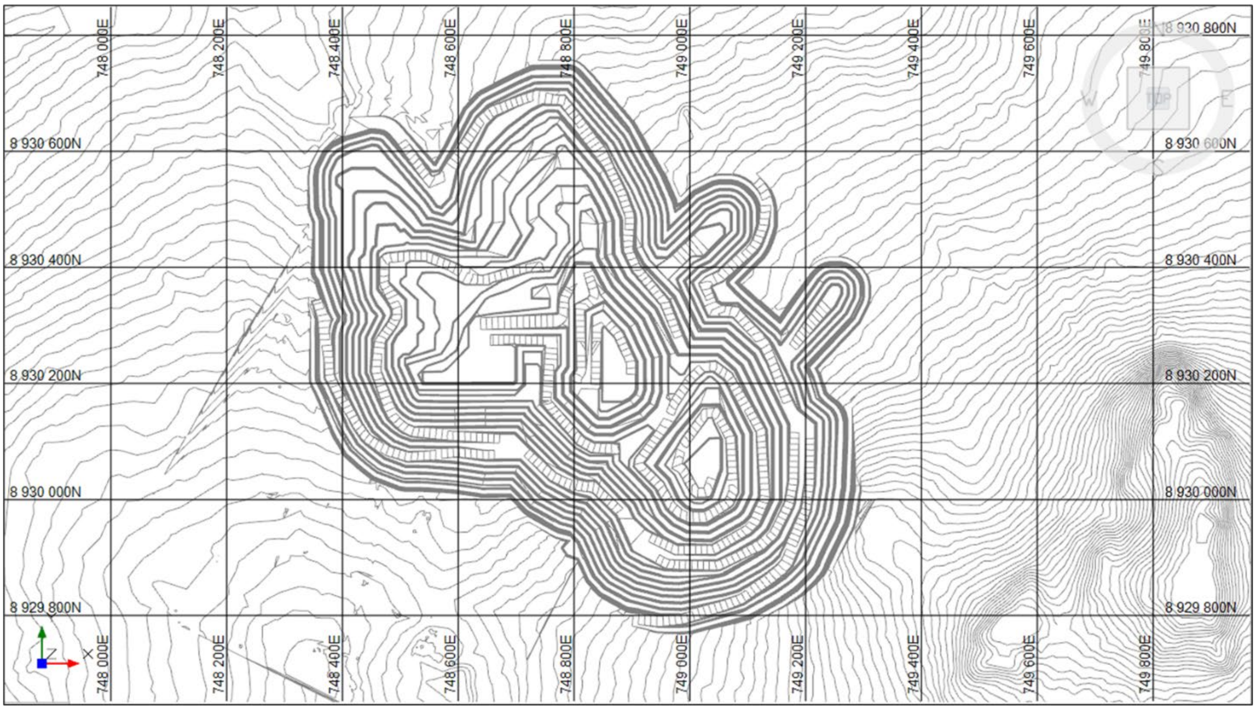
At Serrote the selection of the mining costs for the 2019 pit limit design was based on past studies as well as MVV's parent company experience at its Santa Rita Mine, which is of similar scale and scope. In addition, since MVV elected to develop a more robust subset of the Mineral Reserves, the selection of the initial mining cost was less critical. The US$2.00/t mining cost selected for the determination of the final pit limit design was appropriate and correlated well with the final mining operating cost estimated for the property after changes in US$:R$ exchange rates are taken into account.

15.2.5 Ramp Width and Grade

The pit limit design considers ramps with a total nominal ramp width of 15 m and a gradient of 10%. The pit limit design includes partial berm tapering where berms meet the haul roads. The ramp width is based on three times the width of the primary haul truck considered (an 8 x 4 truck such as the Mercedes Actros 4844 currently used at Serrote) with a nominal load capacity of 35 t.

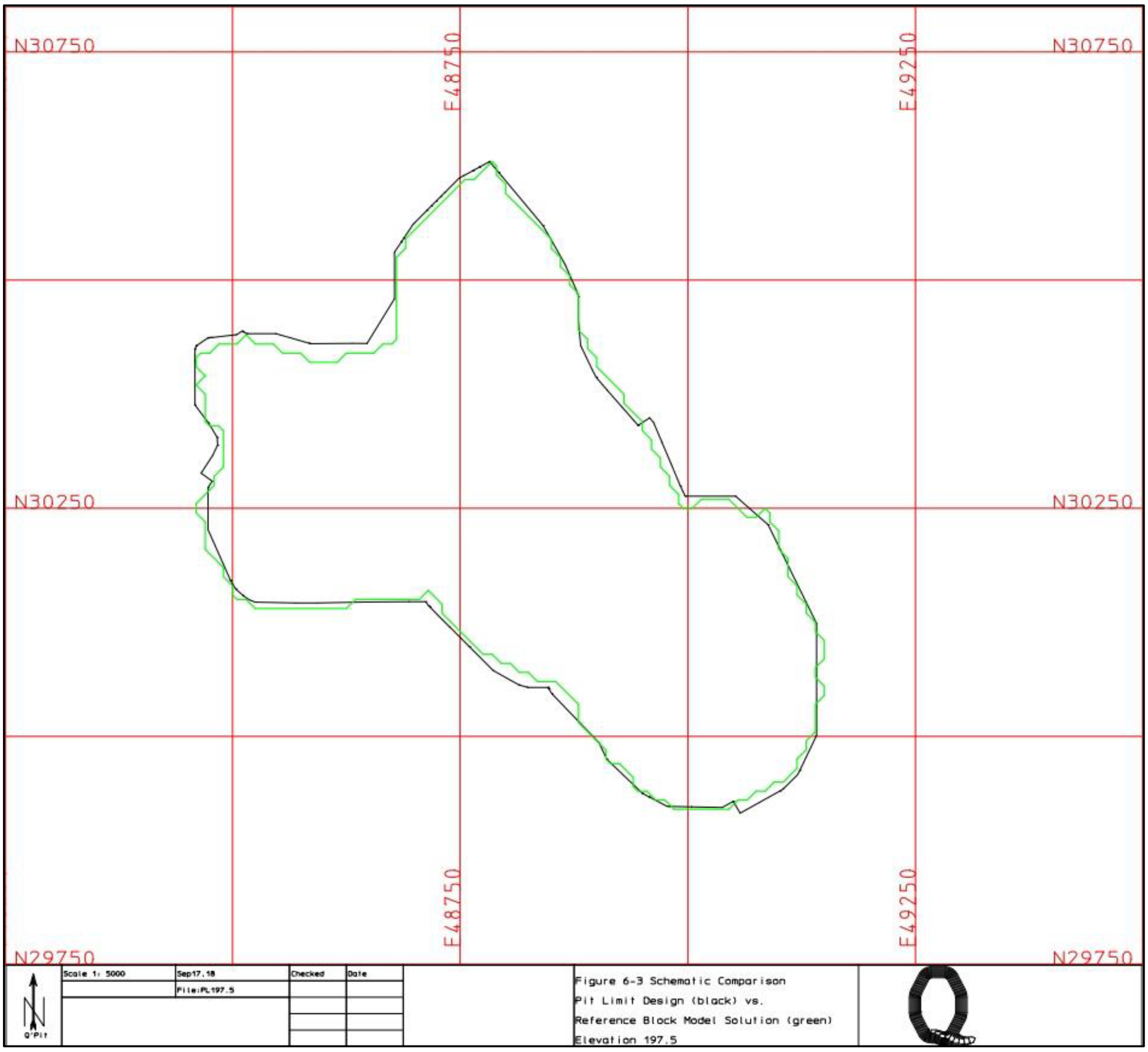
15.2.6 Detailed Pit Limit Design

The Serrote open pit limit design is significantly smaller than the excavation supported by the guide block model solution. Based on earlier sensitivity analyses, MVV decided to use the more robust subset of the Mineral Resource, defined by the Lerchs and Grossmann methodology solution at a copper metal price of US$2.70/lb Cu, as the basis for the final pit limit. The Base Case pit limit design is shown in Figure 15-1. A schematic comparison of the pit limit design with the reference block model solutions used as a guide for the design is shown in Figure 15-2. It can be seen that the guide block model solutions and the final pit limit design are in close agreement with the selected section.



Source: MVV, 2023

Figure 15-1: Pit Limit Design Used for 2019 Mineral Reserve Estimate



Source: MTS et al., 2019.

Note: Plan view EL197.5 m.

Figure 15-2: Comparison of 2019 Pit Limit Design versus Reference Block Model Solution

15.3 Detailed Open Pit Mine Design

The Mineral Reserve estimate is based on detailed pit limit designs, which were validated by a LOM mine plan. The pit limit analysis and detailed pit limit design were originally carried out by Q'Pit and later updated by MVV.

15.3.1 Methodology and Software

Q'Pit used its proprietary software for modelling and analysis of the open pit limit location and to determine the sensitivity by deriving a set of block model solutions, employing a network formulation of the Lerchs and Grossmann methodology. The following information was considered for the pit limit analysis:

- Measured and Indicated Mineral Resources from the Mineral Resource block models
- The parameters for the in-situ diluted material valuation
- The geometrical parameters for slope angles, ramp width, grade, and mining widths as well as a model of the ramp configurations within the open pit limit

The detailed pit limit design and phasing were carried out using Q'Pit's mine planning software on mid-bench contour representation. The designs were then converted by Q'Pit to toe and crest representation.

15.4 2023 Validation of Open Pit Mine Design Limit

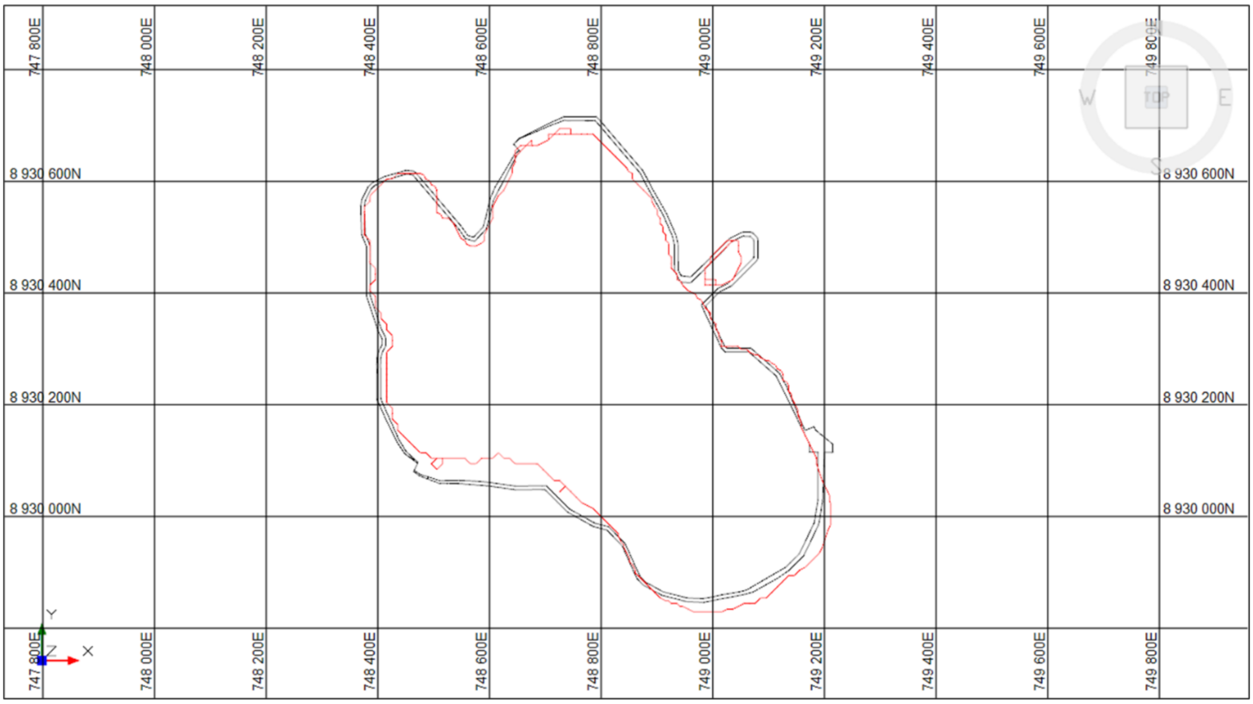
The Serrote pit optimization was studied in early 2023 to verify that the pit design limit remained valid given increased mine operating costs, metal prices, and changes to the offtake parameters when compared to those used in 2019. An updated NSR calculation was estimated with the parameters listed in Table 15-3. For ore type Mano the average NSR is estimated at $34.47/t after royalties, and Gabbro is estimated at $35.47/t after royalties.

An optimal pit shell was selected and is compared to the current pit design limits, as presented in Figure 15-3. As seen from the figure, the two sets of limits compare well, and therefore the current pit design remains valid.

Table 15-3: 2023 Parameters for Estimating the Value of Material In-Situ
ACG Acquisition Company Limited – Serrote Mine

Parameter	Value	Units	Notes
Mining cost	2.47	US$/t mined	Updated to average from LOM financial model
Processing cost total	6.98	US$/t ore	
Sustaining Capex	2.43	US$/t ore	
G&A cost	2.44	US$/t ore	
Process cost & G&A	11.85	US$/t ore	Used for cut-off grades, reserves, in-situ value calculation, and pit limit design
Process Plant Recovery			
Cu	84.6 Mano 86.8 Gabbro	%	
Au	65.0	%	
Metal Prices			
Cu	3.50	US$/lb	
Au	1,550	US$/oz troy	
Royalties, Net Smelter Return (NSR)			
Cu	2.00 0.85	% NSR % Gross revenue	Government and landowners
Au	35.00	% Payable Au	ACA
Concentrate Parameters and Costs			
Cu concentrate grade	40	%Cu	
Cu concentrate moisture	9.4	%	
Concentrate transport cost	144.7	US$/wmt	
Smelting cost	48.8	US$/dmt	
Smelter deduction	1	Cu% Units	

Parameter	Value	Units	Notes
Cu smelter payable	96.8	%	
MgO Penalty	6.0	US$/dmt	
Cu refining	0.05	US$/lb Cu	
Au refining	4.0	US$/oz troy	
Au smelter deduction	0	g/t	
Au smelter payable	92	%	



Note: Elevation is at 180 m RL. Pit design is black line, 2023 optimal pit shell #61 is red line.

Figure 15-3: Comparison of Pit Limit Design to 2023 Optimal Pit Shell

15.5 Mineral Reserves Estimate

The Mineral Reserves were audited by the CP using two methodologies.

The first was depletion of the 2019 feasibility study Mineral Reserve with actual mining from the start of production in December 2020 to the end of 2022. In the 2019 study, Q'Pit estimated the Mineral Reserves based on the Measured and Indicated Mineral Resources in the block model supplied by MVV and the detailed final pit limit design carried out by Q'Pit using the mine design criteria presented in Table 15-1. The design criteria included metal prices of US$3.00/lb Cu and US$1,250/Au oz, 84% Cu recovery and 65% Au recovery. The Proven and Probable Mineral Reserves were estimated using the in-pit Measured and Indicated Mineral Resources, respectively, and the cut-off grade from a contained in-situ mineralisation value (NSR) of US$9.55/t. The resulting tonnage of sulphide ore was 45.14 Mt at a grade of 0.58% Cu and 0.10 g/t Au.

The second method involved updating the block model with the 2023 parameters presented in Table 15-3 and determining the Mineral Reserve contained within the pit design using January 1, 2023, starting bench face topography. The design criteria included metal prices of US$3.50/lb Cu and US$1,550/Au oz, 85% Cu recovery in Mano type mineralisation, 87% Cu recovery in Gabbro, and 65%

Au recovery. The cut-off value NSR was US$11.85/t and the resulting tonnage of sulphide ore was 45.17 Mt at a grade of 0.58% Cu and 0.10 g/t Au.

Both methods resulted in essentially the same tonnes and grades. The increase in metal prices from 2019 to 2023 has been offset by the increase in operating costs, resulting in no material change to the original 2019 Mineral Reserve Estimate except for depletion due to mining.

As of January 1, 2023, an ore stockpile of 1.58 Mt at 0.61% Cu and 0.10 g/t Au has been established during mining operations at Serrote.

The Mineral Reserves for the Serrote Mine, with an effective date of December 31, 2022, are listed in Table 15-4. The estimates of the copper and gold grades in Table 15-4 are based on the diluted grades of the deposit block model for material coded as sulphide. The Competent Person for the estimate is Mr. Andrew Bradfield, P.Eng., of P&E Mining Consultants Inc.

Table 15-4: Serrote Mineral Reserve Estimate
ACG Acquisition Company Limited – Serrote Mine

Classification	Quantity (Mt)	Diluted Grades		Contained Metals		
		Cu (%)	Au (g/t)	Cu (kt)	Cu (Mlb)	Au (koz)
Proven	41.17	0.59	0.10	243.8	537.5	134.9
Probable	5.56	0.54	0.08	29.9	65.8	13.8
Total Mineral Reserves	**46.73**	**0.58**	**0.10**	**273.7**	**603.3**	**148.6**

Notes to the Mineral Reserve Estimate:

1. The Competent Person for the Mineral Reserve Estimate is Andrew Bradfield, P.Eng., of P&E Mining Consultants Inc.
2. Mineral Reserves are reported using the 2014 CIM Definition Standards, 2019 CIM Best Practices, and have an effective date of December 31, 2022.
3. The Mineral Reserve is estimated using metal prices of US$3.50/lb Cu and US$1,550/Au oz, 85% Cu processing recovery in Mano mineralisation and 87% Cu processing recovery in Gabbro mineralisation, and 65% Au processing recovery.
4. The estimates were carried out using an NSR cut-off value of US$11.85/t.
5. Proven Reserves include stockpiled ore of 1.58 Mt at 0.61% Cu and 0.10 g/t Au.
6. Totals may not add due to rounding.

The mine plan includes an estimate of 76.1 Mt of waste rock to be mined. Inferred Mineral Resources were set as waste in the pit optimizations and mine plans. The waste rock tonnage includes an estimate of 6.3 Mt of oxide material that contains mineralisation. This material is currently not planned to be processed and is stockpiled separately as a potential future heap leach opportunity. As of the effective date of this CPR, a stockpile of approximately 7.7 Mt of oxide material exists at the Serrote Mine.

15.5.1 Sensitivity of the Mineral Reserves to the Open Pit Geometry and Size

A sensitivity analysis established that the Serrote open pit limit geometry is robust in the north, east and west parts of the open pit for a wide variation of the design parameters, due to the orebody geometry. These parts of the orebody are higher grade and have a lower stripping ratio than the south part. The geometry of the south part of the pit is more sensitive to changes in the design parameters. In 2019 MVV elected to set the south part of the final pit limit using a revenue factor of 0.9. This broadly corresponded to a copper price of US$2.70/lb Cu and also introduced a measurable level of robustness in the pit limit in the south part of the pit.

The final pit limit design is considered conservative, and it will potentially remain valid for substantial adverse changes in the design parameters. The pit limit can be reviewed in future studies, particularly the south part, to determine if it should be adjusted according to updated economic parameters, such as metal prices and mining costs.

15.5.2 Sensitivity of the Mineral Reserves to Changes in Cut-off Grades

Information that affects the cut-off grades used for estimating the Mineral Reserves include the copper and gold metal prices, exchange rates, overall mine and process variable and fixed costs, and copper concentrate transport, smelting, refining, and processing costs.

15.6 CP Comments on "Item 15: Mineral Reserve Estimate"

The CP considers that the open pit methodologies, design criteria and parameters used are appropriate. The CP is not aware of any other factors that could materially impact the estimate of the Minerals Reserves for Serrote that are not presented in this CPR.

16.0 MINING METHODS

16.1 Open Pit Mining Methodology

16.1.1 Introduction

The Serrote Mine has been developed as a conventional open pit operation using hydraulic excavators in backhoe configuration, rigid body trucks and top hammer drills as the primary mining equipment. The mine plan is based on a peak total ore and waste rock production rate of 12.7 Mt/a and an operating life of 12 years. Ore will be delivered to the crusher pad adjacent to the process plant site at an average rate of 11,390 t/d or 4.1 Mt/a.

Several pads have been constructed for contractor laydown areas, construction materials storage yards, and stockpile pads, in addition to the preparation of platforms at the plant site. A number of stockpile areas were established during the pre-production period, including areas for topsoil, oxide material, low grade sulphide material, and operating stockpiles for management of the mill feed. The pre-production period was completed in March 2021. The overall site plan is shown in Figure 16-1.

The final pit will have a elevation of 325 masl and a pit bottom elevation of 75 masl, a total depth of 250 m.

Mining is carried out by a contractor that supplies its own equipment fleet, equipment maintenance, and personnel, including a subcontract for explosives services. MVV plans to purchase its own mining equipment and Serrote will become an Owner-operated mine in 2025.

The Base Case operating model is the basis for the operating and capital cost estimates.

16.1.2 Mine Operations by MVV

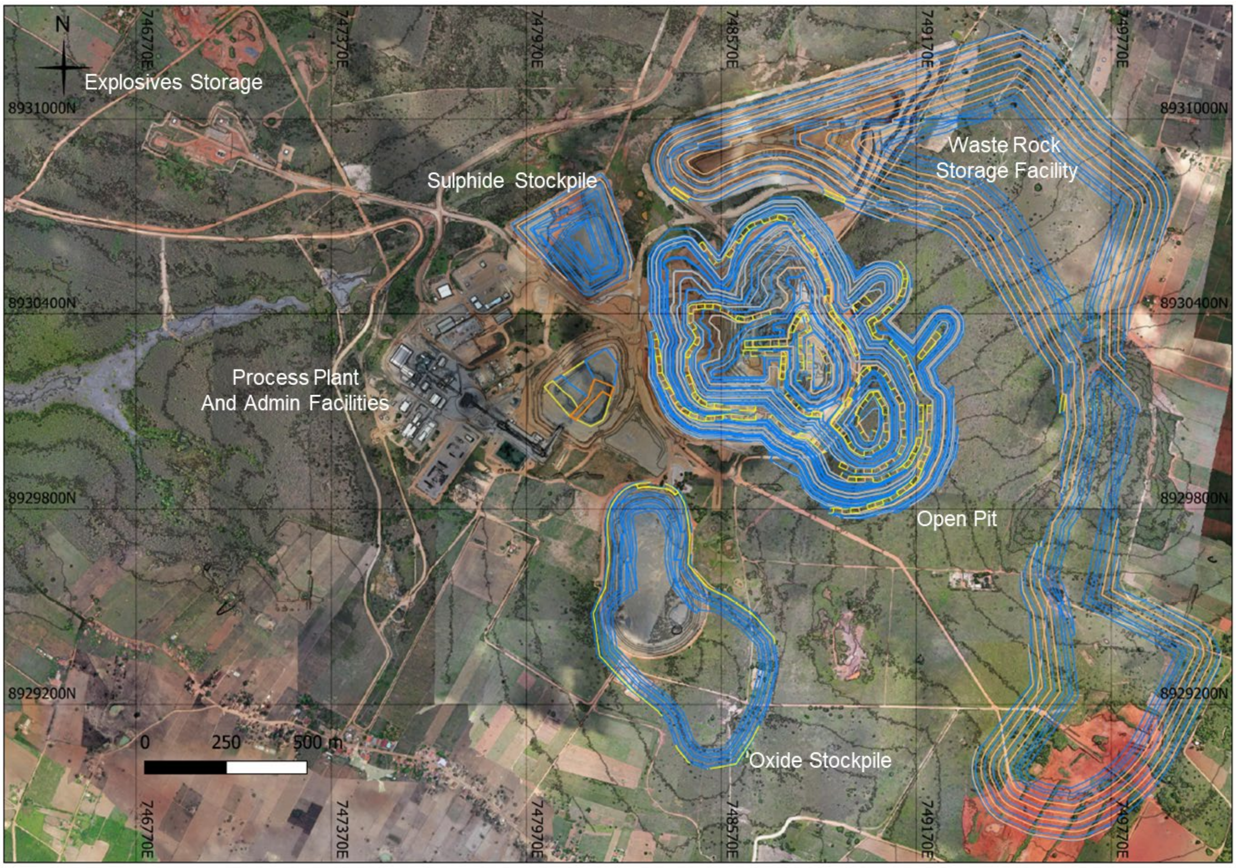
The mine plan is based on contractor mining to the end of 2024, then using MVV’s equipment, personnel, and facilities for the mine operations as of 2025.

16.1.3 Overview of the Planned Open Pit Operating Environment

The bedrock at Serrote is overlain by saprolite from 0 m to 20.5 m thick (average 8.2 m). This layer contains the oxide Mineral Resource (considered as a separately managed waste material in the mine plan). The mineralized zone sub-crops at the saprolite/rock contact. There is only one outcrop of the orebody (the discovery outcrop).

The open pit area is overlain by a thin topsoil layer of varying thickness, typically 0.25–1.0 m. When possible, the topsoil is delivered directly to reclamation areas. The remainder of the topsoil is stored for use during reclamation activities later in the mine life.

Below the topsoil and above the saprolite is a layer of overburden material, with varying thickness from 0 m to 18 m (average 4.2 m).



Source: MVV, 2023.

Figure 16-1: Serrote Mine Site Plan

Top hammer drills are utilized on 10 m operating benches. Ore is mined in two 5-m flitches (half benches). The blast hole diameter for the ore zone is 127 mm and for waste and oxide zones is 140 mm. A wider drill pattern is used for the waste rock and oxide zones compared to ore zones. Ore and waste zones are outlined based on exploration drilling, infill drilling when required, and mining information from overlying benches. Drill holes in the ore zone and a percentage of the drill holes in the adjacent waste rock are assayed to provide information for grade control. Once final pit walls are encountered a wall control program will be implemented utilizing primarily buffer blasting and, when required, pre-splitting.

Blasting is by emulsion explosive, provided by a mixing facility operated by the blasting contractor who provides down-the-hole service. The blasting contractor subcontracts to the main mining contractor. Crushed rock for blast hole stemming is provided by a contractor as needed.

The primary loading and hauling equipment are 3.7 m^3 and 4.6 m^3 hydraulic excavators supported by 4.0 m^3 front-end loaders and 8x4, 35 t rigid body trucks. This equipment is used for primary mining operations, removal of saprolite and topsoil, and for stockpile re-handling.

Mine haul roads are designed at a nominal 15 m width with a typical maximum gradient of 10%. Some out-of-pit roads, including roads to the topsoil stockpiles are designed at an 8% gradient.

Tracked dozers are used to maintain the waste rock storage facility (WRSF) surfaces and berm maintenance, as well as maintenance of the open pit mine primary truck loading areas. Road maintenance is carried out by graders, a small front-end loader and water trucks.

Photographs of the Serrote open pit taken in March 2023 are presented in Figure 16-2.

Source: MVV, 2023

Note: Top photograph is looking west, bottom photograph is looking east.

Figure 16-2: Serrote Open Pit Photographs

16.1.4 Selectivity, Mining Recovery and Dilution

Selectivity, mining recovery and dilution of the Mineral Resource are inter-related factors. Selectivity is the intentional separation during the truck loading process of materials of different characteristics e.g., waste from ore; low grade material to be routed to the stockpile being separated from high grade material to be routed to the primary crusher. The measure of better selectivity achieved with the mining operation is the lower dilution of the ore with waste materials and higher Mineral Reserve recovery from the mine. The ore loss is the difference between the in-situ Mineral Reserve and the quantity delivered to the process plant by the mine. Dilution is sometimes separated into internal and edge dilution. Internal dilution refers to grade adjustments within mining boundaries or ore domains, and edge dilution refers to the ore loss and dilution by waste in the ore/waste contact.

Selectivity depends on the characteristics and the geological complexity of the deposit, the bench height, the capacity of the equipment and the mine operating methods, specifically the operating methods related to blasting, assaying and ore domain definition.

The current resource model estimation methodology (ordinary kriging) inherently introduces dilution in the estimate of the block grades. The selective mining unit is equal to the individual block size of 10 m x 10 m x 5 m. Studies estimated the internal dilution for selective mining units of 10 m x10 m x 10 m at 10%.

In addition to the dilution inherent in the block modelling process, MVV introduced a block edge contact dilution in the block model and generated diluted copper and gold block grades as well as a diluted bulk density. The block edge contact dilution broadly represents 0.875 m of each 10 x 10 x 5 m block shifted to the neighbouring block horizontally at each block edge and 0.25 m vertically to the top and bottom benches. This methodology results in a reduction of 0.8% of the Measured and Indicated fraction of the in-pit Mineral Resource tonnage and a reduction of 3.4% and 2.7% in the copper and gold contained metals, respectively, compared with the quantities estimated on the basis of the block model prior to dilution.

The CP considers that the dilution introduced into the Serrote block model is appropriate, and is conservative due to the following:

- The Serrote orebody consists of a compact mineralized zone of significant extent. The first ore zone that is being mined has sectional dimensions of 425 m x 70 m. Earlier studies noted that over 75% of the Mineral Resource is contained within well-defined ore zones with good continuity along and across strike;
- The ore has physical characteristics that significantly enhance selectivity:
- The mineralisation colour is quite distinct, black versus a pink-grey for the majority of the waste rock;
- The ore bulk density is 3.3 t/m³ versus 2.7 t/m³ typically for the majority of the waste rock, a difference that is substantial enough to be noticeable by the excavator operators and the truck operators based on machine performance;
- Grade control procedures and domain flagging are enhanced by the simplicity of the identification of magnetite in the ore zones;
- The operating bench considered for the operations. Generally, the lower the operating height the better the selectivity. Ore is blasted using 10 m high benches that are excavated in two 5 m high flitches;
- The type and the size of the loading equipment selected. The primary loading equipment unit is a hydraulic excavator with a 4.6 m³ bucket supported by a 4.2 m³ front-end loader. Hydraulic excavators and front-end loaders are two of the most efficient loading units with

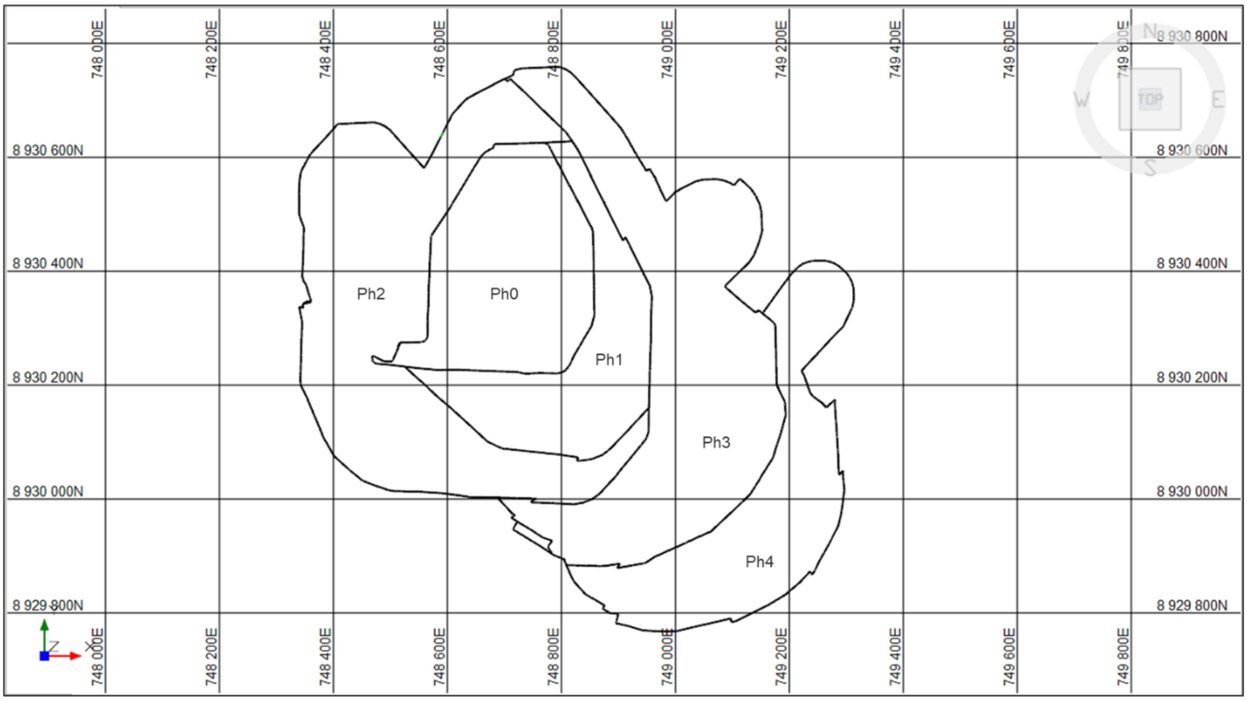
respect to selectivity. The typical width of the loading unit bucket ranges from 2.15 m to 2.55 m.

- MVV applies operating practices to enhance selectivity, including minimization of blast movement by using specialized blasting techniques, and proven grade control practices.

16.2 Mine Planning

16.2.1 Phasing

A phased development is planned for the Serrote deposit. Open pit mining phases are feasible mining shapes used as guides for the generation of long-term mine plans at varying level of detail, typically in annual increments. Figure 16-3 shows a schematic of the open pit mining phase layout.



Source: MVV, 2023.

Figure 16-3: Plan View of Serrote Phase Layout

The long-term mine plan contains sufficient detail to be used as the basis for the estimates of equipment requirements and capital and operating costs.

The following were considered for the design of the mining phase pit designs:

- A target minimum mining width of sustained mining in phases of 60 m;
- The specified minimum localized mining width of 30 m;
- The requirement to reach a sustainable ore face as early as possible within each phase, and to minimize waste rock stripping;
- Operational aspects, including active mining area interaction, phase re-entry angles, ramp placement and ramp connections as well as the efficiency of ramp exits with respect to the primary crusher, the WRSF, and stockpile locations;
- For the security of ore supply, double ramp access to the pit bottom is established from Phase 3 onwards. For Phases 0 to 2, ramp placement considers minimizing interaction of operations

with the primary haulage ramp. In addition, pit wall slope angles of 42º in single-bench configuration are used in nearly all temporary phase walls;

- The overall phase size in terms of total tonnes and the relation to the number of annual vertical bench advances, the required annual production and the overall mine life;
- The start of operations in the north area of the pit with two preliminary phases prior to the final pit phases;
- The use of single benches, shallower slopes and wider ramps for internal phase walls, to reduce operational interference due to over-bench spillage;
- The target of a higher-grade and lower stripping ratio part of the Mineral Reserve as early as possible. This was realized by developing the phases based on an incremental analysis of the Mineral Reserve with respect to the expected cost of the primary metal presented by each phase.

The Serrote open pit will be developed in five phases (0 to 4). The open pit development benefits from the low depth of saprolite on top of the orebody and the limited quantity of oxide mineralisation overlying the sulphide ore.

The locations of Phase 0 and Phase 1 target the development of the part of the orebody that constitutes the highest grade, lower stripping ratio part of the Mineral Reserve which is currently being mined. In addition, these phases target the development of an orebody zone with good, well defined continuity along and across strike as well as vertically. It is expected that this will provide time to develop good on-site grade control procedures.

Phases 2 and 3 deplete the northwest and northeast parts of the deposit. Phase 2 establishes the preferred route in terms of haulage efficiency access to the primary crusher, which is used for the remainder of the mine life for the majority of the ore in Phases 2 to 4.

The southern end of the deposit is depleted by Phase 4.

16.2.2 Mine Production Plan

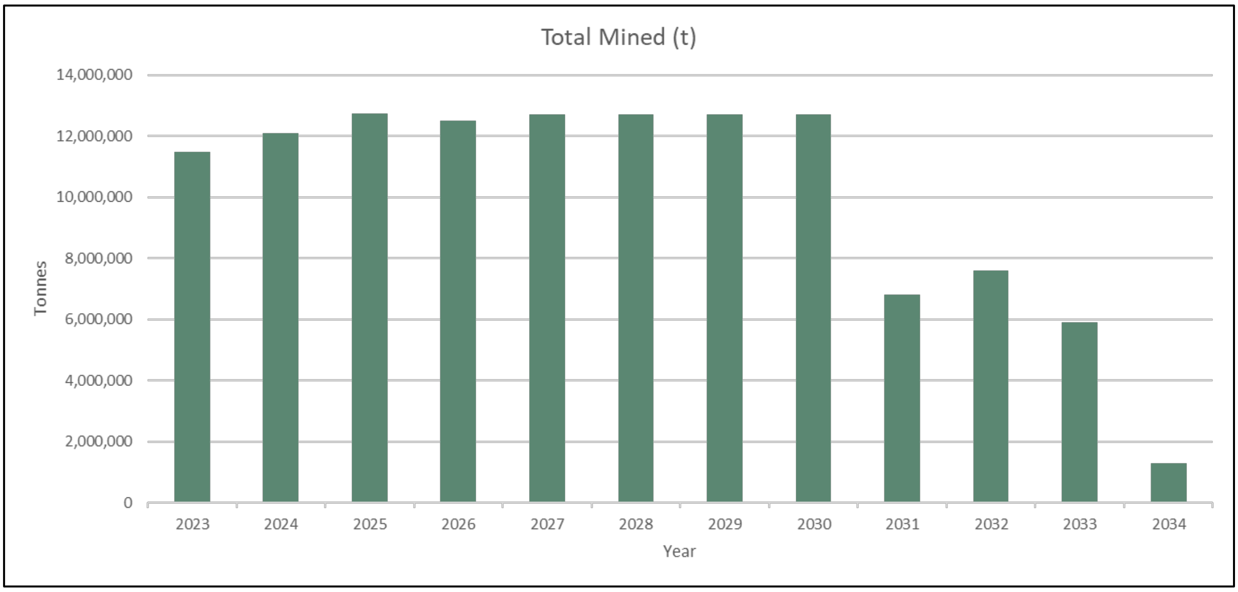
The rate of maximum vertical advance per phase is limited to 50 m/a, which is equivalent to five 10 m benches for the drilling and blasting operation or ten 5 m flitches for loading operations. The vertical advance constraint is active in the later years of operations, supporting the use of a stockpile to meet the constraint of feeding the process plant at its nominal capacity.

Table 16-1 shows the main quantities estimated in the Base Case mine plan in annual increments.

Figure 16-4 presents the total material mined per year. The process plant feed copper and gold grade profile by period is shown in Figure 16-5.

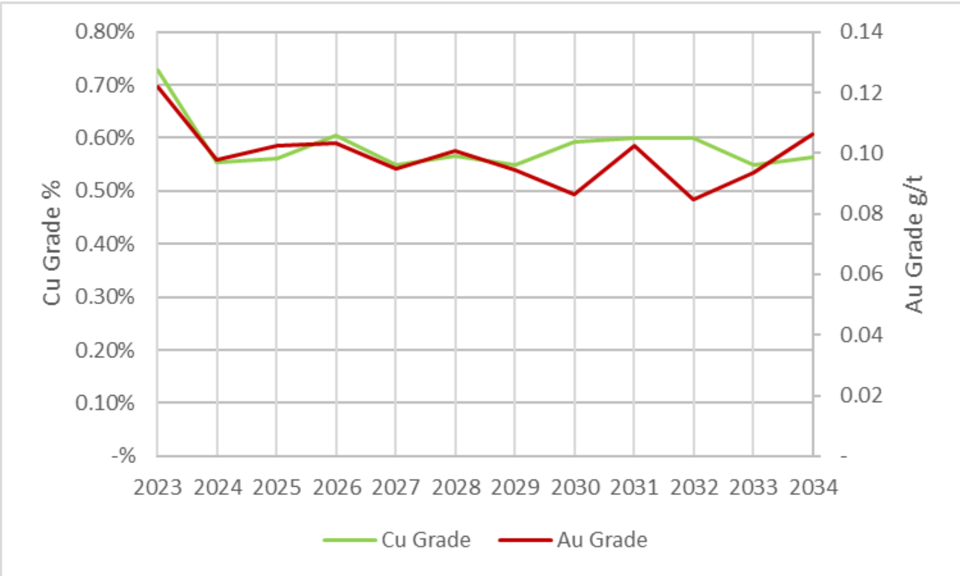
Table 16-1: Mine Production Plan
ACG Acquisition Company Limited – Serrote Mine

Period	Units	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	*Total*
Total tonnes	Mt	11.5	12.1	12.7	12.5	12.7	12.7	12.7	12.7	6.8	7.6	5.9	1.3	***121.2***
Waste rock mined	Mt	7.7	8.0	8.7	8.5	8.7	8.6	8.6	8.7	2.7	3.5	1.8	0.6	***76.1***
Ore mined	Mt	3.7	4.1	4.1	4.0	4.0	4.1	4.1	4.0	4.1	4.1	4.1	0.7	***45.2***
Strip ratio	w:o	2.07	1.94	2.12	2.13	2.18	2.10	2.10	2.15	0.67	0.87	0.44	0.77	***1.69***
Ore processed	Mt	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	1.5	***46.9***
Cu grade	%	0.73	0.55	0.56	0.60	0.55	0.57	0.55	0.59	0.60	0.60	0.55	0.56	***0.59***
Au grade	g/t	0.12	0.10	0.10	0.10	0.09	0.10	0.09	0.09	0.10	0.08	0.09	0.11	***0.10***



Source: MVV, 2023

Figure 16-4: Total Material Mined by Year



Source: MVV, 2023

Figure 16-5: Cu and Au Grade Profile

16.2.3 Waste Handling

The Serrote final open pit design is estimated to contain 76.1 Mt of waste rock which consists of fresh rock, saprolite, overburden and topsoil. Past studies, summarized in Section 20.2.3, established that potential for acid rock drainage generation from material stored in the WRSF is unlikely.

The oxide material stockpile has a minimum capacity of 15 Mt. No economic value is placed on this material for the purposes of the pit limit design and mine planning. As haulage distances to the WRSF and the oxide stockpile are approximately the same, there is no significant additional expense incurred in stockpiling the oxides. MVV maintains the option of potentially processing the oxides at a later stage.

16.2.4 Sulphide Stockpiles

A sulphide ore stockpile is maintained to ensure constant process plant feed and to maximize head grade. The stockpiled ores are re-handled during periods when process plant feed from the open pit is less than the process plant capacity. Stockpiled ore will also be treated at the end of the mine life.

16.3 Mining Equipment

It is planned that the mining contractor will supply and operate its own fleet of mining equipment up to the end of 2024, and from 2025 onwards MVV will own and operate a new fleet. The equipment type and size selection were carried out by MVV, and both the contractor and MVV fleets will be of compatible sizes. Key considerations for the selection of the primary and secondary equipment unit type and size included:

- Safe operation, taking into account the site specific operating conditions;
- Location of the mine site and the limited existing mining infrastructure and experience in the mine vicinity;
- Relative scale of the mining operations for total tonnes and ore tonnes mined per year;
- Type of the rock to be mined, which includes competent and highly abrasive materials;
- Selectivity requirements;
- Impact on the overall operating and capital costs.

The equipment fleet currently in operation is listed in Table 16-2.

