Technical Report Summary on the Aripuanã Zinc Project, State of Mato Grosso, Brazil S-K 1300 Report

Nexa Resources S.A.

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SLR

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1.0 EXECUTIVE SUMMARY

1.1 Summary

SLR Consulting Ltd (SLR) was retained by Nexa Resources S.A. (Nexa, or the Company) to prepare an independent Technical Report Summary on the Aripuanã Zinc Project (Aripuanã or the Project), located in the state of Mato Grosso, Brazil. The purpose of this Technical Report Summary is to support the disclosure of updated Mineral Resource and Mineral Reserve estimates. This Technical Report Summary conforms to United States Securities and Exchange Commission's (SEC) Modernized Property Disclosure Requirements for Mining Registrants as described in Subpart 229.1300 of Regulation S-K, Disclosure by Registrants Engaged in Mining Operations (S-K 1300) and Item 601 (b) (96) Technical Report Summary. SLR visited the property in February and June 2017. SLR has prepared this amended Technical Report Summary to provide additional information about metallurgical recoveries and lead, silver, and gold markets, and to disclose the accuracy of the cost estimates. SLR notes that the effective date of the technical information contained herein remains September 30, 2021.

Nexa is a publicly traded company on the Toronto Stock Exchange (TSX) and the New York Stock Exchange (NYSE). It is a reporting issuer in all provinces and territories of Canada and is under the jurisdiction of the Ontario Securities Commission.

Nexa is a large-scale, low-cost, integrated zinc producer with over 60 years of experience developing and operating mining and smelting assets in Latin America. Nexa has a diversified portfolio of polymetallic mines (zinc, lead, copper, silver, and gold) and also greenfield projects at various stages of development in Brazil and Peru. In Brazil, Nexa owns and operates two underground mines, Vazante and Morro Agudo (Zn and Pb). It also operates two zinc smelters in Brazil (Três Marias and Juiz de Fora). In Peru, Nexa operates the El Porvenir (Zn, Pb, Cu, and Ag), Cerro Lindo (Zn, Cu, Pb, and Ag), and Atacocha (Zn, Cu, Pb, Au, and Ag) mines, as well as the Cajamarquilla zinc smelter near Lima. Nexa's development projects in Peru include Magistral, Shalipayco, Florida Canyon (JV with Solitario), Hilarión, and Pukaqaqa. In Brazil, Nexa is developing the Aripuanã Zinc Project (Zn, Pb, Cu, Au, and Ag), which is currently under construction.

The Project is 100% owned by Mineração Dardanelos Ltda. (Dardanelos), a wholly-owned subsidiary of Nexa.

To date, the focus of exploration activities on the Project has been the Arex, Link, Ambrex, and Babaçú deposits, which contain the current Mineral Resources and Mineral Reserves. A feasibility study (FS) was completed in 2018, and construction began in July 2019. Earthworks are complete, surface facilities are under construction, and underground development is underway, with mechanical completion expected in Q4 2021 and production scheduled to begin in 2022.

1.1.1 Conclusions

SLR offers the following conclusions for each area:

1.1.1.1 Geology and Mineral Resources

- The Aripuanã deposits are located within the central-southern portion of the Amazonian Craton, in which Paleoproterozoic and Mesoproterozoic lithostratigraphic units of the Rio Negro-Juruena province (1.80 Ga to 1.55 Ga) predominate.
- The Aripuanã polymetallic deposits are typical volcanogenic massive sulphide (VMS) deposits associated with felsic bimodal volcanism. Four main elongate mineralized zones, Arex, Link, Ambrex, and Babaçú, have been defined in the central portion of the Project.
- Two separate material types have been identified – massive sulphide stratabound Zn-Pb mineralization, and Cu-Au bearing stringer mineralization found in the footwall of the stratabound zones.
- The drilling, sampling, sample preparation, analysis, and data verification procedures meet or exceed industry standard, and are appropriate for the estimation of Mineral Resources.