Table 16-2: Equipment List by Application
ACG Acquisition Company Limited – Serrote Mine

Equipment	Model	Capacity/Class	Fleet	Application
		Primary Equipment		
Hydraulic Excavator	Cat 374	75 t / 4.6 m^3	2	Production loading - All units as backhoe.
Hydraulic Excavator	Liebherr R954 CSME	60 t / 3.7 m_3	3	Production loading - All units as backhoe.
Hydraulic Excavator	Cat 320D	20 t / 1.9 m^3	1	Mine infrastructure
Front-End Loader	Liebherr L966	23 t / 4.2 m^3	1	Production loading
Haul Trucks	Mercedes Benz Actros 4844K	35 t / 20 m^3	22	Production haulage
Blast Hole Drill	Sandvik Pantera DP 1500i	4 – 5.5”	4	Production drilling - wall control drilling
		Secondary Equipment		
Grader	Cat 140K	16 t	2	Road/bench/dump/access road
Track Dozer	Cat D7	30 t	1	Loading and dump areas
Track Dozer	Cat D6T	21 t	2	Loading and dump areas
Water Truck	Mercedes Benz MB 3344	20,000 L	2	Road/pad maintenance
		Ancillary Equipment		

Equipment	Model	Capacity/Class	Fleet	Application
Maintenance and Support Truck	Accelo 1016/39	4 t	1	Equipment maintenance
Fuel/Lube truck	Mercedes Benz Atego 1726	6,000 L	2	Field maintenance
Crane Truck	Mercedes Benz Atego 2426	7 t	1	Field maintenance
Portable Lights	Atlas Copco M20	4,000 W	8	Work area lighting

Studies based on the production schedule indicate that 20 to 22 haul trucks will be required until 2030 when the requirements will decrease to 15, then to 10 for the last two years of mine life. The seven loading units will be required to 2030 and will subsequently decrease to four for the remaining mine life.

16.4 Work Schedule

MVV is operating Serrote using three 8-hour shifts for the mine operating personnel and hourly maintenance personnel. Crew lead hands and supervisors are scheduled to work on the same rotation as the operating personnel.

Mine management and most supervisory, engineering, and office personnel work on a five days per week, eight hours per day schedule, typically Monday to Friday, with two days off.

16.5 Blasting

MVV uses an explosives contractor to provide down-the-hole service for blasting. Emulsion explosives are utilized at powder factors of 0.51 kg/t for ore, 0.24 kg/t for waste rock and 0.20 kg/t for oxide material. The ore powder factor is high to maximize feed through the primary crusher. The grizzly at the primary crusher has an opening size of 700 mm x 1,000 mm, therefore a P_{80} target of 700 mm has been set, requiring a high powder factor.

MVV supplies the designs for the blast patterns. The contractor supplies the explosive agents and accessories, stems the holes, and ties in and initiates the blasts. Current drill and blast parameters are presented in Table 16-3.

Table 16-3: Drill and Blast Parameters
ACG Acquisition Company Limited – Serrote Mine

Parameter	Ore	Waste	Oxide
Burden (m)	2.55	4.20	5.10
Spacing (m)	3.00	4.80	5.30
Sub-drilling (m)	0.70	0.70	0.70
Powder factor (kg/t)	0.51	0.24	0.20
Bench height (m)	10.0	10.0	10.0
Hole diameter (cm)	127 (5”)	140 (5.5”)	140 (5.5”)

Optimizations and adjustments to blast design parameters such as the mass and number of blast holes per delay and the blast tie in patterns to control blast vibration and improve efficiency are undertaken by MVV and the blasting contractor.

16.6 Geotechnical Evaluation

The initial geotechnical design of the open pit mine was developed by VOGBR (2010) and included recommendations for the geotechnical parameters and stability analyses. Walm reviewed the 2019 feasibility study open pit limit design in 2018, updated the geotechnical studies for the 2019 feasibility study optimized pit, and validated the geotechnical parameters for the geometrical design of the open pit.

The review of the geotechnical and geometrical design of the final pit was based on geotechnical data in the VOGBR (2010) report, structural data obtained from drill holes using a high-resolution optical televiewer (Hi-OPTV) operated by the Instituto de Pesquisas Tecnológicas and the database containing geotechnical descriptions of the drill holes prepared by MVV. Walm's 2018 geotechnical analysis included:

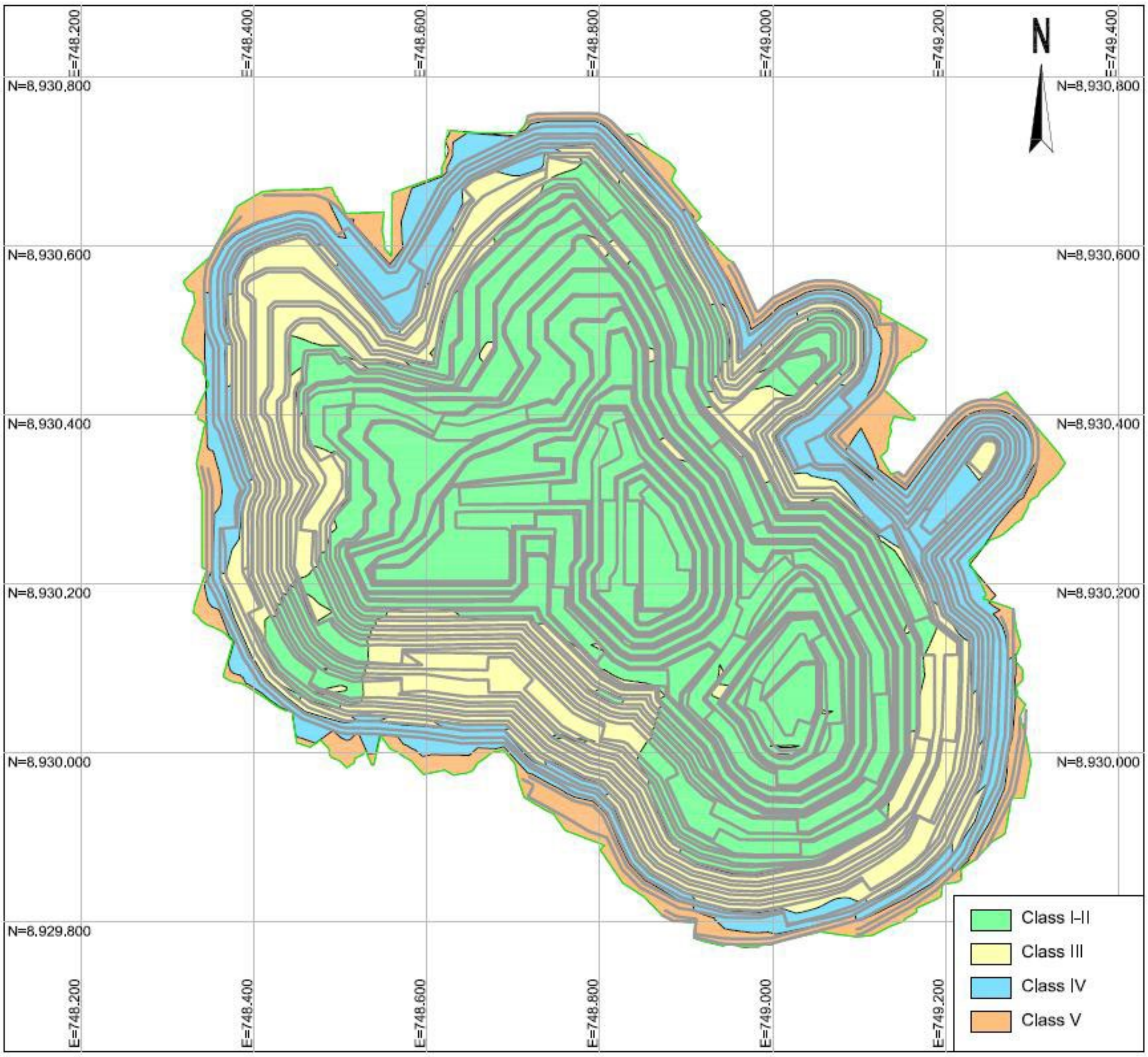
- Analysis and consolidation of the data;
- Development of 19 vertical geomechanical cross-sections (geomechanical 2D model);
- Development of the 3D geomechanical model;
- Definition of the structural domains using data obtained from the Hi-OPTV filming of the drill holes;
- Review of the geotechnical and geometrical design of the final pit, with updated recommendations for the slope angles for bench, inter-ramp and overall;
- Hydrological studies for the design of the surface drainage of the final pit.

The geomechanical classification was carried out based on the geomechanical descriptions developed by VOGBR and the adjusted geomechanical descriptions by MVV based on the drill hole photos. The classification was based on the RMR system (Rock Mass Rating) of Bieniawski (1989).

For the development of the geomechanical models (2D and 3D), 19 geomechanical cross-sections were prepared, coinciding with the directions of the sections that made up the geological model supplied by MVV. These cross-sections were interpreted on the basis of the geomechanical information from the drill holes. The rock masses present in the Mine area are classified as follows (Figure 16-6):

- Rock Mass Classification V: this is a poor to very poor rock mass, consisting of soil and saprolite. Class V rock mass has a thickness between 5 m to 25 m and covers the entire area of the Mine. It is not present in the final pit design. There are some lenses of this class of rock mass at shallow depth;
- Rock Mass Classification IV: this is a poor gneiss rock mass, consisting of very altered and fractured rock. The thickness varies from 6-60 m. Class IV rock mass occurs as a continuous layer below Class V and as lenses within rock mass Classes V, III and I-II in areas that present a high degree of fracturing. In the final pit, it occurs significantly only in the east and northwest regions of the pit.
- Rock Mass Classification III: this is a fractured rock mass with a moderate to high compressive strength and low degree of fracturing. In general, Class III rock mass is a continuous layer under Class IV with thickness between 15 m to 160 m, as well as lenses within the Class I-II rock mass, which can reach 60 m thick. Rock mass Class III outcrops in the northwest and south–southeast portions of the final pit limit walls.

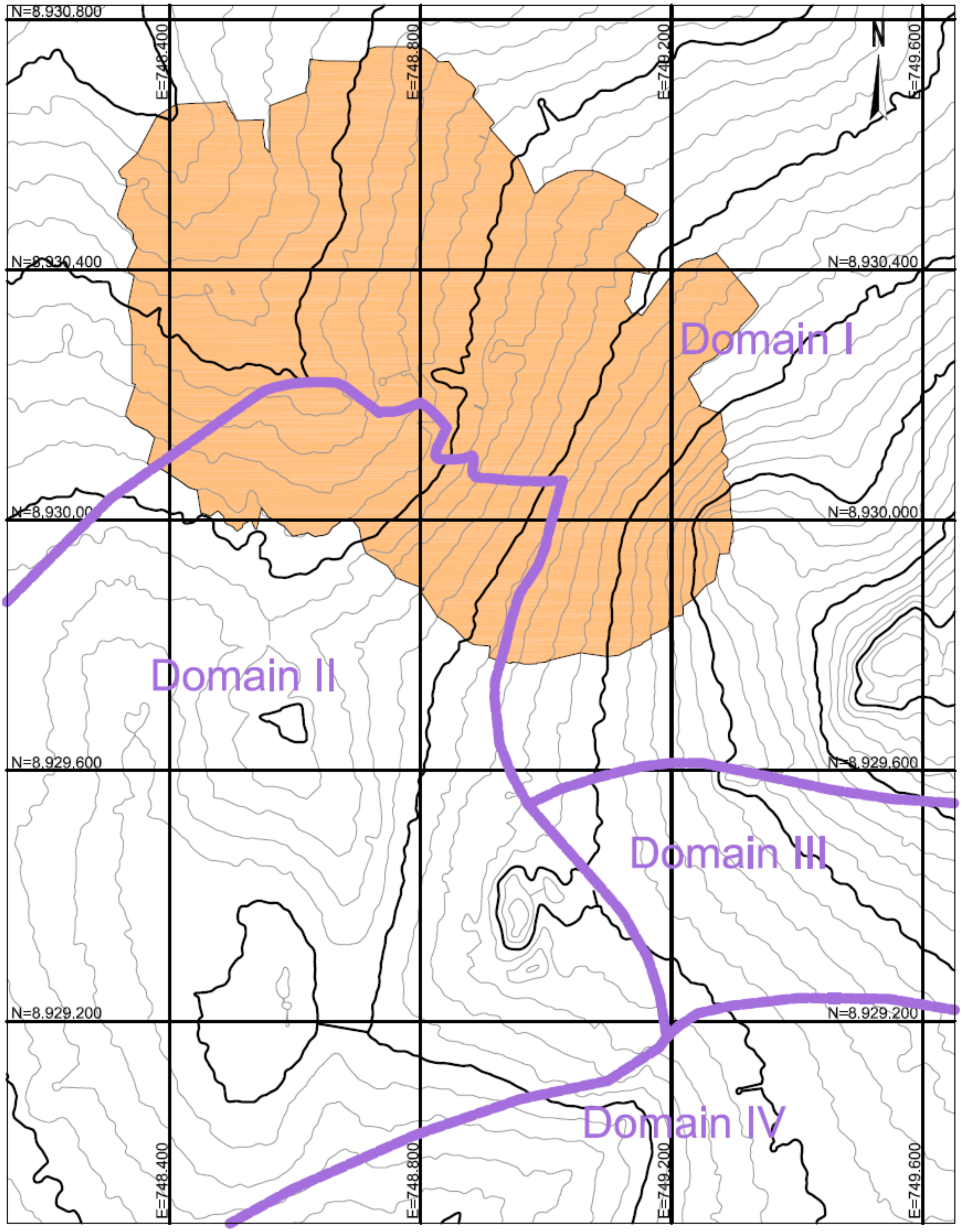
- Rock Mass Classification I-II: this is a rock mass of good geomechanical quality, with high compressive strength, without alteration and little fracturing. Class I-II rock mass is found immediately under the Class III and is present at the base of all the sections. It also occurs as small lenses in the middle of Class III. Class I-II occurs extensively in practically all of the final pit limit walls.



Source: Walm, 2018

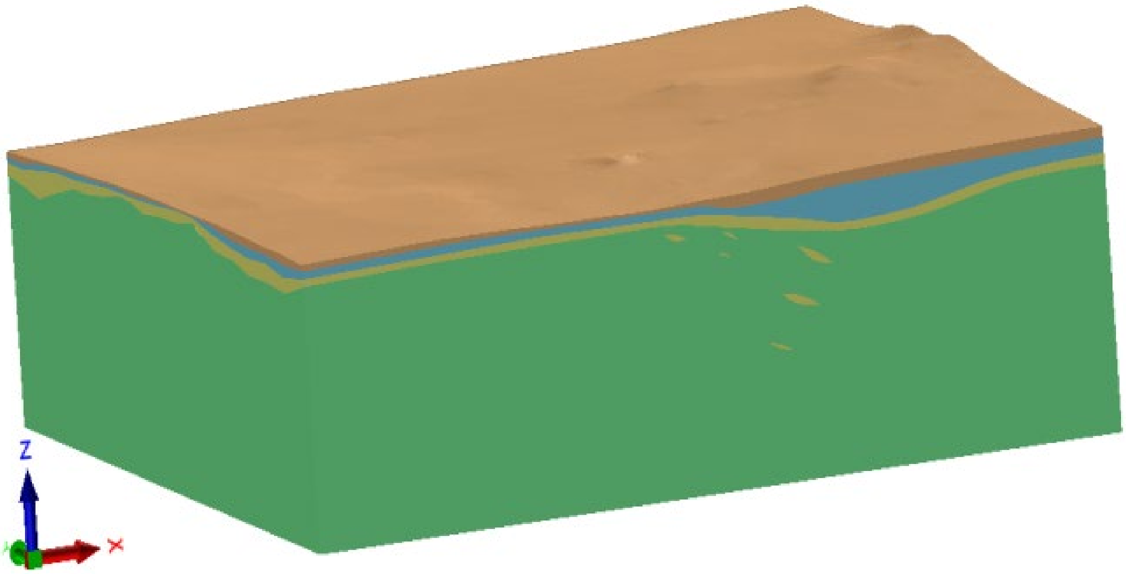
Figure 16-6: Rock Mass Classes in the Final Open Pit

The analysis of the structural data was performed using data from Hi-OPTV filming of 20 drill holes. A total of 3,146 structural measurements (foliations and fractures) were obtained. These data were analysed and compiled, seeking to define the geological/ structural factors in the area of the final pit. The first step was to develop stereograms for the foliation and fractures, using the measurements from each drill hole separately. After analysing the trends, it was possible to identify four structural domains (Figure 16-7), differentiated by the predominant direction of foliation. The discontinuity families were also separated for each domain. Figure 16-8 presents an overview of the 3D geomechanical model for the Serrote Deposit.



Source: Walm, 2018

Figure 16-7: Structural Domains



Source: Walm, 2018.

Notes:

1. Classification by colour as follows: Class V beige, Class IV blue, Class III yellow, and Class I-II green.

Figure 16-8: Overview of the 3D Geomechanical Model

With the structural domains defined, the next step was the geometric compartmentalization of the pit to define possible failure modes. The combination of the main families of discontinuities with the direction/inclination of the walls was used to determine geometric/kinematic failures of different types.

The proposed final open pit limit, supplied by MVV in August 2018, was sub-divided into 21 areas that have wall slopes with an approximately similar direction. Based on the directions of the compartments and the structural domains determined, it was possible to define the failure modes that could occur in each geometric compartment of the pit.

Once the types of failure (planar, wedge, toppling or circular) that could occur in each sector of the final pit were defined, stability analyses were carried out using the limit equilibrium method for the final wall slopes at bench, inter-ramp and global level. The results define the open pit slope geometry.

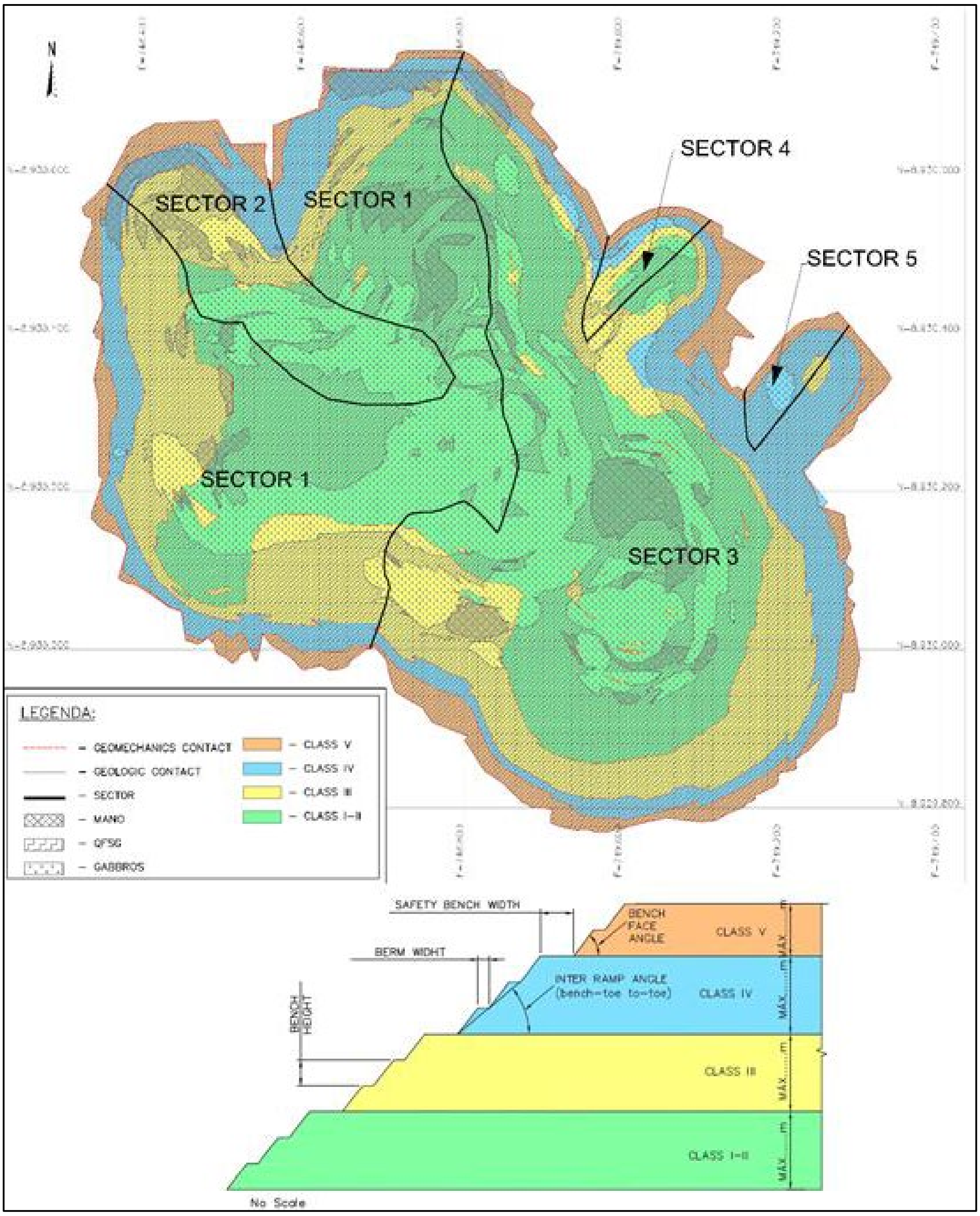
16.6.1 Summary of Recommended Slope Designs

Based on the results of the studies performed, including the stability analyses using the limit equilibrium method the geometrical parameters presented in Table 16-4 and Figure 16-9 were adopted for the final open pit limit wall slopes.

Table 16-4: Final Pit Slope Geometry
ACG Acquisition Company Limited – Serrote Mine

Rock Types	Mass Class	Sector	Bench			Inter-Ramp Angle (bench toe to toe)		Safety Bench Width (m)
			Height (m)	Berm Width (m)	Maximum Angle (°)	Maximum Height (m)	Maximum Angle (°)	
Mano	V	All	10	6.5	45	30	31	15
	IV	All			60	150	39	

Rock Types	Mass Class	Sector	Bench			Inter-Ramp Angle (bench toe to toe)		Safety Bench Width (m)
			Height (m)	Berm Width (m)	Maximum Angle (°)	Maximum Height (m)	Maximum Angle (°)	
	III	1, 4 and 5			70		45	
		2 and 3			75		47	
		All			80	300	50	
	I-II	1, 4 and 5	20	8.5	65		48	
		2 and 3			75		55	
QFSG and Gabbros	V	All			45	30	31	
	IV	All	10	6.5	60	150	39	
	III	All			75		47	15
	I-II	All			80	300	50	
		All	20	8.5	75		55	



Source: Walm, 2018

Figure 16-9: Final Sectors for Slopes in the Final Open Pit

16.6.2 2022 Geotechnical Study

A geotechnical study was completed by Geoestrutural in 2022 based on new geotechnical drill holes and reinterpretation of previous drill hole logs. New design sectors were created and open pit wall slopes were determined within each sector. The study indicated that certain sectors have potential for steeper pit slopes compared to the 2019 feasibility study inputs. MVV plan to evaluate the Geoestrutural study, and complete further geotechnical drill holes to guide an update of the open pit design later in 2023.

16.6.3 Hydrogeology

The hydrogeological characteristics of the mine were developed by VOGBR (2008), VOGBR (2011) and reviewed by Micon (2012). The region has a semi-arid climate, with low rainfall (approximately 700 mm/year) and high evaporation (approximately 1,760 mm/year). The inflow of ground water into the open pit is not anticipated to be significant. The pit walls are composed of fresh or nearly fresh rock, with relatively low estimated water storage and conveyance potential. The saturated soil layer is relatively thin, leading to the presence of a small amount of water (primary storage).

The ground water stored in the materials to be excavated should not affect the mining activities given the slow evolution of the excavations and high rate of potential evapotranspiration. It is anticipated that a significant portion of this ground water will evaporate before it builds up at the bottom of the pit.

The effective ground water recharge to the aquifer system in the Mine area is low (estimated to be 80 mm/year), as a result of the low rainfall and high evaporation. Recharge is only effective during intense rainfall events and periods of reduced evaporation (a condition that only occurs during the wet season).

The ground water levels in the area were monitored using 15 drill holes from October 2007 to December 2009. From July 2008 the monitoring also included eight water level indicators in the area.

Considering the open pit boundaries, wall slope geometry and the amount of material to be excavated, the estimate of the total ground water volume stored in the primary (intergranular) and secondary (fissure) porosity systems of these materials amounts to 9 x 106 m^3. It is estimated that the ground water would need to be continuously pumped at an approximate average rate of 100 m^3/h to draw the water table down.

The average annual recharge contribution, estimated to be 80 mm/year, must be applied to a catchment basin of approximately 250 ha (2.5 km^2). This results in an average flow into the catchment basin of 23 m^3/h. Thus, the average total ground water inflow (gross, conservative value) is estimated to be 123 m^3/h over the LOM. Effectively, this value could be lower, due to some of the ground water being removed as moisture with the material excavated and some will evaporate when the ground water is exposed to the atmosphere (high rate of evaporation). Therefore, the ground water flow is not included in the water balance. However, given the final open pit bottom level below the surface, it is likely that ground water inflow into the pit will occur from occasional hydraulic connections. These could be established with areas distant from the pit by interception of lineaments and hydrogeologically active fractures as mining progresses. These occasional hydraulic connections might bring in water from the Salgado Stream and, more probably, from the creek that runs north of the open pit area.

Based on this information the mine dewatering system has been designed for 200 m^3/h of water with a small amount of suspended solids. The system is planned to consist of four submersible pumps in series to transfer water to the tailings thickener.

16.6.4 2022 Hydrogeology Study

In 2022 a hydrogeology study was completed by MDGeo. MVV plans to evaluate the MDGeo study, and complete further water well drill holes to guide an update of the open pit design later in 2023, with special regard for dewatering requirements – which MDGeo indicated to average approximately 50 m^3/h (lower than 2019 feasibility study estimate of 200 m^3/h). The dewatering pumps currently operate six to eight hours/day.

16.7 Mine Waste Rock Storage Facility Design

The mining activities generate four types of overburden/waste materials: topsoil, saprolite (overburden), transitional weathered rock, and waste rock. Topsoil is stored separately from the other materials. The other three overburden/waste materials extracted from the open pit are disposed of in one WRSF. This is located along the southeast, east, and northeastern areas of the pit, as illustrated in Figure 16-1.

16.7.1 Criteria and Assumptions

The WRSF design was developed according to the Associação Brasileira de Normas Técnicas (ABNT) NBR 13029/2017 technical standard, which recommends the stability analysis of the placement slopes of the stockpile meet the factors of safety (FoS) listed in Table 16-5.

Hydrological studies were developed with the following objectives:

- Characterization of the rainfall regime in the Mine area;
- Establishment of the design flow rates for sizing of the hydraulic structures for surface drainage.

The sizing of the surface drainage structures considered the following minimum return periods recommended by the ABNT NBR 13029/2017 technical standard for design rainfall:

- 100 years for structures with a low flow rate, such as berms, protection channels and collection channels between embankments;
- 100 years for temporary peripheral channels for surface waters;
- 500 years for the definitive peripheral channels for surface waters.

The following assumptions were adopted in the design of the WRSF:

- The material that will form the WRSF has no potential for generating acid drainage, i.e., it is classified as inert and non-hazardous, according to ABNT NBR 10004/2004.
- The disposal of the waste in the WRSF will be from the bottom up, according to the annual production from the open pit.
- Production of waste, mineralized oxide material, sulphide ore to be stockpiled, and topsoil for three periods (pre-stripping, Year 3, Final) is presented in Table 16-6, which shows the production by weight, volume (in-situ), and bulk density of the material in-situ estimated at the time of the 2019 feasibility study.
- Final volumes for disposal, based on the data in Table 16-6, swell factor, and specific weights in the structure after disposal are presented in Table 16-7. For the design of the WRSF, two stages were considered: Production up to Year 3 and Final.

Table 16-5: Factors of Safety for WRSF Design
ACG Acquisition Company Limited – Serrote Mine

Condition	Analysis	Factor of Safety
Normal	General slope	1.50
Critical		1.30
Predominant face of soil	Slope between berms	1.50
Predominant face of rock		1.30

Source: Information from ABNT NBR 13029/2017

Table 16-6: Topsoil, Oxide, Overburden and Stockpiled Sulphide Ore Production ACG Acquisition Company Limited – Serrote Mine

Scenario	Material		Production In-situ (t)	Volume In-Situ (m^3)	Bulk Density in-situ (t/m^3)
Period 1: Pre-stripping	Topsoil		—	53,424	—
	Oxide		3,382,788	1,221,885	2.77
	Plant and construction	Overburden	1,604,491	600,000	2.67
	Overburden	Overburden + transitional	1,038,701	367,127	2.83
		Waste	2,397,584	802,604	2.9
	Total Overburden		3,436,285	1,169,731	2.94
Period 2: Year 3 accumulated	Topsoil		—	109,125	—
	Oxide Stockpile		12,228,220	4,290,249	2.85
	Overburden	Overburden	2,085,970	749,569	2.78
		Transitional	1,677,591	604,484	2.78
		Waste	14,217,040	4,941,872	2.88
	Total Overburden		17,980,601	6,295,925	2.86
Period 3: final accumulated	Topsoil		—	195,245	—
	Oxide Stockpile		13,640,601	4,799,643	2.84
	Overburden	Overburden	2,085,970	749,569	2.78
		Transitional	1,677,591	604,484	2.78
		Waste	79,446,482	27,772,382	2.86
	Total Overburden		83,210,043	29,126,435	2.86
Sulphide ore	Max. size low-grade stockpile (<0.5% CuEq)		1,663,792	526,607	3.16
	Max. size high-grade stockpile (>=0.5% CuEq)		562,106	171,956	3.27

Table 16-7: Volume of Material Criteria for WRSF and Stockpile Design ACG Acquisition Company Limited – Serrote Mine

Structure		Production In-situ (Mt)	Volume In-situ (Mm^3)	Bulk Density In-situ (t/m^3)	Swell Factor	Final Volume (Mm^3)
WRSF	Period 2: Year 3 (capital cost estimate)	17.98	6.30	2.78	1.40	8.99
	Final	83.21	29.13	2.79	1.40	41.61

Structure		Production In-situ (Mt)	Volume In-situ (Mm³)	Bulk Density In-situ (t/m³)	Swell Factor	Final Volume (Mm³)
Oxide stockpile	—	13.64	4.80	2.84	1.50	7.18
Temporary sulphide stockpile	Low-grade	1.66	0.53	3.16	1.58	0.83
	High-grade	0.56	0.17	3.27	1.65	0.28
	Total	2.23	0.70	3.19	1.59	1.11

- The saprolite (overburden) extracted from the open pit during pre- stripping was not disposed of in WRSF; it was used as fill for construction;
- Remaining operating life of WRSF design is 13 years;
- Pile sediment generation rate of 60 m³/ha/a
- Rate of generation of sediments for natural areas of 10 m³/ha/a
- The physical rates, geotechnical parameters for drained and non-drained resistance, compressibility and permeability of the waste were obtained from laboratory and field testing;
- In the absence of hydrological information at the studied points, the studies for the determination of the design flow rates were developed using techniques of transformation rain/flow rate, using records from rainfall stations in the study area.

16.7.2 Geometric and Geotechnical Design of the WRSF Phases

The current geometric design adopted for the WRSF includes the following:

- Embankments with slopes of 1.33H:1.0V;
- Bench heights equal to 10.0 m;
- Berm widths equal to 12.0 m;
- Access ramp widths equal 12.5 m;
- Access ramp slopes equal to 10%.

The WRSF has been designed in two stages: the first stage up to the end of 2023, and the second stage to the end of the operating life. The main components of the structure are listed below:

- The WRSF is composed of an uncontrolled compacted fill made up of waste rock material, highly permeable;
- Internal drainage system (underdrains) consisting of permeable materials to collect the percolated flows and direct them to the toe of the pile;
- Surface drainage system consisting of peripheral channels;
- Instrumentation: water level indicators installed in the body of the structure, as well as surface markers and flow meters;
- Sediment containment sump: a structure to contain the sediment generated by the WRSF (and the oxide stockpile).

The main characteristics of the WRSF are shown in Table 16-8. The sediments generated in the northern and central portions are directed via drainage channels to the TSF. A sediment containment sump will be located in the southwest portion of the final WRSF to contain the sediments generated by the southern portion of the WRSF.

Table 16-8: WRSF Characteristics
ACG Acquisition Company Limited – Serrote Mine

Characteristics	Phase II – Final
Maximum height (m)	89.51
Slope	1.33H:1.0V
Height of the banks (m)	10.0
Width of the berms (m)	12.0
Crest maximum elevation (m)	360.0
Road width (m)	12.5
Road slope (%)	10.0
WRSF area (m^2)	965,623
WRSF total volume (Mm^3)	42.3

16.7.3 Hydraulic Design of the WRSF Surface Drainage System

The surface drainage system of the WRSF consists of peripheral channels at the contact between the WRSF and the natural ground profile. A dissipation basin and sump will be installed to contain the sediments.

16.8 Sulphide and Oxide Stockpile Design and Management

Mining will generate sulphide ore and oxide material to be stockpiled in separate stockpiles:

- The sulphide stockpile, which is located to the northwest of the pit, is divided into two parts depending on the ore grade. This is a temporary structure; the stockpiled ore will be re-handled and processed during the life of the mine;
- The oxide stockpile, which is located to the southwest of the open pit; currently this material will not be processed.

16.8.1 Criteria and Assumptions

There is no specific technical standard for the design of ore stockpiles, therefore, the stockpiles were designed in accordance with the ABNT NBR 13029/2017 technical standard, which is for the design of stockpiles for waste/overburden. The criteria adopted were the same as those adopted for the design of the WRSF for geotechnical and hydrological–hydraulic.

The assumptions adopted for the design of the sulphide and oxide stockpiles are summarized as follows:

- The oxide material has minimal potential for generating acid drainage and is classified as an II-A residue (i.e., non-inert and non-hazardous). The sulphide ore has potential for generation of acid drainage (based on the ABA-M tests carried out) and is classified as an II-A residue (not inert).
- The stockpiles are built using the bottom-up method.

- The design criterium of oxide material and sulphide ore considered in the structures are presented in Table 16-9.

Table 16-9: Characteristics of the Oxide and Sulphide Stockpiles
ACG Acquisition Company Limited – Serrote Mine

Characteristics	Oxide Stockpile	Sulphide Ore Stockpile
Maximum height (m)	38.00	38.00
Slope	1.33H:1.0V	1.33H:1.0V
Height of the banks (m)	20.00	20.00
Width of the berms (m)	13.50	13.50
Crest maximum elevation (m)	330.00	304.00
Road width (m)	12.50	12.50
Road slope (%)	10.0	10.0
Storage area (m^2)	300,688	86,424
Storage total volume (Mm^3)	7.54	0.88 – high grade 0.60 – low grade

Note: The design height of 20 m was adjusted to a construction height of 10 m.

- Operating life of 14 years.
- The physical and geotechnical parameters for drained and non-drained strength, compressibility and permeability of the materials were obtained from laboratory and field tests.
- Since there was no hydrological information at the studied points, the studies for the determination of the design flow rates were developed based on techniques of transformation rain/flow rate, using the records from the rainfall stations in the area.
- For the oxide stockpile, where elevated dissolved metals concentrations in seepage is possible (see Section 20.2.4.2), a low permeability 0.5 m compacted soil layer is incorporated in the foundation design, grading to a collection channel.
- For the sulphide stockpile, where there is potential for acid drainage, the following assumptions were made:
  - This is a temporary ore stockpile and the geological/geotechnical investigations performed around and under the stockpile area showed that the ground water level is deep and the permeability of the material in the foundations is low; an impermeable liner system in the foundation is constructed consisting of a 0.50 m layer of compacted clay soil.
  - The compacted foundation is sloped to direct the water drainage to a limestone lined basin where the potential acid drainage is neutralized.
  - The water quality is monitored.

The geometric concept adopted for the design of the stockpiles is the same as that adopted for the WRSF.

The surface drainage system of the stockpiles consists of peripheral channels at the toe of the piles on the natural ground profile, a dissipation basin and sumps for the containment of sediments.

16.9 CP Comments on "Item 16: Mining Methods"

The mine plan is based on contractor mining to the end of 2024, and will transition to MVV's equipment, personnel and facilities for the mine operations as of 2025. The mine has been in production since Q4 2021 and has gained experience and efficiency. The CP is not aware of any issues that could materially impact mine production at Serrote.

17.0 RECOVERY METHODS

17.1 Summary

In July 2013, AMEC completed basic engineering services for the sulphide ore processing plant to treat 7.1 Mt/a of copper sulphide feed, with a single grinding line (ball mill) and flotation, producing a filtered copper concentrate product. In 2014 the implementation strategy was changed, and process optimization was carried out. The main changes were:

- Processing of the oxidized ore, previously treated as waste, in a leaching, solvent extraction and electro-winning circuit to produce copper cathode;
- Implementation of a lower capacity sulphide beneficiation plant (4.1 Mt/a), expandable;
- Optimization of the open pit, with more selective reserves (higher grade, lower volume, lower stripping ratio).

These adjustments resulted in significant technical, economic and socio-environmental gains over the previous design, and also provided a longer operating life.

In 2015 engineering was started for the optimized design with the engineering company ECM Projetos Industriais. At this stage process flowsheets, definition of capacities and equipment, and mechanical arrangements were developed. However, the project was put on hold by MVV. Although not complete, the process flowsheets, re-sizing of the process equipment, load study, single line diagrams, mechanical arrangements and other documents were issued.

In December 2017 Aura Minerals announced the sale of MVV to a new controlling group. Project activities resumed in 2018, keeping the 2015 strategy but focusing only on the sulphide beneficiation plant, leaving space for a future oxide plant and expansion of the sulphide plant.

In 2018 Ausenco was contracted to develop basic engineering with design criteria based on testwork results obtained in 2018. Ausenco completed the detail design in 2020 for a process plant to treat 4.1 Mt/a of ore from the Serrote pit. The location of the process plant is as close as practical to the mine.

At a feed rate of 4.1 Mt/a and average grades of 0.59% Cu and 0.1 g/t Au, 84% copper recovery, 65% gold recovery and plant utilization of 91.7%, the plant was expected to process an average of 12,250 t/d (dry basis). The average production rate of copper concentrate was estimated to be approximately 46,000 t/a at a minimum grade of 40.5% Cu. The mine life was estimated to be 14 years. Figure 17-1 shows the simplified flowsheet used for the initial plant operations.

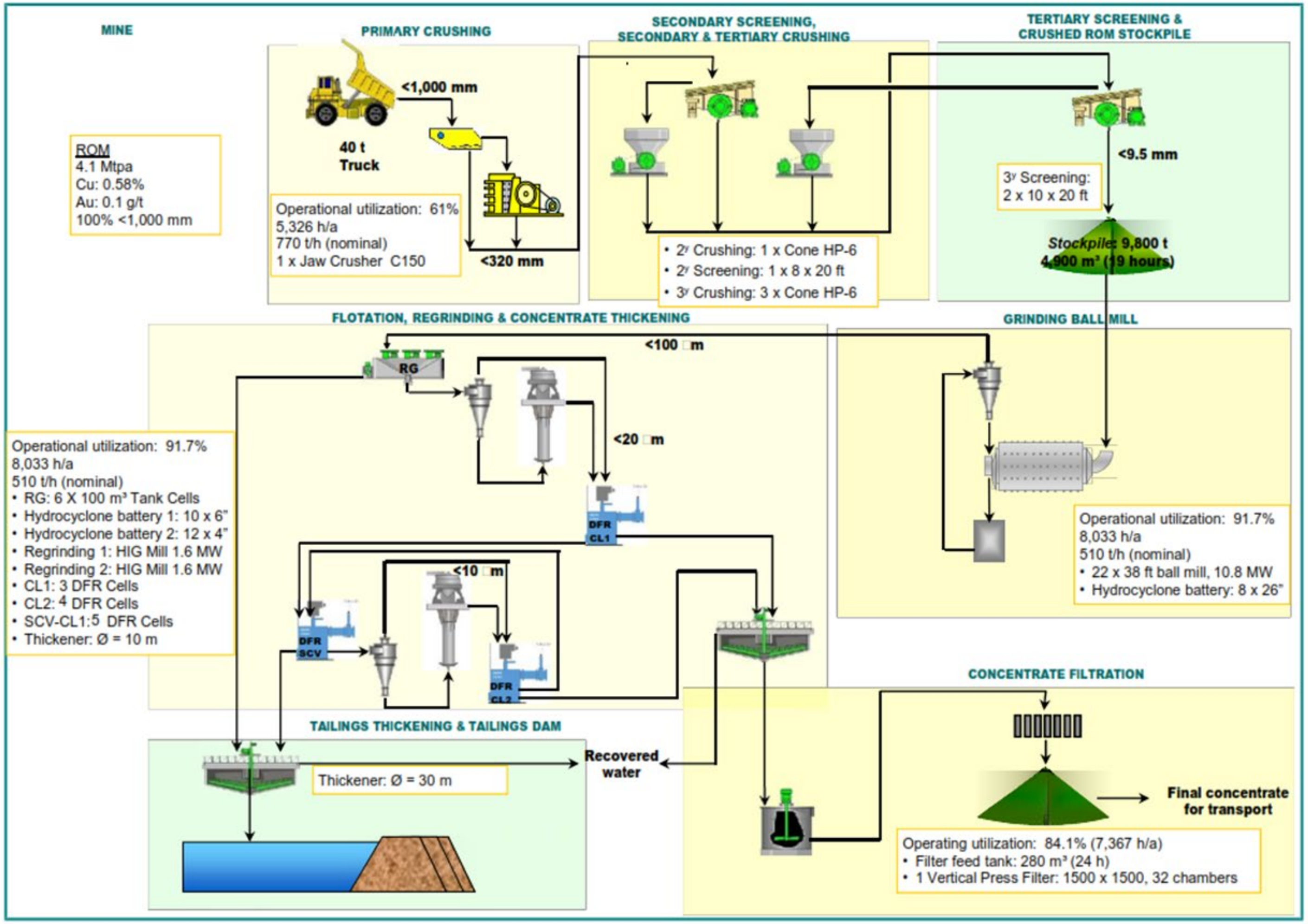
The plant construction was completed in May 2021 and plant operations started in June 2021. Ramp-up was completed in Q4 2022 when steady state operations were achieved at the design throughput.

Both the copper recovery and concentrate grades were low over the first 6 months of operation (54% to 58% recovery at grades of 20% to 25% Cu). Improvements have been made and in November 2022 the plant achieved the design recovery of 84.5% although the concentrate grade remained between 22% and 25% Cu (MVV prioritised recovery over grade). As discussed in Section 13.10, testwork carried out by SGS Geosol in 2022 showed the potential for significantly increasing concentrate grade and increasing recovery. Testwork also showed that an increase in the impeller tip speed in the conventional laboratory cells increased recovery.

In July 2022 the flowsheet was changed to that shown in Figure 17-2. This flowsheet was being used at the time of this CPR in December 2022.

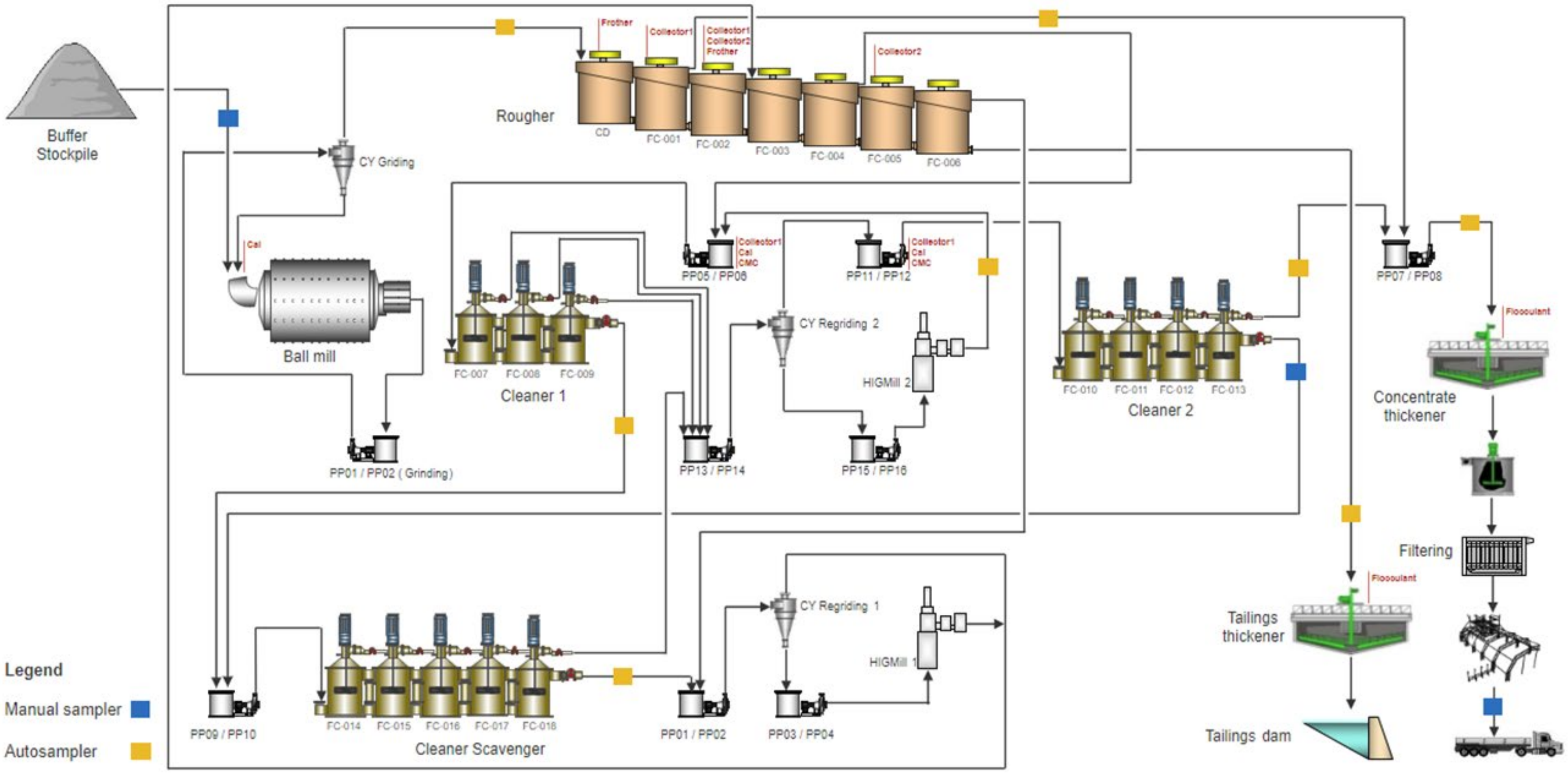
Comminution is carried out in three crushing stages as in the original flowsheet (no changes have been made to the crushing circuit). There is a single stage of ball milling, and two regrinding stages within the cleaner and cleaner-scavenger flotation circuit. Rougher flotation is carried out in conventional tank cells, there are two stages of cleaning and a cleaner-scavenger stage carried out in Woodgrove direct flotation reactor (DFR) cells. Flotation tailings are directed to the TSF. Final concentrate, planned to be at around 1.3% mass recovery, is currently around 2.1% mass recovery for the operating period. This is thickened and then filtered in a vertical press filter for shipment to smelters.

MVV has indicated that they are planning more changes to the flowsheet in 2023 to improve plant performance, particularly the concentrate grade.



Source: MTS et al., 2019.

Figure 17-1: Simplified Initial Process Flowsheet



Source: MVV, 2022.

Figure 17-2: Simplified Process Flowsheet July 2022 to November 2022

17.2 Process Design Criteria

The following main process design criteria were consolidated based on the following:

- Testwork completed prior to start up;
- Experience based on design, construction and operation of similar process plants;
- Information from similar operations in Brazil and worldwide.

The following summarizes the initial recommended parameters:

- Copper recovery: a model was developed to estimate copper recovery as a function of the head grade and lithology. Overall Cu recovery (average LOM) was 84.5%;
- For the current LOM production plan the following recovery equation has been used:
- Copper recovery = 0.95*(LN % Cu head grade) + 92.172
- This equation gives results that are in line with current plant recoveries; however, the plant metallurgical team has compiled a database that is being used to identify correlations between plant feed characteristics and metallurgical performance;
- Gold recovery: recovery was confirmed by LCT results: 65%;
- Copper grade in concentrate: a model was developed to estimate the copper concentrate grade based on the copper/sulphur ratio (Cu/S) of each lithology. The block model lacked extensive sulphur assays to support a sound estimate of the Cu/S ratio, therefore, a decision was made to adopt the same values obtained in the LCT results for the PH0 composite (Year 1 = 40% Cu), PH1 composite (Year 2 and Year 3 = 42% Cu) and Year 4 on (40% Cu). Sulphur assays using Laboratory Equipment Company (LECO) analysers and sequential copper assays are now being carried out as part of the infill drilling program to support further development of the short-term mine plan;
- Silver grade in concentrate: the LCT results showed silver grades from 25 g/t to 40 g/t;
- Copper concentrate specification: a model was developed to estimate the MgO and SiO2 contents supported by a full suite analysis of the concentrate produced in the PH0 and PH1 LCTs. The results showed a clean concentrate with low levels of deleterious elements and minimal MgO penalties.

The process design criteria are summarized in Table 17-1. Plant operating results have not been as expected from the testwork. Improvements have been made and further flowsheet changes are planned in 2023 and onwards up to 2026.

MVV has indicated that it will update the design criteria in 2023 based on recent testwork results and plant performance.

Table 17-1: Process Design Criteria
ACG Acquisition Company Limited – Serrote Mine

Description	Unit	Value
Primary, secondary and tertiary crushing operating availability (basis – 365 d/y)	%	60.8
Primary, secondary and tertiary crushing operating hours	h/a	5,326
Milling operating availability (basis – 365 d/a)	%	91.7
Milling operating hours	h/a	8,033
Ore Nominal Throughputs		

Description	Unit	Value
Yearly	Mt/a	4.1
Daily crushing rate	t/d	18,480
Daily milling rate	t/d	12,250
Hourly milling rate	t/h	510.4
Head Grades		
Copper, average	%	0.59
Copper, average for first 3 years of operation	%	0.71
Copper, maximum for design	%	0.95
Gold, average (LOM)	g/t	0.1
Recoveries (LOM average)		
Copper	%	84.5 (*)
Gold	%	65.0
Concentrate Grades (LOM average)		
Copper	%	40.5
Gold	g/t	5.26
Concentrate Production		
Copper concentrate (at average grade)	t/a	50,470
Copper concentrate (2021–2023) considers ramp-up	t/a	44,996
Copper content (based on average grade)	t/a	20,440
Gold in copper concentrate	oz/a	8,400
ROM Characteristics		
Specific gravity	t/m^3	3.30
Moisture	%	5.0
Bond low energy impact work index (CWI)	kWh/t	18.6 to 24.1
Abrasion index (Ai)	g	0.386
Top size	mm	1,000
Particle size distribution (PSD)		
Passing 800 mm	%	100
Passing 750 mm	%	98
Passing 500 mm	%	88
Passing 250 mm	%	68
Passing 100 mm	%	40
Passing 50 mm	%	22
Passing 25 mm	%	13
Passing 10 mm	%	10
Passing 5 mm	%	6

Description	Unit	Value
Primary Crushing (Jaw Crusher)		
Truck type		Actros 4844K – 38 t or similar
Closed side setting (CSS)	mm	160
F_{80} (before scalping)	mm	400
P_{80} (grizzly passing + crusher discharge)	mm	150
Secondary Crushing (Cone Crusher)		
Closed side setting (CSS)	mm	38
Product size (crusher discharge)	mm	80% <50
Tertiary Crushing (Cone Crusher)		
Closed side setting (CSS)	mm	15
Product size (tertiary screening US)	mm	80% <8.7
Ball Mill Circuit		
Circuit type		Closed with cyclones
Bond work index (BWI)	kWh/t	16.9
Specific energy	kWh/t	18.25
F_{80}	mm	8.5
P_{80}	µm	100
Circulating load	%	350
Media diameter	mm	75
Media addition	kg/t	1.0
Copper Rougher Flotation		
Feed pulp density (solids content)	%	30
Pulp pH	-	9.5
Laboratory effective residence time	min	10
Adopted residence time	min	25
Stage copper recovery (maximum for design)	%	94
Stage mass recovery (maximum for design)	%	14
Concentrate copper grade	%	4.6 to 6.1
Concentrate solids percentage	%	25
Cu Rougher Concentrate Regrinding		
Circuit type		Open with cyclone scalping
Specific energy	kWh/t	17.2
Mill type		HIG Mill, Outotec
F_{80}	um	71
P_{80}	µm	20

Description	Unit	Value
Media diameter	mm	4
Media addition	kg/t	0.032
Copper First Cleaner Flotation		
Reactor type		DFR, Woodgrove
Feed pulp density (solids content)	%	20
pH	-	10.5
Adopted residence time	min	5.0
Stage copper recovery	%	65
Concentrate copper grade	%	39.1
Concentrate solids percentage	%	25
Copper Cleaner-Scavenger Flotation		
Reactor type		DFR, Woodgrove
Feed pulp density (solids content)	%	15
pH	-	10.5
Adopted residence time	min	7.2
Stage copper recovery	%	87.8
Concentrate copper grade	%	13.0
Concentrate solids percentage	%	25.0
Copper Second Cleaner Flotation		
Reactor type		DFR, Woodgrove
Feed pulp density (solids content)	%	15
Pulp pH	—	10.5
Adopted residence time	min	7.9
Stage copper recovery	%	83.6
Concentrate copper grade	%	34.7
Concentrate solids percentage	%	25.0
Copper Concentrate Dewatering: Thickening		
Unit area	$m^2/t/d$	0.125
Unit area (design)	$t/m^2/h$	0.21
Thickener underflow	%	65
Copper Concentrate Dewatering: Filtration		
Filter type		Pressure Filter
Filter cake moisture	%	9.2
Feed tank residence time, at nominal rate	h	24
Copper Tailings Dewatering: Thickening		
Unit area	$m^2/t/d$	4.5

Description	Unit	Value
Unit area (design)	t/m²/h	1.034
Thickener underflow	%	66
Reagent: Lime		
Dosage at ball mill pump box	g/t plant feed	175
Dosage at rougher feed	g/t plant feed	35
Dosage at 1st regrind	g/t plant feed	250
Dosage at 2nd regrind	g/t plant feed	100
Reagent: Collector 1 (AP 4037 or similar)		
Dosage at rougher	g/t plant feed	15
Dosage at cleaner 1	g/t plant feed	5
Dosage at cleaner 2	g/t plant feed	5
Reagent: Collector 2 (PAX or similar)		
Dosage at rougher	g/t plant feed	15
Dosage at cleaner 1	g/t plant feed	5
Dosage at cleaner 2	g/t plant feed	15
Reagent: Frother 1 (MIBC or similar)		
Dosage at conditioning	g/t plant feed	50
Dosage at rougher	g/t plant feed	50
Dosage at cleaner 1	g/t plant feed	50
Dosage at cleaner 2	g/t plant feed	60
Reagent: Depressant (CMC 7LT or similar)		
Dosage at cleaner 1	g/t plant feed	50
Dosage at cleaner 2	g/t plant feed	10
Dosage at cleaner–scavenger	g/t plant feed	10
Reagent: Flocculant (anionic polyacrylamide)		
Dosage at concentrate thickener	g/t thickener feed	10
Dosage at Tailings thickener	g/t thickener feed	25

Notes:

1. (*) Cu recovery varies with sulphide ore content.
2. (**) Average consumption. For design purposes, the handling system will be sized for 210 g/t total MIBC dosing rate.

17.3 Process Plant Description

17.3.1 Introduction

The plant layout is designed to take advantage of the natural ground slopes and maximize gravity flow of the pulp through the process. This required platforms at different elevations for the unit processes. The aim of the design was to optimize operability of the plant and reduce materials costs.

In Q4 2018, MVV started additional process studies, including new metallurgical testwork at ALS Kamloops in Canada, to confirm the regrind P_{80} and to optimize the flotation circuit in terms of reagents and froth washing. In late June 2019 Ausenco proposed, in agreement with MVV/Appian, a process flowsheet and technology for regrinding and cleaner flotation, which gave flexibility and improvements in the copper concentrate quality (approximately 40% Cu grades, at similar recovery levels, 84.5%).

In July 2019 the regrinding and cleaner flotation flowsheet and technology were defined following completion of a workshop involving MVV, consultants, Appian and Ausenco. Ausenco updated the mass balance, flowsheet and layout for the new concept.

Due to the finely disseminated nature of the Serrote copper and gold minerals, fine grinding is required to liberate the minerals from iron and gangue minerals. The most economic flowsheet for this type of material usually requires floating a low grade bulk rougher concentrate containing locked middling particles. The rougher concentrate is then reground prior to the cleaner flotation circuit.

Secondary copper minerals are present in the Serrote deposit including bornite, chalcocite and covellite. The floatability of these minerals depends on particle size. Fine bornite (<20 µm) does not float readily using conventional equipment (columns) and recovery could be affected.

To address the issue of finer particles, the Serrote flotation circuit incorporates Woodgrove DFR cells. Figure 17-1 shows the flowsheet developed in December 2019 and used for initial operations. The flowsheet has two regrind stages with high intensity grinding (HIG) Mills (P_{80} = 20 µm and 12 µm) and DFR cells (2 cleaner stages and 1 cleaner-scavenger stage).

The plant feed rate is 4.1 Mt/a at an average Cu feed grade of 0.71% Cu for the first three years and 0.59% Cu for the remaining years, with plant utilization of 91.7%. The mine life is estimated to be 14 years, and the plant is expected to process an average of 12,250 t/d (dry basis). The average production rate of copper concentrate was estimated to be approximately 50,300 t/a (dry basis) at an average grade of 40.5% Cu.

Comminution consists of three crushing stages, a single stage of ball milling and two regrind stages. This circuit has not been changed.

Flotation is carried out in four stages: roughing in conventional tank cells and two cleaning stages and one cleaner-scavenger stage in DFR cells with two classification and regrind circuits. The circuit has been changed by changing piping and flows but the equipment is the same.

Flotation tailings are directed to the TSF. Final concentrate, at a planned 1.3% mass recovery but an actual 2.1% for the operating period June 2021 to November 2022, is thickened and then filtered in a horizontal press filter for shipment to smelters.

The main plant areas are:

- Crushing and screening:
- Primary crushing;
  - Secondary crushing and screening
- Tertiary crushing and screening;

  - Crushed ore stockpile;
- Concentrator:
  - Grinding;
  - Flotation;
  - Regrinding and cleaner and cleaner-scavenger flotation;
  - Tailings thickening;
  - Copper concentrate thickening;
  - Concentrate filtration and storage;
  - Reagents.

The crushing and screening circuit nominal capacity is 770 t/h; the concentrator nominal capacity is 510 t/h. A description of the areas is provided in the following sub-sections.

A study completed by Ausenco in March 2021 showed that the crushing and grinding circuits have the capacity to increase throughput by up to 10% with the existing equipment.

17.3.2 Primary Crushing

The primary crushing circuit is fed by 38 t capacity trucks. The run of mine (ROM) ore is dumped into a 50 m^3 bin, which can be fed from two sides simultaneously. The top of the bin is fitted with a static grizzly with spacing of 1 m between the bars to provide protection from oversize rocks. Ore passes from the bin over a 1.5 m x 6.2 m vibrating grizzly feeder. Undersize falls onto an 800 mm wide belt conveyor and the oversize passes to a Metso C150 jaw crusher. The crushed product discharges onto the same belt conveyor that receives the vibrating grizzly undersize. The combined products are conveyed to the secondary screen.

A rock breaker is installed at the side of the jaw crusher to break any large rocks that jam in the crusher feed. Dust suppression systems are installed at critical material transfer points.

The primary crushing building is three storeys and has a footprint of 86 m^2; it is a steel structure with no roof or side sheeting.

An electric hoist is provided for routine jaw crusher maintenance; a manual hoist is provided for conveyor maintenance. Other equipment maintenance is carried out using a mobile crane.

Primary crusher product is transported by a belt conveyor equipped with a weightometer, a metal detector and a metal extraction magnet for protection of the secondary screen and secondary crusher.

17.3.3 Secondary Screening and Crushing and Tertiary Crushing

The belt conveyor from primary crushing feeds a 2.4 m x 6.1 m (8 ft x 20 ft) double-deck secondary screen. The screen oversize passes to a Metso HP-6 secondary cone crusher, and the undersize passes to an 800 mm wide belt conveyor. The secondary crusher discharge drops onto a belt conveyor equipped with a weightometer which feeds the tertiary screen feed bin.

Tertiary crushing consists of three Metso HP-6 cone crushers. Each crusher is fed by a 1,000 mm wide belt feeder located below the tertiary crusher feed bin. The crushed ore falls onto the 1,000 mm wide belt conveyor that feeds the tertiary screen feed bin.

Tertiary screen undersize is conveyed to the crushed ore stockpile and the screen oversize is returned to the tertiary crusher feed bin.

A dust suppression system is fitted at the critical material transfer points.

The secondary and tertiary crushers and secondary screen are located in the same building, which is a steel structure with no roof or side sheeting. It has four storeys and the footprint is 450 m^2.

An overhead crane is provided for routine maintenance of the cone crushers, the belt feeder drive pulleys and the secondary screen. Other equipment maintenance is carried out using a mobile crane.

17.3.4 Tertiary Screening

The tertiary screen feed bins are fed by the secondary and tertiary crushing product collection conveyor. This conveyor has a mobile head pulley to ensure that material of the same size distribution is delivered to each bin. The capacity of each bin is 120 m^3.

The ore is reclaimed from the bins by two 1,600 mm wide belt feeders. Each one feeds a 2.4 m x 6.1 m (10 ft x 20 ft) double-deck banana screen. The oversize from the tertiary screens falls onto the 800 mm wide tertiary screen oversize belt conveyor, equipped with a metal detector and metal extraction magnet. This conveyor has a mobile head pulley to distribute the material evenly to the three tertiary crusher feed bins. The undersize from the screens discharges to the 800 mm wide fine ore stockpile feed conveyor which is equipped with a weightometer.

A dust suppression system is installed at critical material transfer points.

The tertiary screening building is a four storey steel structure with no roof or siding; the footprint is 350 m^2.

An overhead crane is provided for routine maintenance of the belt feeder drive pulleys and screens. Other equipment maintenance is done using a mobile crane.

17.3.5 Crushed Ore Stockpile

Crushing circuit product is stored in the crushed ore stockpile which has a total capacity of 36,570 t and a live capacity of 9,800 t (68 hours and 18 hours, respectively, of plant operation). The live capacity is the capacity that can be reclaimed by the belt feeders without using a bulldozer. The total capacity can only be reclaimed by pushing ore to the belt feeder chutes.

Ore from the 28.5 m diameter stockpile is reclaimed by two belt feeders (two operating). Both feeders are sized for the overall reclaiming capacity and, in an emergency situation, each feeder can operate alone at the full reclaiming capacity. The reclaimed material discharges onto the 800 mm wide ball mill feed conveyor, equipped with a weightometer.

Dust suppression systems are installed at critical material transfer points.

The belt feeders and ball mill feed conveyor are located inside a 76 m long concrete tunnel under the stockpile. This tunnel is equipped with a forced air ventilation system and two exits (to meet Brazilian safety regulations).

An electrical hoist is provided for routine maintenance of the belt feeder and the ball mill feed conveyor pulleys.

17.3.6 Grinding

The grinding circuit consists of one FLSmidth 22 ft diameter x 38 ft long ball mill with a 10.8 MW dual pinion drive, operating in closed circuit with a cyclone cluster containing eight 26 in diameter cyclones (5 operating and 3 stand-by). The cyclone cluster is fed by two pumps (one operational and one stand-by), MillMAX 18 x 16-44 MMD manufactured by FLSmidth.

The ball mill is fed by the ball mill feed conveyor and the underflow from the cyclone cluster. Water and milk of lime are introduced into the ball mill feed chute (spout feeder). The mill discharge passes through a trommel, to remove ball chips and coarse particles, and gravitates to the 30 m^3 cyclone feed pump box. Ball chips and coarse material (scats) are collected periodically. The cyclone overflow feeds the flotation circuit.

In the future, if required, a magnetic separation circuit could be installed to remove magnetite from the grinding circuit circulating load. The current design does not include magnetic separation. This facility would be installed next to the grinding building to facilitate the return of the non-magnetic material to the grinding circuit.

The grinding building is a steel structure with four storeys, no roof and no siding. Maintenance is carried out on the ball mill and slurry pumps using a mobile crane. A jib crane is provided for cyclone maintenance.

Mill balls are stored in bags in the grinding building. A jib crane is used to unload the bags from the truck and move them to the storage area. An electrical hoist is used to discharge the bags into the ball feed bucket (the jib crane can also be used). The bucket is hoisted up to discharge the balls into the mill feed chute. The ball diameter is 76 mm.

The grinding substation is positioned to take advantage of routing the cables on the pipe rack. The regrind equipment (HIG mills, cyclones) is located attached to the grinding building.

Spillage from the grinding circuit is collected in a floor sump and returned to the cyclone feed pump box by a vertical pump. The spillage storage volume in the grinding building is 358 m^3. The vertical pump directs the recovered material to the cyclone feed pump box. There is also access for clean-up for a small front-end loader.

17.3.7 Flotation and Regrinding

The ball mill cyclone overflow feeds the rougher flotation circuit. The rougher flotation has seven Outotec 100 m^3 tank cells in series. The rougher concentrate from the first and second cells is pumped directly to the concentrate thickener. The rougher concentrate from the third, fourth, and fifth cells is pumped to the cleaner 1 cells. The rougher concentrate from the sixth and seventh cells is pumped to the HIG mill 1 circuit (10 x 6" cyclones and a HIG mill) at the cleaner-scavengers. The tailings from the rougher cells flows by gravity to the final tailings thickener

The concentrate from the three cleaner 1 cells (3 Woodgrove DFR cells) is pumped to the HIG mill 2 circuit (12 x 4" cyclones and a HIG mill). The cyclone overflow is pumped to the cleaner 2 feed and the underflow passes through the HIG mill and is returned to the cleaner 1 feed. The tailings from the cleaner 1 cells pass to the cleaner-scavenger circuit.

The cleaner 2 circuit consists of 4 Woodgrove DFR cells. The cleaner 2 concentrate is pumped to the concentrate thickener and the tailings are pumped to the cleaner-scavenger circuit. The cleaner-scavenger circuit consists of 5 Woodgrove DFR cells. The concentrate from the cleaner-scavenger circuit is returned to the HIG mill 2 cyclone feed with the cleaner 1 concentrate. Cleaner scavenger tailings and the concentrate from rougher cells 6 and 7 are pumped to the HIG mill 1 circuit. Underflow from cyclone 1 passes through HIG mill 1 and is pumped together with the cyclone overflow to the fourth cell in the rougher circuit.

The regrind mills are Outotec HIG mills, each with a 1,600-kW variable speed motor.

The flotation building has a total area of 800 m^2 and is a steel structure with no roof or siding. The blowers that provide air for the rougher flotation cells are located near the flotation area. The cleaners and cleaner-scavengers are placed on concrete structures. The compressed air for these cells is provided from the compressed air central building.

Equipment maintenance is carried out using a mobile crane.

Spillage from this area is collected in a floor sump and pumped back to the first rougher cell.

17.3.8 Tailings Thickener

The rougher flotation tailings flow by gravity to the tailings thickener. The tailings thickener is a hi-rate thickener (30 m diameter) with a steel tank elevated on steel legs. Flocculant is added to the thickener feed. The thickener overflow reclaimed water passes to the process water tank.

Thickener underflow at approximately 65% solid by weight, is pumped to the TSF by two Warman 8/6 AHPP pumps (one operating and one stand-by). In the future, as the tailings discharge point at the TSF changes, it will be necessary to install two more pumps and a pipeline in series with the existing line, to form two trains (one train operating and one stand-by).

Thickener maintenance is done using a mobile crane. Pump maintenance uses a manual hoist. If there is a power outage, the stand-by generator will automatically start to provide power for the thickener drive mechanism.

17.3.9 Copper Concentrate Thickening and Storage

The final copper concentrate is fed to a 10 m diameter conventional thickener with a metal tank elevated on steel legs. Flocculant is added to the feed. The thickener underflow, at 65% solids by weight, is pumped to the agitated 220 m^3 filter feed tank. Clarified overflow from the thickener is pumped to the process water tank.

Thickener maintenance is done using a mobile crane. A hoist is provided for the pump maintenance. If it is necessary to drain the thickener or the concentrate tank, the concentrate is collected in a bunded area under the thickener. A mobile pump is used to return it to the thickener. If there is a power outage, the stand-by generator will automatically start to provide power for the thickener drive mechanism.

17.3.10 Filtration and Storage

The concentrate is pumped from the filter feed tank to the pressure filter (1,500 mm x 1,500 mm with 32 plates) to reduce the moisture content to approximately 9%. The filter cake from the pressure filter discharges by gravity to the floor to form a stockpile.

Filter feed pumps (Warman 6/4 AH, one operating and one stand-by), pump concentrate from the filtration feed tank to the filter press and recirculate concentrate back to the feed tank as required by the filter operating cycle. During the pressing and drying steps, the feed pulp is recirculated to the filtration storage tank to prevent sedimentation in the line.

The filtrate reports to the filtrate pump box, from which it is pumped (Warman 3/2 AH, one operating and one stand-by) back to the concentrate thickener.

The concentrate is stockpiled below the filters. The concentrate is then stored in a shed that has sufficient volume for one shipload (approximately 11,000 t). When Serrote is advised of the shipping schedule at the Maceio port the concentrate is loaded by wheel loaders into road trucks at the concentrate shed at Serrote and trucked to the port. The trucks are covered for transport. After loading, the wheels of the trucks are washed to remove concentrate. The trucks then pass to the weigh scale at the Serrote main gate. Spillage from the truck wash water is returned to the concentrate thickener.

The filtration equipment and the copper concentrate stockpile are enclosed in a 920 m^2 steel building with roofing and siding.

If there is a power outage, the stand-by generator will automatically start to provide power for the filter feed tank agitator motor.

An overhead crane is provided for routine maintenance of the filter. Other equipment maintenance is carried out using a mobile crane.

17.3.11 Reagents

The reagents plant consists of receiving/storage, preparation and distribution facilities for the following flotation and thickening reagents:

- Depressant (CMC);
- Collector 1;
- Collector 2;
- Frother;
- Flocculant;
- Lime.

The collector 1 and frother are used as received, with no preparation/dilution. Collector 1 is received in drums or isotanks, and frother is received in 22 m³ isotanks.

Other reagents need preparation/dilution using water. They are received in maxi-sacs (around 625 kg each). The collector 2 (PAX) is stored and handled separately from other reagents because of the smell and explosion risk (if there is a high concentration of fine solid particles suspended in a confined area).

Three separate buildings are used for reagents storage: one for frother; one for depressant, collector 1, CMC, flocculant and lime; and one for collector 2. The frother storage building is close to the reagent preparation building. There is a firefighting system in this building because the frother is flammable. Collector 2 is stored close to the open pit in a separate building. The other reagents are stored in the main reagent storage, preparation and distribution building.

The reagent facilities are enclosed in a steel building with roofing and half siding. An overhead crane is provided for routine operation and maintenance of reagent area.

17.4 Plant Control, Instrumentation and Communication

The automation system supports the operations and administration areas.

Data communication in the automation system is by a fibre optic backbone. The backbone consists of single-mode fibre optic cable (24 fibres, 12 pairs).

The plant areas are connected using ring topology. For remote areas, star or tree topology is used.

17.4.1 Main Operational Controls

The process control supervisory system and the electrical control supervisory system are designed and programmed to provide operating control for all plant areas.

17.5 Production Schedule

Plant operations started in June 2021, the ramp-up phase was estimated to be 18 months; and the plant achieved the nominal design production rate in Q4 2022. The ramp-up targets for ore throughput and copper recovery and the actual data are shown in Table 17-2.

The actual plant throughput achieved the target within the target timeframe; however, the build-up was slower than predicted. In part, this was due to the downtime required to make the circuit changes necessary to improve the copper recovery and concentrate grade. These changes were successful in achieving close to the target copper recovery in Q4 2022. More changes are planned in 2023 and onwards.

Table 17-2: Ramp-Up Table
ACG Acquisition Company Limited – Serrote Mine

Month	Target % of Nominal Ore Throughput (%)	Target Plant Ore Throughput (kt/m)	Target Copper Recovery (%)	Actual Plant Ore Throughput (kt/m)	Actual Copper Recovery (%)
1	13	44	42.9	63.6	26.12
2	26	90	64.2	169.3	24.25
3	41	144	72.9	174.6	36.68
4	51	170	78.1	143.6	39.98
5	69	240	79.2	181.7	54.51
6	67	225	80.6	191.4	57.63
7	79	276	81.1	230.8	58.01
8	93	325	82.0	190.2	54.02
9	89	281	82.8	169.0	65.07
10	94	328	83.8	280.2	71.95
11	96	325	84.8	285.9	73.12
12	96	335	85.1	289.1	78.68
13	97	327	85.9	313.6	77.56
14	99	345	85.4	252.9	79.30
15	82	286	85.6	281.9	80.69
16	100	335	85.7	358.7	81.70
17	100	347	85.9	359.3	81.79
18	96	322	86.2	344.1	84.47

17.6 Plant Operations June 2021 to December 2022

The plant production results for June 2021 to December 2022 are shown in Table 17-3.

Table 17-3: Plant Production Results – June 2021 to December 2022
ACG Acquisition Company Limited – Serrote Mine

Month/Year	Feed (t)	Cu in Feed (%)	Cu in Concentrate (%)	Cu Recovery (%)	Conc. Produced (t)	Cu in Conc. (t)	Cu in Tailings (%)
Jun-21	63,583.2	0.579	16.04	26.12	284.0	45.6	0.432
Jul-21	169,336.5	0.715	20.03	24.25	1,467.1	293.9	0.547
Aug-21	174,620.5	0.713	22.07	36.68	2,053.0	453.1	0.457
Sept-21	143,618.0	0.767	22.73	39.98	1,936.7	440.3	0.466
Oct-21	181,717.0	0.698	22.47	54.51	3,079.6	691.9	0.323
Nov-21	191,400.7	0.585	20.10	57.63	3,209.7	645.1	0.252
Dec-21	230,757.0	0.588	20.55	58.01	3,830.9	787.4	0.251
Jan-22	190,163.6	0.711	24.63	54.02	2,965.0	730.4	0.332
Feb-22	169,026.4	0.710	24.22	65.07	3,226.5	781.3	0.253
Mar-22	280,152.0	0.710	23.36	71.95	6,126.7	1,431.2	0.204
Apr-22	285,948.0	0.697	22.97	73.12	6,344.9	1,457.2	0.192
May-22	289,096.1	0.701	26.88	78.68	5,932.1	1,594.6	0.153
Jun-22	313,640.4	0.701	22.35	77.56	7,626.0	1,704.4	0.161
Jul-22	252,942.4	0.694	23.93	79.30	5,815.5	1,391.5	0.147
Aug-22	281,860.6	0.738	22.37	80.69	7,505.6	1,679.4	0.146
Sept-22	358,654.9	0.811	23.20	81.70	10,251.3	2,377.8	0.153
Oct-22	359,273.6	0.742	22.84	81.79	9,551.4	2,181.3	0.139
Nov-22	344,088.8	0.730	23.56	84.47	9,006.0	2,121.8	0.116
Dec-22	376,223.5	0.750	22.74	82.04	10,178.3	2,315,0	0.138

Initially the plant did not reach the planned production because of poor performance in the cleaner circuit (low enrichment and low recovery). It was also determined that there was an opportunity for flash flotation (to quickly recover a high grade concentrate at the start of the rougher circuit) and testwork demonstrated the ability to scalp the concentrate from the first rougher cell. Adjustments were made to reagent dosages (significant reduction in frother, collector 2 was changed to SEX-SIBX/50:50 blend, and addition of CMC gangue depressant) to the roughers) which improved results and plant stability. Operations focused on recovery, with an acceptable quality concentrate.

The conditioner cell ahead of the roughers was converted to a flotation cell leading to an increase of 17% in overall residence time and allowing flash flotation in the first two of the now seven rougher cells. The target rougher recovery downstream in the remaining five rougher cells was maintained. Rougher recovery is now between 85% and 90%. Two-thirds of the final concentrate is now recovered from the first two rougher cells significantly reducing the load on the cleaners. These changes were implemented between February 2022 and July 2022 leading to an improvement in recovery from 54% (January 2022) to 84% (November 2022).

The operations team is working on the following areas to improve and stabilize plant operations and performance:

- Fine tuning of plant controls;
- Operating the HIG mills at the optimum point (including classification effectiveness);
- Improving understanding of the geometallurgy of the feed and the metallurgical response of each lithology type and head grade;
- In 2023, improving the copper grade in the concentrate by installing a dedicated cleaner cell (tank cells in the range between 20 m^3 and 50 m^3 are available) for enrichment of the first rougher 1 concentrate (from around 24% Cu to >35%Cu with 90% recovery in the stage). This will increase the overall copper grade in the concentrate to 30% when combined with the cleaner 2 concentrate;
- In 2024 and 2025, the addition of one additional cleaner tank cell to improve the overall concentrate grade to 32% Cu;
- In 2026, the installation of a four stage cleaner circuit (similar to the SGS Geosol flowsheet shown in Figure 13-7) using tank cells with impellors with higher tip speeds to produce a 40% Cu concentrate;
- Carry out LCT and pilot plant testwork to further investigate the optimum cleaner circuit configuration and test higher flotation cell impeller tip speeds. The latter has been tested on conventional cells in the laboratory and at pilot scale for the Woodgrove cells with encouraging results. The goal is to produce a final concentrate of around 40% Cu, while maintaining recovery between 84% and 85%.

17.7 CP Comments on "Item 17: Recovery Methods"

17.7.1 CP's Comments

- The plant has achieved the design ore throughput.
- The plant has had difficulty in achieving the expected copper recovery and concentrate grade. Mineralogical analysis has shown that this due to the inability of the Woodgrove cells to effectively upgrade the rougher concentrate and achieve an adequate cleaner circuit recovery with the Serrote ore. This is discussed in Section 13.
- The flowsheet changes carried out by the Serrote operations team have successfully increased the plant recovery to the design level.

17.7.2 Recommendations

- The CP is in agreement with the plan to install a tank cell to upgrade the rougher flash concentrate.
- The CP is in agreement with the testwork and improvement plan outlined in paragraph 17.6.

18.0 PROJECT INFRASTRUCTURE

18.1 Introduction

The key infrastructure areas for the Serrote Mine are shown in Figure 18-1. All necessary infrastructure for the current operation has been completed and is sufficient for the LOM plan. Surface rights for infrastructure and mining are discussed in Section 4.5. Serrote operates year-round.

18.2 Roads and Logistics

18.2.1 Site Access

The access road to the Serrote Mine is at a junction from Alagoas State road AL-486, which links the city of Craíbas to route AL-115. An intersection was built to link route AL-486 to a 500 m access road that leads to the Serrote Mine gatehouse. The road from the main gate to the process plant and administration facilities is approximately 1,500 m long and 13 m wide. Other internal roads at the site are 8 or 10 m wide. There are existing roads throughout the site area that were established during mine construction.

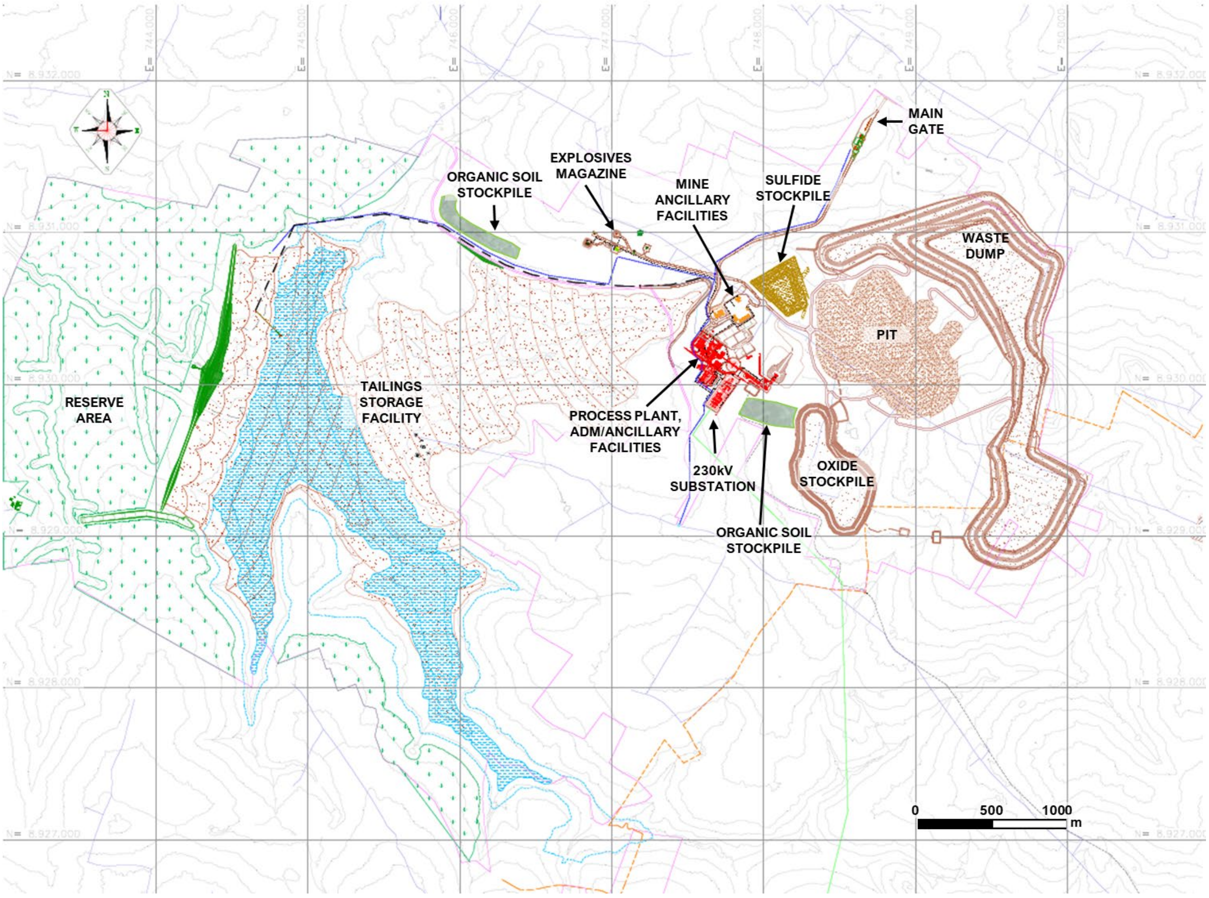
Road access is used for the supply of materials and equipment to the mine site and for transporting concentrate to the port of Maceió.

18.2.2 Ports

The concentrate production rate is approximately 260-300 dmt/d and is stored in a 10,000 dmt capacity storage shed next to the concentrate filtering facility at the mine.

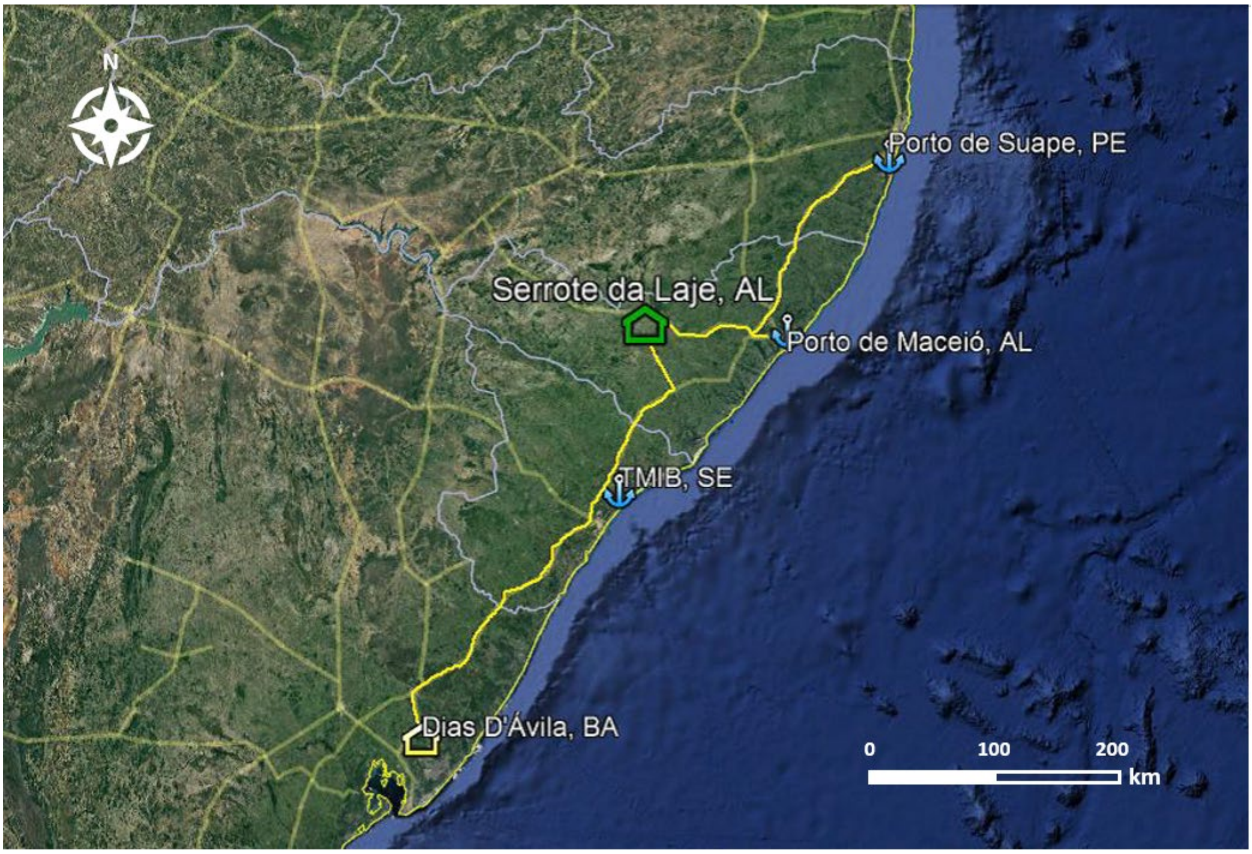
Concentrate has been transported to port of Maceió in Alagoas State since the first shipment in Q4 2021. There are two alternative ports in the northeast region of Brazil that potentially could meet the Mine's requirements for the importation of equipment and materials and the export of copper concentrate: Suape which is a public port, and TMIB which is private (Figure 18-2).

The port of Maceió is located within the city of Maceió, approximately 140 km from the site. The population is accustomed to truck movements in and out of the port. The port has several available areas for rent, most of them on unused land. There are existing covered warehouses which MVV is using through a spot use contract. Studies for long term rental are being developed and a definitive contract is expected in 2023.



Source: MTS et al., 2021.

Figure 18-1: Infrastructure Site Plan



Source: MVV, 2021, on Google Earth backdrop.

Figure 18-2: Port Locations

18.3 Stockpiles

Stockpiles are discussed in Section 16.8.

18.4 Waste Rock Storage Facilities

The WRSF is discussed in Section 16.7.

18.5 Tailings Storage Facilities

The TSF design is discussed in Section 20.6.

18.6 Camps and Accommodation

No on-site accommodation has been constructed. Employees and contractors reside in Arapiraca, Craíbas and surrounding communities. Arapiraca is the second largest city in Alagoas and had an estimated population of 233,000 inhabitants in 2020.