- As prepared by Nexa and adopted by SLR, the Aripuanã Measured and Indicated Mineral Resources, effective as of September 30, 2020, comprise 8.1 million tonnes (Mt) at 2.1% Zn, 0.7% Pb, 0.3% Cu, 0.4 g/t Au, and 22 g/t Ag for 169,000 tonnes (t) Zn, 60,000 t Pb, 25,000 t Cu, 98,000 ounces (oz) Au, and 5.8 million ounces (Moz) Ag. Mineral Resources are reported on a 100% Nexa attributable ownership basis.
- Inferred Mineral Resources comprise 39.5 Mt at 3.3% Zn, 1.2% Pb, 0.3% Cu, 0.6 g/t Au, and 34 g/t Ag for 1.3 Mt Zn, 482,000 t Pb, 131,000 t Cu, 737,000 oz Au, and 43.0 Moz Ag.
- Based on additional drilling completed since 2018, the Babaçú deposit has been incorporated into the Project's Mineral Resource estimate. The deposit remains open and presents exploration potential beyond the current Mineral Resources. Limited exploration has identified additional mineralized bodies including Massaranduba to the south and Arpa to the north.

1.1.1.2 Mining and Mineral Reserves

- The deposits support a production rate of 2.2 million tonnes per annum (Mtpa), producing an average of 70,000 t of zinc per annum (tpa) (zinc equivalent of 119,000 tpa, after converting other metals based on net revenue).
- Deposit geometry and geomechanical properties are amenable to bulk longhole mining methods, in primary/secondary or longitudinal retreat sequencing, depending on thickness.
- As prepared by Nexa and adopted by SLR, the Aripuanã Proven and Probable Mineral Reserves, effective as of September 30, 2020, comprise 23.5 Mt at grades of 3.7% Zn, 1.4% Pb, 0.25% Cu, 0.31 g/t Au, and 34 g/t Ag, containing 859,800 t Zn, 319,000 t Pb, 59,700 t Cu, 236,100 oz Au, and 25.9 Moz Ag. Mineral Reserves are reported on a 100% Nexa attributable ownership basis.
- Dilution and extraction estimates include:
  - Dilution – planned (captured within stope designs) and additional unplanned dilution applied as factors ranging from 5% to 15%, by mining method.
    - SLR's preference is to apply dilution as a hanging wall/footwall distance, rather than a global percentage (as has been done in estimating Mineral Reserves). The percentage approach applies too much dilution to larger stopes and not enough to smaller stopes.
    - SLR reviewed the impact of this methodology and found that using percentage dilution may introduce small inaccuracies to some individual stope estimates, however, it has little impact on the overall estimate.
  - Extraction – initial selection of resources by stope optimization and design, plus additional factors of 85% to 100% (100% dilution only occurs during development), by mining method.
- The stope shapes are based on optimizer output, with some editing and manual redesign. There will be opportunities to reduce planned dilution and increase extraction after infill drilling and before mining as part of the short-term planning process.
- The Arex, Link, and Ambrex deposits are not directly connected underground, making it difficult to share slow-moving mobile equipment efficiently. Fleet unit numbers are adequate to achieve the proposed mine production with limited sharing.

1.1.1.3 Mineral Processing

- The results of the metallurgical test work form the basis for the current engineering design of the sequential talc, copper, lead, and zinc flotation circuit.
- Stringer and stratabound mineralization have been tested separately and in blends of various proportions. Different comminution results and recovery kinetics were observed during bench-scale test work for the different mineralization. The decision was initially made to process the two material types separately on a campaign basis, however, continued test work on blends indicated that acceptable recoveries and concentrate grades can be achieved when processing blended ore.

- Process performance is projected as:
  - Stratabound Zinc – 89.5% recovery to Zn concentrate. Silver recovery to this concentrate will be 10%.
  - Stratabound Lead – Variable recovery in the range of 80% to 90% with a life of mine (LOM) average of 84.5% to Pb concentrate. Gold and silver recoveries to this concentrate will be 20% and 55%, respectively.
  - Stratabound Copper – 67.6% to Cu concentrate. Gold and silver recoveries to this concentrate will be 50% and 20%, respectively.
  - Stringer Copper – Variable recovery in the range of 85% to 95% with a LOM average of 86.9% recovery to Cu concentrate. Gold and silver recoveries to this concentrate will be 63% and 50%, respectively.
  - Regression models have been developed from the test work to relate recovery to head grade for each of the metals and have been used to estimate recovery in the cash flow model for the LOM.
- Test work in late 2019 and early 2020 by SGS GEOSOL on composites representing ore to be processed in the first nine quarters of operation (based on the FEL3 LOM plan) confirmed that acceptable recoveries and concentrate grades could be achieved. While zinc and copper recoveries were within expected ranges, lead recovery was below expectations. However, since many of the locked cycle tests (LCT) using these composites did not reach equilibrium, recoveries and concentrate grades need to be verified.
- Pilot plant test work is being conducted by Nexa at its Vazante Mine using blended (stratabound and stringer) bulk ore samples drawn from the run of mine (ROM) stockpile at Aripuanã. Results from this test work were not available at the time of writing this Technical Report Summary.
- Grinding circuit simulations were conducted to evaluate the capacity of the grinding circuit when processing different ore types. The simulations indicated that throughput would be limited to 216 tonnes per hour (tph) (4,730 tpd) for stringer ore and 289 tph (6,300 tpd) for stratabound ore, with throughput between these two cases for blends of stringer and stratabound ore. SLR estimated that throughput of stringer ore of up 5,000 tpd could be achieved for ore corresponding to the 75th percentile of hardness values determined during test work, rather than the higher hardness values used in the grinding circuit simulations.
- Talc (non-sulphide fines) removal by flotation is sometimes required prior to sequential flotation of Cu, Pb, and Zn. Copper losses to the talc concentrate can be recovered by reverse copper flotation from the talc concentrate, which will be implemented in the processing plant if required.
- Concentrates are expected to be generally clean without penalizable levels of deleterious elements.

1.1.1.4 Environment

- No environmental issues were identified from the documentation available for review that could materially impact the ability to extract the Mineral Resources and Mineral Reserves.
- Nexa maintains a list of permits for the Project along with any relevant expiry dates, which was provided to SLR. These include installation and operating licenses. Nexa reports regularly to the Mato Grosso environmental regulatory agency (SEMA) on compliance with conditions of Installation License No. 69614/2018 for the Project.
- Nexa has assessed the environmental impacts of the Project in the 2017 Environmental Impact Assessment (EIA) for all Project phases, taking into account the baseline conditions. Management programs and monitoring plans were included in the EIA to mitigate the identified impacts, and further detail on these programs and plans were provided in a stand-alone Environmental Control Plan in 2018. The EIA and subsequent management plans are comprehensive in the detail they provide. Some aspects such as resource use efficiency are yet to be considered by the developing Project. In the SLR Qualified Person's (QP) opinion the proposed environmental plans are adequate to address issues related to environmental compliance.
- Nexa reports that it has ISO systems in place and has committed to complying with all relevant legal requirements.

1.1.1.5 Social

- The 2017 EIA includes a social baseline description, assessment of socio-economic impacts, and management plans detailing measures to prevent, minimize, or mitigate the identified socio-economic impacts. These components are generally consistent with social impact assessment practices. Since the completion of the 2017 EIA, Nexa has continued to monitor socio-economic indicators. This monitoring program is focused on the potential impacts for the various phases of the Project. Nexa implements a complaint register to gather and respond to complaints from the public. In the SLR QP's opinion the social management programs and tools for Aripuanã are adequate to address potential issues related to local communities and Indigenous Peoples.
- Consultations with Indigenous Peoples regarding Project impacts and mitigations were undertaken. A study of the Indigenous communities was carried out to assess the environmental and socio-cultural impacts arising from the Project.
- The agreement signed with the artisanal miners cooperative establishes a consent from Nexa for use of 517 ha for artisanal mining activities for a period of two and a half years, which may be renewed for an equal period. The assigned area has no interference with the mining concession area related to the Aripuanã Project, which is located in another mining right owned by Nexa. The agreement also establishes that all environmental damages arising from the artisanal mining activity in the assigned area will be the cooperative's responsibility, and Nexa is exempt from any environmental liabilities arising from their activities.
- Nexa plans to employ mostly local people averaging approximately 65% local employees. Nexa reports that 54% of job vacancies in 2019 were filled by women.
- Nexa's developing the Project contributes positively to community well-being and development. The Project has provided assistance to the local authorities and communities in responding to the current COVID-19 pandemic. Nexa has established environmental and social management programs, as well as health and safety programs for its employees. Corporate policies, procedures, and practices are implemented in a manner consistent with relevant International Finance Corporation (IFC) Performance Standards.