18.7 Built Infrastructure

18.7.1 Administrative Ancillary Buildings

Administrative ancillary buildings were constructed as precast concrete structures with concrete block walls on cast-in-place concrete floors. A sewage collection and treatment system was installed. Rainwater is collected in an independent system and directed to a tank for water re-use.

The administration infrastructure includes:

- Gatehouse: reception, security, information technology (IT), and weighscale controller rooms; the latter with a view of the access road and the weighscale. Two automatic boom barriers and two manual boom barriers (controlled by a guard) are used to control vehicle access. Access to the waste management centre is also through the boom barriers.
- Trucker support: adjacent the gatehouse; used for deliveries and concentrate transport.
- Change house: located next to the canteen on the upper pad of the administration area; 60-person capacity.
- Administration office: reception area, offices for management, administration, human resources (HR), purchasing, legal, IT, engineering inspection and contractors. Located near first aid post, on the lower pad of the administration support area; can accommodate 103 persons per shift. An access control system and security TV cameras are installed in the administration areas and substations to provide security for these areas.
- First aid post: adjacent administration offices; has independent access for an ambulance and also houses the fire truck. The building has a reception area, doctor's office, observation room, pharmacy, first aid room, storage area for safety equipment, male and female toilets and change rooms.
- Kitchen/canteen: can accommodate 96 people. The cooking facilities have additional capacity to work as a central kitchen preparing meals to be distributed to the contractor sites where required.

18.7.2 Operational Ancillary Buildings

The operational ancillary buildings are situated near the process plant and the open pit. They include:

- Process plant workshop: a 720 m^2 metallic structure with masonry lower walls and metal cladding above the masonry; located at the grinding area.
- Laboratory: 600 m^2; designed to handle 90 samples per day from the Geology Department, Mining Department and the process plant.
- Control room: positioned close to the process plant to view and monitor all process plant operations, including crushing, grinding and flotation.

18.7.3 Mine Ancillary Facilities

The facilities to support mine operations are sited over an 18,676 m^2 dedicated area. The complex includes a main workshop building, tire shop, welding area, drilling maintenance bay, fuel station, washing bay, offices, change room, cafeteria and other structures. The floor area of the buildings is 2,791 m^2.

The main workshop building has six bays, including one lubrication bay. The building has also oil storage, a warehouse and offices.

There is a second workshop building with a tire shop, welding area and a dedicated drill maintenance bay and warehouse.

The wash bay and the fuel station are located at the entrance.

Other support facilities are located in two separate buildings including mine management, geology and planning offices, dispatch system room, and training room. A new office facility for mine operations is currently being constructed.

18.8 Electric Power

The electrical power supply to the south–central area of the State of Alagoas, where the Serrote Mine is located, is provided by the Arapiraca III substation, which is fed by the 230 kV Rio Largo II, Arapiraca III and Arapiraca III-Penedo transmission lines. The system is also connected to the Penedo-N. S. Socorro-Jardim substations by a 230 kV transmission line. Companhia Hidro Elétrica do São Francisco (CHESF) is the concessionaire of this system.

The electrical supply system consists of an exit bay in the Arapiraca III substation and a 230 kV transmission line (approximately 21 km long) to the 230/13.8 kV stepdown Serrote substation. The Serrote substation has two incoming 230 kV bays, two 25/30 MVA transformer sections and one 13.8 kV distribution switchgear.

Electrical power is distributed from the mine's main substation via 13.8 kV overhead distribution lines. The area substations close to the main substation are supplied through 13.8 kV lines and underground ducts. Administration areas and low electrical power requirement areas have power supplied at 380/220 V.

Plant emergency electrical power is provided by a 480 V packaged diesel generator located in the thickening and filtration substation. Emergency power supports critical loads only and does not maintain production.

The plant estimated electrical power load consists of:

- Total installed: 36 MW;
- Maximum demand: 24 MW;
- Average demand: 20 MW;
- Annual consumption: 155,000 MWh.

18.9 Water Supply

The Arapiraca water supply is provided by the state water utility company CASAL. This water is sourced from the São Francisco River via a pipeline to the CASAL reservoir. MVV tied into the CASAL pipeline via a 7 km long pipeline to connect to MVV's freshwater reservoir on site. Water is exclusively sourced from the São Francisco River.

The 1,450 m^3 capacity recycled water tank has approximately one hour live capacity, and is currently fed from the TSF and thickener overflow. Water pumped from the open pit is disposed upstream in the TSF, filling its reservoir.

The water is used as follows:

- Fresh water:
    - Dust suppression system for crusher and coarse ore stockpile;
    - Process plant water storage tank;
    - Make-up water to recovered water tank;
    - Make-up water to closed circuit oil cooling system;
    - Flushing of on-stream analysers and cooling system to compensate for evaporation from the cooling tower;
    - Reagent preparation;
    - Explosives magazine;

- Slurry pump seal water system;
- Recycled water:
  - Dust suppression on roads;
  - Plant nursery;
  - Process make-up;
  - Process plant services;
  - Filter plant.

18.10 Water Management

18.10.1 Hydrological System

The Serrote Mine lies almost entirely within the Salgado River sub-catchment. The Salgado River is a tributary on the left bank of the Traipú River basin, which is in turn a tributary on the left bank of the São Francisco River, which is the largest and most important river in northeast Brazil. The dendritic drainage pattern is generally oriented southeast–northwest.

Figure 18-3 shows the hydrographic Salgado River basin, showing the limits of the drainage area upstream of the TSF. The TSF will be the main water reservoir for the Mine.

A climate study was undertaken to assess the design rainfall in the Mine area for hydrological assessments and for the of water management designs.

Fluviometric stations operated by MVV in the Salgado Stream sub-basin were used to estimate a runoff coefficient of 3.5%. This coefficient was used to estimate mean flows within the Mine area. The coefficient was low, despite the nearly 300 water retention structures such as dams that are visible on satellite imagery upstream of the Mine, which significantly impact surface runoff, reducing stream flow. The recent rainy season resulted in a runoff coefficient of approximately 15%. Studies to update water balance predictions are ongoing. There are likely two primary contributors to the discrepancy in runoff coefficients:

- Previous studies have not adequately included extremely wet years, when the catchment is saturated, increasing runoff.
- Many small dams have been constructed by farmers and small communities upstream of Serrote. During normal precipitation years, these significantly attenuate flows into the downstream catchment. However, during wet years when they fill up, that attenuation is reduced significantly. Ongoing designs should assume that these dams are not present.

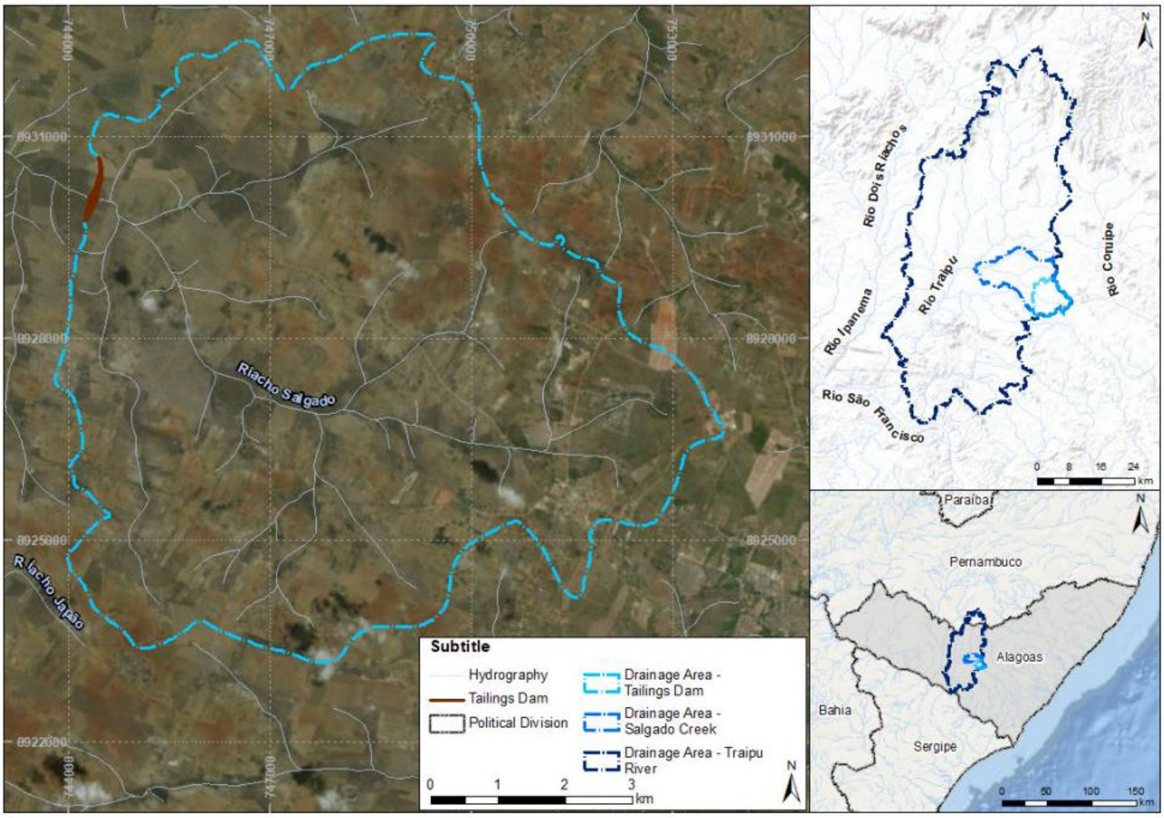
The past few years at Serrote have been extremely wet, possibly as a result of global climate change. Future designs should therefore be based on more conservative assumptions related to the degree of saturation of the upstream catchment, and the storage in the small dams located upstream of the TSF.

18.10.2 Groundwater

There are at least three wells within the Mine area. While the operating characteristics of these wells have been investigated, MVV has no current plans to exploit this water source.

Groundwater is expected to infiltrate the pit at a flow rate of up to 200 m^3/h. As there are uncertainties as to the flow rate, in relation to seasonal variations, the in-pit flows were not included in the Mine water balance. As mentioned in 18.10.1, studies are ongoing. In the last rainy season, a peak of up to 1,000 m^3/h was observed. The current open pit dewatering system can manage this flow.

During operation, it has also been noted that the catchment immediately downstream of the Serrote TSF has a high-water table, with water seeping from the ground surface in the places. While the phreatic surface was likely high historically, it is in part being exacerbated by the water level in the TSF which is increasing groundwater levels. The tailings deposition plan calls for tailings to be deposited from the TSF embankment which should help to reduce seepage into the ground below the TSF. This might be offset somewhat by increasing tailings and water levels, but overall seepage should reduce over time once deposition starts from the TSF embankment. Existing downstream groundwater monitoring data indicate water quality currently meets environmental discharge requirements and is allowed to discharge to the downstream drainage. It is important to note that instrumentation is showing that the internal drains are controlling the phreatic surface in the TSF embankment, and that the embankment is stable.



Source: Walm, 2018.

Figure 18-3: Hydrographic Sub-Basin of the Salgado Stream

18.10.3 Surface Water Quality

The monitoring of surface water quality in the area began in 2007. Subsequent programs were undertaken to generate a database of baseline water characteristics. There are three data collection periods, September 2007 to May 2008, November 2009 to March 2014, and 2018 to date. Samples were only taken when water was available to sample; much of the year, there is no flow to sample.

Sample results indicate that the waters have high dissolved solid levels and electrical conductivity. Calcium, copper, iron, manganese, phosphorus, chloride, magnesium, sulphate and sodium were reported, with the copper, iron and manganese most likely due to soil geochemistry.

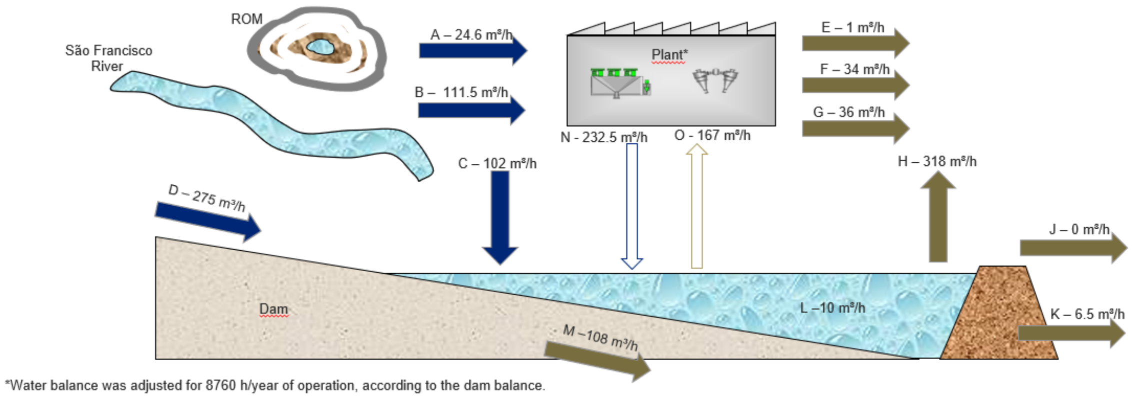
Some variability in the dissolved oxygen, biological oxygen demand and chemical oxygen demand parameters was observed. There were low bacteriological parameters, with higher levels being observed on limited occasions.

18.10.4 Water Balance Modelling

The overall water balance included the process plant and TSF, based on an operational throughput rate of 8,760 t/d. The average water balance is summarized in Figure 18-4. Seasonal and climatic variations are to be expected that will deviate from this average.

The total average freshwater demand is estimated to be approximately 112 m^3/h (shown as the freshwater demand (Stream B) in Figure 18-4). The total process plant water demand is estimated at about 1,700.3 m^3/h, including 1,396.8 m^3/h recirculated from the thickeners, 167 m^3/h of water reclaimed from the TSF, 111.9 m^3/h of fresh water and 24.6 m^3/h of water contained in the run-of-mine (ROM) material.

Two water reservoirs were provided to supply process water demand (see Section 18.9). As mentioned in section 18.10.1 the water balance is being revisited to consider actual data during mine operations.



*Water balance was adjusted for 8760 h/year of operation, according to the dam balance.

PLANT*				TSD			
Inputs	Flow Rate (m^3/h)	Outputs	Flow Rate (m^3/h)	Inputs	Flow Rate (m^3/h)	Outputs	Flow Rate (m^3/h)
A – ROM	24.6	E – Product (concentrate)	1	C – Precipitation	102	H – Evaporation	318
B – São Francisco River Water Intake	111.9	F – Plant Losses	34	D – Run off	275	J – Overflow	0
O – Reclaimed water from the TSF	167	G – Uses/ Services	36	N – Tailings water	232.5	K – Percolation	6.5
		N – Tailings water	232.5			L – Volume variation	10
						M – Retained water	108
						O – Reclaimed water from the TSF	167
TOTAL	**303.5**	**TOTAL**	**303.5**	**TOTAL**	**609.5**	**TOTAL**	**609.5**

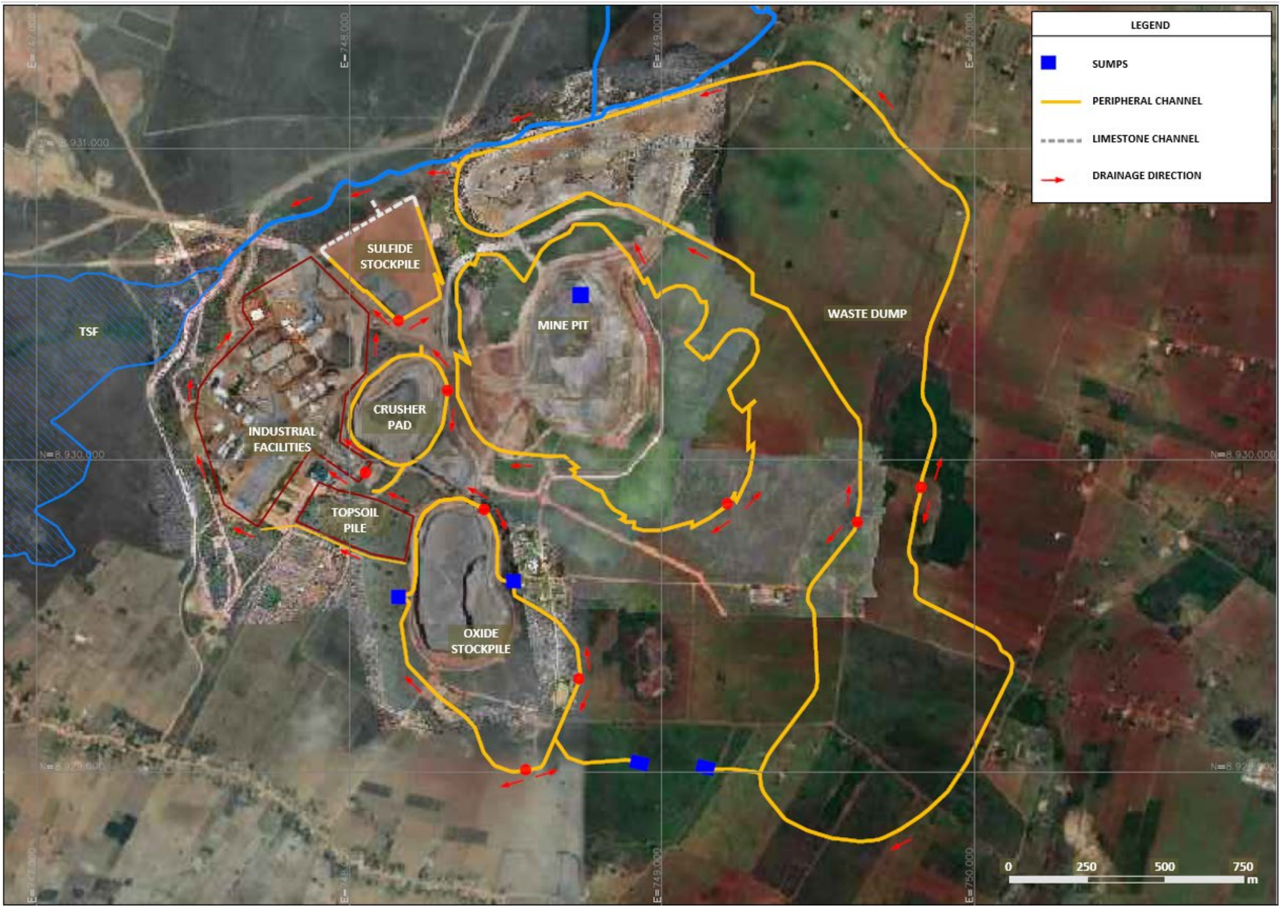
Source: Wood, 2020.

Figure 18-4: Water Balance (average)

18.10.5 Water Management Infrastructure

All surface drainage structures were sized based on ABNT technical standards. The standard prescribes the 24-hour 500-year return period storm for the design of peripheral channels used to collect and convey surface drainage. Structures specifically requiring diversion drainage management are the sulphide and oxide stockpiles, the WRSF, and the open pit.

Figure 18-5 shows the locations of the various surface drainage infrastructure.



Source: MVV, 2020.

Note: Figure north is to top of page.

Figure 18-5: Proposed Surface Drainage Structures

18.11 Communications and Information Management Systems

These include:

- Supervision and control system (SSCP)
- Electrical supervision and control system (SSCE)
- Data network and telephony system
- Access control system
- Closed circuit television
- Fire detection and suppression system

18.12 Waste Management

Waste is temporarily stored at the waste management centre, except for organic waste that is sent for composting. The waste management centre has a security post, administration area, observation post, areas for reception and sorting of recyclable waste and hazardous waste, storage yard for inert waste, and storage yard for empty barrels.

After checking the waste type, the waste is weighed on the weigh-scale at the gate house and recorded.

A contractor is responsible for the final disposal of waste and maintains records and documentation related to the service. For all hazardous waste sent to final disposal, a certificate of destruction must be issued.

18.13 CP Comments on "Item 18: Project Infrastructure"

As of Q1 2023 all key mine site infrastructure is in place.

19.0 MARKET STUDIES AND CONTRACTS

19.1 Metal Prices and Exchange Rate

The commodity prices used in the financial analysis of the open pit base case are derived from the consensus median of leading banks and financial institutions as of January 2023, and are presented in Table 19-1. A portion of copper production is subject to hedging agreements. 6,066 t of copper have been hedged up to Q1 2024. Otherwise, copper metal prices are subject to spot market conditions. Gold metal prices are subject to spot market conditions. There are no metal streaming agreements in place. A portion of R$ is subject to a US$:R$ exchange rate hedge at rates ranging from 5.56 to 5.74 up to the end of September 2023. Afterwards the exchange rate is subject to spot market conditions.

Table 19-1: Commodity Price and Exchange Rate Forecasts
ACG Acquisition Company Limited – Serrote Mine

Item	2023	2024	2025	2026	Long-Term
Copper (US$/lb)	3.55	3.82	3.94	3.89	3.59
Gold (US$/oz)	1,753	1,719	1,654	1,593	1,615
Exchange Rate US$:R$	5.39	5.44	5.66	5.55	5.55

19.2 Market Outlook and Concentrate Sales Terms

19.2.1 Market Outlook for Metals

19.2.1.1 Copper

Copper is a ‘through-the-cycle’ commodity with applications across many industries such as: electrical, energy, communications, transport, infrastructure and industrial equipment. Over the long term, an additional 6 Mt of copper globally by 2032 is required to meet the rising intensity of use per capita and continued population growth to continue to support historical growth rates. An incentive price of the magnitude US$3.50/lb Cu is required to incentivize the pipeline of lower quality projects to meet the projected demand deficit of refined copper.

19.2.1.2 Gold

Gold has firmly established price levels of approximately US$1,800/oz over the past three years. The need to de-carbonize mines, longer permitting cycles, and the lack of development projects with in-situ infrastructure all contribute to sustained commodity price forecasts over the long term.

19.3 Concentrate Sales

MVV has a single contract in place with a large global trader covering 100% of the copper concentrate production for export from Brazil. The contract is effective until December 31, 2025, or until 160,000 dry metric tonnes of concentrate have been delivered, whichever is later. The contract can be extended. Concentrate is typically shipped in batches of 10,000 tonnes with a target of monthly shipments. The offtake contract and terms are proprietary. Benchmark treatment charges/refining charges are updated annually. The CP has reviewed the contract and has confirmed that the terms are appropriately included in the financial model.

At projected 24–40% copper, the Serrote concentrate is considered a high-grade concentrate and has attracted good terms from the off-taker. At projected 2.5 g/t to 5.75 g/t Au, the gold content in the Serrote concentrate is relatively low and is suitable for all smelters/refineries.

MgO is the only impurity in the concentrate and incurs a minor penalty charge.

19.4 Contracts

MVV has entered into an agreement for all aspects of open pit mining with Fagundes Construção e Mineração S/A. The contract includes activities such as drilling, loading and hauling of ore and waste rock, and operation of support equipment such as dozers and graders. ENAEX Brasil, through subsidiary IBQ – Industrias Quimicas S/A, has been subcontracted for supply and loading of explosives in drill holes and blasting.

The CP has reviewed the mining contracts and has confirmed that the terms are appropriately included in the financial model. MVV is planning to transition from open pit contractor mining to Owner-operated mining starting in Q1 2025. Downpayments and acquisition of mining equipment will take place from Q3 2024 to Q3 2027.

20.0 ENVIRONMENTAL STUDIES, PERMITTING, AND SOCIAL OR COMMUNITY IMPACT

20.1 Introduction

The environmental impacts of the Serrote mining operations were identified and evaluated in the Environmental and Social Impact Assessment dated June 2022. This document identified and evaluated the impacts from the construction, operation, and closure stages of the operation, along with recommendations for control, mitigation, monitoring and environmental compensation actions.

The communities surrounding Serrote mining operations currently have economic, cultural, technical, and structural dynamics typical of rural areas, particularly related to the cultivation and preparation of tobacco. Many of the significant impacts to the local communities of the Serrote mining operations include relocations of residents within the Serrote mining operations footprint and alterations to the landscape. One significant residual physical impact associated with post-closure land use includes the alteration of the landscape during construction and operation of the mine. Design and operational practices along with surveillance programs are fundamental in controlling, mitigating, and monitoring the effects of the operations to ensure that the environmental standards set out in the laws, licences, and permits are met and respected.

Positive changes can be expected, particularly for the Craíbas municipality, from the increase in income generated by taxes collected during the construction (Imposto Sobre Serviços de Qualquer Natureza or ISSQN (municipal tax on services) and Imposto Sobre Circulação de Mercadorias e Serviços or ICMS (essentially a value-added tax)) and operation (CFEM, ISSQN and ICMS) phases. The Serrote mining operations has created and diversified employment and training opportunities for the residents of the local municipalities. Direct job opportunities are an important positive effect, particularly those jobs generated by operations; these are of higher quality than those generated during the construction phase because they are long term and require higher vocational qualifications.

The Environmental Plans, Projects and Programs aim to mitigate, monitor, and compensate for the impacts identified in the construction, operation, and closure stages, thus ensuring environmental viability. In order to achieve this viability, the construction of the Mine and operation activities were effectively managed, and preventive measures implemented to reduce the social and environmental impacts, at the same time enhancing the positive impacts.

This section presents a broad evaluation and review of the following factors for the Mine:

- Project design, construction and operation:
  - Production plan;
  - Mining, ore and waste rock handling and storage;
  - Water management and water balance;
  - Ore processing;
  - Tailings management and storage;
  - Other infrastructure and emissions;
  - Employment;
  - Waste management;
- Closure and rehabilitation;
- Permitting and regulatory requirements;

- Environmental management programs;
- Community and government relations.

20.2 Project Considerations

Aspects of Project design and operation relevant to environmental and socioeconomic performance are discussed in the following sections.

20.2.1 Mining and Resource to be Mined

The mine is a single open pit, with a maximum depth of 220 m occupying an area of 65 ha. The projected lifespan of the Mine is 14 years; the LOM material movement is discussed in Section 16 as part of the production plan.

The mine plan calls for pre-stripping of the organic cover soil, waste rock and oxide mineralized material. Organic cover soil (termed "topsoil" in Section 16) will be extracted and stored in piles for later use in rehabilitation. MVV advised on May 12, 2021, that approximately 258,000 m^3 of organic cover soil has been salvaged and stored in several sites within the Mine area.

The waste rock is currently placed external to the pit. The oxide mineralized material will be placed in a separate pile until a treatment and processing method is defined. Mixed material contains both oxide and sulphide copper minerals and will be placed with the sulphide ore, in a dedicated portion of that stockpile, pending metallurgical testwork to determine if the material can be ROM feed. Neither the mixed nor the oxide material is included in the current mine plan.

Groundwater is expected to be intercepted in the pit at approximately 280 masl (VOGBR, 2007). Based on 2007–2009 studies, inflow of groundwater into the pit is estimated to be 123 m^3/h over the LOM. The mine dewatering system is designed for 200 m^3/h to manage water accumulations from both groundwater inflow and precipitation events (see Section 16.5.2) and transfer water to the tailings thickener.

20.2.2 Waste Rock Management

Waste rock is placed in the WRSF. On completion the waste rock storage facility will be almost 90 m in height and a prominent geographical feature where local terrain is only slightly undulating with relatively little topographic relief.

Some of the mined waste rock will be used elsewhere in the Mine. Approximately 1.6 Mt of overburden (saprolite) mined from the pit was allocated for Project construction purposes. The TSF design calls for approximately 400,000 m^3 rockfill for the Phase 2 downstream shell.

A water quality effects assessment study underway (see Section 20.3.5.2) has identified the need for a plan to ensure that all mine rock and overburden used elsewhere in the Mine be carefully evaluated for geochemical suitability, and that quality control procedures be implemented to: i) prevent contamination with unsuitable rock and ii) track the use of these materials. Additional recommendations for implementing this plan are discussed in Section 26.

20.2.3 Waste Rock Geochemistry

Serrote waste rock is classified as Class II-A (non-inert and non-hazardous) according to ABNT NBR 10004/2004, based on 2008 analysis of three waste rock drill core composites.

Serrote waste rock consists predominantly of quartz–potassium feldspar–sillimanite gneiss, with lesser quantities of garnet biotite gneiss, granite gneiss, gabbro and pegmatites, and very minor amounts of mafic dike material.

A total of 56 modified acid base accounting tests were carried out in 2008 on waste rock drill core samples to evaluate the possibility of generating acid drainage from the material. The results determined that potential for acid drainage generation from the waste rock was "unlikely"; however, the tests indicated low availability of neutralizing potential. Therefore, drainage quality could be sensitive to the presence of rock containing sulphide, metal oxide constituents, and other similar materials. The gabbro unit, in particular, is a relatively minor waste rock unit but has a greater tendency to contain disseminated sulphide minerals than the other waste rock units and has been identified for additional characterization. An important operational aspect of waste rock management will be good control of ore and waste rock segregation, including procedures that prevent the deposition of sulphide-rich or other mineralized material on the WRSF. Since the geological contact between barren waste rock and mineralisation tends to be extremely sharp and visually discernible, following a simple, consistent visual criteria procedure should be an effective day-to-day tool for segregation.

Additional waste rock geochemical characterization will be carried out as part of the water quality effects assessment program discussed in Section 20.3.5.2. The work will augment the existing understanding, characterize metal solubilization aspects of the waste rock units, and inform mine rock management strategies.

20.2.4 Ore Handling and Processing

20.2.4.1 Material Handling and Storage

MVV identified four main mineralized material types:

- Sulphide ore;
- Oxide mineralized material;
- Mixed mineralized material;
- Refractory mineralized material.

Depending on grade and scheduling, sulphide ore may be directly fed into the primary crusher, placed in the ROM stockpile, or stored in the sulphide stockpile. These piles will be fully depleted by the end of the Mine life. As described in Section 20.2.1, mixed material will be placed with the sulphide ore in a dedicated portion of that stockpile. Oxide material will be stored in a separate oxide stockpile, will remain at the end of Project life, and the costs of reclamation are included in the closure plan.

The sulphide and oxide stockpiles are designed with a low permeability base to direct infiltrating water towards a subdrain and drainage collection system, to allow for routine monitoring and management if required.

Approximately 0.4 Mt of refractory mineralized material mined as of early April 2021 is stored in a discrete pile located between the oxide stockpile and ROM stockpile, and additional volumes have subsequently been stored in a segregated area in the WRSF. MVV advised on April 9, 2021, that this material will remain at these locations until additional characterization and a long-term management plan are completed.

20.2.4.2 Mineralisation Geochemistry

A total of 18 modified acid base accounting tests were carried out in 2008 on mineralized drill core samples to evaluate the possibility of generating acid drainage from the material. Approximately 30–40% of samples tested showed 'uncertain' to 'likely' acid generation potential, and thus, stockpiles of this material should be managed assuming that seepage and runoff could contain elevated levels of metals, possibly with net acidity.

Oxide material samples (saprock and saprolite categories) showed virtually complete oxidation of sulphide to sulphate. Samples tested returned neutral to alkaline paste pH, indicating no net acidity production. Nonetheless, sulphur and metals are in a relatively soluble form, and the boundary between oxide and sulphide material is gradational. Thus, metal mobilization is assumed to be possible, and stockpiles should be managed accordingly.

Additional geochemical characterization is planned as part of the water quality effects assessment program discussed in Section 20.3.5.2. Similar to the planned waste rock studies, the additional studies will augment the existing understanding, characterize metal solubilization aspects of the mineralized units, and inform mine rock management strategies.

20.2.4.3 Processing

The process uses conventional froth flotation reagents and associated flocculants and will optimize water recycle to minimize freshwater requirements. Critical transfer points where dust may be generated will be provided with dust suppression systems.

20.2.5 Water Management

Water management, water balance and surface and ground water quality are discussed in Section 18.10.

The overall site water balance is negative due to the regionally high evaporation rates and moderate to low precipitation. MVV will operate, maintain and optimize, whenever possible, the water management system to maximize the reuse of effluents and the recirculation of water. Fresh water needs are estimated to average 112 m^3/h over the life of the Mine. Approximately 167 m^3/h will be reclaimed from the TSF supernatant ponds.

The Project is mostly situated within a single drainage basin (the intermittently flowing Salgado Creek), and net surface drainage from Project areas will ultimately report to the TSF. The waste rock pile, oxide stockpile and sulphide stockpiles will have peripheral channels and collection sumps to capture surface and underdrain water.

Since fresh water is purchased from CASAL, MVV does not require a specific water use licence for its fresh water needs. A water licence is required to capture water from the Salgado stream in the TSF, which has been obtained.

MVV is permitted to release excess tailings dam seepage downstream provided that applicable water quality criteria are met. Existing water quality monitoring indicates seepage flows meet regulatory discharge requirements and are currently being discharged downstream of the TSF.

20.2.6 Tailings Management

The TSF design satisfies Brazil regulatory requirements and guidelines and the requirements of the Canadian Dam Association (CDA) Application of Dam Safety Guidelines to Mining Dams (2014), considered international best practice.

In accordance with CDA guidelines and current Brazil regulations, the Serrote TSF has an “Extreme” hazard classification, and as a result has been designed to store or pass, via the spillway, the 24-hour duration probable maximum precipitation event (PMP). The TSF was designed considering a wet freeboard of 2 m, at an elevation of 242.0 m. However, it was suggested by Tellus in the Regular Safety Inspection Report (RISR) (Tellus, 2022) that a dry freeboard of 1 m (at elevation of 243.0 m) be used to eliminate the potential risk for wind-generated waves to overtop the dam and align with the most recent Brazilian regulatory framework. To accommodate this requirement, MVV executed in Q1 2023 an enlargement of the spillway, as per SAFF Consultants' design. Serrote TSF has been fully compliant within CDA and Brazilian standards.

A dam break analysis was conducted by Tellus in support of the RISR (Tellus, 2022) and to be used in Emergency Action Plans. The analysis was conducted as a "rainy day" event, to simulate the potential of a failure which would occur as a result of overtopping due to an extreme flood event. Maps showing the extent of estimating flooding, flood wave arrival distance and time, impacted residential housing, and impacted community infrastructure due to a dam break scenario are presented in the RISR (2022). This information has been provided to the local communities through MVV's "open door" (Portas Abertas) community outreach program and local stakeholder communications. In addition to storing tailings, the TSF will receive drainage from much of the Mine area and adjacent surroundings (approximately 61.6 km2), and thus will also serve as an important water management structure for the Mine. Storage capacity of the impoundment versus elevation is presented in Figure 20-1.

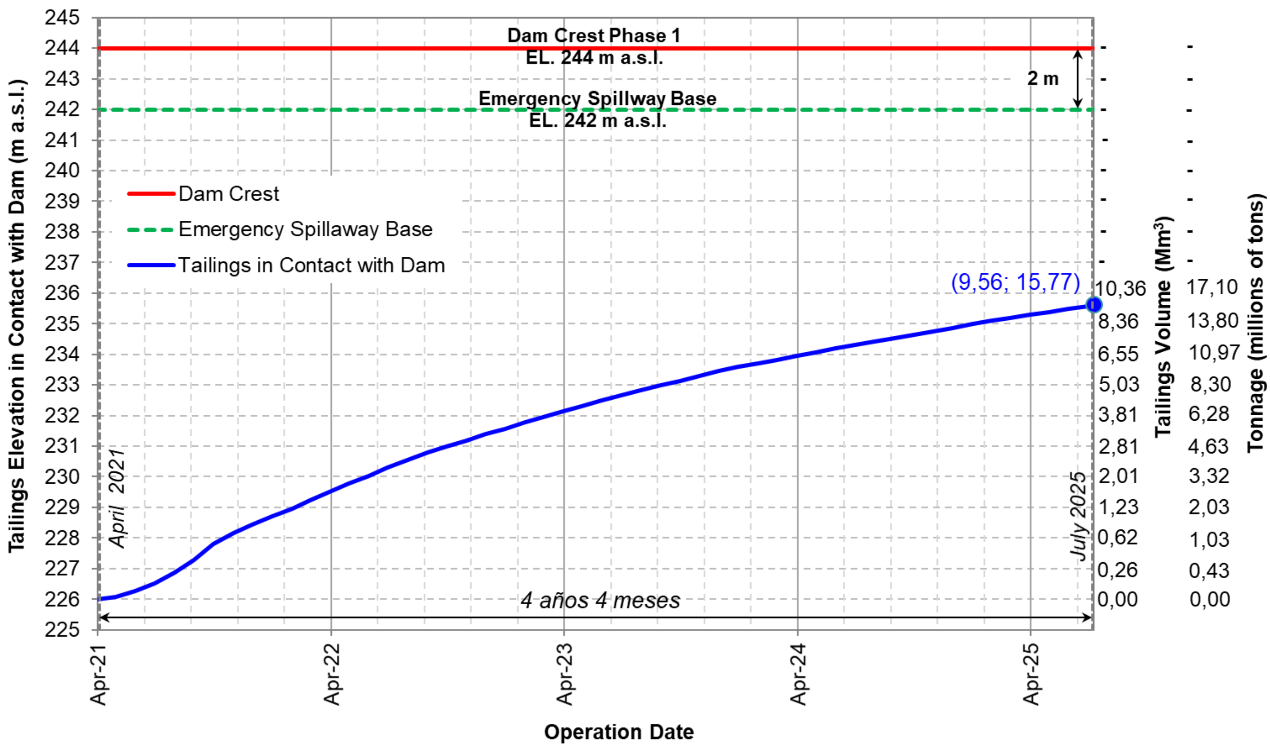


Figure 20-1: Stored Tailings Over Time

Seepage through the dam is managed through the internal drain system and is designed to route flows to the seepage collection pond downstream of the dam. The existing seepage collection pond, however, was damaged due to seepage from the surrounding catchment which caused the HDPE liner to uplift. Due to the elevated water surface level of the downstream creek, it is not possible to construct a gravity flowing drain to alleviate the uplift on the liner, thus a sump and pumping system would be required to allow for a fully functioning seepage collection pond. As seepage water currently meets standards to allow for discharge to the environment, it was recommended that the pond be removed, and seepage flows directly discharged. The water quality continues to be monitored and MVV ensures preparedness to return dam seepage to the TSF supernatant pond at all times. The new design for the seepage collection will be executed as part of the Phase 2 raise scope (by December 2024).

20.2.6.1 Tailings Geochemistry

The tailings are classified as Class II-A (non-inert and non-hazardous) according to ABNT-NBR 10004/2004, based on the 2008 analysis of a composite locked cycle test product (considered representative of the sulphide ore and of the process circuit design at that time).

Serrote tailings are low sulphide (typically<0.1%) but have a low proportion of carbonate minerals. Modified acid base accounting and net acid generation testing carried out in 2010 by SGS Canada Inc. on 15 tailings samples from metallurgical testing indicated that 10 of the samples were highly unlikely to generate acidity (SGS Canada, 2011). The other five samples reported a lower proportion of carbonate to sulphide minerals suggesting uncertainty as to whether these samples will be able to sufficiently neutralize the minor quantities of acid that may be produced in an oxidizing environment. Net acid generating testing of these samples, reported near neutral to alkaline final pH values and no net acidity was generated. The testwork also indicated an elevated level of total iron in the decant solutions, attributed to the suspended solid load in the samples.

In 2008, a 1 kg composite sample of tailings was tested in a 15-week long humidity cell test program, designed to assess longer term leaching characteristics of the material. The results of the weekly leachate analysis supported the conclusion that the tailings are unlikely to generate net acidity. Leachate maintained an alkaline pH throughout the test. Concentrations of most metals demonstrated stable to slightly fluctuating concentrations during the test period, with the exception of selenium, which showed a distinct increasing trend, although at trace concentrations, during weeks six to 15.

The earlier testwork is augmented by longer term kinetic testing (over 50 weeks duration) under subaerial and saturated conditions being carried out by Lorax Environmental Services, Canada. Work was completed on a Phase 0/1 tailings composite from late 2019 through early 2021, and tests evaluating a Phase 2/3 and a Phase 4 tailings composite were initiated during December 2020 and January 2021 and completed in a draft report in May 2022. Acid base accounting indicates that the tailings composites are not potentially acid generating. To date, all kinetic tests have yielded neutral to slightly alkaline pH leachate, and thus indicating that metal loadings in the TSF will be governed by metal leaching processes occurring at neutral pH. Laboratory test results are screened against selected water quality guidelines and norms (British Columbia Canada, Brazil Freshwater Class 2, and IFC Effluent Guidelines) to identify “Parameters of interest”. These parameters will be closely tracked during the next study phases of water quality effects modelling, where the loading rates of tailings will be derived and integrated into a water balance model extending site-wide and into the receiving environment. The parameters of interest based on results to March 2021 are shown in Table 20-1.

Table 20-1: Parameters of Interest in Tailings Geochemical Kinetic Test Work
ACG Acquisition Company Limited – Serrote Mine

Tailings Composite	Parameters of Interest – Dissolved Metals (as of March 2021)	
	Saturated Kinetic Test (Saturated Column)	Unsaturated Kinetic Test (Humidity Cell)
Phase 0/1	Phosphorus, fluoride, aluminium, molybdenum, tungsten	Aluminium, arsenic, copper, fluoride, phosphorus, selenium
Phase 2/3	Phosphorus, fluoride, aluminium, cadmium, molybdenum, tungsten	Selenium
Phase 4	Not evaluated	No parameters of interest identified to date

20.2.6.2 TSF Governance

MVV has put in place a strong governance program to ensure compliance with dam safety standards in order to prevent accidents, ensure the safety of the public, and avoid environmental consequences. MVV is required to meet the safety standards and regulations of dams, in particular, the ones defined by the national dam policy of the Ministry of the Environment (Law 12.334/2010) and the laws and regulations of the Agência Nacional de Mineração (ANM): DNPM No. 416/2012 (dam registration) & Resolution No. 95/2022; Ordinance No. 14/2016 and Ordinance No. 70.389 / 2017 (PAEBM Actions – Emergency Plan for Mining Dams); Associação Brasileira de Normas Técnicas (ABNT) NBR No. 13028/2017. The TSF operations, maintenance, and surveillance manual and Emergency Action Plan were developed to conform with Brazil requirements and international best practice, with the most recent versions issued 20 June 2022. The facility is duly registered with the National Mining Agency ANM as "In Operation" as of 15 July 2021.

Under best management practices, responsible parties for the permitting, operation, and maintenance of the dam have been accordingly defined by MVV. The responsible executive for the TSF is Paulo Castellari of MVV. The role of engineer of record for the TSF has been filled by Rogerio Cyrillo of WSP, and independent third-party reviews for dam safety and compliance have been conducted by Tellus.

It is understood that the TSF does not currently meet the Global Industry Standard on Tailings Management (GISTM) that has been internationally adopted, however, plans for adoption and implementation of the GISTM are underway and are anticipated to be incorporated into future TSF designs and operations.

20.2.7 Other Infrastructure and Emissions

20.2.7.1 Atmospheric Emissions

Atmospheric emissions from fugitive dust sources generated during the construction, operation and closure phases and are primarily produced by equipment and vehicular traffic, earthworks, and excavation and dumping of mine rock. Dust are generated at point sources by the primary and secondary crushing plants, conveyor belts and mill feeders.

MVV uses fixed sprinklers/misters and water trucks to control the fugitive atmospheric emissions, especially those generated in the various stockpiles and WRSFs, roads, and in the dry phase of processing. At the process plant, water spray systems are installed at ore transfer points and at the crusher feed and outlet points.

Under Operation Licences No 2021.27051149681.EXP.LON and No 2021.27051149786.EXP.LON, the operator must submit reports regarding compliance with the Air Quality Management Plan. As part of this compliance, air quality monitoring is conducted and reported. With the last report dated November 2022 (Qualitex, 2022). Air quality monitoring included analysis of total suspended particles, PM-10, PM-2.5, and sulphur dioxide from six monitoring points near the mine and in the surrounding areas. Results of the air quality monitoring reported in the November 2022 document indicate parameters monitored are within the required air quality standards set by CONAMA Resolution No. 491/2018.

20.2.7.2 Vibration

Ground vibration due to blasting in the open pit regularly occurs as part of normal mining activities. MVV uses emulsion and electronic fuses for blasting, which enhances vibration management, MVV controls the explosive charges in compliance with the legal vibration standards established by the Brazilian ABNT NBR 9653/2018 technical standard, which is the guide for evaluation of the effects caused by the use of explosives in mines near urban areas. This standard specifies the methodology for reducing the risks inherent in the use of explosives for rock fragmentation in the mining and general construction industry. The standard establishes parameters compatible with available technology, for the safety of neighbouring populations.

Damping systems are installed on crushers and ball mills to minimize the generation of vibration.

Vibration monitoring was conducted in November 2022 (Technoblast, 2022). The results of the November 2022 vibration monitoring indicate that both vibration and acoustic pressure were within the recommended safety limits provided in ABNT NBR 9653/2018.

20.2.7.3 Noise

Noise emissions come from construction and operations phases including haulage and dumping of ore and waste rock, ore processing (crushers, ball mills and conveyor belts), and equipment and vehicle operation.

In October 2022, Technoblast prepared a study for MVV on a level of noise generated by Serrote. The results of this study concluded that the Company generated lower level of noise than the limits established by NBR 10151. Where possible, noise will be mitigated by control measures including preventive maintenance of stationary and mobile equipment to maintain exhaust and mechanical systems in optimal condition, consideration of noise attenuation in equipment selection and installation, and topographic and vegetative buffer zones.

20.2.7.4 Liquid Effluents

Liquid effluents will be generated throughout Project life including domestic (e.g., sewage) effluent from sanitary and cafeteria facilities; industrial effluents from the maintenance facilities (mainly hydrocarbon-contaminated water); industrial effluent (tailings) from the process plant; and effluents generated in the laboratory. Domestic effluents are treated at the Mine’s wastewater treatment plant and discharged via infiltration field; the monitoring of the effluent discharge parameters are below the limits established by CONAMA 430/11. Hydrocarbon-contaminated effluents are treated within oil–water separator systems, and water will be re-circulated and reused in the maintenance shop. Industrial effluents from the process plant and laboratory are neutralized and reused in the process circuit.

20.2.7.5 Solid Waste

There is no on-site landfilling of solid waste. MVV contracts a company to manage the Serrote’s solid waste facility, where wastes are centralized, segregated and shipped off site. Recyclable plastic, paper, and wood are donated to a waste collection association in Craíbas, and metal is stockpiled to be sent to a scrap-metal facility. Fruit and vegetable organic waste is composted on site. Non-recyclable and non-hazardous waste are transported to the regional Agreste landfill. The Agreste facility meets state environmental and waste management requirements and is located less than 10 km from the Mine.

Wastes designated by national criteria as hazardous (Class 1) are segregated, temporarily stored, and disposed of in accordance with regulations. Some categories of hazardous waste can be landfilled in a dedicated area of the Agreste landfill facility.

20.2.7.6 Vegetation Removal

The Serrote mining operation requires vegetation removal which can result in associated fauna habitat loss; this process and the handling of vegetation material is carefully controlled and requires a distinct permit issued by the state environmental agency (IMA).

The vegetation removal activities use methods that favour the spontaneous escape of the fauna species in the area, with rescue and relocation of the fauna only if needed. During vegetation removal, as many plant propagules as possible (seeds, fruits, seedlings, cacti) are collected and sent to the MVV nursery for future introduction in the revegetation areas. In accordance with permit requirements trees greater than 10 cm diameter are stockpiled in a designated area within MVV's Fazenda Uruçu property. Small trees, shrubs, and grasses are incorporated into organic cover soil stockpiles for future revegetation.

20.2.8 Employment

The Project's peak direct labour for construction was approximately 2,500 workers.

Section 24 shows that the Mine's Operations phase requires approximately 940 full-time workers. As discussed in Section 16, the first four years of mine operation and mine fleet maintenance is executed by a contractor, who is responsible for approximately 300 of the on-site workers.

20.3 Environmental-Socioeconomic Management and Effects

MVV has implemented its Environmental and Social Management Program to manage all aspects and environmental impacts related to the Serrote operation such as vegetation removal, changes in land use and landscape, and effects to surrounding communities (vehicular traffic, air emissions, noise and vibrations).

Aiming at controlling, mitigating, monitoring and compensating, the Environmental and Social Management System incorporates environmental education for employees and surrounding communities, compensation, monitoring, and controls.

20.3.1 Environmental and Community Relations Personnel for Project

The Project has a Permit & Environment team consisting of a coordinator, three analysts, and two environmental technicians, along with subcontracted personnel as required for monitoring, revegetation, and other activities. The Social & Community team consists of a coordinator and six analysts.

The Permit & Environment teams report to local HSE manager and Social & Community team reports to ESG corporate manager.

20.3.2 Regulatory Affairs and Environmental Management System

20.3.2.1 Environmental Control Plans

The environmental and social management of the Serrote Mine follows the actions established in the Environmental Control Plans (PCAs) submitted to IMA as part of the environmental permitting processes (Construction Licence and renewals) from 2008 to present and the actual Operation Licence.

Table 20-2 describes the 17 PCA documents. These PCAs define MVV's environmental and social control plan, and commitments to regulators and other stakeholders. Under the mine operating licence, MVV is required to annually report on compliance with these plans.

Table 20-2: Environmental Control Plans
ACG Acquisition Company Limited – Serrote Mine

Program	Content
RT-02 Environmental Management for the Implementation of Works (PGAO)	Describes environmental management and monitoring required during construction of the Mine
RT-03 Water Resource Management Program (PGRH)	Guidelines and procedures to minimize the impact on water resources during construction and operations
RT-04 Air Quality Management Program	Requirements for monitoring and reporting air quality
RT-05 Industrial Waste Management Program	Program to facilitate management of waste through well-defined procedures to reduce, recycle or reuse materials during construction and operations
RT-06 Emergency Response Plan and Risk Management Program	Mechanisms for effective management of risks and accidents associated with the Mine to protect the integrity of the environment, health and safety of personnel and local communities
RT-07 Noise and Vibration Monitoring Program	Program to monitor noise during the Mine life cycle so that prompt corrective action can be taken if necessary
RT-08 Meteorological Monitoring Program	The collection of weather and climate data to facilitate decision making
RT-09 Conceptual Mine Closure Program	A program that shows, in concept, guidelines for closing the mine, plant and auxiliary facilities. The program will be updated periodically as operating experience is gained.
RT-10 Program for Rehabilitation of Degraded Areas (PRAD)	Methods for environmental remediation through the stages of construction and operation of the Mine
RT-11 Fauna Monitoring and Protection Program	Details the rescue plan for fauna impacted by the Mine
RT-12 Flora Monitoring and Protection Program	Program to minimize Project impact on flora and habitats
RT-13 Environmental Compensation Program	Establishes a conservation unit in conformance with Law No. 6948, 15 May 2009
RT-14 Resettlement Program	Actions for planning, implementing and monitoring the relocation of people who are currently established or living in the LSA
RT-15 Environmental Education Program	Outlines the commitment by MVV to environmental education
RT-16 Labour Qualification Program	Program implemented to assist in the education and qualification of the local population, facilitating access to a greater number of jobs
RT-17 Communication Program	Guidelines to effective communication about the Mine to the local communities and other stakeholders
RT-18 Archaeological Monitoring Program	Guidelines for effective management of areas of potential interest discovered during construction and operation

20.3.2.2 Regulatory Affairs and Environmental and Social Management System (SGAS)

Since 2021, MVV has utilized an internal Environmental and Social Management System (SGAS), and the Permit & Environment team are responsible for maintaining the system. Key documents and processes are defined to carry out the following functions:

- Overseeing the preparation of documents for the SGAS;
- Providing resources for the administration of the SGAS, together with General Management;
- Preparing internal and external reports on environmental issues;
- Monitoring and executing actions to respond to the environmental agencies: compliance and follow-up of environmental programs and conditions, attending to environmental interests such as agreements, Terms of Conduct Adjustment (TAC);
- Analysing the causes of non-conformities, recording the results and proposing corrective and preventive actions;
- Environmental inspections;
- Monitoring and collaborating with senior management for continuous improvement of the SGAS;
- Managing actions to be taken in the event of an environmental emergency.

20.3.3 Auditing and Due Diligence

20.3.3.1 Environmental and Social Due Diligence

An Environmental and Social Due Diligence review carried out by ERM Consultants Canada, required for the Project Financing, was the key driver in refining the understanding and enhancing the management of the Mine's environmental and socioeconomic effects (ERM, 2019). The review assessed compliance against national legislation, international standards (including International Finance Corporation (IFC) Performance Standards (2012), World Bank Group Environmental, Health, and Safety Guidelines (2007), World Bank Group Environmental, Health, and Safety Guidelines for Mining (2007) and the Equator Principles (2013), and Good International Industry Practice (GIIP) guidance.

The review identified environmental, health and safety (EHS) risk areas and/or gaps considered to be in the moderate or low category. In general, low category risks were related to adaptation needs to the systems, procedures, and policies, while moderate category risks were areas requiring additional effort such as implementation of a program or assessment.

ERM prepared a monitoring report for the fourth quarter of 2022 (ERM, 2023), which indicated the project is making progress with Environmental and Social Action Plan (ESAP) actions and are generally in-line with applicable Lender standards. The report indicates 19 actions of the project in compliance with 25 gaps and corrective actions being forward to the next monitoring phase. Delivery of hydrogeological studies, development of management plans, supply chain audits, waste management, and management systems were identified as the main items required for full compliance with ESAP commitments and Lender standards.

20.3.3.2 Internal Inspections and Audits

MVV has developed an internal environmental inspection system as part of its SGAS. This plan includes quarterly monitoring to assess actions toward full compliance with the ESAP.

20.3.4 Permit Management

MVV advised on 21 May 2021 that Project permitting is up to date with most major permits for the operations phase obtained. The state environmental agency (IMA) issued two Operating Licences on May 27, 2021, to cover Project works and activities: i) Open Pit, Waste Rock Storage Facility and Operational Support Areas, and ii) Processing Plant, Sulphide Stockpile, Phase 1 and 2 Tailings Storage

Facility and Administrative Support Areas. The licences are valid for four years, with the renewal request to be submitted at least 120 days prior to 27 May 2025. Table 20-3 lists the status of major permits required for the operations phase.

Table 20-3: Status of Permits for Operations Phase
ACG Acquisition Company Limited – Serrote Mine

Order	Enterprise	Type Of Licence	Organ	Process No.	Licence No.	Issue	Maturity	Observation
1	Adductor	IPHAN consent	IPHAN	01403.000442/2018-13	Official Letter No. 213/2019/DIVTEC IPHAN-AL/IPHAN-AL-IPHAN	10/29/2019	-	-
2	Transmission Line 230 kV	IPHAN consent	IPHAN	01403.000443/2018-68	Official Letter No. 745/2019/DIVTEC IPHAN-AL/IPHAN-AL-IPHAN	12/10/2019	-	-
3	Mine	Cadastral Registration Certificate	Federal police	202,010,230,914,294,000	2020-00575606	11/9/2020	-	-
5	Serrote Mine	IPHAN consent	IPHAN	01403.000327/2008-77	Letter No. 024/2009	8/24/2009	-	-
6		Mining Concession Ordinance	ANM	840,235/1982	Ordinance No. 597	10/19/2011	-	-
7	Serrote mine	Craft	IMA/AL	4903-8482/2018	Official Letter No. 034-2019-GDP-IMA-AL	1/10/2019	-	-
8	Serrote mine	Land Use and Occupation	City Hall of Craíbas	AT	AT	5/7/2019	-	-
9	Distribution Line 13 kV	Land Use and Occupation	City Hall of Arapiraca	9675/2019	AT	5/8/2019	-	-
11	Serrote mine	settle in	City Hall of Craíbas	AT	No. 8/2020	8/11/2020	-	-
12	Tailings dam	Concession of Water Works	SEMARH/AL	23010.0000002889/2019	ORDINANCE No. 0049/2020 – SRH/SEMARH	1/22/2020	1/21/2024	-
13	Tailings dam	Effluent Release Grant	SEMARH/AL	23010.0000001984/2020	ORDINANCE No. 0750/2020 – SRH/SEMARH	12/17/2020	12/15/2028	-
15	Tailings dam	Grant of Superficial Capitation	SEMARH/AL	23010.0000000188/2020	ORDINANCE/SEMARH No. SRH – 0079/2021	4/12/2021	3/30/2025	-
16	Plant	Operating licence	IMA/AL	2020.14092649797.LO.IMA	2021.27051149681.EXP.LON	5/31/2021	5/27/2025	-

Order	Enterprise	Type Of Licence	Organ	Process No.	Licence No.	Issue	Maturity	Observation
17	Serrote mine	Federal Technical Registration	IBAMA	AT	6201946	7/4/2018	-	-
18	Serrote mine	Notice of Imission of Possession	ANM	840,235/1982	No. 16/2012	7/4/2012	-	-
19	Serrote mine	FUNAI consent	FUNAI	08620.005648/2020-39	Official Letter No. 918/2020/CGLIC/DPDS/FUNAI	6/28/2020	-	-
22	Well 01	Concession of Water Works	SEMARH/AL	23010.0000001295/2021	ORDINANCE – SEMARH No. SRH – 0297-2021	9/8/2021	-	-
23	Well 02	Concession of Water Works	SEMARH/AL	23010.0000001317/2021	ORDINANCE – SEMARH No. SRH – 0311-2021	9/14/2021	-	-
24	Well 03	Concession of Water Works	SEMARH/AL	23010.0000001316/2021	ORDINANCE – SEMARH No. 0733 – SRH-2022	8/11/2022	-	-
25	Well 04	Concession of Water Works	SEMARH/AL	23010.0000001334/2021	ORDINANCE – SEMARH No. 0732 – SRH-2022	8/11/2022	-	-
26	Explosives Store	Registration certificate	Army	2021-24078	301719	10/22/2021	8/21/2023	-
27	Fuel station	Operating licence	IMA/AL	2021.11064498071.LO.IMA	2021.19111200845.EXP.LO	11/19/2021	11/19/2023	-
28	Mine	Operating licence	IMA/AL	2021.10050861353.LO.IMA	2021.27051149786.EXP.LON	5/27/2021	5/27/2025	-
29	Adductor	Operating licence	IMA/AL	2021.25104214342.RLO.IMA	2022.05011214339.EXP.LON	1/5/2022	1/5/2024	-
30	Manhole 01	Grant Exemption	SEMARH/AL	23010.0000002863/2021	-	05/10/2022	-	-
31	Manhole 02	Grant Exemption	SEMARH/AL	23010.0000002864/2021	-	05/10/2022	-	-
32	Manhole 03	Grant Exemption	SEMARH/AL	23010.0000002865/2021	-	05/10/2022	-	-
33	Manhole 04	Grant Exemption	SEMARH/AL	23010.0000002866/2021	-	05/10/2022	-	-
34	Manhole 05	Grant Exemption	SEMARH/AL	23010.0000002867/2021	-	05/10/2022	-	-
35	Cupira Bridge	Grant Exemption	SEMARH/AL	23010.0000002869/2021	-	05/10/2022	-	-

Order	Enterprise	Type Of Licence	Organ	Process No.	Licence No.	Issue	Maturity	Observation
36	Fuel station	Supply Point Operation Authorization Certificate	ANP	-	D3D8.BC5E.5E32.3219	5/18/2022	8/16/2022	ANP's systems suffered a cyber-attack, so MVV is unable to access the systems to update the Licence. In folder 02 we present the statement issued by the ANP and the link to access the statement.
38	Soil borrowing area	Environmental Authorization	IMA/AL	2021.17124794481.AUT.IMA	2022.02050317247.EXP.AUT	5/2/2022	5/2/2023	-
39	Serrote mine	Permit for Location and Operation	City Hall of Craíbas	-	598	02/06/2023	12/31/2023	Document can only be renewed after it has expired,
40	Transmission Line 230 kV	Authorization for Cutting Isolated Trees	IMA/AL	22718480	2027.4.2022.74272	4/13/2022	4/13/2023	-
41	Transmission Line 230 kV	Operating licence	IMA/AL	2022.07035287916.RLO.IMA	2022.03051262451.EXP.LON	5/3/2022	5/3/2024	-
42	Acoustic Barrier	Environmental Authorization	IMA/AL	2021.24110833037.AUTO.IMA	2022.29040316978.EXP.AUT	4/29/2022	4/29/2023	-
43	Adductor	Land Use and Occupation	City Hall of Arapiraca	28931-2018	28931-2018	11/26/2018	-	-
44	Adductor	Land Use and Occupation	City Hall of Craíbas	-	-	11/23/2018	-	-
45	Transmission Line 230 kV	Land Use and Occupation	City Hall of Arapiraca	17252-2018	17252-2018	7/31/2018	-	-

Order	Enterprise	Type Of Licence	Organ	Process No.	Licence No.	Issue	Maturity	Observation
46	Transmission Line 230 kV	Land Use and Occupation	City Hall of Craíbas	-	-	12/10/2018	-	-
48	Tailings dam	Granting of Waste Disposal	SEMARH/AL	2.301E+18	ORDINANCE/SEMARH No. 0557/2022	4/1/2022	3/31/2026	-
49	Serrote mine	Environmental Authorization (In situ management)	IMA/AL	2022.06072579174.AUTF.IMA	2022.08090346777.EXP.AUT	9/8/2022	9/9/2023	-
50	Explosives Store	Business Blaster Permit	PC/AL	20105012497/2022	00292-301719-2022	8/1/2022	8/1/2023	-
51	Serrote mine	Authorization for Alternative Land Use	IMA/AL	22718461	2027.5.2022.51975	11/9/2022	1/17/2024	-
52	Explosives Store	Individual Blaster Permit	PC/AL	20105.0000019457/2022	00295_301719-2022	10/21/2022	10/21/2023	-
53	Tailings dam	Granting of Water Works	SEMARH/AL	23010.0000003108/2022	-	-	-	Application made on 09/22/2022, for grant to raise the tailings dam

20.3.5 Environmental Effects

20.3.5.1 Updated Environmental and Social Impact Assessment

The Project's PCAs for construction and operation licensing are based on an environmental impact assessment completed in 2009. MVV commissioned the consulting firm Ferreira Rocha to prepare an updated ESIA in 2020. The updated ESIA, completed in 2022, did not uncover any major additional impacts beyond what had already been identified in the initial studies developed during the previous licensing process. During the development of the ESIA, gaps were identified in meeting compliance with IFC Performance Standards. As part of the ESIA process, an Environmental and Social Management/Action Plan was prepared and included in the ESIA. This plan addresses the measures needed to manage impacts in accordance with international standards and guidance documents and through the adoption of the best international industry.

20.3.5.2 Water Quality Effects Assessment

Lorax Environmental Services of Vancouver, Canada, was contracted to carry out a comprehensive water quality effects assessment for the Mine. The work was initiated in June 2019 to address information gaps identified during due diligence auditing for further assessment of potential Project effects to the downstream receiving environment (water quality and aquatic biota). There are several components and phases to complete the full assessment which will be integrated with ore, waste rock and tailings management plans as well as the site water balance.

To date the work has identified the need for additional geochemical characterization of all mine wastes. To this end, laboratory-based kinetic tests to assess water quality effects under saturated and unsaturated conditions were carried out on a Phase 0/1 tailings composite from late 2019 to late 2020 (50+ weeks). Tests evaluating a phase 2/3 and a phase 4 tailings composite were initiated during December 2020 and January 2021. Results are provided in the Lorax report (Lorax, 2022), and conclusions indicate that Phase 2/3 and Phase 4 tailings are non-acid generating and have a low potential for metal leaching, consistent with Phase 0/1 tailings.

A mine rock characterization program (waste rock and ore) to augment existing data was carried out during 2021, including laboratory and field-based testing.

Additional water quality monitoring was conducted at additional stations downstream from the Mine to establish a wider base of characterization of the receiving environment. Water quality monitoring has continued through 2022 (MVV, 2022). Aquatic biota assessments to supplement the existing baseline data has also occurred into 2022 (MVV, 2022a).

Results of the tailings and mine rock characterization and additional receiving environment monitoring will be integrated into a water balance and water quality effects model extending site- wide and into the receiving environment.

The assessment has also identified the need for a metal leaching/acid rock drainage management plan to: i) manage potential effects from mine waste solids, stockpiled ore, as well as exposed pit walls, and ii) ensure appropriate planning, tracking, and categorization of mine rock and its use and storage throughout the Mine. MVV has included provision for routine acid base accounting of mine rock as part of its mine and processing operations laboratory contract with SGS Geosol.

20.3.6 Monitoring

MVV has legal requirements for monitoring air quality, climate, ambient noise and vibration, water quality, and flora and fauna. The monitoring programs are stipulated in the Mine's PCAs, described in

Section 20.3.2.1. MVV and designated subcontractors are responsible for monitoring, reporting, and implementing corrective measures as required.

MVV established internal procedures for the required monitoring programs, and is carrying out the monitoring, with no issues of note observed in results (MVV, 2022, MVV 2022a).

20.3.7 Revegetation

Revegetation measures for the Mine are defined in the Plan for Rehabilitation of Degraded Areas (PRAD), submitted to the state environmental agency (IMA) as part of the Mine's environmental control plans for Project construction approval. MVV last updated its PRAD in April 2021, including aspects to conform to International Finance Corporation standards. The Project's Operating Licence issued May 27, 2021, stipulates that an updated PRAD shall be submitted at the time of licence renewal in early 2025.

Throughout the Mine's construction and operating phases, organic cover soil (termed topsoil in Section 16) will be stripped from new work areas and stored for future use for revegetation.

Many areas exposed during the construction phase have been replanted with grasses to minimize erosion and dust generation and improve the visual landscape. Similar work was executed for lower slopes of the WRSF (currently 'final slopes' as WRSF limits) as a pilot / initial investigation with satisfactory results.

Revegetation activities will emphasize use of native species when possible and avoid the use of any species recognized as invasive. MVV's Permit & Environment team operates a plant propagation and nursery facility and where possible salvages live plant material for transplant in other Project areas. During the Mine's construction phase the team has been active in overseeing vegetation removal, plant salvage and transplanting, seedling production, and fauna management as required.

MVV advised on 20 Mar 2023 that near 140,000 seedlings have been produced at their site propagation facilities since January 2019. Over 11,000 cactus propagules were salvaged from Project areas and planted as part of the "Tree Fence" along the limits of the site. Approximately 258,000 m^3 of organic cover soil had been salvaged from construction areas and stockpiled for future use.

20.3.8 Environmental Conservation Program

The Project is obligated to support the implementation and maintenance of conservation units in Brazil in accordance with Federal Law No. 9.985 (July 18, 2000). As of September 2018, MVV had expended R$0.5 million towards studies related to the creation of the Serra da Mão conservation unit, with an additional R$3.5 million allocated in Project costs towards this initiative. Although MVV and state agencies have held several meetings over the last two years, no further progress has been made by the state towards an action plan for the remaining funds.

20.4 Closure

The most recent site-wide update of the Mine's conceptual closure plan and associated cost estimate was carried out in 2023 (Arcadis, 2023). Per the Mine's Operating Licence issued May 27, 2021, a stipulation in the permit requires submittal of an updated closure plan at the time of licence renewal in early 2025.

20.4.1 Closure Schedule and Actions

The current closure plan indicates a five-year closure period, with two additional years prior to the start of closure where preparations begin for closure. The post-closure phase will see maintenance and monitoring carried out over a five-year period.

The basic closure actions for each operations area used for costing purposes are summarized in Table 20-4.

Table 20-4: Basic Closure Actions for Each Operational Area
ACG Acquisition Company Limited – Serrote Mine

Operational Area	Closure Actions
Pit	Perimeter fencing Revegetation of the upper portion Implementation of a drainage system Geotechnical monitoring
Waste Pile, Oxidized Pile and Crushing Plateau	Implementation of a drainage system Revegetation Geotechnical monitoring
Tailings facilities	Implementation of drainage systems, Covering and revegetation of the beach portion, Geotechnical monitoring Perimeter fencing
Process plant and support facilities (maintenance shop complex, fuel stations, explosive storage magazines)	Dismantling and removal of equipment Demolition of metal, concrete and masonry structures Removal of structures topographic reconfiguration Re-contouring, drainage system construction and revegetation, where applicable
Administration areas and gate house	Demolition and removal of structures Revegetation where applicable Due to the proximity to the local communities, the buildings may be maintained for use as educational institutions, headquarters of associations and municipal bodies.
Water supply system	Demolition and removal of structures/revegetation (*)

Note: *If there is demand from public water and energy distribution agencies for existing structures, MVV has the option to negotiate with interested parties for reuse of those structures to serve local and regional communities.

20.4.2 Closure Costs

A total of US$18.8 million (R$98.1 million at an exchange rate of R$5.21 per US$1) is assumed in the cost model for closure, including US$0.6 million for pre-closure updates and studies and preparation of the detailed mine closure plan, US$17.5 million for closure activities, and US$0.7 million for monitoring, inspections, and maintenance during post-closure. No contingency is considered in the estimate nor potential salvage value of components. There are no specific legislated requirements in Brazil for reclamation or closure bonding for mining projects.

20.5 Community Affairs and Government Relations

20.5.1 Communities in the Area of Direct Influence of the Serrote Mine

There are 14 communities within the area of direct influence of the Mine. MVV is in constant communication with the residents, and holds regular community meetings, under the company's Social Dialogue Initiative. Topics that have been raised in the community forums include mining-related items such as blasting, TSF operations, global issues such as human rights, and fire prevention. The forums are intended to be flexible, with topics discussed as they are raised. The meetings are held monthly in public spaces, to ensure that each attendee can make comments.

At the end of each meeting, MVV requests that attendees participate in a confidential satisfaction survey, and responses are placed into a suggestions box. MVV reviews these documents and incorporates the comments and suggestions into future meeting agendas to ensure community concerns and comments are addressed.

MVV uses the WhatsApp messaging application as a tool to support communications between the communities and MVV's community relations team.

20.5.2 Grievance Mechanism

In addition to the Social Dialogue Initiative, MVV developed its "Contact Us" (Fale Conosco) program, which currently uses WhatsApp, 'call free' phone number and email, to receive, register, resolve, respond to, and manage any communications (e.g., praise, complaints, information, requests and suggestions) from external stakeholders. The "Contact Us" program was established to ensure that external stakeholders have access to MVV and can provide feedback or ask questions.

MVV has a contract with a specialized third-party, which guarantees confidential treatment of information. The system records information in a database, and monitors the stakeholder communications and MVV's responses, agreements and commitments adopted.

The "Contact Us" program is currently being updated to incorporate the most recent industry grievance mechanism guidelines.

20.5.3 Resettlement of Families

A resettlement program was undertaken from 2012 to 2020 that affected 213 properties and 153 landholding families. The relocation process was performed in line with IFC PS5 (Land Acquisition and Involuntary Resettlement), including a proper compensation for the assets and a livelihood restoration plan. The Resettlement Action Plan was assessed by ERM during the ESIA and no issues were raised.

To the Effective Date of the CPR, MVV has no record of complaints in the Grievance Mechanism in relation to the resettlement process.

MVV maintains an ongoing social dialogue with the resettled families, including regular meetings.

20.5.4 Stakeholder Engagement Plan

MVV has a Stakeholder Engagement Plan in place that set out the company's guidelines for addressing stakeholder concerns, stakeholder communications, and stakeholder relationships. The plan is constantly updated to reflect the Mine development stage, scenario changes, stakeholder profiles, and the type and nature of stakeholder feedback.

The initiatives presented in the plan are in full compliance with MVV's Code of Ethical Conduct, corporate policies and international standards, such as the Equator Principles and the International Finance Corporation's 2012 guideline. The initiatives also comply with human rights standards, such as the Universal Declaration of Human Rights (1948), the Sustainable Development Goals for 2030, and International Labour Organization (ILO) Convention 169.

MVV has a dedicated Social and Community team in place to manage and monitor the plan.

20.5.5 Regional Political Context

The current State Governor of Alagoas, Mr. Paulo Dantas, was elected in 2022, becoming effective in January 2023. He was supported by the previous Governor Mr Renan Filho (currently National Minister of Transport), who has a good relationship with MVV, having visited the site on several occasions.

During the most recent elections in late 2022, the former vice-governor was elected Mayor of Arapiraca - the second biggest city in Alagoas state.

Craíbas also had a change of mayor in the elections, with Mr. Teófilo Pereira elected to the position. Mr. Pereira is well-connected within the state, and has good relationships with State officials.

Craíbas also had a change at the City Hall in the elections, being Mr. Teófilo Pereira elected to the position of Mayor. Mr. Pereira is well-connected within the Alagoas politicians, and has also good relationships with Federal officials

20.5.6 MVV Institutional Program “Portas Abertas”

MVV instituted, after Covid-19 restrictions ceased, an “Open Doors” (portas abertas) program which consists of personal guided tours of the Mine that provided external stakeholders with Project-specific information, in particular on aspects of the environmental and engineering disciplines. A particular focus of the Open Doors program is communication around the TSF. The Social and Community team maintains a constant schedule of door-to-door technical visits to all stakeholders within the designated TSF Self-Rescue Zone. The teams explained the TSF construction process, and outlined how the TSF is operated during the LOM.

MVV also maintains regular communication to external stakeholders by way of general community-related information updates on the Mine, weekly information emails, and monthly newsletters on social and environmental actions. MVV is also active in the press and social media spheres.

20.5.7 Social Projects

MVV has developed a portfolio of social projects in conjunction with communities in the area of direct Project influence, which focus on the areas of social entrepreneurship, environmental education, science and technology. In 2022 a total of six projects were supported, and in 2023 another seven projects will be supported.

In the following sections can be found a summary of MVV initiatives on social projects in the territory.

20.5.7.1 “The Caatinga Guardians”

The Caatinga is a biome that is characterized by a type of desert vegetation. The training was designed to provide participants with a course-completion certificate of “Botanical Identifier and Guide”.

The course included modules such as environmental education, botany, Caatinga flora and fauna, how to identify animals that pose a risk to human health, waste treatment and disposal, recycling, and discusses the various government bodies tasked with biome conservation.

20.5.7.2 Teacher Training Initiative

MVV partnered with Educando, a non-governmental organization that has been operating since 2009 to provide support for teacher training initiatives in the science, technology, environment, arts and mathematics areas (the "STEM" initiative). The program focuses on complementary teacher training, such as active learning in classes, improving student outcomes, supporting teaching students as to how social and emotional skills can be integrated with natural sciences and mathematics, and providing teachers with a means to expand students' horizons and choices in technical and scientific careers.

Educando operates in 14 Brazilian states and abroad; and has supported training 6,533 teachers from 768 schools, which ultimately benefitted more than 570,000 students.

20.5.7.3 Poultry Farming Initiative

A poultry-farming initiative has been in place since 2014. The initiative includes provision technical assistance with poultry raising. The initiative is partnered with Brazil's Micro and Small Business Support Service (SEBRAE).

20.5.7.4 Female Entrepreneurs

The Female Entrepreneurship project aims to develop economic alternatives for women within the communities surrounding the Mine. The intent of the program is to increase family income, identify areas where production volumes could be increased, revenue generated, or profit margins be improved. The program has included support for women to have stalls at local food fairs.

20.5.7.5 Local Suppliers Development Program

The Brazilian Support Service for Micro & Small Businesses in Arapiraca is supporting MVV's efforts to leverage business opportunities in the region. The initiative focuses on local traders and potential service providers.

20.5.7.6 Covid-19 Support

MVV provided significant support to local municipalities in support of the efforts to face the Covid-19 pandemic, including:

- Donation of hundreds of grocery baskets to citizens in Craíbas and Arapiraca, at the request of local councillors and the State Public Ministry;
- Donations of cleaning products (bleach, detergent and paper towels), supporting donations from local suppliers (alcohol gel, masks and thermometers) to health departments in Arapiraca, and Craíbas, and to the state police;
- Donation of thousands of rapid Covid-19 tests to hospitals.

20.5.7.7 Social Dialogue Initiative

The Social Dialogue initiative was implemented in April 2019. Under this program, all 14 communities within the Mine area of influence are visited on a monthly basis. The communities are divided into four groups, so that one community group meets each week. As of the Effective Date of the CPR, the Mine approval rate is >90%.

20.6 Tailings Storage Facility (TSF)

20.6.1 Introduction

Tailings from the process plant are conveyed via a slurry pipeline to a conventional cross-valley TSF. During the first phase of operations, the TSF consists of a zoned earthfill embankment comprising an upstream low permeability compacted earthfill shell, a central chimney drain, and a downstream compacted earthfill embankment underlain by a blanket drain and associated filter zones. The planned Phase 2 downstream raise will consist of an upstream core and filter zones, and a downstream rockfill zone overlying the Phase 1 embankment.

The TSF location is shown in Figure 20-1, showing the final Phase 2 configuration with a crest elevation of 251.0 masl.

Both stages of the TSF will be provided with a spillway system on the left abutment capable of discharging the routed probable maximum flood (PMF).

The tailings are classified as Class II-A, i.e., non-hazardous and non-inert waste, based on the ABNT NBR 10004/2004 technical standard. The dam reservoir area is unlined.

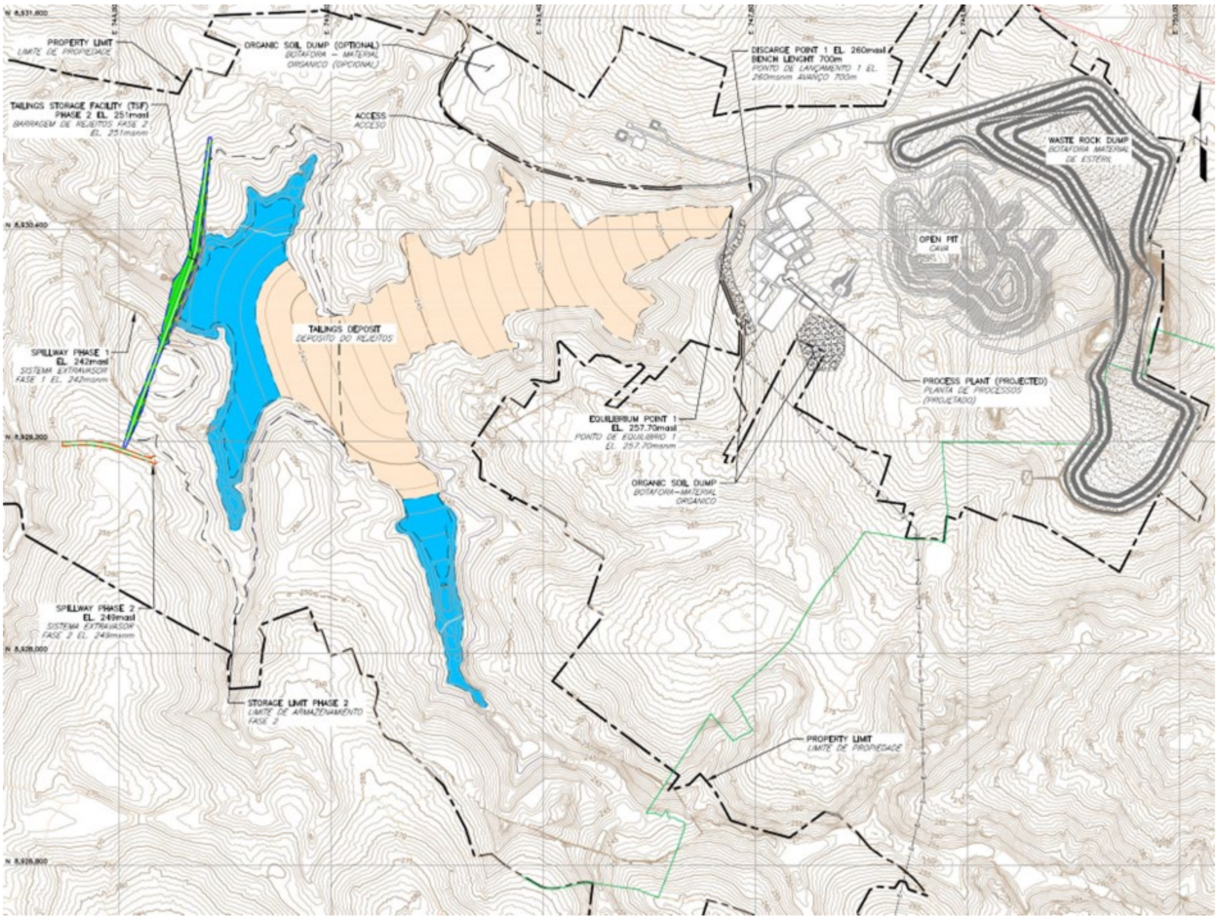
The Project will produce approximately 51 Mt of ore over the 14-year mine life, and the TSF (Phase 2) was designed to contain the LOM tailings volume. However, it is anticipated that additional reserves will be discovered that will significantly extend the LOM, which will require additional tailings storage capacity. The tailings is thickened to a solids content of approximately 50% before being deposited in the TSF. Water released from the slurry following tailings deposition is reclaimed and returned to the process plant.

Construction of Phase 1 of the TSF, to a crest elevation of 244.0 masl was competed 27 January 2021. As-Built “Construction Quality Guarantee of Serrote Starting Dike – Phase 1 Final Report” was submitted by WSP (Formerly Wood E&I) on March 15, 2021. The “As-Built” plan view of the Serrote TSF embankment is presented in Figure 20-2. Operation of the TSF began in mid-June 2021.

Production through the first year of operations slowly ramped up from initial production rates averaging approximately 4,000 t/day, to an average of 12,000 t/day at the end of December 2022.

Phase 2 of the TSF was originally intended to be to be single seven-meter raise to an elevation of 251.0 masl. It has since been split into two additional raises (4 m followed by 3 m) to achieve the same final crest elevation of 251 masl. Detailed designs for Phase 2 are anticipated to be completed in mid-2023 for the initial Phase 2 (4 m) downstream TSF raise.

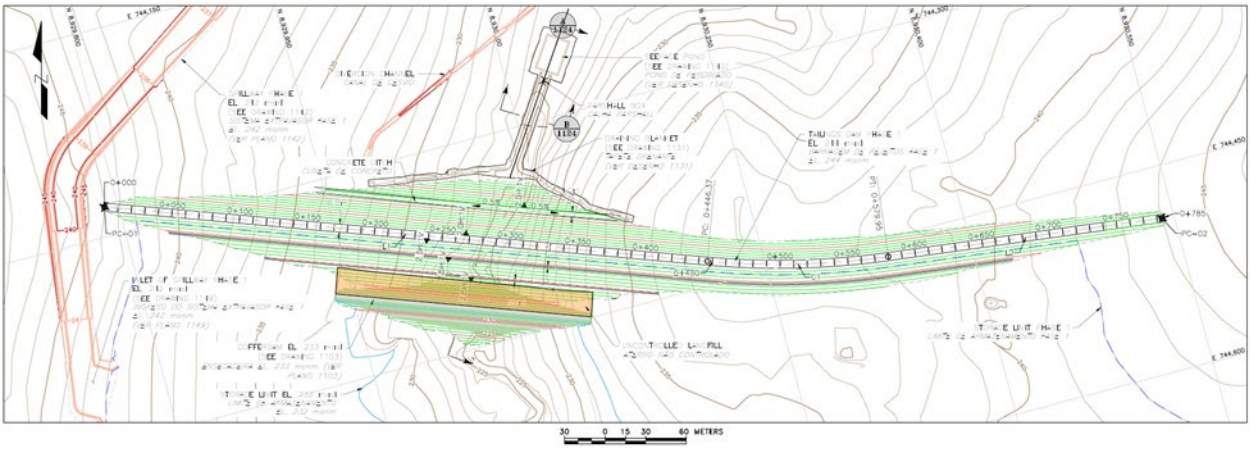
The Brazilian Standards for Mining Tailings Dams (ABNT NBR 13028/2017) and Canadian Dam Association (CDA) recommendations were used to define acceptable factors of safety (FOS) for the TSF embankment. Pseudo-static conditions were modelled using a horizontal ground acceleration of 0.2 g, corresponding to an event having a 10,000-year return interval in line with the CDA consequence classification of extreme. All factors of safety obtained from the slope stability analyses for Phases 1 and 2 significantly exceeded the values required by the Brazilian and Canadian standards/recommendations.



Source: Wood, 2020.

Note: Grid shows scale. Figure north is to top of page.

Figure 20-2: SF Location Showing TSF Phase 2 Embankment



Source: Wood, 2021.

Note: Scale presented in figure. Figure north is top of page.

Figure 20-3: Phase 1 TSF Embankment "As-Built" Plan View

20.6.2 Site Conditions and Investigations

Several site investigations were conducted in the TSF location by VOGBR (2008 and 2012) and Wood (2019). Work conducted included geological and geotechnical mapping, rotary percussive and auger drilling, test pitting, and standard penetration, Lugeon packer, and LeFranc tests. This work identified suitable borrow areas for embankment construction and provided geotechnical and geological data for foundation preparation.

The first annual dam safety inspection (DSI) was completed by WSP on 31 August 2022 and 1 September 2022. Personnel from WSP including Rogerio Cyrillo (the EOR), and Daniel Servigna conducted the site inspections and provided a close out meeting to site personnel. Key observations/recommendations of the site inspections included:

- The dam is in good condition with no signs of cracking, distress or concerning deformation.
- Slopes are in generally good condition, with minor repairs required including establishing a new hydroseed layer due to current hydroseed being insufficient, riprap on the upstream face to be completed during dry season in February 2023), minor erosional features on the upstream, and downstream slopes should be monitored and repaired.
- The spillway is in generally good condition. The spillway slab is starting to become undercut from discharge flows, this should be repaired by grouting cavities and constructing a sloping apron to direct flows into the channel. Additionally, some erosion occurred within the discharge channel causing minor damage to the reno mattresses, and channel bottom. However, bedrock is shallow in the area and will provide sufficient erosion protection in the future.
- The seepage collection pond has become damaged due to uplift of the HDPE liner from surrounding seepage forces. Due to the elevation of the downstream river, it is not possible to construct a gravity drain beneath the pond liner, thus a sump and pumping system would be required to maintain the seepage collection pond. Since seepage water currently meets regulatory standards for discharge to the environment it has been recommended that the pond be abandoned, and seepage flows should be allowed to flow directly to the downstream environment. Seepage flow rates and water quality should continue to be monitored throughout the life of the TSF.

Monthly monitoring reports for the dam have been produced throughout operation of the TSF. The monitoring reports show geotechnical instrumentation records of the dam are within the expected parameters. Increases in piezometric levels were recorded on the upstream slope and no piezometric levels were recorded on the downstream slope. The dam inclinometers did not register displacements above safety levels and the seepage flow remained constant throughout the year, indicating a good functioning of the internal drainage system.

20.6.3 Tailings Characteristics

Solid–liquid separation and rheological tests, conducted by Pocock and SGS in 2010, were used for tailings characterization. Tailings characteristics and assumptions included:

- Tailings have a specific gravity of 3.2.
- Tailings would be thickened to 65% prior to deposition in the TSF.
- TSF sizing was based on a short- to medium-term tailings solids content of 77%;
- The final tailings solids content after consolidation was assumed to be 80%.
- The material sizing would be 77.46% passing 200#, with no material fraction >212 µm;
- Tailings solids contents were 20–30%, to provide an underflow solids content of 66–70%;

- Water will be rapidly released from the discharged tailings. Sedimentation ratios will vary from 578 cm/h (tailings with more than 20% solids content) to 2,193 cm/h (tailings with less than 20% solids content).
- Survey of the already disposed tailings material show that the tailings are behaving as originally anticipated. Current deposition shows the dry beach area is settling at an approximate slope of 0.8% and wet tailings beneath the supernatant pool are settling at an approximate slope of 1.0%.