1.1.1.6 Construction Progress

- Detailed engineering is 99% complete.
- Physical construction progress has been estimated by Nexa to be 55.37% as of the end of December 2020.
- 70% of long-lead equipment has been delivered to site.
- Pre-commissioning and commissioning are scheduled for the second half of 2021, with ramp-up to full production starting in 2022.
- Delays from the original schedule include:
  - Delays in completion of detailed engineering and outcomes of detailed engineering resulting in increases in quantities including earthworks and construction materials, investment in mine development, consumables, and spare parts, among others.
  - Additional infrastructure services due to issues experienced during earthworks activities.
  - Additional scope such as new equipment and infrastructure items in the process plant and in the tailings dry stack piles.
  - Increase in third-party services.
  - Upgrades at the Dardanelos power substation.
  - Logistics constraints on the upgrade of the Aripuanã river bridge.
  - The COVID-19 pandemic.

1.1.1.7 Costs and Economics

- Pre-production capital costs remaining from 2021 onward total approximately US$234 million.
- Contingency comprises 7.6% of direct and indirect capital costs.
- Operating costs average US$34.35 per tonne over the LOM, with higher unit costs at the start and end when full production is not achievable.
- Long-term metal prices (from 2026 onwards) are based on Nexa's projections. Nexa's long term price model uses multiple variables including supply (mine and refined), demand, cost drivers, capital cost, and other key elements. The long-term prices derived are in line with the consensus forecasts from banks and independent institutions and are as follows: US$1.11/lb Zn, US$0.87/lb Pb, US$3.01/lb Cu, US$1,500/oz Au, and US$16.87/oz Ag.
- Smelter terms are projected by Nexa based on selling 46% of produced concentrates directly to China and 54% to Nexa's internal smelters and are consistent with industry benchmarks.
- The after-tax Net Present Value (NPV) at a 9% discount rate is $356 million, and the Internal Rate of Return (IRR) is 31.9%.
- This NPV and IRR does not include capital expenditures to date. Capital costs up to Q2 2020 amounted to US$201 million. Nexa has forecast expenditures of US$117 million in H2 2020, US$227 million in 2021 and US$1 million in 2022, totalling US$547 million. An additional US$201 million of sustaining capital is estimated during the LOM, which includes US$66 million in mine development and US$20 million in mine closure cost. Considering capital expenditures to date, the Project's after-tax NPV at a 9% discount rate is US$27 million, and the IRR is 9.8%.

1.1.2 Recommendations

SLR offers the following recommendations for each area:

1.1.2.1 Geology and Mineral Resources

1. Infill areas where poorly angled drill holes are driving the geological interpretation.
2. Investigate the use of density weighting during compositing and interpolation.
3. Following up with additional step out drilling at Babaçú to increase the Mineral Resources.
4. Drill the Babaçú NW Exploration Target to convert the exploration target to Mineral Resources.
5. Continue to review minor issues with certain Certified Reference Materials (CRMs) used in analytical quality assurance procedures.

1.1.2.2 Mining and Mineral Reserves

1. Review and optimize stope shapes after infill drilling and before mining as part of the short-term planning process.
2. Implement a rigorous grade control program during operations, to assess the impact of the various material grades and effectiveness of blending on the process recovery.