20.6.4 TSF Design Criteria

The TSF design is conventional in terms of configuration, safety and containment of slurry tailings, and is typical of those used in mining operations around the world for containing water and tailings.

A diversion channel was constructed on the right abutment, and a coffer dam was provided upstream of the Phase 1 embankment to facilitate construction.

The dam body consists of an engineered compacted fill, comprising selected material from borrow areas and drains and filters sourced from external suppliers. The dam spillway is on the left abutment of the TSF, in a topographical saddle. The spillway channel width is to be expanded in 2023 from the original design dimensions by four meters along its entire length to provide better flow conveyance.

The upstream embankment slope is lined with reno mattresses in the lower section and riprap in the upper section to protect from wave action. The remaining sections of the upstream slope have yet to be fully lined with riprap as originally designed. The downstream slopes are grassed to limit erosion, however initial hydroseeding applications have not fully vegetated the slope so additional hydroseeding applications are to be completed. Instrumentation consists of Casagrande type open tube and vibrating wire piezometers that are installed in the foundation, water level indicators installed upstream of the TSF, survey monuments constructed on the downstream embankment surface, inclinometers installed in the downstream embankment shell, and a flow meter installed downstream of the TSF to measure seepage flows.

The design can be summarized as:

Phase 1: maximum height of 16 m, crest of 6 m in width and 785 m in length. Internal drainage system consisting of a central chimney drain and blanket drain. Upstream slope protection using a reno mattress underlain by a geotextile. A seepage collection pond downstream.

Phase 2: maximum dam height of 23 m, crest of 10 m width, and 1,850 m in length. Benches of 4 m width located every 10 m in vertical height. As the Phase 2 downstream shell will consist of high permeability rockfill, the blanket drain will not need to be extended below the Phase 2 downstream embankment shell. The volume of rockfill used for the downstream shell will be approximately 400,000 m3, sourced from waste rock generated during mining activities.

The spillway was designed to discharge the routed probable maximum flood (PMF) resulting from the 24-hour probable maximum precipitation (PMP) (Table 20-5).

Table 20-5: PMP Discharge Parameters
ACG Acquisition Company Limited – Serrote Mine

Parameter	Units	PMP
Design precipitation	mm	367.8
Maximum incoming flow rate	m^3/sec	325.0
Maximum outgoing flow rate	m^3/sec	125.3

Parameter	Units	PMP
Water level at start of PMP event	m	238.70
Maximum water level	m	243.70
Freeboard	m	0.30

A single discharge point will be used for first stage of the TSF and will be located in the northern portion of the reservoir adjacent to the process plant. Tailings will flow by gravity to the TSF. During Phase 2, deposition will initially take place from the TSF embankment crest to displace the pond away from the embankment, after which deposition will again take place from the deposition point used for the first phase.

Return water supply assurance assumes a return water pumping rate of 200 m^3/hour for the initial tailings density of 1.65 t/m^3 and the final tailings density of 1.78 t/m^3.

20.6.5 TSF Operating Philosophy

An operating manual was prepared for the TSF providing guidelines to be followed during operations. These guidelines will help maintain the physical, geotechnical and hydraulic safety of the structure. The operations manual has been currently developed to meet guidance from the CDA for a dam with and "extreme" classification rating. All features of the Dam have been design accordingly and meet international industry standards. Guidelines for periodic safety inspections and maintenance practices were also included.

Dam break analyses have been conducted by Tellus to aid in development of the sites ERP which have also been provided to the community through their community outreach and communication programs. These programs are in place to ensure the safety of the downstream population.

According to Brazilian legislation an MVV geotechnician is designated as responsible for the dam and submits bi-weekly reports to the ANM indicating the operational condition of the dam, piezometric levels and structural conditions.

20.6.6 Tailings Storage Facility (Costs)

TSF sustaining capital costs were estimated based on the quantities of earthworks, vegetation removal, equipment and piping associated with the dam raising, water reservoir expansion and tailings transport requirements over the LOM. The dam raising and reservoir expansion were estimated based on Wood's design and the tailings disposal plan. The equipment and pipeline costs were based on Ausenco's design.

21.0 CAPITAL AND OPERATING COSTS

21.1 Capital Costs

21.1.1 Capital Cost Summary

The Serrote Mine was built from 2019 to the end of 2021 at an estimated capital cost of US$194.5 million with all taxes included. The cost accounts for all infrastructure necessary to begin operations such as the processing plant, initial tailings dam facility, mining pre-production, administration buildings and warehouse, plus Owner's costs and commissioning. Process plant capacity was designed at 4.1 Mt/a. Up to the end of 2018 sunk costs were incurred for Project development and early construction expenditures, such as land acquisition, geological exploration, geotechnical investigations, permitting, process testwork, engineering and site infrastructure. The estimated value of previous sunk costs for the Mine is approximately US$94 million. Financing and legal costs are not included in the initial capital costs.

MVV declared commercial production on December 27, 2021, and the mine has been operating continuously since then. This CPR considers a mine plan with a start date of January 1, 2023. All capital costs in the LOM plan are considered as sustaining capital.

The Serrote Mine has continued operations during the COVID-19 pandemic without major impact on production. Concentrate shipments have been dispatched according to contract. New health and safety protocols have been put in place to mitigate COVID-19 issues and to track follow-up actions.

All cost estimates in this section of the CPR are expressed in Q1 2023 US$. Unless otherwise indicated, all costs in this section of the CPR are expressed without allowance for escalation or interest rates. The currency exchange rates used in the estimate are based on forecast rates of R$5.39 per US$1.00 for 2023, and a long term rate of R$5.55 per US$1.00.

21.1.2 Sustaining Cost Estimate

Sustaining capital costs over the open pit LOM are estimated at US$132 million (Table 21-1).

Table 21-1: LOM Sustaining Capital Cost Estimate
ACG Acquisition Company Limited – Serrote Mine

Item	Sustaining Capital (US$M)
Tailings dam	24.4
Mine and mining equipment	33.7
Process plant	18.6
Capitalized deferred waste stripping	37.2
Closure cost	17.7
Total	**131.6**

The accuracy of the sustaining capital cost estimate is supported by the design and engineering carried out by MVV and Appian Capital Advisory for the process plant, mine and mining equipment, and capitalized deferred waste stripping; WSP for the tailings dam; and Arcadis for the closure cost. Input to the sustaining capital cost estimate is appropriate to a feasibility study level. Given the detailed design level and pricing basis, the overall estimated accuracy is expected to be ±15% of the final sustaining capital costs.

21.1.2.1 Tailings Dam

The tailings dam design was completed by WSP for the open pit LOM. Based on the construction quantities required for upcoming raises, MVV completed a cost estimate based on quotations for the work planned. Embankment construction materials are initially from nearby borrow pits, and later are mainly ROM waste rock. Tailings dam sustaining capital costs were estimated based on the quantities of earthworks, vegetation removal, equipment and piping associated with embankment raising, water reservoir expansion and tailings transport requirements over the LOM.

21.1.2.2 Mining Equipment

Mine sustaining capital includes the purchase of new equipment required over the LOM to meet the mine production variations and fleet renewal, according to the mine plan. MVV plans to convert from contractor open pit mining to Owner operations starting in Q1 2025. New mining equipment will be purchased with 20% down payment and 80% financing. The costs are based on quotations. A residual value of 15% to 40%, depending on the type of equipment, is expected as a salvage value at the end of the open pit life.

21.1.2.3 Process Plant and Site

The process plant and site costs were calculated by the processing team at MVV based on historical replacement and/or refurbishing costs for the processing plant equipment and associated infrastructure. Quotes were obtained on new items for process optimization and to improve maintenance and operability.

21.1.2.4 Capitalized Deferred Waste Stripping

For each year in the mine plan, if the waste to ore strip ratio is greater than the LOM average ratio, then the mining cost of the excess amount of waste rock is capitalized.

21.1.2.5 Closure

Arcadis completed an updated closure cost estimate for the LOM plan, taking into account decommissioning of the site, tailings storage facility maintenance, and monitoring.

21.2 Operating Costs

21.2.1 Operating Cost Summary

The all-in sustaining operating cost (AISC) for the Serrote Mine is estimated to average \$19.74/t processed over the open pit LOM, equivalent to \$1.85/lb Cu payable. Table 21-2 summarizes the operating cost breakdown by activity and Table 21-3 presents the LOM plan.

Table 21-2: Base Case Operating Cost Summary ACG Acquisition Company Limited – Serrote Mine

Item	Units (US$/t)	Unit Cost (US$/t)	LOM Total (US$M)
Open pit mining costs	$/t mined	1.84	
Open pit mining costs	$/t processed	4.77	223
Processing costs	$/t processed	7.01	328
Site G&A	$/t processed	2.69	126
Smelting and freight	$/t processed	3.23	151
Au By-product credits	$/t processed	(3.10)	(145)
C1 cost [1]	**$/t processed**	**14.60**	**682**
Royalties	$/t processed	2.33	109
Sustaining capital costs	$/t processed	2.82	132
All-In Sustaining Cost [2]	**$/t processed**	**19.74**	**923**

Notes:

1. C1 cost is cash operating costs less net by-product credits.
2. All-in sustaining cost (AISC) is C1 cost plus royalties and sustaining capital expenditures.

Table 21-3: Serrote Annual Production ACG Acquisition Company Limited – Serrote Mine

Parameter/Year	Unit	LOM	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Waste rock mined	Mt	**76.1**	7.7	8.0	8.7	8.5	8.7	8.6	8.6	8.7	2.7	3.5	1.8	0.6
Ore mined	Mt	**45.2**	3.7	4.1	4.1	4.0	4.0	4.1	4.1	4.0	4.1	4.1	4.1	0.7
Strip ratio	w:o	**1.69**	2.07	1.94	2.12	2.13	2.18	2.10	2.10	2.15	0.67	0.87	0.44	0.77
Mine movement	Mt	**121.2**	11.5	12.1	12.7	12.5	12.7	12.7	12.7	12.7	6.8	7.6	5.9	1.3
Ore processed	Mt	**46.7**	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	1.6
Concentrate	dmt kt	**638.8**	97.4	60.1	61.0	52.7	47.7	49.3	47.7	51.6	52.3	52.3	47.7	18.8
Cu production	Mlb	**510.9**	54.9	42.4	43.1	46.5	42.1	43.5	42.1	45.5	46.1	46.1	42.1	16.6
Cu production	kt	**231.8**	24.9	19.2	19.5	21.1	19.1	19.7	19.1	20.6	20.9	20.9	19.1	7.5
Cu payable	Mlb	**498.0**	51.6	43.7	44.2	45.0	37.2	45.6	37.2	46.5	45.7	37.2	46.5	17.7
Cu payable	kt	**225.9**	23.4	19.8	20.0	20.4	16.9	20.7	16.9	21.1	20.7	16.9	21.1	8.0
Au production	koz	**94.9**	9.1	8.4	8.8	8.8	8.1	8.6	8.1	7.4	8.8	7.2	8.0	3.5
Au payable	koz	**88.5**	8.1	8.2	8.6	8.2	6.9	8.7	6.9	7.3	8.3	5.6	8.3	3.5

21.2.2 Basis of Estimate

21.2.2.1 Wages and Salaries

Salary and wage rates are based on current labour rates. The calculation of all-in labour cost included burdens to cover all statutory payments, Company sponsored benefit plans and programs, and costs associated with vacation, insurance, retirement plan, sick leave, and absenteeism. Site personnel are expected to reside in the city of Arapiraca and in the general vicinity of the mine and commute by bus.

21.2.2.2 Work Schedule

The work schedule assumes production will operate 24 hr/day, seven days/week, 365 days/year.

21.2.2.3 Energy Costs

A diesel fuel price of R$6.50/litre (US$1.21/litre in Q1 2023) has been used for estimation of operating costs. Electrical power costs for the Mine were calculated to average R$341/MWh, (US$0.063/kWh in Q1 2023) over the LOM, inclusive of taxes.

21.2.2.4 Freight

Freight costs are based on executed contracts for port operations and land freight, and quotes for the other types of freight, in line with historical costs.

21.2.2.5 Tax Rebates

MVV accumulates credits for PIS (social integration program) and COFINS (social security financing contribution), both value-added federal taxes, and ICMS (value-added state taxes on sales and services) from the acquisition of services and goods within Brazil. As MVV is a 100% exporting company, it is allowed to recover a portion of the value-added taxes during production. The recovered taxes are shown as a tax rebate in the operating costs. The recovery rates are specified in a tax report by KPMG Assessores Ltda. (2020).

21.2.3 Mining

MVV has entered into an agreement with a contractor, Fagundes Construção e Mineração S/A., for open pit mining at the Serrote Mine. The contract includes all open pit mining activities, such as drilling, blasting, loading and hauling of ore and waste rock. Explosives and blasting services are subcontracted to ENAEX Brasil, through subsidiary IBQ - Industrias Quimicas S/A.

Mining costs for 2023 and 2024 are based on the executed contracts plus Owner's costs for technical staff and support. As of 2025, mining equipment will be supplied and operated by MVV. New equipment will be phased in to replace contractor equipment, and some contractor equipment may be purchased by MVV. The unit mining operating cost over the LOM is estimated to average $1.84/t material mined and is presented in Table 21-4. The inclusion of tax rebates and allocating expenses to waste rock capitalized deferred waste stripping have reduced the unit mining cost.

Unit mining costs have been estimated to reduce from an average of $2.05/t mined during the contractor years to an average of $1.51/t mined during the Owner-operated years of 2025 through 2030, before the strip ratio decreases appreciably as of 2031.

Table 21-4: Base Case Unit Mining Operating Cost
ACG Acquisition Company Limited – Serrote Mine

Item	Unit Cost (US$/t mined)	LOM Total (US$M)
Loading	0.28	34
Hauling	0.69	84
Drilling and blasting	0.70	85
Support	0.57	69
Mine management	0.15	18
Tax credits	(0.25)	(31)
Capitalized deferred stripping	(0.31)	(37)
Total Mining Costs	***1.84***	***223***

21.2.4 Processing

Process plant operating costs include the costs for operating and maintaining the processing facilities, from the primary crusher through to concentrate loadout, as well as process and reclaim water pumping, and operating the tailings storage facility. The processing costs account for the expenses associated with purchasing consumables, equipment maintenance, personnel, and power consumption.

Consumable costs include items such as crusher liners, mill liners, grinding media, all chemical reagents, and an allocated cost for office/laboratory supplies.

Electrical power consumption was derived from the estimated electrical load of individual pieces of equipment on the equipment list.

The average LOM unit processing cost is estimated at $7.01/t and is presented in Table 21-5.

Table 21-5: Base Case Unit Processing Operating Cost
ACG Acquisition Company Limited – Serrote Mine

Item	Unit Cost (US$/t processed)	LOM Total (US$M)
Materials	0.48	22
Fuel and lube	0.01	0
Consumables	2.75	129
Laboratory	0.20	9
Water	0.32	15
Labour and G&A	1.26	59
Electrical power	1.82	86
Tailings storage facility	0.03	1
Services	0.86	40
Tax credits	(0.75)	(35)
Total Processing Costs	**7.01**	**328**

21.2.5 Site General and Administrative

The general and administrative (G&A) operating costs are the expenses for cost centres that are not directly linked to the mining and process disciplines, and include labour and overhead costs.

The G&A unit operating cost is estimated to average $2.69/t over the LOM and is presented in Table 21-6.

Table 21-6: Base Case G&A LOM Cost Estimate
ACG Acquisition Company Limited – Serrote Mine

Item	Unit Cost (US$/t processed)	LOM Total (US$M)
Health, safety and environmental	0.39	18
Administration - site	1.55	73
Labour - site	0.77	36
Tax credits	(0.02)	(1)
Total G&A Costs	**2.69**	**126**

21.3 Manpower

Table 21-7 presents a summary of open pit, process plant, and G&A manpower per annum. The mine plans to transition from contractor mining to Owner-operated mining in 2025.

Table 21-7: Manpower Summary
ACG Acquisition Company Limited – Serrote Mine

Item	With Mining Contractor	Owner-Operated
	Owner	
Mining	45	382
Processing	156	156
Admin	103	103
Sub-Total	**304**	**641**
	Contractor	
Mining	285	20
Processing	182	182
Admin	336	336
Sub-Total	**803**	**538**
	Total Mine	
Mining	330	402
Processing	338	338
Admin	439	439
Total	**1,107**	**1,179**

21.4 CP Comments on "Item 21: Capital and Operating Costs"

21.4.1 Mining Costs

The CP notes:

- Initial capital costs have been spent and are considered as sunk costs; all ongoing capital costs are sustaining capital costs.
- The mine operating costs were based on the mine plan.
- Mining up to the end of 2024 will be done by a contractor; an agreement has been signed and the contractor is currently operating at site.
- MVV will purchase its own equipment fleet in 2024 and will conduct Owner operations as of 2025.

21.4.2 Processing, Infrastructure and G&A Costs

The CP notes:

- Initial capital costs have been spent and are considered as sunk costs.
- Process plant operating costs were calculated by MVV and reviewed by MM Consultores; quotations were obtained for electrical power, water, reagents, material and consumables; labour costs were based on a detailed organization chart and actual payroll costs.
- Concentrate transport costs were based on the ten shipments to date.

22.0 ECONOMIC ANALYSIS

22.1 Cautionary Statement

The results of the economic analyses discussed in this section represent forward-looking information. The results depend on inputs that are subject to a number of known and unknown risks, uncertainties and other factors that may cause actual results to differ materially from those presented here. Information that is forward-looking includes:

- Mineral Reserve estimates;
- Commodity prices and exchange rates;
- Mine production plan;
- Mining and process recovery rates;
- Mining dilution and mining recovery;
- Sustaining costs and operating costs;
- Closure costs and closure requirements;
- Environmental, permitting and social risks.

Additional risks to the forward-looking information include:

- Changes to costs of production from what is assumed;
- Unrecognized environmental risks;
- Unanticipated reclamation expenses;
- Unexpected variations in quantity of mineralized material, grade or recovery rates;
- Geotechnical or hydrogeological considerations during mining being different from what was assumed;
- Failure of mining methods to continue to operate as anticipated;
- Failure of process plant, equipment or processes to operate as anticipated;
- Changes to assumptions as to the availability of electrical power, and the power rates used in the operating cost estimates and financial analysis;
- Ability to maintain the social licence to operate;
- Accidents, labour disputes and other risks of the mining industry;
- Changes to interest rates;
- Changes to tax rates.

22.2 Basis of Evaluation

A financial model was developed to estimate the Serrote Mine base case open pit LOM plan comprised of mining the Proven and Probable Mineral Reserve within the open pit. The LOM plan covers a period of 12 years beginning Q1 2023. Financial evaluation of the Mine was based on a discounted cash flow model, from which net present value (NPV) was determined. A measure of the internal rate of return (IRR) is not possible in this case since the initial capital costs have been expended and are considered sunk costs as of December 27, 2021, when commercial production was declared. The sensitivity of the NPV to changes in the base case assumptions was also examined.

22.3 Financial Model Parameters

22.3.1 Exchange Rate, Inflation and Discount Rate

The financial analysis was prepared on a real currency basis with all cash flows expressed in Q1 2023 US$ terms. Project revenues are determined by metal prices in US$ and capital expenditures and operating costs are denominated in R$ and US$. For the Mine base case, the exchange rates used for expenditures denominated are shown in Table 19-1, with a long term exchange rate of R$5.55 = US$1, reflecting consensus rates as of January 2023.

The discount rate in the financial model is 8%.

22.3.2 Consensus Metal Prices

Financial modelling of the base case used the metal prices shown in Table 19-1, with long term prices of US$3.59/lb copper and US$1,615/oz gold. As part of the sensitivity analysis, a range of metal prices 20% above and below the base case values were tested.

22.3.3 Tax Regime

The financial analysis includes provisions for Brazilian taxes applicable to the Serrote Mine. Taxable income is subject to federal income tax of 34% consisting of 25% base rate (*Imposto de Renda - Pessoa Jurídica*, IRPJ) and a 9% social contribution (*Contribuição Social sobre o Lucro Líquido,* CSLL). Capital and operating expenditures are subject to a state value added tax (*Imposto sobre Circulação de Mercadorias e Serviços*, ICMS) and federal tax (*Programa de Integração Social/Contribuição para o Financiamento da Seguridade Social*, PIS/COFINS), which are recovered in full through other federal taxes (withholding tax, income tax and social contribution). Due to limitations on recoverability for exporting companies, only 10% of ICMS credits generated are treated as recoverable.

The base case assumes that the Serrote Mine is eligible for the *SUDENE* program, which encourages economic development in Northeast Brazil. This incentive program provides for a 75% reduction in the base income tax rate, for a period of 10 years from the start of operations.

The base case also includes the Drawback Regime consisting of the deferral of the taxes generated by products that are used in the production process of exported goods (copper concentrate). The Drawback Regime is designed to stimulate exports by exemption of taxes related to imports and acquisitions in the internal market (PIS/COFINS for domestic purchases). The most relevant goods that will be purchased under the Drawback Regime are explosives, reagents, mill liners and mill balls. The recovered taxes are shown as a tax rebate in the operating costs. The recovery rates are specified in a tax report by KPMG Assessores Ltda. (2020).

The base case also includes benefits from the Alagoas State integrated development program (*Programa de Desenvolvimento Integrado*, Prodesin) into which MVV was accepted on 22 May 2012. Among others benefits, this allows the deferral of the ICMS on imports and domestic acquisitions related to MVV's capital expenditure.

An interstate tax is due to the state of origin, which is not covered by the Prodesin (this can be converted into a tax credit), and the difference between what would be due in an internal purchase and what was paid to the other state, should be paid by the state of Alagoas. This difference is also deferred by the Prodesin Regime.

22.3.4 Royalties and Surface Rights

Brazilian Mineral Resources are property of the Federal Union, and the exploitation of Mineral Resources requires financial compensation to the Federal Union, the States, the Federal District and the Municipalities. Surface ownership does not imply rights over the mineral product, however, the landowner is ensured participation in the results of mining activities.

During the mining operation, the main financial obligation arising from mineral rights is the Compensação Financeira pela Exploração de Recursos Minerais (CFEM, Financial Compensation for the Exploitation of Mineral Resources). The CFEM is a royalty payment levied on the economic use of Mineral Resources and is payable on the value of the sale of the mined product. For MVV the CFEM rate is 2% NSR for copper and gold.

According to Brazilian mining legislation, mineral rights holders have the right to use and access the areas to be explored and mined. This includes rights of way and easements over public and private lands. The landowner or any other holder of the surface rights where the mineral deposit is located is entitled to a royalty equivalent to 50% of the CFEM paid (for MVV 1% NSR for copper and gold).

The instrument established by the Mining Code to establish surface rights for mining companies is the Servidão Mineral (mining easement or right of way). MVV applied for the Servidão Mineral in September 2018. The owner of a mining concession must apply for the area deemed necessary to conduct its business, and the application is reviewed by the National Mining Agency. The Servidão Mineral provides undisputable access to the land required for use by a mining project, including the mine and plant area, all ancillary facilities and infrastructure and areas outside the mineral concession itself.

Funds managed by Appian Capital have acquired a 35% gross revenue royalty on all proceeds from gold sales as part of the funding for the construction of the Mine, effective throughout the LOM.

22.4 Economic Analysis

The unleveraged LOM base case Project cash flow is presented in Table 22-1. The NPV at an 8% discount rate is estimated at US$540 million. Copper revenue represents 93% of metal revenue, and gold revenue is estimated to be 7% of metal revenue.

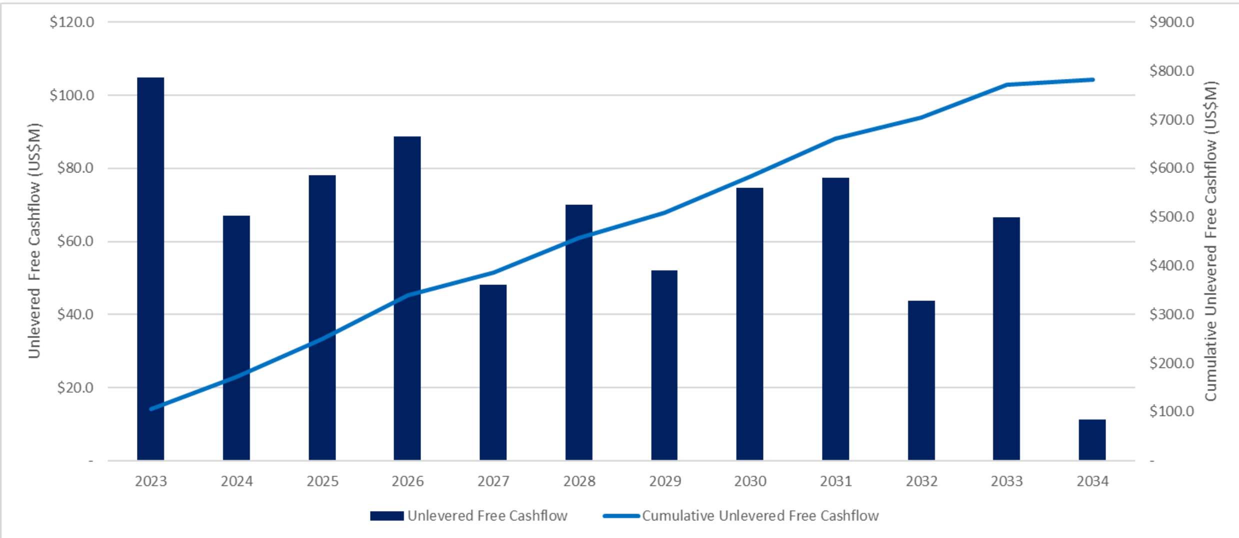
The annual base case cash flows are shown in Figure 22-1 and Table 22-2.

Internal rate of return (IRR) and Project payback years are not applicable in this case since the initial capital costs have been expended and are considered sunk costs.

Table 22-1: LOM Unlevered Free Cash Flow Summary
ACG Acquisition Company Limited – Serrote Mine

Item	LOM Total (US$M)
Copper revenue	1,825.5
Gold revenue	145.0
Hedges	9.6
Royalties	(108.7)
Smelting and freight	(151.0)
Net Smelter Return	1,720.4
Mining	(222.9)
Processing	(327.6)
General and administration	(125.9)

Item	LOM Total (US$M)
Pre-Tax Cash Earnings	1,044.0
Income taxes	(138.4)
After-Tax Cash Earnings	905.6
Sustaining capital and closure	(131.6)
Working capital	6.7
Unlevered Free Cash Flow	**780.7**
Net Present Value After Tax at Discount Rate of 8%	**540.3**



Source: MVV, 2023.

Figure 22-1: LOM Unlevered Free Cash Flow

Table 22-2: Base Case Life-of-mine Annual Cash Flow
ACG Acquisition Company Limited – Serrote Mine

	LOM Total	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Operating Statistics													
Total ore and waste mined (Mt)	**121.2**	11.5	12.1	12.7	12.5	12.7	12.7	12.7	12.7	6.8	7.6	5.9	1.3
Ore processed (Mt)	**46.7**	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	1.6
Copper grade (%)	**0.59**	0.73	0.55	0.56	0.60	0.55	0.57	0.55	0.59	0.60	0.60	0.55	0.56
Gold grade (g/t)	**0.10**	0.12	0.10	0.10	0.10	0.09	0.10	0.09	0.09	0.10	0.08	0.09	0.11
Copper conc. produced (k dmt)	**638.8**	97.4	60.1	61.0	52.7	47.7	49.3	47.7	51.6	52.3	52.3	47.7	18.8
Copper, payable (Mlb)	**498.0**	51.6	43.7	44.2	45.0	37.2	45.6	37.2	46.5	45.7	37.2	46.5	17.7
Gold, payable (koz)	**88.5**	8.1	8.2	8.6	8.2	6.9	8.7	6.9	7.3	8.3	5.6	8.3	3.5
Cash Flows (US$M)													
Copper revenue	**1,825.5**	179.8	168.7	172.5	174.5	137.0	163.8	133.6	167.0	164.2	133.6	167.0	63.6
Gold revenue	**145.0**	13.9	14.2	14.0	13.1	11.4	14.0	11.1	11.8	13.5	9.0	13.4	5.7
Hedges	**9.6**	9.1	0.5	-	-	-	-	-	-	-	-	-	-
Royalties	**(108.7)**	(10.5)	(10.3)	(10.4)	(10.1)	(8.3)	(10.1)	(8.1)	(9.4)	(9.9)	(7.3)	(10.0)	(4.0)
Smelting and refining	**(151.0)**	(22.3)	(14.8)	(14.6)	(12.5)	(10.4)	(12.6)	(10.3)	(12.8)	(12.7)	(10.3)	(12.9)	(4.9)
Net Smelter Return	**1,720.4**	169.9	158.3	161.6	165.0	129.6	155.0	126.3	156.6	155.1	125.0	157.6	60.4
Mining costs	**(222.9)**	(22.8)	(25.5)	(18.4)	(18.7)	(18.3)	(19.3)	(19.5)	(20.4)	(16.9)	(18.4)	(16.9)	(7.9)
Processing costs	**(327.6)**	(29.5)	(30.3)	(28.0)	(27.8)	(27.8)	(27.9)	(27.7)	(27.7)	(27.5)	(27.5)	(27.3)	(18.5)
General and administrative costs	**(125.9)**	(14.1)	(12.1)	(11.0)	(11.2)	(11.2)	(10.7)	(10.7)	(10.7)	(10.1)	(10.1)	(10.1)	(3.7)
C1 cash cost (US$/lb Cu)[1]	**1.37**	1.45	1.57	1.31	1.27	1.51	1.24	1.53	1.29	1.17	1.54	1.16	1.65

	LOM Total	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
C1 cash cost	**682.4**	74.9	68.5	58.1	57.0	56.3	56.5	57.0	59.9	53.7	57.4	53.8	29.3
EBITDA[3]	**1,044.0**	103.5	90.5	104.1	107.4	72.3	97.1	68.4	97.8	100.6	68.9	103.2	30.3
EBITDA margin (%)	***53***	*51*	*49*	*56*	*57*	*49*	*55*	*47*	*55*	*57*	*48*	*57*	*44*
Income taxes	**(138.4)**	(6.4)	(5.6)	(4.5)	(4.1)	(5.9)	(14.8)	(10.7)	(15.2)	(14.8)	(19.0)	(31.3)	(6.1)
Working capital	**6.7**	15.2	0.2	(0.8)	(0.4)	0.1	0.0	0.0	0.3	(1.2)	0.2	(0.2)	(6.6)
Sustaining capital	**(131.6)**	(18.3)	(14.4)	(16.9)	(12.0)	(16.0)	(12.6)	(5.9)	(8.8)	(6.9)	(5.8)	(4.6)	(9.3)
AISC (US$/lb Cu)[2]	**1.85**	2.01	2.13	1.93	1.76	2.17	1.74	1.91	1.68	1.54	1.90	1.47	2.41
AISC	**922.7**	103.7	93.2	85.3	79.1	80.7	79.3	71.1	78.0	70.6	70.5	68.4	42.6
Unlevered Free Cash Flow	**780.7**	**94.0**	**70.7**	**81.9**	**90.9**	**50.5**	**69.7**	**51.8**	**74.1**	**77.6**	**44.3**	**67.1**	**8.2**
Cumulative Cash Flow		94.0	164.6	246.5	337.4	387.9	457.6	509.4	583.5	661.2	705.4	772.5	780.7
NPV @ 8% discount rate	**540.3**												

Note:

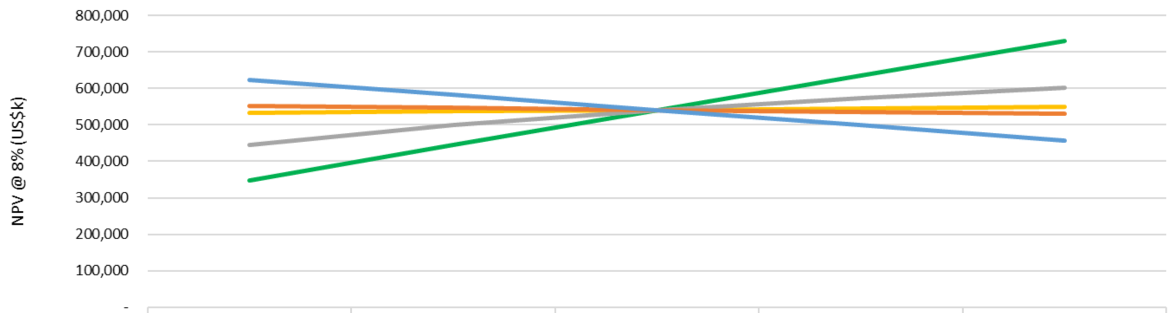
1. C1 cash cost = cash operating costs less net by-product credits.
2. AISC = all-in sustaining costs, which are C1 cash cost plus royalties and sustaining capital expenditures.
3. EBITDA = earnings before interest, taxation, depreciation, and amortization.

22.5 Sensitivity Analysis

The sensitivity of the Mine to changes in metal prices, exchange rate, sustaining capital costs and operating cost assumptions was tested using a range of 20% above and below the Base Case values.

22.5.1 NPV Sensitivity

The sensitivity to NPV is shown in Figure 22-2. The Serrote Project is most sensitive to the copper price, followed by operating costs. Sensitivity to grade is the same as for price because of the relationship between the grade, the product and the metal price.



	-20%	-10.0%	0.0%	10.0%	20.0%
Copper price	$347,911	$444,760	$540,300	$635,229	$729,840
Gold price	$532,224	$536,463	$540,300	$544,830	$548,948
FX	$445,659	$498,850	$540,300	$574,038	$601,891
Sust. capex	$551,662	$546,155	$540,300	$535,141	$529,617
Opex	$622,733	$581,663	$540,300	$498,993	$457,297

Source: MVV, 2023.

Figure 22-2: NPV Sensitivity

22.5.2 Discount Rate Sensitivity

The sensitivity of the Mine NPV to the cost of capital was tested using discount rates of 5% and 10% (Base Case discount rate, 8%). Table 22-3 shows the impact of these discount rates.

Table 22-3: Discount Rate Sensitivity
ACG Acquisition Company Limited – Serrote Mine

Discount Rate	NPV After Tax (US$M)
Cumulative net cash flow	781
5% discount rate	614
8% discount rate (Base Case)	**540**
10% discount rate	500

Note: Base case is bolded.

22.6 CP Comments on "Item 22: Economic Analysis"

Financial analysis on the Serrote Mine demonstrates positive economics and Project viability. The Serrote Mine is most sensitive to the copper price, followed by the operating costs. Sensitivity to grade is the same as for price because of the relationship between the grade, the product, and the metal price.

23.0 ADJACENT PROPERTIES

There are no adjacent properties to report in this section.

24.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this CPR understandable and not misleading.

25.0 INTERPRETATION AND CONCLUSIONS

25.1 Geology and Mineral Resources

- As of December 31, 2022, inclusive of Mineral Reserves, Measured Mineral Resources for open pit operations are estimated to total 61,415 thousand tonnes (kt) at 0.55% copper (Cu) and 0.10 g/t gold (Au), and Indicated Mineral Resources are estimated to total 35,254 kt at 0.53% Cu and 0.08 g/t Au. In addition, Inferred Mineral Resources are estimated to total 4,883 kt at 0.52% Cu and 0.07 g/t Au.
- Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves (CIM (2014) definitions were followed for Mineral Resources.
- The Serrote deposit and Caboclo exploration target are examples of mafic–ultramafic magmatic copper sulphide deposits and are very well understood by the MVV staff. Caboclo is located approximately 20 km from the Serrote processing facilities.
- Protocols for drilling, sampling preparation and analysis, verification, and security meet industry standard practices and are appropriate for the purposes of a Mineral Resource estimate.
- Drill programs included insertion of blank, duplicate, and standard reference material samples.
- The QA/QC program as designed and implemented by Serrote and Caboclo is adequate, and the assays values are suitable for use in Mineral Resources estimate.
- Data have been validated using numerous checks that are appropriate and consistent with industry standards.
- Database construction and security were adequate.
- The geological models are reasonably constructed using available geological information and are appropriate for Mineral Resource estimation.
- The assumptions, parameters, and methodology used for the Serrote Mineral Resource estimate are appropriate for the style of mineralisation and proposed mining methods.
- Drilling was completed at regularly spaced intervals over the mineralisation and is considered representative of the deposits.
- Sample collection, preparation, analysis and security for reverse circulation (RC) and core drill programs are in line with industry-standard methods for copper–gold deposits.
- The use of wet samples for density measures is acceptable because the Mine rock types typically have <1% porosity when fresh, thus the wet and dry densities are very much the same.
- Exploration completed to date is appropriate and has been adapted to the local regolith development. The programs have identified the Serrote deposit and Caboclo exploration target and most of the exploration results have been followed up with drilling.
- Queimada Bonita prospect has anomalous copper, gold, and nickel values that warrant additional investigation.
- The Caboclo area presents a reasonable potential that should be considered for further exploration, such as the Rogério, Petrúcio, and Zezé targets.

25.2 Mining and Mineral Reserves

- As of December 31, 2022, the Mineral Reserves were estimated as:
  - Proven Mineral Reserves: 41.17 million tonnes (Mt) at 0.59% Cu and 0.10 g/t Au
  - Probable Mineral Reserves: 5.56 Mt at 0.54% Cu and 0.08 g/t Au
  - Total Mineral Reserves: 46.73 Mt at 0.58% Cu and 0.10 g/t Au
- The Mineral Reserve estimation for the Mine incorporates industry-accepted practices and is reported using CIM (2014) definitions.
- Measured and Indicated Mineral Resources that were classified by material type as sulphide were converted to Mineral Reserves. Inferred Mineral Resources in sulphide and material classified as oxide were considered as waste. Only copper and gold economic values were considered.
- The Mineral Reserve estimates are based on detailed pit limit designs, which were validated by a life-of-mine (LOM) mine plan.
- A sensitivity analysis established that the Serrote open pit limit geometry is robust in the north, east, and west parts of the open pit for a wide variation of the design parameters, due to the orebody geometry. This part of the orebody is higher grade and has a lower stripping ratio. In contrast, the geometry of the south part of the pit is more sensitive to changes in the design parameters.
- Information that affects the cut-off grades used for estimating the Mineral Reserves include the copper and gold metal prices, exchange rates, overall mine and process plant variable and fixed costs, and copper concentrate transport, smelting, refining, and processing costs.
- The CP is not aware of any other factors that could materially impact the estimate of the Mineral Reserves for Serrote that are not presented in this CPR.
- Mining operations are conducted year-round. The Serrote Mine has been developed as a conventional open pit operation using conventional equipment. The Serrote pit will be developed in five phases. The current mine plan was prepared using a peak mine production rate of 12.7 million tonnes per annum (Mt/a) and a mine operating life of 12 years. Ore is delivered to the crusher pad adjacent to the process plant at an average rate of 11,390 tonnes per day (t/d) or 4.1 Mt/a.
- Mining is carried out by a contractor that supplies its own fleet of mining equipment up to the end of 2024; from 2025 onwards, MVV will own and operate a new fleet. The equipment type and size selection were carried out by MVV, and both the contractor and MVV fleets will be of compatible sizes.
- Mining activities will generate four types of overburden/waste materials: topsoil, saprolite (overburden), transitional weathered rock, and waste rock. There will be one waste rock storage facility (WRSF), an oxide material stockpile, and a temporary sulphide ore stockpile.

25.3 Mineral Processing

- The process plant using Woodgrove flotation cells, until recently, had not been able to reproduce the copper recovery or concentrate grades achieved in the metallurgical testwork that was carried out up to the end of 2020. The flowsheet changes implemented in July 2022 resulted in an increase in recovery to the design levels; however, the concentrate grades continue to be lower than design.

- The testwork carried out by SGS Geosol in 2022 showed the potential for significantly increasing concentrate grade and increasing recovery. The work also showed that an increase in the impeller tip speed in the conventional laboratory cells increased recovery.
- Pilot scale testwork carried out by Woodgrove in 2022 showed the recovery could be improved by increasing the impeller tip speed and using a different gangue depressant; however, the improvement did not indicate that the design recovery or concentrate grades could be achieved.
- A large proportion of the copper losses occur in liberated copper minerals <5 µm and >40 µm in size and copper minerals locked in complex gangue particles. Laboratory testwork has shown high recoveries and concentrate grades can be achieved with selective regrinding and additional flotation residence time in conventional cells.
- The Caboclo material appears to be similar to the Serrote ore and responded well to the original flowsheet designed for Serrote. Future testwork should take into consideration the lessons learned in the Serrote plant.
- In spite of lower copper recoveries during Serrote's ramp-up period, copper in concentrate production has been either in line or above plan.

25.4 Infrastructure

- The Serrote Mine is accessed via paved roads from the cities of Craíbas and Arapiraca. Road access is used for the supply of materials and equipment to the mine site and for transporting concentrate to the port of Maceió approximately 140 km from the Mine site. Concentrate has been transported to the port of Maceió since the first shipment in Q4 2021.
- Existing infrastructure includes the gatehouse, trucker support building, change house, administration offices, workshop offices, first aid post, kitchen/canteens, process plant with workshop, laboratory, process control room, main workshop building, tire shop, welding area, drilling maintenance bay, fuel station, wash bay, and power sub-station. All infrastructure construction necessary for the Serrote Mine operations was completed by the end of 2021.
- No on-site accommodation is available. Employees and contractors reside in Arapiraca, Craíbas and surrounding communities. Arapiraca is the second largest city in Alagoas and had an estimated population of 233,000 inhabitants in 2020.
- Electrical power is supplied via a 21 km long powerline that connects the Serrote sub-station with the national grid at the Arapiraca III substation. Plant emergency power is provided by a 480 V packaged diesel generator located in the thickening and filtration substation. Emergency power supports critical loads only, and does not maintain production.
- MVV is tied into the CASAL (the Alagoas state water utility) pipeline that provides the water supply for Arapiraca. The pipeline feeds a freshwater reservoir on site. Process water is supplied from a combination of recirculated flow from the thickeners, water reclaimed from the tailings storage facility (TSF), and water contained in the run-of-mine (ROM) material. Fresh water is used to top up this supply when required.
- Water management infrastructure was designed to Brazilian standards. Structures specifically requiring diversion drainage management are the sulphide and oxide stockpiles, the WRSF and the open pit.

25.5 Environment

25.5.1 Environmental

- The environmental impacts of the Serrote Mine were identified and evaluated for the construction, operation and closure stages, along with proposals for control, mitigation, monitoring and environmental compensation actions.
- The Mine has undergone an independent Environment and Social Due Diligence review process against national legislation and international standards (including IFC Performance Standards, Equator Principles, and Good International Industry Practice). MVV has implemented an action plan to address the findings which includes quarterly audits to assess status of actions identified in the Environmental and Social Action Plan (ESAP).
- Tailings geochemistry studies to date indicate Phase 2/3 and Phase 4 tailings are non-acid-generating and have a low potential for metal leaching, consistent with Phase 0/1 tailings. Additional geochemical characterization is ongoing to augment the existing understanding, characterize metal solubilization aspects of the mine rock, pit walls, and tailings, and inform management strategies. Results will be integrated into a water balance and water quality effects model extending site-wide and into the receiving environment.
- MVV commissioned the consulting group Ferreira Rocha to prepare an updated Environmental and Social Impact Assessment (ESIA) and Environmental Social Management Plan, who then completed the document in June 2022. MVV is using the updated ESIA to guide development of ongoing environmental and social management plans.
- MVV has legal requirements for monitoring air quality, climate, ambient noise and vibration, water quality, and flora and fauna. The monitoring programs are stipulated in the Mine's Environmental Control Plans (PCAs); these documents were submitted to the state environmental agency during the Mine's installation licence permitting process.