1.1.2.3 Mineral Processing

1. Confirm the recovery and concentrate grade values derived from earlier test work that have been used in project cash flow calculations by completing the ongoing pilot test work at Nexa's Vazante Mine using bulk blended ore samples simulating the processing of stringer and stratabound material together. This test work may also provide opportunities to optimize flotation conditions to maximize recovery and concentrate quality.
2. Using the talc flotation circuit configuration arrived at during test work at SGS GEOSOL in early 2020, confirm talc rejection efficiency and copper losses through pilot test work at Vazante Mine.

1.1.2.4 Environment

1. Develop and implement a project-specific environmental policy.
2. Revise the management plans on a regular basis and improve them where relevant based on feedback such as monitoring data or stakeholder comments. An action should therefore be specifically included in the management plans which describes how and when these plans will be revised and updated.
3. Ensure that the environmental monitoring plans are being implemented according to the Environmental Control Plan.
4. Compare monitoring results to relevant international standards, e.g., IFC standards specified in various guideline documents, in addition to local or national applicable standards.
5. Nexa has indicated that all third-party water users were identified, and the monitoring program was developed taking these users into account. Information should be maintained on potential sensitive receptors with respect to impacts such as dust generation, noise and third-party water surface and groundwater users so that these receptors can be monitored as relevant in order to ensure that all potential Project impacts are adequately managed.

The following recommendations associated with tailings disposal are proposed for the next phase of the design:

1. Classify the tailings management facility (TMF) in terms of the Global Tailings Standard or the Canadian Dam Association. The classification may require more conservative design criteria in terms of flood management and seismic loading.
2. Consider the stability assessment of the individual components of the double lined system and the interface between the components in the stability analyses. In particular, the interface between the smooth side of the geomembrane and the sand leakage detection layer.
3. Complete a deformation analysis to determine if the long-term strain of the high density polyethylene geomembrane is within acceptable limits.
4. Implement measures to control dust generation from the slopes of the TMF and internal access roads and ramps during the dry season.
5. Implement requirements to allow the progressive rehabilitation of the slopes.
6. Implement deposition planning for the wet season and the associated logistical requirements for the use and management of the inflatable warehouses.
7. Investigate the extent of the colluvial layer within the foundation of the TMF to provide a more accurate estimate of the volume of material that must be removed.
8. Carry out an initial assessment of the stability of the capping clay layer on the intermediate bench slopes to determine if slope flattening is required for closure.
9. Determine a source of clay with suitable quality for use as a lining and capping material.
10. Complete a formal risk assessment.

1.1.2.5 Social

1. Nexa has conducted extensive stakeholder engagement with communities in the area, including Indigenous Communities. As the Project evolves, Nexa should develop a stakeholder engagement plan going forward and update this plan regularly. A separate plan should be developed for engagement with Indigenous Communities. The Engagement with Indigenous Communities plan should specifically determine if these stakeholders are satisfied with the risks, impacts, and management measures identified for the Project. All stakeholder engagement plans should consider the current COVID-19 pandemic in terms of how interaction with stakeholders can be achieved both effectively and safely for as long as the pandemic is a factor.
2. Revise the social management plans on a regular basis and improve where relevant, based on feedback such as monitoring data or stakeholder comments. An action should therefore be specifically included in the management plans which describes how and when these plans will be revised and updated.
3. Clearly document the socio-economic monitoring program and methods and include benchmarks.

4. Develop and implement site-specific occupational, health, and safety plans.
5. Develop and implement a Chance Find procedure for heritage resources.
6. Maintain clear records on any worker grievances or ethical violations, if not done already.
7. Consider implementing preferential hiring, training, and development of Indigenous Peoples specifically.

1.1.2.6 Costs and Economics

1. Continuously monitor costs and exchange rates and lock in costs as soon as possible to eliminate economic uncertainty.