25.5.2 Permitting

- MVV advised on May 21, 2021, that Project permitting is up to date with all permits for the operations phase obtained. The Operating Licences for the Operations Phase of the Mine and for Mineral Processing and Tailings Management were issued by the state environmental agency on May 27, 2021, and will be due for renewal in May 2025.

25.5.3 Closure

- The most recent site-wide update of the Mine's conceptual closure plan and associated cost estimate was carried out in January 2023. Per the Project's Operating Licence issued May 27, 2021, an updated closure plan shall be submitted at the time of licence renewal in early 2025.
- A total of US$18.8 million (R$98.1 million at an exchange rate of R$5.21 per US$1) is assumed in the cost model for closure.

25.5.4 Social

- There are 14 communities within the area of direct Project influence. MVV is in constant communication with the residents, and holds regular community meetings, under the company's Social Dialogue Initiative. MVV uses the WhatsApp messaging application as a tool to support communications between the communities and MVV's community relations team.
- A resettlement program was undertaken from 2012 to 2020, under which 153 families residing in the area needed for the mining operations were resettled. To the Effective Date of the CPR,

MVV has no record of complaints and/or complaints lodged using the Grievance Mechanism in relation to the resettlement process. MVV maintains an ongoing social dialogue with the resettled families including regular meetings.

- A Grievance Mechanism is in place. MVV has a contract with a specialized third-party, which guarantees confidential treatment of information. A computer database records and monitors the stakeholder communications, and MVV's responses, agreements and commitments adopted.
- MVV has a Stakeholder Engagement Plan in place that set out the company's guidelines for addressing stakeholder concerns, stakeholder communications, and stakeholder relationships. The plan is constantly updated to reflect the Mine development stage, scenario changes, stakeholder profiles, and the type and nature of stakeholder feedback.
- MVV instituted an "Open Doors" (Portas Abertas) program which consisted of guided tours of the Mine that provided external stakeholders with Project-specific information, in particular, on aspects of the environmental and engineering disciplines. The Open Doors program extends to general community-related information updates on the Mine. These include individualized information provision to stakeholders, weekly information emails, and monthly newsletters on social and environmental actions. MVV is also active in the print and social media spheres to ensure that all stakeholders remain informed as to MVV's activities.
- MVV developed a portfolio of social projects in conjunction with communities in the area of direct Project influence, which focused on the areas of social entrepreneurship, environmental education, science and technology.

25.5.5 TSF

- The TSF is a conventional cross-valley TSF to be constructed in two phases. Construction of the TSF first phase was competed during January 2021. Operations at the TSF began in mid-June 2021 and are ongoing. Phase 1 will operate for four years from the commencement of operations in June 2021; Phase 2 will operate for the remaining LOM and will require a dam raise, which is anticipated to be completed in two raises, one 4 m raise and a final 3 m raise.
- The Mine will produce approximately 54 Mt of ore over the 14-year mine life, and the TSF was designed to contain the LOM tailings volume. However, if additional resources are discovered during the LOM, additional tailings storage capacity may be required beyond the currently proposed final TSF design.
- The TSF has been designed and operated in accordance with all applicable Brazilian regulations, as well as to meet the Canadian Dam Association (CDA0 guidelines considered international standard. Operations at the TSF follow the strict governance framework put in place by MVV, which meet regulations defined by the national dam policy of the Ministry of the Environment, and the laws and regulations of the Agência Nacional de Mineração (ANM0. Operating permits for Tailings Management were issued by the state environmental agency on May 27, 2021, and will be due for renewal in May 2025. The facility is currently registered as "In Operation" as of June 20, 2022, with ANM. Application for "Granting of Water Works" required for the TSF Phase 2 raise was submitted on September 22, 2022; the permit is currently in processing.
- Geotechnical instrumentation records of the dam are within the expected parameters. Increases in piezometric levels were recorded on the upstream slope and no piezometric levels were recorded on the downstream slope. The dam inclinometers did not register displacements above safety levels and the seepage flow remained constant throughout the year, indicating a good functioning of the internal drainage system. Water quality monitoring

indicate that seepage flows downstream of the dam meet environmental discharge regulations. Seepage flows are currently directly discharged to the downstream environment.

- Annual dam safety inspections indicate that the dam is performing well with minor damages to ancillary TSF features due to the major storm events that occurred at the site. Minor repairs include minor erosional damage repair on embankment slopes, finishing upstream riprap placement, establishing full vegetative cover on the downstream slope, minor repairs to the spillway, and abandonment of the seepage collection pond.

25.6 Markets and Contracts

- MVV has a single contract in place with a large global trader covering 100% of the copper concentrate production.
- Copper and gold are payable in the concentrates. At a projected 24% to 40% copper the Serrote concentrate is considered a high-grade concentrate and has attracted good terms from the off-taker. At a projected 2.55 g/t to 5.75 g/t Au, the gold content in the Serrote concentrates is relatively low and is suitable for all smelters/refineries.
- MVV's base case metal price assumptions are considered to be in line with the periodic forecasts of future copper and gold prices prepared by several banking institutions and research analysts. The forecasts used vary for the period 2023–2026, reverting to long-term pricing in 2027. The long-term prices include US$3.59/lb Cu and US$1,615/oz Au. The long-term Brazilian reais to US$ exchange rate forecast used in the economic analysis is 5.55.
- The open pit mining contract is with Fagundes Construção e Mineração S/A.

25.7 Costs and Economics

The Serrote Mine was built from 2019 to the end of 2021 at an estimated capital cost of $194.5 million with all taxes included. The cost accounts for all infrastructure necessary to begin operations such as the processing plant, initial tailings dam facility, mining pre-production, administration buildings and warehouse, plus Owner's costs and commissioning. Process plant capacity was designed at 4.1 Mt/a.

MVV declared commercial production on December 27, 2021, and the mine has been operating continuously since then. This CPR considers a mine plan with a start date of January 1, 2023. All capital costs in the LOM plan are considered as sustaining capital.

- The sustaining capital cost over the LOM is estimated to be US$132 million, including costs related to mining, process plant, tailings storage facility expansion, and mine closure.
- The LOM operating cash cost is estimated to be US$14.60/t ore processed, and the all-in sustaining cost (AISC) is estimated at US$19.74/t ore processed which is equivalent to $1.85/lb Cu payable.
- Annual operating costs range from US$59 million to US$74 million for full years of operation with variations in costs mainly attributable to mining costs, which vary due to strip ratios and equipment life cycles.

The cash outflows and inflows for the base case were estimated to calculate the NPV.

- The undiscounted unlevered free cash flow is estimated at US$781 million. The NPV after tax at a discount rate of 8% is estimated at US$540 million. IRR and Project payback years are not applicable in this case since the initial capital costs have been expended and are considered sunk costs as of Q4 2021.
- The Serrote Project is most sensitive to the copper price, followed by exchange rate. Sensitivity to grade is the same as for price because of the relationship between the grade, the product, and the metal price.

25.8 Risks and Opportunities

25.8.1 Risks

The CPs have assessed critical areas of the Mine and identified risks associated with the technical and cost assumptions used. These are summarized in Table 25-1.

Table 25-1: Risk Analysis Summary
ACG Acquisition Company Limited – Serrote Mine

Project Element	Issue	Mitigation
Geology and Mineral Resources	Tonnage and grade variation	Improve the mineralized wireframes, and knowledge of the structural geology and include major features in the 3D geological model.
Mining	Lower grades or tonnages mined	Expert mining contractor; backup equipment; time usage models; dispatch monitoring; experienced management team.
Processing	The proposed flowsheet changes do not provide the expected improvements in copper recovery and increased concentrate grades.	Continue laboratory and in-plant testwork. Consider future replacement of the Woodgrove cells with conventional tank cells.
TSF	Failure / Instability	Expert third-party design engineer of record appointed; downstream construction method; instrumentation in place; inspection/monitoring routines; seismology controls.
	Uncontrolled release of contact water during wet years due to emergency spillway capacity	Phase 2 TSF expansion design currently under way - emergency spillway capacity design is based on conservative assumptions to account for the unusual wet years plus very large storm events.
	Stopped production due to insufficient storage capacity	Phase 2 expansion design to be completed in Q3 2023. Completion of Phase 2-A (to crest elev. 248 masl) construction expected in Q2 2024. Construction of Phase 2B (to crest elev. 251 masl) is expected to be completed in 2027 and it will be able to store the expected LOM production of 54Mt.
	Compliance with new regulations and industry standards, including GISTM	Early planning in future designs; currently working toward compliance with GISTM.

25.8.2 Opportunities

A summary of the Mine related opportunities identified by the CPs in their review is shown in Table 25-2.

Table 25-2: Opportunities
ACG Acquisition Company Limited – Serrote Mine

Area	Opportunity	Comment
Geology and Mineral Resources	Update metal prices	The metal prices used to constrain Mineral Resources could be updated with higher prices which could enlarge the resource pit-shell.
	Caboclo	This project is in the advanced exploration stage, and future Mineral Resources estimates should add resources.
Mining and Mineral Reserves	Pit layback	Potential exists to capture additional mineralisation, currently outside the Mineral Reserves pit boundary by reviewing the mine design to incorporate additional pit laybacks.
	Oxide material	Oxide mineralisation is estimated as part of the Mineral Resources but is not included in the current mine plan. This material has potential to be included in the mine plan if studies support that oxide leaching and solvent extraction/electrowin cathode production on-site is economic.
	Caboclo	Mineralisation at the Caboclo exploration target is not included in the current mine plan. There is potential, with additional metallurgical testwork and technical studies to incorporate this mineralisation into mine planning.
Metallurgy and Processing	Magnetite recovery	Magnetite within the tailings represents a potentially saleable product that should be investigated with testwork and technical studies.
	Accelerate program of flowsheet improvements to bring earlier copper recovery and concentrate grade improvements.	This will require a more aggressive testwork and capital expenditure program.

26.0 RECOMMENDATIONS

26.1 Geology and Mineral Resources

GeoEstima has the following recommendations for Geology and Mineral Resources

1. Update the Mineral Resource estimate with the results of the ongoing drilling program. The new drilling information may better define the limits of mineralisation, increase the volume of material in the deeper portion of the deposit, and upgrade the resource classification in some areas, thus increasing the life of the mine.
2. Improve the modelling and knowledge of the copper oxide zone at Serrote and investigate process options.
3. Build a detailed structural model and structural domains in order to customize local search anisotropies and directions.
4. Review the existing geochemical data in the Caboclo area to confirm lateral extents of mineralized bodies and infill the existing drill spacing gaps. The review should include the new data from the 2021 up to 2022 drilling campaign.
5. Develop metallurgical testwork program to check the Caboclo recovery assumptions.
6. Estimate Mineral Resources for the Caboclo area, which has good potential to extend the Serrote Operation.
7. Update the Mineral Resource pit shell and cut-off inputs based on current economic parameters.
8. Review cut-off input parameters to have a consistent baseline with the Mineral Reserve inputs in future resource updates.
9. Investigate the potential contamination observed in some blank samples for copper at ALS Chemex.

26.2 Mining and Mineral Reserves

1. The Serrote Mine is in the process of compiling updated geotechnical and hydrogeological information and studies. Geotechnical drill holes and Mineral Resource drill holes have been completed and further holes are planned. Once these studies are complete new open pit optimizations can be reviewed, using applicable long-term projections for input parameters such as metal prices, exchange rates and operating costs. A new mine plan and processing schedule would then be generated for input to a revised financial model for the Mine. The objective would be to review whether a substantial pushback to the south end of the open pit is justified. This study is estimated at US$3 million to complete, including drilling.

26.3 Mineral Processing

The CP is in agreement with the MVV testwork program and plan to improve and stabilize plant operations and performance, which includes the following components:

1. Fine tune plant controls.
2. Operate the high intensity grinding (HIG) mills at the optimum point (including classification effectiveness).
3. Improve understanding of the geometallurgy of the feed and the metallurgical response of each lithology type and head grade.

4. In 2023, to improve the copper grade in the concentrate, install a dedicated cleaner cell (tank cells in the range between 20 m^3 and 50 m^3 are available) for enrichment of the first rougher 1 concentrate (from around 24% Cu to >35%Cu with 90% recovery in the stage). This will increase the overall copper grade in the concentrate to 30% when combined with the cleaner 2 concentrate.
5. In 2024 and 2025, install one additional cleaner tank cell to improve the overall concentrate grade to 32% Cu.
6. In 2026, install a four stage cleaner circuit using tank cells with impellers with higher tip speeds to produce a 40% Cu concentrate.
7. Carry out locked cycle tests (LCT) and pilot plant testwork to further investigate the optimum cleaner circuit configuration and test higher flotation cell impeller tip speeds. The latter has been tested on conventional cells in the laboratory and at pilot scale for the Woodgrove cells with encouraging results. The goal is to produce a final concentrate of around 40% Cu, while maintaining recovery between 84% and 85%.

26.4 Infrastructure

There are no recommendations related to infrastructure.

26.5 Environment

1. Start the TSF Phase 2 embankment raise to crest elevation 254 masl construction in Q4 2023, so it is complete on or before the end of Q3 2024. The TSF embankment raise design should be based on conservative assumptions related to the upstream catchment's degree of saturation and should include a spillway design that adheres the updated Brazilian regulations (ANM, 2022), the relocation of the discharge system (i.e., spigots) to the crest of the embankment, and the development of a tailings beach over water. The design of this phase is underway, and completion is expected by Q3 2023.
2. Keep the water licence (required to capture fresh water from the Salgado stream in the TSF) active in case demand for fresh water cannot be met by CASAL at any point in time.
3. For the next closure cost revision, which must be reviewed and updated every five years, incorporate borrow and organic soil cover requirements and sourcing to assess the need to extend post-closure activities beyond five years for certain facilities such as the TSF.
4. Based on climate data, is it reasonable to assume a large portion of the TSF will remain inundated with only the outer edges requiring cover material placement. Once a quantitative water balance is completed to confirm this assumption, conduct a review of the closure plan and adjust the cost estimate accordingly.

27.0 REFERENCES

ALS Metallurgy, 2020a: Metallurgical Testing for the Serrote Project: Report prepared by ALS Metallurgy for Appian Capital Advisory LLP, February 21, 2020

ALS Metallurgy, 2020b: Metallurgical Testing for the Serrote Project – Variability Testing, Report KM6062, Revision 2: Report prepared by ALS Metallurgy for Appian Capital Advisory LLP, August 5, 2020

ALS Metallurgy, 2020c: Metallurgical Testing for the Serrote Project – Addendum Report, KM6062 Addendum: report prepared by ALS Metallurgy for Appian Capital Advisory LLP, October 20, 2020.

ALS Metallurgy, 2020d: Metallurgical Testing for the Serrote Project – Tailings Generation, Report KM6241: report prepared by ALS Metallurgy for Appian Capital Advisory LLP, December 22, 2020.

Amorim, J.L., 1995: Programa Levantamentos Geológicos Básicos do Brasil. Arapiraca, Folha SC.24-X-D-V. Estado de Alagoas. Escala 1:100.000, Brasília, CPRM.

Arcadis, 2022: Closure Plan Serrote Mine, Mineracao Vale Verde, 1.08.01.35898-FM-RT-0003-Rev.2, October 2022.

Beaudry, C., 2008: Arapiraca Project: Review of QAQC Procedures and Results and Proposal for the Manufacture of Project Pulp Standards: internal report prepared for Aura Minerals Inc., Mineração Vale Verde Ltda, 12 May 2008, 65 p.

Berrocal J., Assumpçao M. ,Antezana R., Dias Neto C. M., Ortega R., França H., and Veloso J.A.V., 1984: Sismicidade do Brasil: Institute Astronômico e Geofísico, São Paulo, Brazil.

Bieniawski, Z.T., 1989: Engineering Rock Mass Classifications: A Complete Manual for Engineers and Geologists in Mining, Civil, and Petroleum Engineering: Wiley, 1989.

Brito, R.S.C., Amorim, J.L., Macambira, M.J.B., Leal, E.D., Pimentel, M.M., Silva Filho, M.A., Torres, H.H.F., Gioia, S.M.L. and Junges, S.L., 2003: Preliminary Sm-Nd and Pb-Pb isotopic data of the Fe-Cu-Au-bearing Serrote Da Laje Complex, Arapiraca, Alagoas, Brazil: Short Papers – IV South American Symposium on Isotope Geology, pp. 720–723.

Canadian Dam Association, 2014: Application of Dam Safety Guidelines to Mining Dams.

Canadian Institute of Mining, Metallurgy and Petroleum (CIM), 2014: CIM Definition Standards for Mineral Resources and Mineral Reserves, prepared by the CIM Standing Committee on Reserve Definitions: adopted by the CIM Council, May 2014.

Canadian Securities Administrators (CSA), 2011: National Instrument 43-101, Standards of Disclosure for Mineral Projects, Canadian Securities Administrators.

Canedo, G., 2009: Cobre Solúvel Relações com Demais Dados Analíticos e Descritivos e Sus Implicações – Serrote da Laje: internal report to MVV, 13 February 2009, 8p.

Canedo, G.F., 2016: Os depósitos Serrote da Laje e Caboclo (CU-au), Nordeste do Brasil: Sulfetos Magmáticos Hospedados em Rochas Ricas em Magnetita e Ilmenita Associadas a Intrusões Máficas-Ultramáficas: Masters thesis, University of Brasília.

Cawthorn, R.G., and Meyer, F.M., 1993: Petrochemistry of the O'Kiep Copper District Basic Intrusive Bodies, Northwestern Cape Province, South Africa: Economic Geology, v. 88, pp. 590–605.

CIMVAL, 2019: The CIMVal Code for Valuation of Mineral Properties, prepared by the Special Committee of the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) on the Valuation of Mineral Properties (CIMVAL), November 29, 2019.

Davis, B., 1995: Statistical Control for the Production of Assay Laboratory Standards: SME Preprint Number 95-17, 5 p.

Eckstrand, O.R., and Hulbert, L.J., 2007: Magmatic Nickel-Copper-Platinum Group Element Deposits: in Goodfellow, W.D., ed., Mineral Deposits of Canada: A Synthesis of Major Deposit Types, District Metallogeny, the Evolution of Geological Provinces, and Exploration Methods; Geological Association of Canada, Mineral Deposits Division, Special Publication No. 5, pp. 205–222.

ERM Consultants Canada Ltd (ERM), 2019: Serrote da Laje Copper Project, ESDD Report: report prepared by ERM for Endeavour Financial, dated 5 March 2019, 81 p.

ERM, 2020: Serrote da Laje Copper Project, ESDD Report: report prepared by ERM for Endeavour Financial, dated 15 Nov 2020, 91 p.

ERM, 2022. Serrote de Laje Monioring Report, Q4 2022 Monitoring Report; 16 February 2023.

Ferreira F., 2008: Projecto Serrote da Lage – Arapiraca Relatório de Avaialção do Model Metalogenético: internal report, Aura Minerals Inc. May 2008, 23 p.

Ferreira, G., 2016: Dissertacao Depositos de Cobre e Ouro do Serrote da Laje e Caboclo: Masters Thesis No. 370, University of Brasilia.

Ferreira Rocha, 2020: Environmental and Social Impact Assessment (ESIA) and Social Management Plan (ESMP): report prepared by Ferreira Rocha for MVV, dated 23 Dec 2020, in draft, 529 p.

Financial Conduct Authority, 2022: Primary Market Technical Note 619.1 Guidelines on disclosure requirements under the Prospectus Regulation and Guidance on specialist issuers, May 2022.

Foo, B., Jacobs, C., Spooner, J., Lewis, W.J., Major, K.W., and Lister, D., 2012: NI 43-101 Technical Report on the Feasibility Study for the Serrote da Laje Project, Alagoas State, Brazil: Report prepared by Micon International Limited for Aura Minerals Inc., effective date 15 October 2012, 314 p.

Gaspar, J.C., 2008: Cu-Au Ore from the Serrote da Laje Deposit: Chemical Composition and Ni Content in Minerals from Assay Products: report prepared by Serviços Geológicos e Representações Ltda. for Vale Verde Mineração, 9 p.

General Assembly of the United Nations, 1948: Universal Declaration of Human Rights, 10 December 1948.

Geoestrutural, 2022. Stability and Sizing Studies of Short, Medium and Long Term Wall Slopes of the Serrote Mine. 30 August 2022.

Horbach, R., 2007: Ore Resources of the Serrote da Laje Copper-Gold Deposit, A Review. v. I Text, pp. 1–57, v. II Annexes 1 to 16, and v. III Annexes 17 to 30.

Horbach, R. and Marimon, M.P.C., 1988: O depósito de Cobre de Serrote da Laje: Anais do XXXV Cogr. Brás. de Geol., Belém, Pará, V.1, pp. 1–15.

KPMG Assessores Ltda., 2020: Mineração Vale Verde Ltda., Serrote da Laje Project, Financial Model Tax Review, 3 April 2020.

Leal, E.D., Santana, R.R., Lira, M.B., Silva, J.J., 2002: O Deposito de Cobre do Serrote da Laje, Relatório Final de Avaliação GAVAK: Gerencia Técnica de Avaliação, Belo Horizonte, DOCEGEO.

Lorax, 2022: Technical Memorandum, Serrote -Phase 2/3 and Phase 4 Tailings Kinetic Study Update, Lorax Environmental, 17 May 2022.

Maier, W.D., and Barnes, S.J., 1999: The origin of Cu Sulphide Deposits in the Curaçá Valley, Bahia, Brazil: Evidence from Cu, Ni, Se, and Platinum-Group Element Concentrations: Economic Geology, v. 94, pp. 165–183.

McNulty, T, 1998: Developing Innovative Technology: Mining Engineering Magazine Society for Mining, Metallurgy & Exploration, October 1998, 6 p.

McNulty, T. 2014: Plant Ramp-Up Profiles an Update with Emphasis on Process Development: Canadian Institute of Mining, Metallurgy and Petroleum; Proceedings of the 2014 Conference of Metallurgists, 9 p.

MDGeo, 2022. Conceptual Hydrogeological Model Report of the Serrote Mine. August 29, 2022.

MTS et al., 2019: Serrote Project Alagoas State, Brazil, Technical Report: report prepared in NI 43-101 technical report format, prepared by I. Crundwell, T. Eggleston, E. Koniaris, D. Lister, A. Maycock, and J.C. Virgili on behalf of Crundwell Mineral Resource Consultants Inc., Mine Technical Services Ltd., Q'Pit Inc., Altura Environmental Consulting, MM Consultores Ltda., and Walm Engenharia e Tecnologia Ambiental for Mineração Vale Verde Ltda, effective date 17 January 2019

MTS et al., 2021: Serrote Operation, Bahia State, Brazil, NI 43-101 Technical Report, unpublished report prepared by T. Eggleston, I. Crundwell, A. Bradfield, A. Maycock, D. Lister, and D. Servigna for MVV, July 2021, 357 p.

MVV, 2018: Serrote da Laje and Caboclo Deposits: internal Mineração Vale Verde presentation, September 2018, 37 p.

MVV, 2022: Serrote Mine, Technical Request – Environmental Report – Water Resources Analysis, SR-0000-MAB-RT-0030, 1 December 2022.

MVV, 2022a: Serrote Project, Conditioning Services Report, Operation License No. 2021.27051149786.EXP.LON Serrote Mine, SR-0000-MAB-RL-9086, 26 May 2022.

MVV, 2023a: Legal Opinion – NI 43-101, provided by Bichara Advogados, 7 March 2023.

Oliveira, E.P., and Tarney, J., 1995: Genesis of Precambrian Copper-Rich Caraíba Hypersthenite- Norite Complex, Brazil: Mineral. Deposita, v. 30, pp. 351–373.

Qualitex Engenharia E Servicos, 2021. Relatorio Tecnico R. 12725.2021.V0 – Rejeito. Prepared for Mineracao Vale Verde LTDA, November 2021.

Qualitex, 2022: Mining Vale Verde Do Brazil LTDA, Technical Report 3751.2022, Ambient Air Quality Monitoring, Qualitex Engenharia E Servicos, February 2022.

Roscoe, W.E., 2007: Valuation of Non-Producing Mineral Properties Using Market Comparables: Proceedings of the Sixth Joint Business Valuation Conference of the Canadian Institute of Business Valuators and the American Society of Appraisers, Toronto, October 19-20, 2006; The Journal of Business Valuation 2007, pp. 207-231.

Roscoe, W.E., 2012: Metal Transaction Ratio Analysis – A Market Approach for Valuation of Non-Producing Properties with Mineral Resources. VALMIN Seminar Series Proceedings. The Australasian Institute of Mining and Metallurgy Publication Series No. 3/2012, pp. 85-94.

SCAN, 2007: Levantamento Magnetométrico Projeto Arapiraca Alvos Caboclo e Serrote Da Laje, prepared by SCAN – Consultoria e Projetos Ltda, Rio de Janeiro, Agosto 2007.

SGS Geosol, Flotation Testwork on Samples From The Serrote Industrial Plant Final Report 0788-2202 – 27 December 2022

SGS Minerals, 2011: An Investigation into the Recovery of Copper, Gold and Magnetite from Samples of the Caboclo Deposit: report prepared by SGS Minerals for Aura Minerals, July 8, 2011, 26 p.

SGS Canada, 2011: An Investigation into Geochemical Characterisation of Aura Serrote Tailings: SGS Canada Inc., 93 p.

Simpson, R.G., 2008: Mineral Resource Update, Serrote da Laje Copper-Gold Deposit, State of Alagoas, Brazil: Geosim Services Inc.

Simpson, R., 2009: Mineral Resource Update Serrote da Laje and Caboclo Deposits of the Arapiraca Copper-Gold-Iron Ore Project, State of Alagoas, Brazil: Geosim Services Inc., April 2009, Spring, V. and el-Rassi, D., 2007: Technical Due Diligence on The Arapiraca Copper-Gold Property, State of Alagoas, Brazil: report prepared by Watts, Griffis And McOuat Limited for Aura Gold Inc., 69 p.

Technoblast, 2022. Technical Report, Seismographic Monitoring, R-166/22, Mineracao Vale Verde Do Brasil LTDA, Technoblast Detonation and Seismography Services Ltd., October 2022.

VOGBR, 2007: Scoping Study (FEL 1) Estudos Geológico-Geotécnicos Dos Taludes Da Cava Do Alvo Serrote Da Laje: report prepared by VOGBR for DOCEGEO, 04AURA001-1-GL- RTE-0001 Rev 01.

VOGBR, 2008: Modelo Hidrogeológico Conceitual, Projeto Serrote da Laje: report prepared by VOGBR for DOCEGEO, relatório técnico nº 558-VO-200-222-002, Versão 00:

VOGBR, 2010: Estudos de viabilidade Bancável – Avaliação Geoténica dos Taludes da Cava, Volume II, Document no 4MVVL003-1-GT-RTE-0001, Version 00

VOGBR, 2011: Report Feasibility Study for Serrote da Laje Project: FEL II, document number VG11-142-1-GT-RTE-0002

VOGBR, 2012a: Recursos Hídricos & Geotecnia, Relatório Técnico Barragem de Rejeitos: report # SL-4120-CIV-RL-0101, prepared for Aura Minerals Inc., July 2012

VOGBR, 2012b: Recursos Hídricos & Geotecnia July 2012, Technical Report on Water Balance and Tailings Deposition Plan (Relatório Técnico Balanço Hídrico e Plano de Disposição de Rejeitos): report # SL-4120-CIV-RL-0102, prepared for Aura Minerals Inc.

Walm Engenharia e Tecnologia Ambiental, 2018a: Relatório Técnico de Revisão / Validação do Projeto Geotécnico da Cava a Céu Aberto, doc nº SR-1101-GEO-RL-0100

Walm Engenharia e Tecnologia Ambiental, 2018b: Plano de Gestão de Recursos Hídricos: documento nº SR-0000-GTC-RL-0100 Wood 2019: Relatório De Investigação Geotécnica: documento nº SR-3002-GTC-RL-1101: report prepared by Wood plc for MVV.

Wood, 2020: Tailings Deposition and Water Balance Modelling, SR-3002-CIV-RL-1102, Rev 4: report prepared by Wood plc for MVV.

WSP, 2021: Serrote EOR Dam Safety Inspection, internal Technical Memorandum prepared by WSP USA Environmental & Infrastructure Solutions, Inc. for MVV, 28 December 2022.

28.0 DATE AND SIGNATURE PAGE

This report titled "Competent Person's Report on the Serrote Mine, Alagoas, Brazil" with an effective date of December 31, 2022, was prepared and signed by the following authors:

	(Signed & Sealed) *David J.F. Smith*
Dated at Toronto, ON June 12, 2023	David J.F. Smith, CEng, FIMMM SLR Consulting (Canada) Ltd.
	(Signed & Sealed) *Orlando Rojas*
Dated at Santiago, Chile June 12, 2023	Orlando Rojas, AIG GeoEstima SpA
	(Signed & Sealed) *Andrew Bradfield*
Dated at Toronto, ON June 12, 2023	Andrew Bradfield, P.Eng. P&E Mining Consultants Inc.
	(Signed & Sealed) *Anthony Maycock*
Dated at Santiago, Chile June 12, 2023	Anthony Maycock, P.Eng. MM Consultores SpA
	(Signed & Sealed) *Daniel Servigna*
Dated at Denver, CO June 12, 2023	Daniel Servigna, P.E. WSP USA Environment & Infrastructure Inc.

29.0 CERTIFICATE OF COMPETENT PERSON

29.1 David J.F. Smith

I, David J.F. Smith, CEng, FIMMM, as an author of this report entitled "Competent Person's Report on the Serrote Mine, Alagoas, Brazil" with an effective date of December 31, 2022 (the CPR), prepared for ACG Acquisition Company Limited, do hereby certify that:

1. I am Global Technical Director – Mining, Mining Advisory with SLR Consulting (Canada) Ltd of 55 University Avenue, Suite 501, Toronto, Ontario, M5J 2H7, Canada.
2. I am a graduate of the University of Newcastle upon Tyne, United Kingdom with a BSc (Eng) in Mining Engineering.
3. I am registered as a Chartered Engineer in the UK with the Engineering Council and am a Fellow of Institute of Materials, Minerals and Mining (Membership #43860). I have worked as a mining engineer for over 40 years since my graduation. My relevant experience for the purpose of the CPR is:
    - Review and report as a mining consultant involved in numerous consulting and engineering assignments including; project technical evaluations, technical report preparation for project financing and fund-raisings, IPOs, merger and acquisitions, due diligence reviews and engineering studies from scoping to basic engineering
    - Numerous consulting assignments on gold and base metal mine development projects and operating mines
    - Senior positions with a leading international mining and tunnelling contractor, managing international mine and tunnel construction projects as well as developing a successful engineering consulting business.
    - Former Board director for an international mining consulting firm, responsible for leading the UK technical staff, and ensuring the technical quality of the firm's consulting assignments across the consulting division.
4. I have read the definition of "Competent Person" set out in the Financial Conduct Authority (FCA) Primary Market Technical Note 619.1 (FCA Technical Note) and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be a Competent Person for the purposes of the FCA Technical Note.
5. I have not visited the Serrote Mine.
6. I am responsible for overall preparation of the CPR, including Sections 2, 3, 23, and 24.
7. I am independent of ACG Acquisition Company Limited.
8. I have had no prior involvement with the property that is the subject of the CPR.
9. I have read CIM (2014) definitions and the FCA Technical Note, and the CPR has been prepared in compliance with these guidelines.
10. At the effective date of the CPR, to the best of my knowledge, information, and belief, the CPR contains all scientific and technical information that is required to be disclosed to make the CPR not misleading.

Dated this 12th day of June 2023

(Signed & Sealed) *David J.F. Smith*

David J.F. Smith, CEng, FIMMM

29.2 Orlando Rojas

I, Orlando Rojas, AIG, as an author of this report entitled "Competent Person's Report on the Serrote Mine, Alagoas, Brazil" with an effective date of December 31, 2022 (the CPR), prepared for ACG Acquisition Company Limited, do hereby certify that:

1. I am Director and Principal Consultant with GeoEstima SpA, of Floor 19, Edificio Parque Oriente, 5320 Alonso de Cordova, Las Condes Santiago, Chile.
2. I graduated from Universidad de Chile, Chile, in 1993 with a BSc (Science) in Geologist and from Ecole des Mines de Paris in 2001 with a Specialist in Geostatistics diploma (CFSG).
3. I am registered as a Geologist in Australia and Chile with the Australian Institute of Geoscientists (Membership #5543) and Comision Minera Chile (#285). I have worked as a geologist consultant for a total of over 30 years since my graduation. My relevant experience for the purpose of the CPR is:
   - Numerous consulting assignments related to mineral resources evaluation and geometallurgy on base metal and gold for exploration projects, mine development projects, and operating mines.
   - Senior position in a large mining company and executive positions in a mining corporation
   - Experience in mineral resource evaluation in other similar mineral deposits to Serrote
4. I have read the definition of "Competent Person" set out in the Financial Conduct Authority (FCA) Primary Market Technical Note 619.1 (FCA Technical Note) and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be a Competent Person for the purposes of the FCA Technical Note.
5. I visited the Serrote Mine on November 14 to 16, 2022.
6. I am responsible for Sections 1.1.1.1, 1.1.2.1, 1.3.1 to 1.3.5, 4.1 to 4.8, 4.10, 5 to 12, 14, 25.1, 26.1, and related disclosure (pertaining to Geology and Mineral Resources) in Sections 1.4, 25.8, and 27 of the CPR.
7. I am independent of ACG Acquisition Company Limited.
8. I have had no prior involvement with the property that is the subject of the CPR.
9. I have read CIM (2014) definitions and the FCA Technical Note, and the CPR has been prepared in compliance with these guidelines.
10. At the effective date of the CPR, to the best of my knowledge, information, and belief, Sections 1.1.1.1, 1.1.2.1, 1.3.1 to 1.3.5, 4.1 to 4.8, 4.10, 5 to 12, 14, 25.1, 26.1, and related disclosure (pertaining to Geology and Mineral Resources) in Sections 1.4, 25.8, and 27 of the CPR for which I am responsible contain all scientific and technical information that is required to be disclosed to make the CPR not misleading.

Dated this 12th day of June 2023

(Signed & Sealed) *Orlando Rojas*

Orlando Rojas, AIG

29.3 Andrew Bradfield

I, Andrew Bradfield, P.Eng., as an author of this report entitled "Competent Person's Report on the Serrote Mine, Alagoas, Brazil" with an effective date of December 31, 2022 (the CPR), prepared for ACG Acquisition Company Limited, do hereby certify that:

1. I am the Chief Operating Officer of P&E Mining Consultants Inc., of Suite 304, 201 County Court Blvd, Brampton, Ontario, Canada, L6W4L2.
2. I am a graduate of Queen's University, Kingston, Ontario, Canada, with an honours B.Sc. degree in Mining Engineering in 1982.
3. I have practiced my profession continuously since 1982. I am a Professional Engineer of Ontario (License No.4894507). I am also a member of the National CIM. My relevant experience for the purpose of the CPR is:
   - 13 years as the COO or VP Operations of junior mining companies, primarily gold, also base metals and diamonds, open pit and underground operations.
   - 15 years as a GM or COO of several consulting companies. Numerous technical reports and various assignments, scoping to feasibility study, due diligence and royalty reviews, mergers and acquisitions.
   - 7 years as a mining engineer at a senior level for various consulting companies.
   - 6 years as a mining engineer at open pit and underground mining operations
4. I have read the definition of "Competent Person" set out in the Financial Conduct Authority (FCA) Primary Market Technical Note 619.1 (FCA Technical Note) and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be a Competent Person for the purposes of the FCA Technical Note.
5. I visited the Serrote Mine on February 16, 2023.
6. I am responsible for Sections 1.1.1.2, 1.1.1.4, 1.1.1.6, 1.1.1.7, 1.1.2.2, 1.1.2.4, 1.2, 1.3.6, 1.3.7, 1.3.10, 1.3.12, 1.3.13, 15, 16, 18, 19, 21, 22, 25.2, 25.4, 25.6, 25.7, 26.2, 26.4, and related disclosure (pertaining to Mining and Mineral Reserves) in Sections 1.4, 25.8, and 27 of the CPR.
7. I am independent of ACG Acquisition Company Limited.
8. I have had prior involvement with the property that is the subject of the CPR since 2019 including acting as a QP on two internal Technical Reports.
9. I have read CIM (2014) definitions and the FCA Technical Note, and the CPR has been prepared in compliance with these guidelines.
10. At the effective date of the CPR, to the best of my knowledge, information, and belief, Sections 1.1.1.2, 1.1.1.4, 1.1.1.6, 1.1.1.7, 1.1.2.2, 1.1.2.4, 1.2, 1.3.6, 1.3.7, 1.3.10, 1.3.12, 1.3.13, 15, 16, 18, 19, 21, 22, 25.2, 25.4, 25.6, 25.7, 26.2, 26.4, and related disclosure (pertaining to Mining and Mineral Reserves) in Sections 1.4, 25.8, and 27 of the CPR for which I am responsible contain all scientific and technical information that is required to be disclosed to make the CPR not misleading.

Dated this 12th day of June 2023

(Signed & Sealed) ***Andrew Bradfield***

Andrew Bradfield, P.Eng.

29.4 Anthony Maycock

I, Anthony Maycock, P.Eng., as an author of this report entitled "Competent Person's Report on the Serrote Mine, Alagoas, Brazil" with an effective date of December 31, 2022 (the CPR), prepared for ACG Acquisition Company Limited, do hereby certify that:

1. I am Principal of MM Consultores SpA, of Monjitas 550, Oficina 19, Santiago, Chile.
2. I am a graduate of the University of London (Royal School of Mines), London in 1969 with a BSc Degree in Mineral Technology.
3. I am registered as a Professional Engineer in the Province of British Columbia, Canada (Reg.# 13275). I have worked as metallurgist and Senior Consultant for a total of 53 years since my graduation. My relevant experience for the purpose of the CPR is:
   - Plant Manager and metallurgist in copper concentrators in Zambia
   - General Manager and Senior Metallurgist for two international engineering companies in the mining industry
   - Project Manager and Senior Metallurgist on many copper, gold and base metals projects
   - Author of the metallurgical sections for several Canadian NI 43-101 reports.
4. I have read the definition of "Competent Person" set out in the Financial Conduct Authority (FCA) Primary Market Technical Note 619.1 (FCA Technical Note) and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be a Competent Person for the purposes of the FCA Technical Note.
5. I visited the Serrote Mine on June 28, 2018, and February 5, 2020.
6. I am responsible for Sections 1.1.1.3, 1.1.2.3, 1.3.8, 1.3.9, 13, 17, 25.3, 26.3, and related disclosure (Mineral Processing) in Sections 1.4, 25.8, and 27 of the CPR.
7. I am independent of ACG Acquisition Company Limited.
8. I provided independent metallurgical consulting services to the Serrote project during the metallurgical testing and engineering design phases.
9. I have read CIM (2014) definitions and the FCA Technical Note, and the CPR has been prepared in compliance with these guidelines.
10. At the effective date of the CPR, to the best of my knowledge, information, and belief, Sections 1.1.1.3, 1.1.2.3, 1.3.8, 1.3.9, 13, 17, 25.3, 26.3, and related disclosure (Mineral Processing) in Sections 1.4, 25.8, and 27 of the CPR for which I am responsible contain all scientific and technical information that is required to be disclosed to make the CPR not misleading.

Dated this 12th day of June 2023

(Signed & Sealed) ***Anthony Maycock***

Anthony Maycock, P.Eng.

29.5 Daniel Servigna

I, Daniel Servigna, PE, MBA, as an author of this report entitled "Competent Person's Report on the Serrote Mine, Alagoas, Brazil" with an effective date of December 31, 2022 (the CPR), prepared for ACG Acquisition Company Limited, do hereby certify that:

1. I am Principal Geotechnical Engineer, Mine Waste with WSP USA Environment & Infrastructure Inc., 2000 S. Colorado Blvd. Suite #2-1000. Denver, CO 80222.
2. I am a graduate of:
   a. Universidad del Zulia (Venezuela) in 2001 with a Bachelor of Science in Civil Engineering,
   b. University of Illinois at Urbana-Champaign (USA) in 2006 with a Master of Science in Civil/Geotechnical Engineering, and
   c. University of Denver (USA) in 2016 with a Master of Business Administration
3. I am registered as a Professional Engineer in the following US states:
   a. Colorado/USA (PE# 47859),
   b. Nevada/USA (PE# 22873),
   c. Utah/USA (PE# 974831-2202), and
   d. New Mexico/USA (PE# 23610).
4. I have worked as a geotechnical engineering consultant in the mining industry for a total of 17 years since my graduation. My relevant experience for the purpose of the CPR is:
   - Designer of tailings storage facilities in various environmental settings, including tropical climate,
   - Principal geotechnical engineer with emphasis in management of tailings storage facilities, and
   - Engineering consultant for surface mining infrastructure design and operation.
5. I have read the definition of "Competent Person" set out in the Financial Conduct Authority (FCA) Primary Market Technical Note 619.1 (FCA Technical Note) and certify that by reason of my education, affiliation with a professional association and past relevant work experience, I fulfil the requirements to be a Competent Person for the purposes of the FCA Technical Note.
6. I visited the Serrote Mine from August 31 to September 1, 2022.
7. I am responsible for Sections 1.1.1.5, 1.1.2.5, 1.3.11, 4.9, 20, 25.5, 26.5, and related disclosure (pertaining to Environment and TSF) in Sections 1.4, 25.8, and 27 of the CPR.
8. I am independent of ACG Acquisition Company Limited.
9. I have had prior involvement with the property that is the subject of the CPR as the Engineer of Record of the Tailings Storage Facility (TSF).
10. I have read CIM (2014) definitions and the FCA Technical Note, and the CPR has been prepared in compliance with these guidelines.
11. At the effective date of the CPR, to the best of my knowledge, information, and belief, Sections 1.1.1.5, 1.1.2.5, 1.3.11, 4.9, 20, 25.5, 26.5, and related disclosure (pertaining to Environment and TSF) in Sections 1.4, 25.8, and 27 of the CPR for which I am responsible contain all scientific and technical information that is required to be disclosed to make the CPR not misleading.

Dated this 12th day of June 2023

(Signed & Sealed) ***Daniel Servigna***

Daniel Servigna, PE, MBA

30.0 APPENDIX 1 - FCA PRIMARY MARKET TECHNICAL NOTE 619.1 APPENDIX II MINING COMPETENT PERSON'S REPORT – RECOMMENDED CONTENT

Competent persons should provide competent person's reports structured in accordance with either the model content recommended under the code, statute or regulation the company is reporting under or, where there no such model content is set out in the code, the competent person should address the information set out in this appendix. Where it would be appropriate to adapt these contents for the circumstances of the issuer, we ask the competent person to draw this to the attention of, and discuss with, the FCA before the report is finalised.