1.2 Economic Analysis

The economic analysis contained in this Technical Report Summary is based on Aripuanã's Mineral Reserves, economic assumptions provided by Nexa, and capital and operating costs as presented in Section 18 of this Technical Report Summary. A summary of the key criteria is provided below.

1.2.1 Economic Criteria

1.2.1.1 Physicals

- LOM processing of 23.5 Mt, grading 3.7% Zn, 1.4% Pb, 0.3% Cu, 34 g/t Ag, and 0.3 g/t Au
- Metallurgical recoveries at the LOM average head grades (recoveries vary as a function of head grade) of 89.4% Zn, 83.4% Pb, 67.5% Cu, 70.0% Ag, and 70.0% Au for stratabound material, and 88.8% Cu, 50.0% Ag, and 63.0% Au for stringer material.
- LOM average metal payable of 85% Zn, 95% Pb, 96% Cu, 83% Ag, and 83% Au.
- LOM payable metal of 713,000 t Zn, 251,000 t Pb, 41,000 t Cu, 16.654 Moz Ag, and 131,000 oz Au.
- LOM metal prices derived from Nexa's Internal Projection forecasts converging on long-term prices of US$1.11/lb Zn, US$0.87/lb Pb, US$3.01/lb Cu, US$16.87/oz Ag, and US$1,500/oz Au from 2026 onwards.
- Net revenue includes deductions for transportation, off-site treatment and refining, and royalties.
- Revenue is recognized at the time of production.

1.2.1.2 Costs

- Costs include initial capital costs, sustaining costs, closure costs, working capital, and operating costs.
- Average operating cost over the mine life is US$34.35/t processed.
  - Mining: US$15.34/t
  - Processing: US$13.31/t
  - General and Administrative: US$5.69/t

1.2.1.3 Taxation and Royalties

SLR has relied on a Nexa taxation model for calculation of income taxes applicable to the cash flow.

1.2.2 Cash Flow Analysis

An after-tax Cash Flow Projection has been generated and a summary of the cash flow is presented in Table 1-1.

The Net Present Value (NPV) at a 9% discount rate is $356 million, and the Internal Rate of Return (IRR) is 31.9%, not considering capital expenditures prior to 2021.

Table 1-1: Cash Flow Summary
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	Units	Undiscounted	Discounted at 9%
Mill Feed, Total	Mt	23.5	
LOM	years	11	
Gross Revenue	**US$M**	**2,654**	**1,594**
Royalties	US$M	113	67
Net Revenue	**US$M**	**2,541**	**1,527**
Operating Costs			
Mining	US$M	361	220
Processing and Tailings	US$M	313	184
G&A	US$M	134	82
Total Operating Cost	US$M	808	485
Sales Costs	US$M	331	196
Other Operating Costs		15	14
Operating Margin (EBITDA)	**US$M**	**1,387**	**830**
Initial Capital Costs Remaining (net of taxes)	US$M	215	206
Sustaining Capital (net of taxes)	US$M	158	108
Closure and Other	US$M	20	7
Operational Working Capital	US$M	0	6
Pre-tax Cash Flow	**US$M**	**995**	**503**
After-tax Cash Flow	**US$M**	**761**	**356**
Pre-tax NPV			
Payback	years		3.0
NPV 8%	US$M		542
NPV 9%	US$M		503
NPV 10%	US$M		468
IRR	%		45.0
After-tax NPV			
Payback	years		3.3
NPV 8%	US$M		388
NPV 9%	US$M		356
NPV 10%	US$M		326
IRR	%		31.9

Note: Numbers may not add due to rounding.

1.2.3 Sensitivity Analysis

SLR conducted sensitivity analyses using metal price, head grade, metallurgical recovery, capital costs and operating costs. The Project is most sensitive to changes in metal prices, and least sensitive to capital and operating costs.

1.3 Technical Summary

1.3.1 Property Description

The Project is located in the state of Mato Grosso, western Brazil, 1,200 km northwest of Brasilia, the capital city. The property is located at approximately 226,000 mE and 8,888,000 mN UTM 21L zone (South American 1969 datum).