(i) Legal and Geological Overview – a description of:

(1) the nature and extent of the company's rights of exploration and extraction and a description of the properties to which the rights attach, with details of the duration and other principal terms and conditions of these rights including environmental obligations, and any necessary licences and consents including planning permission;

(2) any other material terms and conditions of exploration and extraction including host government rights and arrangements with partner companies;

(ii) Geological Overview – a description of the geological characteristics of the properties, the type of deposit, its physical characteristics, style of mineralisation, including a discussion of any material geotechnical, hydrogeological/hydrological and geotechnical engineering issues;

(iii) Resources and reserves

(1) a table providing data on (to the extent applicable): exploration results inclusive of commentary on the quantity and quality of this, inferred, indicated/measured resources, and proved/probable reserves and a statement regarding the internationally recognised reporting standard used;

(2) a description of the process followed by the competent person in arriving at the published statements and a statement indicating whether the competent person has audited and reproduced the statements, what additional modifications have been included, or whether the authors have reverted to a fundamental re-calculation;

(3) a statement as to whether mineral resources are reported inclusive or exclusive of reserves;

(4) supporting assumptions used in ensuring that mineral resource statements are deemed to be 'potentially economically mineable';

(5) supporting assumptions including commodity prices, operating cost assumptions and other modifying factors used to derive reserve statements;

(6) reconciliations between the proposed and last historic statement;

(7) a statement of when and for how long a competent person last visited the properties (or a statement that no visit has been made if that is the case);

(8) for proved and probable reserves (if any) a discussion of the assumed:

(a) mining method, metallurgical processes and production forecast;

(b) markets for the company's production and commodity price forecasts;

(c) mine life;

(d) capital and operating cost estimates;

(iv) Valuation of reserves – taking consideration of internationally recognised valuation codes a valuation of reserves comprising:

(1) an estimate of net present value (or a valuation arrived at on an alternative basis, with an explanation of the basis and of the reasons for adopting it) of reserves;

(2) the principal assumptions on which the valuation of proved and probable reserves is based including those relating to discount factors, commodity prices, exchange rates, realised prices, local fiscal terms and other key economic parameters;

(3) information to demonstrate the sensitivity to changes in the principal assumptions; (or a statement that the valuation of reserves is omitted).

(v) Environmental, Social and Facilities – an assessment of

(1) environmental closure liabilities inclusive of biophysical and social aspects, including (if appropriate) specific assumptions regarding sale of equipment and/or recovery of commodities on closure, separately identified;

(2) environmental permits and their status including where areas of material non-compliance occur;

(3) commentary on facilities which are of material significance;

(vi) Historic Production/Expenditures – an appropriate selection of historic production statistics and operating expenditures over a minimum of a three year period;

(vii) Infrastructure – a discussion of location and accessibility of the properties, availability of power, water, tailings storage facilities, human resources, occupational health and safety;

(viii) Maps etc. – maps, plans and diagrams showing material details featured in the text; and

(ix) Special factors – if applicable a statement setting out any additional information required for a proper appraisal of any special factors affecting the exploration or extraction businesses of the company (for example in the polar regions where seasonality is a special factor).

31.0 APPENDIX 2 – VALUATION OF THE SERROTE PROPERTY

This valuation prepared by SLR follows in general the CIMVAL Standards and Guidelines for Valuation of Mineral Properties dated November 29, 2019 (2019 CIMVAL Code). It relies on information in the body of this CPR and a site visit has been undertaken. The basis of value used is Market Value which means the highest price, expressed in terms of money or money's worth, obtainable in an open and unrestricted market between knowledgeable, informed and prudent parties, acting at arm's length, neither party being under any compulsion to transact, as at a given point in time (CIMVAL 2019 Definitions). The effective valuation date is December 31, 2022.

31.1 Valuation Approaches and Methods – Serrote

The objective of this Valuation Section is to estimate a range of Market Values for the Serrote Property. Most of the value lies in the Mineral Reserves and Mineral Resources of the Serrote Mine, but some value accrues to the exploration ground held outside the mine area. There are two main categories of mineral properties, which require different approaches to valuation. These are exploration properties and development properties. This subdivision is based on technical information rather than on the type of mineral tenure.

Development properties are those on which an economically viable mineral deposit has been demonstrated to exist. Such properties are at a sufficiently advanced stage that adequate reliable information exists to value the property by Discounted Cash Flow (DCF) Analysis, with a reasonable degree of confidence. The value of a development property is the net present value (NPV) of a stream of estimated cash flows, discounted at an appropriate rate to reflect the risk of the mining project. Development properties include producing mines as well as properties on which development of an economically viable operation is planned.

Exploration properties are those on which an economically viable mineral deposit has not yet been demonstrated to exist. The real value of an exploration property lies in the potential for the existence and discovery of an economically viable deposit. Only a small number of exploration properties will ultimately become properties with operating mines, however, they have value until such time as exploration work has been sufficient and justified to test the potential. In the mineral industry, exploration properties are optioned, joint ventured, bought, sold, and traded on the basis of perceived exploration potential. The probability of a mineral exploration property becoming a mine is extremely low.

Typically, classifying mineral properties as exploration and development properties is relatively straightforward. There are some properties, however, which lie in a grey area between the two groups. These marginal properties contain well defined Mineral Resources, which could become economically viable at higher commodity prices or lower production costs but have marginal economics at the prices at the time of valuation.

31.1.1 General Considerations

Primary considerations in the valuation of mineral exploration properties include geological setting and potential, in addition to location with respect to established infrastructure, most notably permitted processing plants, and permitted tailings areas. Standalone, isolated projects in non-producing jurisdictions will likely face prolonged scrutiny and extensive pre-production periods. Exploration properties in established mining areas and within known productive geological environments often have a premium value due to the higher perceived potential for discovery of a mineral deposit and because of developed infrastructure. Alternatively, mineral properties remote from areas of infrastructure but within a good geological environment often have lower values. Political stability and the rule of law in a jurisdiction directly impact property values.

The three main approaches to the valuation of mineral properties are Market, Income, and Cost approaches. Different valuation approaches and methods are appropriate for mineral properties at different stages of exploration and development. The 2019 CIMVAL Code summarizes industry practice for appropriate valuation approaches for projects at different stages (Table 31-1).

Table 31-1: Valuation Approaches for Different Types of Mineral Properties[1]
ACG Acquisition Company Limited – Serrote Mine

Valuation Approach	Exploration Properties	Mineral Resource Properties	Development Properties	Production Properties
Income	No	In some cases	Yes	Yes
Market	Yes	Yes	Yes	Yes
Cost	Yes	In some cases	No	No

For the purposes of this valuation, SLR divided the Property into two portions: a Mine Portion which hosts the Mineral Resources and Mineral Reserves and site infrastructure on a Mining Concession (400 ha), and an Exploration Portion which has exploration potential for Cu-Au mineralisation similar to that at the Serrote Mine (11,105 ha). Of this exploration land, 1,998 ha is under Application for Mining Concession and contains the Caboclo Exploration Target, expressed as a range of tonnes and grade.

For the Mine Portion, SLR relied on Discounted Cash Flow (DCF) Analysis (an Income Approach) as the primary method for valuation of the Mineral Reserves and Mineral Resources. Comparable Transactions Analysis (a Market Approach) was used as a second method for valuation of the Mineral Resources inclusive of the Mineral Reserves. Metal Transaction Ratio (MTR) was used as a metric for the Comparable Transactions Analysis: the method is described below and can be used effectively for comparison of polymetallic properties.

For the Exploration Portion, SLR used Comparable Transactions Analysis using unit value per hectare ($/ha) as a comparison metric. The MTR method was also used for the Caboclo Exploration Target.

Various mineral property valuation approaches and methods are described in Roscoe (2007 and 2012).

The following sections summarize the methods used.

31.1.2 Discounted Cash Flow Analysis

DCF Analysis is used for the valuation of advanced projects with Mineral Resources and/or Mineral Reserves, development projects, and operating mines, where sufficient reliable information exists to value the property by DCF Analysis with a reasonable degree of confidence. DCF Analysis is used to determine the Net Present Value (NPV) of a stream of estimated future cash flows from an operation, based on reasonable estimates of input parameters, which include workable mine plans and production rates, Mineral Resources and/or Mineral Reserves, process recovery, commodity price projections or sales contracts, initial and ongoing capital costs, operating costs, environmental and reclamation costs, royalties, taxes, status of permitting, and an appropriate discount rate.

31.1.3 Comparable Transactions Analysis

Comparable Transactions Analysis uses the transaction price of a comparable mineral property to establish a value for the subject property. The method is described in Roscoe (2007).

[1] CIMVAL Code, 2019 (Table 1)

A challenge posed by using the Comparable Transactions Method in the mining industry is that there are no true comparable transactions, unlike in real estate or oil and gas, each mineral property is unique with regard to key factors such as geology, mineralisation, costs, exploration stage, location, and infrastructure. In addition, there are relatively few transactions for mineral properties compared to the frequency of real estate transactions in general. When mineral property transactions do occur, they rarely involve strictly cash, leaving the valuator the task of converting blocks of shares, royalties, or option terms into monetary equivalents. Nonetheless, transaction prices of similar properties can indicate a range of values for a particular mineral property.

Exploration property transactions also give an indication of how active the market may be at any given time. As in the case for most valuations of real estate properties, the reliability of the valuation depends on an active market in comparable properties. Mineral properties differ from real estate properties in several ways. There are no true comparable transactions in the valuation of mineral properties, since each property is considered unique, as noted above. Mineral properties, which are at different stages of exploration or development, and have different geological and related attributes, including perceived exploration potential, may have considerably different values. This is due to the potential for cash flow from an identified mineral deposit, or the potential for discovery of a deposit. Another reason for the large differences in mineral property values, often an order of magnitude or more, is the small volume of mineral property transactions compared to the real estate market.

As with real estate properties, the location of a mineral property may also have a significant impact on its value. Exploration properties in established mining areas often have a premium value because of the higher perceived potential for discovery of a mineral deposit, and because of developed infrastructure. On the other hand, mineral properties remote from areas of infrastructure often have lower values.

For non-resource properties, SLR identifies market transactions on exploration properties comparable to the subject properties and analyses them in terms of total property value and $/ha. An appropriate range of $/ha values is determined and applied to the subject property.

For properties with Mineral Resources, SLR identifies market transactions on properties with Mineral Resources that are similar to the subject properties and analyses them in terms of total property value and value per unit metal contained in the Mineral Resources. For Mineral Resources with more than one metal, SLR uses MTR as a comparison metric, as described below. An appropriate range of values is then determined and applied to the subject property.

31.1.4 Option Agreement Terms Analysis

The Option Agreement Terms Analysis Method was utilized to value many of the properties used as market comparable transactions at the exploration stage without mineral resources.

Most market transactions on non-producing mineral exploration properties are not straightforward cash or share deals, but rather are typically option, earn-in, or JV agreements whereby one party obtains the right to earn an interest in the property from another party by fulfilling certain commitments over a period of time. The terms of the option or earn-in agreement must be analysed to estimate the value of the property being transacted.

In a typical option agreement, a schedule of firm and optional commitments must be fulfilled to earn an interest in the property. Commitments may include payment of cash, issuance of shares by the earn-in party, expenditures on mineral exploration, and royalties on production. In general, the commitments are firm in the first year and optional in subsequent years. Option Agreement Terms Analysis considers the firm commitments to contribute 100% to the value of the property. The optional commitments are assigned a subjective probability based on a prediction of the earn-in party fulfilling each of the annual commitments in the subsequent years of the agreement. The optional commitments multiplied by the probability factor for each year are considered to be the contribution to value. The transaction value is the sum of the firm commitment values and the probability-weighted optional commitment values. If the transaction is for a partial interest in the property, the value is adjusted to a 100% interest in the property.

31.1.5 Metal Transaction Ratio Analysis

For market transactions on Mineral Resource properties with a single metal, a value per unit metal can be calculated from the value of the transaction and the ounces or pounds of metal in the Mineral Resource estimate. The value per unit metal can also be expressed as a percentage of the metal price at the time of the transaction. For properties with more than one metal reported in the Mineral Resources, such as the Serrote Property, an MTR can be calculated which is analogous to the value per unit metal as a percentage of metal price (Roscoe, 2012). The total in situ dollar content of the metals contained in the Mineral Resource is calculated for the property using metal prices as of the date of the transaction. The MTR is the ratio of the transaction value to the in-situ dollar metal content of the Mineral Resources transacted, expressed as a percentage. An appropriate range of MTR values to apply to the Mineral Resources of the subject property is derived from the MTRs of the comparable transactions.

31.2 Valuation of the Serrote Property

As noted previously, SLR divided the Property into a Mine Portion and an Exploration Portion for valuation purposes. SLR valued the Mine Portion using DCF Analysis as the primary valuation method for the Mineral Reserves in the open pit operation. As an additional method, SLR used Comparable Transactions Analysis (MTR method) for Mineral Resources in the Mine Portion. Results of the two methods were compared and weighted to derive a range of Market Values for the Mine Portion.

The Exploration Portion was valued using Comparable Transactions Analysis on copper-dominant exploration properties without Mineral Resources based on $/ha values. The MTR method was also used for the Caboclo Exploration Target.

31.2.1 Income Approach – DCF Analysis

For the purposes of this valuation, SLR relied on the DCF models in the Serrote CPR: Economic Analysis chapter for the open pit operation. A description of the key criteria and assumptions used to create the DCF Models is provided in various sections of the Serrote CPR, including physical, revenue, costs, and economic metrics. The NPV for the Serrote Mine is listed in Table 31-2. An 8% discount rate was used for the Serrote open pit since it is an operating base metal mine. The total after-tax NPV for the Serrote Mine Portion is US$540 million.

Table 31-2: Net Present Value of Serrote Mine
ACG Acquisition Company Limited – Serrote Mine

Operation	Discount Rate	NPV (US$M)
Open Pit	8% after-tax	540

31.2.2 Market Approach – Mineral Resources Inclusive of Mineral Reserves

SLR compiled data on producing mineral properties similar to the Serrote Mine Portion of the Property and on non-producing mineral properties similar to the Caboclo Exploration Target on which transactions have taken place within a reasonable time period of the valuation date using the following criteria:

- Transactions on properties with sulphide copper-dominant deposits hosted by intrusive rocks.
- Transactions with dates from 2018 to 2022 for the December 31, 2022, Valuation Date.
- Comparable transactions were sought for producing and non-producing properties with Mineral Resources and/or Mineral Reserves.
- Numerous properties were identified in North and South America.
- Transactions selected were all arm's length, to the best of SLR's knowledge.

The terms of each transaction, as disclosed in press releases and other publicly available company information, were analysed to derive a value for each transacted property. If the deal was for less than a 100% interest, the value was adjusted to a 100% interest. If shares were used as firm commitments, SLR used the closing share price on the date of the announcement of the transaction.

Two transaction datasets were compiled: one for producing properties and one for non-producing properties. All categories of Mineral Resources for each property were totalled and the in-situ dollar content of the contained metals was calculated using metal prices at the date of the announcement of the transaction. MTR, expressed as a percentage, was derived for each transacted property by dividing the property value by the in situ dollar content.

The MTR values were further analysed to derive a range to apply to the total in situ dollar content of the Serrote Mineral Resources. Considerations in choosing an appropriate range of MTR values to apply to the subject property included:

- Examining mean and median values as well as the overall range of values.
- Considering the variability of values as measured by the coefficient of variation (CV), which is the standard deviation divided by the average.
- Eliminating outliers at the high and/or low end of the value range.
- Considering which properties are more similar to the subject property.
- Rounding derived values appropriately.

Table 31-3 lists details for four transactions on producing copper-dominant properties as of the date of the announcement of the transaction. Comments on the MTR values are:

- MTR values range from 1.80% to 4.62%, with mean and median values of 2.99% and 2.78%, respectively, and a CV of 39%.
- There do not appear to be any outlier MTR values.

Considering the average and median values and its overall range, SLR recommends an MTR range of 2.0% to 4.0% be used for producing properties.

Table 31-3: Comparable Transactions Analysis - Producing Copper Properties in South America
AGC Acquisition Company Limited – Serrote Mine

Property	Location	Transaction Date	Equity Earned	Buyer	Seller	Deal Value 100% Basis (US$)	TOTAL RESERVES & RESOURCES Tonnes	Cu Grade (%)	Mo Grade (%)	Au Grade (g/t)	Ag Grade (g/t)	CuEq Grade (%)	Total In Situ $ Content (US$)	MTR
Sierra Gorda	Chile	14-Oct-21	45%	South 32 Limited	Sumitomo	3,444,444,444	1,786,374,000	0.397	0.019	0.057		0.428	$74,583,027,392	4.62%
Quebrada Blanca	Chile	4-Dec-18	30%	Sumitomo	Teck Resources	4,000,000,000	4,740,340,000	0.399	0.017			0.479	$141,052,496,920	2.84%
Chapada	Brazil	15-Apr-19	100%	Lundin Mining	Yamana Gold	816,326,531	1,403,607,000	0.213		0.192		0.332	$30,034,578,496	2.72%
Red Chris	Canada	3-Oct-19	70%	Newcrest Mining	Imperial Metals	1,148,571,429	1,821,800,000	0.320		0.340	1.090	0.622	$63,893,440,876	1.80%
				All transactions	Average	2,352,335,601	2,438,030,250	0.332	0.018	0.196	1.090	0.465	77,390,885,921	2.99%
					Median	2,296,507,937	1,804,087,000	0.359	0.018	0.192	1.090	0.453	69,238,234,134	2.78%
					Std Dev	1,603,732,287	1,546,507,596	0.088	0.001	0.142		0.121	46,495,468,095	1.18%
					CV	68%	63%	0.264	0.079	0.721		0.260	60%	39%

Recommended Range of MTR Values **2.0% to 4.0%**

Table 31-4 lists details for 35 transactions on non-producing copper-dominant properties as of the date of the announcement of the transaction. Comments on the comparable transactions are summarized below. None of the MTR values appear to be outliers and high, medium, and low groups of MTR values were considered:

- MTR values range from 0.02% to 2.90%, with mean and median values of 0.76% and 0.39%, respectively, and a CV of 116%.
- The MTR values were considered in three groups of highest, middle, and lowest values, as follows.
- The 14 highest MTR values have mean and median values of 1.62% and 1.70%, respectively, with a CV of 48%.
- The next 12 highest MTRs have mean and median values of 0.29% and 0.26%, respectively, and the CV is 46%.
- The lowest group of nine MTRs have mean and median values of 0.04% and 0.02%, respectively, and a CV of 58%.

Considering the average and median values and its overall range, SLR recommends an MTR range of 1.0% to 2.0% for the copper-dominant MTR range for non-producing properties. This range is derived from the highest group of MTR values, based on its overall range and the mean and median values. The highest range is chosen for Mineral Resources because of the presence of the Serrote Mine.

Table 31-4: Comparable Transactions Analysis - Non-Producing Copper Dominant Properties with Resources in South America
AGC Acquisition Company Limited – Serrote Mine

Property	Location	Transaction Date	Equity Earned	Buyer	Seller	Deal Value 100% Basis (US$)	TOTAL RESERVES & RESOURCES Tonnes	Cu (%)	Mo (%)	Au (g/t)	Ag (g/t)	CuEq Grade (%)	Total In Situ $ Content (US$)	MTR
Rosemont	USA	13-Mar-19	7.95%	Hudbay Minerals	Investor Group	943,396,226	1,135,700,000	0.366	0.011		3.499	0.438	32,482,614,645	2.90%
Stardust (Corporate)	Canada	20-Dec-18	13.8%	Teck Resoiurces	Sun Metals Corp.	13,754,960	2,970,000	1.270		1.680	32.59	2.795	496,258,322	2.77%
Oracle Ridge	USA	30-Apr-21	20%	Eagle Mountain Mining	Vincere Resource Holdings	48,807,360	12,200,000	1.508		0.186	16.268	1.751	2,123,941,274	2.30%
Mina Justa	Peru	23-Apr-18	40%	Inversiones Alxar	Minsur	500,000,000	431,900,000	0.748				0.748	22,584,930,564	2.21%
Quellaveco	Peru	14-Jun-18	21.9%	Mitsibishi Corp.	AngloAmerican plc	2,283,105,023	2,960,100,000	0.460	0.015			0.514	108,666,637,632	2.10%
New York Canyon 2	USA	11-Feb-20	75%	Kennecott Exploration	Emgold Mining	7,634,266	17,370,000	0.410				0.410	404,976,202	1.89%
Rosita	Nicaragua	30-Jul-18	75%	Century Mining	Investor Group	11,333,333	11,853,000	0.483		0.478	8.095	0.867	613,793,722	1.85%
Berta	Chile	19-Feb-19	100%	Santiago Metals	Coro Mining Corp.	8,500,000	29,995,000	0.291				0.289	550,024,800	1.55%
Tatogga (corporate)	Canada	10-Mar-21	85.1%	Newmont Mining	GT Gold Corp.	364,405,163	841,000,000	0.258		0.330	0.711	0.469	35,266,998,411	1.03%
MARA Project	Argentina	23-Sep-22	18.75%	Glencore International	Newmont Corporation	666,133,333	2,107,000,000	0.370		0.150	2.280	0.499	78,985,713,852	0.84%
Black Pine	USA	1-Nov-21	100%	Koba Resources	Jervois Global	1,403,061	800,000	1.823		0.413		2.091	167,202,686	0.84%
Michiquillay	Peru	21-Feb-18	100%	Southern Copper Corp.	Undisclosed	400,000,000	1,150,000,000	0.630				0.630	50,951,723,130	0.79%
Minto	Canada	3-Jun-19	100%	Pembridge Resources	Capstone Mining	20,000,000	23,500,000	1.400		0.540	4.800	1.859	2,557,436,172	0.78%
Chita Valley	Argentina	4-Nov-19	49.91%	South 32 Limited	Minsud Resources	10,666,219	41,610,572	0.430	0.017	0.700	2.170	0.559	1,364,848,046	0.78%
Galore Creek/Copper Canyon	Canada	26-Jul-18	50%	Newmont Mining	Novagold Resources	288,991,284	1,161,300,000	0.475		0.284	4.913	0.699	50,871,390,719	0.57%
Stardust, Lorraine, Okeover 2 (corpor	Canada	30-Nov-20	100%	Northwest Copper	Sun Metals	18,467,064	125,012,000	0.381	0.006	0.095	0.774	0.475	4,558,712,363	0.41%
Stardust, Lorraine, Okeover 1 (corpor	Canada	4-Feb-19	100%	Sun Metals	Lorraine Copper	11,981,659	107,038,580	0.364	0.007	0.078	0.904	0.456	2,963,228,035	0.40%
North Rok	Canada	29-Mar-22	100%	Newmont Mining	QuestEx	21,584,459	142,300,000	0.220		0.260		0.374	5,512,384,706	0.39%
Gaspe	Canada	28-Mar-22	100%	Osisko Metals	Glencore	46,997,364	456,000,000	0.310				0.310	14,471,588,000	0.32%
Carmacks 2 (70%) (corporate)	Canada	31-Aug-20	70%	Granite Creek Copper	Copper North Mining	6,233,210	33,095,000	0.784		0.266	3.009	1.072	2,386,439,883	0.26%
Jasperoide (Corporate)	Peru	26-Aug-19	100%	Carube Copper Corp.	Latin America Res. Group	2,741,170	12,187,270	1.320		0.320		1.601	1,095,439,250	0.25%
Kwanika 2021	Canada	28-Dec-21	31%	NorthWest Copper	POSCO	27,695,246	347,300,000	0.266		0.213	0.874	0.401	13,345,359,811	0.21%
Jasperoid	Peru	15-Jul-21	49%	C3 Metals	Hochschild Mining	3,500,462	12,187,270	1.320		0.320		1.522	1,725,698,000	0.20%
Lorraine	Canada	29-Oct-20	51%	Sun Metals	Teck Resources	2,435,802	35,242,000	0.479		0.197		0.656	1,548,085,900	0.16%
New York Canyon 1	USA	28-May-19	100%	Emgold Mining	Searchlight Resources	599,650	17,370,000	0.410				0.410	423,812,304	0.14%
Carmacks 1 (30%) (corporate)	Canada	21-Nov-19	30%	Granite Creek Copper	Undisclosed	2,645,593	33,095,000	0.784		0.266	3.009	1.028	1,977,569,816	0.13%
Okeover	Canada	14-Jan-22	100%	Alpha Copper Corp.	Northwest Copper Corp.	2,541,869	86,800,000	0.310	0.009			0.356	3,056,113,753	0.08%
Berg	Canada	15-Dec-20	70%	Surge Copper Corp.	Centerra Gold	9,746,895	410,650,000	0.307	0.033		3.096	0.427	13,582,025,814	0.07%
Ann Mason (corporate)	USA	31-Oct-18	86.1%	Hudbay Minerals	Mason Resources	18,794,704	2,033,000,000	0.311	0.006	0.029	0.657	0.361	44,271,300,642	0.04%
Axe	Canada	19-Apr-21	100%	Kodiak Copper Corp.	Orogen Royalties	1,061,570	71,100,000	0.380				0.379	2,540,167,000	0.04%
Copper Creek (corporate)	USA	25-Jun-18	100%	Copperbank Resources	Redhawk Resources	3,103,017	186,980,754	0.770				0.768	10,132,313,434	0.03%
Rosita	Nicaragua	28-Jun-21	17.5%	Mark X Ventures	King Global Ventures	232,793	11,853,195	0.486		0.477	8.087	0.847	942,447,156	0.02%
Escalones	Chile	4-Dec-18	100%	Wealth Copper	TriMetals Mining	4,386,454	760,228,000	0.332	0.007	0.045	0.788	0.396	18,572,886,362	0.02%
Big Onion	Canada	7-Dec-21	100%	Gama Exploration	Blue Lagoon Resources	754,938	126,000,000	0.267	0.009			0.305	3,702,975,759	0.02%
Mocoa	Colombia	9-May-18	100%	Libero Copper	B2Gold	4,096,327	636,000,000	0.328	0.036			0.466	20,332,276,164	0.02%
				All transactions	Average	164,506,585	444,878,218	0.602	0.014	0.349	5.363	0.778	15,863,694,695	0.76%
					Median	10,666,219	107,038,580	0.410	0.009	0.266	3.009	0.499	3,056,113,753	0.39%
					Std Dev	428,172,157	704,204,717	0.422	0.011	0.349	7.825	0.596	24,701,646,527	0.87%
					CV	260%	158%	70%	76%	100%	146%	77%	156%	115%
				Highest to 14th highest MTR	Average	377,081,353	626,142,755	0.746	0.014	0.560	8.802	0.994	24,086,935,676	1.62%
					Median	34,403,680	35,802,786	0.472	0.015	0.446	4.150	0.595	2,340,688,723	1.70%
					Std Dev	626,453,445	929,134,896	0.523	0.003	0.487	10.812	0.788	34,355,298,633	0.78%
					CV	166%	148%	70%	20%	87%	123%	79%	143%	48%
				15th to 26th highest MTR	Average	36,156,080	206,843,927	0.593	0.007	0.230	2.247	0.750	8,406,642,399	0.29%
					Median	9,107,435	71,140,290	0.442	0.007	0.263	1.957	0.566	2,674,833,959	0.26%
					Std Dev	80,806,722	332,363,976	0.383	0.001	0.085	1.681	0.452	14,153,937,112	0.13%
					CV	223%	161%	65%	11%	37%	75%	60%	168%	46%
				27th to 35th highest MTR	Average	4,968,730	480,290,217	0.388	0.017	0.184	3.157	0.478	13,014,722,898	0.04%
					Median	3,103,017	186,980,754	0.328	0.009	0.045	1.942	0.396	10,132,313,434	0.03%
					Std Dev	5,915,130	639,494,386	0.156	0.014	0.254	3.472	0.193	13,744,918,287	0.02%
					CV	119%	133%	40%	85%	138%	110%	40%	106%	58%

Recommended Range of MTR Values Highest MTR Grouping **1.0% to 2.0%**

Table 31-5 shows the derivation of the in situ dollar content of the Serrote Mineral Resources, which totals US$5,137 million for open pit resources. Table 31-5 also shows the derivation of the in situ dollar content of the Caboclo Exploration Target which totals US$1,033 million. The potential tonnage and grade of mineralisation at the Caboclo exploration target ranges from 10 Mt to 25 Mt grading from 0.3% Cu to 0.7% Cu, and from 0.1 g/t Au to 0.2 g/t Au. The target is expressed as a range of tonnes and grade for five mineralized zones. The midpoint of the tonnes and grade range is used.

Table 31-5: In situ Dollar Content of the Serrote Mineral Resources
ACG Acquisition Company Limited – Serrote Mine

Area	Metal	Grade	Contained Metal	Unit Price (US$)[1]	In Situ $ Content
Serrote Open Pit - all Mineral Resources Inclusive of Mineral Reserves					
	Cu (%, tonnes)	0.54	546,735	8,365	4,573,304,853
	Au (g/t, oz)	0.10	310,619	1,816	563,972,327
Total					5,137,277,180
Caboclo - Mid-point of Exploration Target Range of Tonnes and Grade					
	Cu (%, tonnes)	0.59	102,500	8,365	857,386,875
	Au (g/t, oz)	0.17	96,452	1,816	175,122,639
Total					**1,032,509,514**

Notes:

1. Metal prices as per the Valuation Date.

Table 31-6 shows the application of the recommended MTR range of 2.0% to 4.0% to the Serrote in situ dollar content. The total value range for Serrote open pit Mineral Resources is US$103 million to US$205 million. Table 31-6 also shows the application of an MTR range for non-producing properties to the Caboclo Exploration Target. A range of 0.5% to 1.0% has been used, which is 50% of the recommended range for the Serrote Mineral Resources because the target is not currently a Mineral Resource.

Table 31-6: Serrote Valuation by Comparable Transactions Analysis
ACG Acquisition Company Limited – Serrote Mine

Item	In Situ $ Content	Range of MTR Values		Range of Values (US$M)	
		Low End	High End	Low End	High End
Serrote Open Pit Resources	5,137,277,180	2.00%	4.00%	103	205
Cabolco Exploration Target	1,032,509,514	0.50%	1.00%	5	10

31.2.3 Market Approach - Exploration Properties Without Resources

Three groupings of Exploration Permits are held as the Exploration Portion of the Serrote Property. SLR has used Comparable Transactions Analysis to value these exploration properties. From information in the CPR, it is apparent that the properties are at various stages of exploration for sulphide copper-dominant deposits similar to that at the Serrote Mine. For valuation purposes, SLR reviewed information in the CPR to infer exploration potential on each of the property groupings as to high, moderate, or low.

SLR searched for sulphide copper-dominant exploration properties without Mineral Resources or Mineral Reserves in South America on which transactions have taken place within a reasonable time period of the Valuation Date using the following criteria:

- Transactions on properties without Mineral Resources being explored for copper and copper-gold.
- Transactions with dates from 2018 to 2022 inclusive for the December 31, 2022, Valuation Date.
- Market transacted properties were identified in Chile, Argentina, Peru, Ecuador, and Brazil.
- Transactions selected were all arm's length, to the best of SLR's knowledge.

The terms of each transaction, as disclosed in press releases and other publicly available company information, were analysed to derive a value for each transacted property. If the deal was for less than a 100% interest, the value was adjusted to a 100% interest. If shares were used as firm commitments, SLR used the closing share price on the date of the announcement of the transaction. Some of the transactions were option deals, for which Option Agreement Transactions Analysis was used to derive a property value.

Details of 31 transacted copper and copper-gold properties are listed in Table 31-7 as of the date of the announcement of the transaction. A property value was derived for each transaction and divided by the property size to obtain a dollar per hectare ($/ha) value. The $/ha values were further analysed to derive a range to apply to the areas of the exploration properties that are part of the Exploration Portion of the Serrote Property. Considerations in choosing an appropriate range of MTR values to apply to the subject property included:

- Examining mean and median values as well as the overall range of values.
- Considering the variability of values as measured by the coefficient of variation (CV), which is the standard deviation divided by the average.
- Eliminating outliers at the high and/or low end of the value range.
- Considering which properties are more similar to the subject property.
- Rounding derived values appropriately.

In Table 31-7, SLR notes the following in its analysis of the $/ha values:

- $/ha values range from $54 to $16,154, with mean and median values of $2,166 and $732, respectively, with a CV of 158%.
- SLR notes that, in general, larger properties tend to have lower values per hectare and smaller properties tend to have higher values per hectare.
- It is apparent that the four smallest properties, less than 600 ha, have much higher $/ha values than the other properties and are not considered further in this analysis.
- Because of the above-noted property size effect, the properties were divided into three groups: 600 to 1,500 ha, 1,500 to 8,000 ha, and larger than 8,000 ha.
- Within each of these groups, some apparent outliers were identified and not included in further analysis. These are the highest and lowest $/ha values in the 1,500 to 8,000 ha group and the two lowest $/ha values in the larger than 8,000 ha group.
- Each of the three size groups was further subdivided into three groups, assumed to represent properties with high, moderate, and low exploration potential.

- For the 600 to 1,500 ha group, the highest three $/ha values have average and median values of $2,814 and $2,481 respectively, with a CV of 29%. The middle two $/ha values have average and median values both of $1,333 and CV of 22%. The lowest four $/ha values have average and median values of $768 and $779, respectively, and CV of 15%.
- For 1,500 to 8,000 ha group, the highest three $/ha values have average and median values of $2,186 and $2,478 respectively, with a CV of 32%. The middle three $/ha values have average and median values of $571 and $565, respectively, and CV of 22%. The lowest two $/ha values have average and median values both of $314 and CV of 2%.
- The properties larger than 8,000 ha are not subdivided and have average and median values of $200 and $186, respectively, and CV of 16%.

Considering the average and median values of each group and its overall range, SLR recommends $/ha ranges for the various property size groups and assumed exploration potential as follow:

Recommended range of $/ha values for properties 600 ha to 1,500 ha

High exploration potential	$2,000 to $3,000
Moderate exploration potential	$1,000 to $2,000
Low exploration potential	$500 to $1,000

Recommended range of $/ha values for properties 1,500 ha to 8,000 ha

High exploration potential	$1,500 to $3,000
Moderate exploration potential	$400 to $800
Low exploration potential	$200 to $400

Recommended range of $/ha values for properties larger than 8,000 ha

Moderate exploration potential	$150 to $300

Table 31-7: Comparable Transactions on Copper Properties in South America without Resources
AGC Acquisition Company Limited – Serrote Mine

Property	Location	Transaction Date	Equity Earned	Buyer	Seller	Area (ha)	Deal Value 100% Basis	Value US$/ha
Sierra Miranda	Chile	3-Aug-18	100	Coro Mining	Capex S.A.	379	6,122,449	16,154
Esperenza	Argentina	26-Jan-21	80	Libero Copper & Gold	Latin Metals	462	3,984,286	8,624
Lana Corina	Chile	21-Mar-22	80	Culpeo Minerals	SCM Antares	550	4,400,000	8,000
Sombrero	Peru	19-Dec-18	80	Auryn Resources	Corporacion Aceros Arequipa	520	2,628,750	5,055
Margarita & Cotatuda	Chile	8-Mar-21	100	Torq Resources	Undisclosed	1,045	3,904,040	3,736
Sarita Este	Argentina	3-Dec-19	51	Golden Minerals	Cascadero Copper	830	2,058,824	2,481
Cristal 2	Chile	4-Dec-18	70	Wealth Minerals	New Energy Metals	900	2,001,809	2,224
Mollecruz	Peru	250Jun-18	100	Auryn Resources	Undisclosed	1,000	1,537,688	1,538
Cristal 1	Chile	1-Mar-18	100	Darien Res. Dev. Corp.	Undisclosed	900	1,016,162	1,129
Llanos & Mercedes	Chile	14-May-19	100	Coro Mining	Undisclosed	667	593,434	890
10 Mining Concessions	Peru	1-Apr-18	100	Chakana Copper	Private Vendor	631	520,408	825
El Palmar	Ecuador	12-Aug-20	100	Sunstone Metals	Undisclosed	800	585,859	732
Porphyritic Copper Project	Peru	29-Apr-19	100	Fidelity Minerals Corp.	Undisclosed	1,200	750,163	625
Tarqui	Ecuador	19-Mar-19	70	BHP Group	Luminex Resources	4,817	22,942,857	4,763
Arikepay	Chile	16-Oct-21	70	Gold Fields	Candente Copper	1,800	4,864,706	2,703
Valeriano	Chile	23-Sep-19	100	ATEX Resources	Investoir Group	3,705	9,182,076	2,478
Planalto	Brazil	5-Nov-18	49	Capstone Mining	Lara Exploration	4,726	6,510,204	1,378
Nord	Chile	31-Oct-19	100	Encantada SpA	Mirasol Resources	1,967	1,372,449	698
Tamarugo	Chile	3-Jul-19	51	Solaris Resources	Freeport-McMoran	5,100	2,882,353	565
Don Enrique	Peru	28-Feb-22	100	EV Resources	Private Vendor	1,800	808,081	449
Panteria	Peru	23-Nov-21	100	Gold Stare Resources	Peruvian Metals	2,000	635,151	318
El Camino II	Argentina	27-May-22	100	NOA Lithium Brines	Aldebaran Resources	2,750	853,535	310
Resguardo	Chile	29-Jun-22	100	Alturas Minerals	Minera Resguardo	3,891	497,462	128
Mogote	Argentina	11-May-22	85	Syndicate Minerals	Golden Arrow Resources	8,000	1,935,928	242
San Martin	Peru	30-Nov-20	51	JOGMEC	Hannan Metals	32,900	7,843,137	238
Cerro Blanco & Morros Blancos	Chile	14-Apr-21	80	Austral Gold	Pampa Metals	13,800	2,635,714	191
San Pietro	Chile	17-Mar-22	100	Golden Exploration	Sumitomo Metal Mining	18,448	3,356,000	182
Arcas	Chile	11-Sep-19	75	Rio Tinto Mining	Aethon Minerals	51,600	8,993,197	174
Caballos	Argentina	9-Mar-21	70	Hanaq Argentina	Golden Arrow Resources	12,000	2,042,857	170
Santa Gracia	Chile	6-Jan-21	90	Stuve Gold	Undisclosed	11,500	1,083,333	94
La Poncha	Argentina	22-Mar-21	100	Sable Resources	Undisclosed	18,114	971,717	54

		Area (ha)	Deal Value 100% Basis	Value US$/ha
All transactions	Average	6,736	3,532,730	2,166
	Median	1,967	2,042,857	732
	Std Dev	11,058	4,399,832	3,416
	CV	164%	125%	158%
Properties 600 ha to 1,500 ha Fifth to 7th highest $/ha	Average	925	2,654,891	2,814
	Median	900	2,058,824	2,481
	Std Dev	110	1,082,170	809
	CV	12%	41%	29%
Properties 600 ha to 1,500 ha Eighth to 9th highest $/ha	Average	950	1,276,925	1,333
	Median	950	1,276,925	1,333
	Std Dev	71	368,775	289
	CV	7%	29%	22%
Properties 600 ha to 1,500 ha Tenth to 13th highest $/ha	Average	824	612,466	768
	Median	734	589,647	779
	Std Dev	261	97,477	115
	CV	32%	16%	15%
Properties 1,500 ha to 8,000 ha Fifteenth to 17th highest $/ha	Average	3,410	6,852,329	2,186
	Median	3,705	6,510,204	2,478
	Std Dev	1,485	2,178,924	709
	CV	44%	32%	32%
Properties 1,500 ha to 8,000 ha Eighteenth to 20th highest $/ha	Average	2,956	1,687,628	571
	Median	1,967	1,372,449	565
	Std Dev	1,859	1,072,452	124
	CV	63%	64%	22%
Properties 1,500 ha to 8,000 ha Twenty-first to 22nd highest $/ha	Average	2,375	744,343	314
	Median	2,375	744,343	314
	Std Dev	530	154,421	5
	CV	22%	21%	2%
Properties larger than 8,000 ha	Average	20,795	3,607,735	168
	Median	15,957	2,339,286	178
	Std Dev	14,563	3,082,555	65
	CV	70%	85%	39%
Properties larger than 8,000 ha without 2 lowest $/ha	Average	22,791	4,467,806	200
	Median	16,124	2,995,857	186
	Std Dev	16,535	3,122,675	32
	CV	73%	70%	16%

Racommended Range of $/ha Values - Properties 600 ha to 1,500 ha	
High Exploration Potential	**$2,000 to $3,000**
Moderate Exploration Potential	**$1,000 to $2,000**
Low Exploration Potential	**$500 to $1,000**
Racommended Range of $/ha Values - Properties 1,500 ha to 8,000 ha	
High Exploration Potential	**$1,500 to $3,000**
Moderate Exploration Potential	**$400 to $800**
Low Exploration Potential	**$200 to $400**
Racommended Range of $/ha Values - Properties Larger than 8,000 ha	
Moderate Exploration Potential	**$150 to $300**

Table 31-8 shows the application of these $/ha ranges to the Serrote exploration properties outside of the Serrote Mining Concession where the operations and infrastructure are located and not including the Mining Concession Applications (1,998 ha) on which the Cabolco Exploration Target is located.

Table 31-8: Valuation of Serrote Exploration Properties
ACG Acquisition Company Limited – Serrote Mine

Property Name	Stage	Area (ha)	Exploration Potential	Recommended $/ha Range		Property Value Range (US$)	
				Low End	High End	Low End	High End
Caboclo	Exploration Licence	1,587	High	1,500	3,000	2,380,080	4,760,160
Standalone	Exploration Licence	1,976	Moderate	400	800	790,484	1,580,968
Queimada Bonita	Exploration Licence	5,544	Moderate	400	800	2,217,436	4,434,872
Total		**9,107**				**5,388,000**	**10,776,000**
Total rounded						**5,000,000**	**11,000,000**

Notes: Serrote Mining Concession and Caboclo Mining Concession Application not included.

31.3 Valuation Summary

In Table 31-9, SLR presents the results of the two valuation methods: DCF Analysis and Comparable Transactions Analysis. SLR has applied weightings to the values derived by each method to derive a Market Value for the Serrote Property. The weightings are based on SLR's view on the confidence that can be placed in each method. For the Serrote open pit, the NPV is weighted 75% and 25% to Comparables because the Mine is in the early stages of operation. The Market Value of the Serrote Mine Portion is in the range of US$431 million to US$456 million. To this range is added the value of the Caboclo Exploration Target and the other exploration properties to derive a total Serrote Market Value range of US$441 million to US$477 million with a mid-point of US$459 million as of the Valuation Date of December 31, 2022.

Table 31-9: Valuation Summary of the Serrote Property
ACG Acquisition Company Limited – Serrote Mine

Area	NPV (US$M)	Weight	Comparables Analysis Range (US$M)		Weight	Weighted Value Range (US$M)		
			Low	High		Low	High	Mid-Point
Serrote Open Pit	540	75%	103	205	25%	431	456	444
Caboclo Exploration Target			5	10	100%	5	10	8
Serrote Exploration			5	11	100%	5	11	8
Total Serrote	**540**		**113**	**226**		**441**	**477**	**459**

31.4 Key Assumptions, Risks, and Limitations

For the purposes of this valuation, SLR has made a number of additional assumptions and estimates.

- SLR has relied on technical information in the CPR, including that supporting the DCF analysis.

- SLR has relied upon the list of exploration properties listed in the CPR.
- SLR has used information in the public domain and in the proprietary S&P Global Market Intelligence (S&P) database that SLR subscribes to.
- For this valuation, SLR has assumed that the properties outside of the Mining Concession could be explored and that any economic deposits delineated on them could be permitted for development.

Highest and Best Use (HBU) is a valuation concept that would produce the highest value for an asset. The HBU must be physically possible, financially feasible, legally allowed, and result in the highest value (International Valuation Standards 140). For this valuation, SLR has considered only the value of mineral rights or subsurface rights that adhere to the mineral claims and has not considered other possible uses or values such as surface rights, water rights, timber rights, and the like that may also be vested in the Property or parts of the Property.

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