The Project consists of a contiguous block comprising one mining concession, two mining applications, one right to apply for mining concession, thirteen exploration authorizations, and three exploration applications covering a total area of 66,336.04 ha. The permits are wholly-owned by Dardanelos.

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

The Project is located in the northwest corner of the state of Mato Grosso, western Brazil, and is accessible from the town of Aripuanã via a 25 km unpaved road, which is well maintained in the dry season. Aripuanã can be accessed from the state capital, Cuiabá, via a 16 hour drive (935 km) on paved and unpaved roads. The final 250 km between Cuiabá and Aripuanã are on unpaved roads, which are in poor condition and require substantial upgrades to ensure road access to site. The town of Aripuanã is also serviced by a paved airstrip suitable for light aircraft.

The climate in the Project area is characterized by hot and humid weather, with distinct dry (April to September) and wet (October to March) seasons, as such it is classified as a "Tropical Savanna Climate" in the Köppen Climate Classification.

The economic base in the town of Aripuanã is rooted in the extractive industries, predominantly timber, agriculture, and tourism. Although located in the Amazon district, deforestation has occurred and the area is defined mostly by plantations of rubber and soybeans, as well as artisanal mining operations. No skilled mining workforce exists in the district. The town of Aripuanã hosts a hospital and related medical facilities as well as primary and secondary schools.

Infrastructure is limited at, and adjacent to, the Project. Infrastructure includes a core handling facility located in the town of Aripuanã. Multi-purpose storage sheds are located at the facility and a nursery for drill site and road reclamation is located on site. There are 270 km of unpaved roads on site, which are difficult to traverse during the wet season (October to March). Fuel prices are elevated in the region and there is a high cost associated with road maintenance.

Services to the Project are provided by the town of Aripuanã, which includes accommodation, restaurants, and stores.

The Dardanelos Hydropower dam (261 MW) was completed at the town of Aripuanã in 2011, approximately 20 km from the Project. A thermal power plant next to the town of Aripuanã airport (Guaçu Power Plant), which uses woodchips and waste as fuel, has a generation capacity of 30 MW.

The Project lies between 250 metres above sea level (MASL) and 350 MASL, and comprises seven occurrences of mineralization: Arex, Link, Ambrex, Babaçú, Massaranduba, Boroca, Arpa, and Mocoto, over a 25 km strike length. The Arex, Ambrex, and Babaçú deposits are visible as three tree-covered mounds on a steep ridge surrounded by flat ground. Vegetation is dense on the ridge but has been largely cleared in surrounding areas that are used primarily for agricultural purposes.

1.3.3 History

Gold mineralization was discovered in the area during the 1700s by prospectors. Although no formal records exist, the area was likely prospected sporadically over the years.

Anglo American Brasil Ltda (Anglo American) began exploration over the property in 1995. At the time, a small area including Expedito's Pit, now part of the Project, was held by Madison do Brasil (now Thistle Mining Inc.) and optioned to Ambrex Mining Corporation (now Karmin).

Dardanelos was created in 2000 to represent a joint venture, or "contract of association," between Karmin and Anglo American, with the intent of exploring for base and precious metals in areas adjacent to the town of Aripuanã. Anglo

American and Karmin held 70% and 28.5% of Dardanelos, respectively, with remaining interest (1.5%) owned by SGV Merchant Bank.

In 2004, the initial agreement between Karmin and Anglo American was amended to allow the participation of Nexa Recursos Minerais S.A. (Nexa Brazil), a subsidiary of the Company. Nexa Brazil subsequently acquired 100% of Anglo American's interest in the Project. In 2007, Karmin purchased SGV Merchant Bank's interests, raising its participation to 30%.

In 2015, Compañía Minera Milpo S.A.A. (now Nexa Resources Peru S.A.A. - Nexa Peru), a subsidiary of the Company, acquired 7.7% of Nexa Brazil interests in Dardanelos.

In 2017, VM Holdings S.A. (VMH) rebranded to become Nexa Resources S.A. (Nexa or the "Company"), and listed on the New York and Toronto stock exchanges.

In 2019, Nexa Brazil purchased Karmin's interests in Dardenelos and acquired Nexa Peru's interest in Dardanelos in 2020. Nexa Brazil is now the sole owner of the Project.

1.3.4 Geological Setting, Mineralization, and Deposit

The Aripuanã deposits are located within the central-southern portion of the Amazonian Craton, in which Paleoproterozoic and Mesoproterozoic lithostratigraphic units of the Rio Negro-Juruena province (1.80 Ga to 1.55 Ga) predominate.

The lithological assemblage strikes northwest - southeast and dips between 35° and near vertical to the northeast.

The Aripuanã polymetallic deposits are typical VMS deposits associated with felsic bimodal volcanism. Four main elongate mineralized zones, Arex, Link, Ambrex, and Babaçú have been defined in the central portion of the Project. Limited exploration has identified additional mineralized bodies including Massaranduba to the south and Arpa to the north.

The individual mineralized bodies have complex shapes due to intense tectonic activity. Stratabound mineralized bodies tend to follow the local folds, however, local-scale, tight isoclinal folds are frequently observed, usually with axes parallel to major reverse faults, causing rapid variations in the dips.

Massive, stratabound sulphide mineralization as well as vein and stockwork-type discordant mineralization have been described on the property. The stratabound bodies, consisting of disseminated to massive pyrite and pyrrhotite, with well-developed sphalerite and galena mineralization, are commonly associated with the contact between the middle volcanic and the upper sedimentary units. Discordant stringer bodies of pyrrhotite-pyrite-chalcopyrite mineralization are generally located in the underlying volcanic units or intersect the massive sulphide lenses and have been interpreted as representing feeder zones.

1.3.5 Exploration

Between 2004 and 2007, VMH, Nexa's former corporate name, carried out geological, geochemical, and geophysical surveys over the Project area to allow a more complete interpretation of the regional and local geology and identification of local exploration targets.

Drilling on the property was carried out from 2004 to 2008, in 2012, and from 2014 to present. The purpose of the drill program in 2004 to 2008 was to explore and delineate mineralization on the property, and in 2012, to improve confidence and classification of the Mineral Resources of the Arex and Ambrex deposits. The Link deposit, an area of mineralization connecting the Arex and Ambrex deposits, and included in the Mineral Resource summary for Ambrex, was discovered in 2014 and delineated in 2015.

Since 2018, the focus of exploration activities on the property has been the Babaçú deposit, where drilling has been successful in upgrading this exploration target to an Inferred Mineral Resource.

Drilling on the Project has been conducted in phases by several companies since 1993. Total drilling at Arex, Link, Ambrex, and Babaçú consists of 718 diamond drill holes totalling 229,654 m. Of these, Nexa has completed 614 diamond drill holes totalling 203,553 m including 30 metallurgical drill holes totalling 5,899 m. Drilling at the other prospects on the property consists of 35 diamond drill holes totalling 13,886 m.

1.3.6 Mineral Resource Estimates

The block models were completed by Nexa personnel using Datamine Studio RM (Datamine Studio) and Seequent's Leapfrog Geo (Leapfrog). Wireframes for geology and mineralization were constructed in Leapfrog based on geology sections, assay results, lithological information, and structural data. Assays were capped to various levels based on exploratory data analysis and then composited to one metre lengths. Wireframes were filled with blocks measuring 5 m by 5 m by 5 m for Arex, Link, and Ambrex, and 10 m by 5 m by 5 m for Babaçú with sub-celling at wireframe boundaries. Blocks were interpolated with grade using ordinary kriging (OK) and inverse distance cubed (ID^3). Blocks estimates were validated using industry standard validation techniques. Classification of blocks was based on distance based criteria.

Mineral Resources as of September 30, 2020 are summarized in Table 1-2. Mineral Resources have been classified in accordance with the definitions for Mineral Resources in S-K 1300, which are consistent with Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves dated May 10, 2014 (CIM (2014) definitions) .

Table 1-2: Summary of Mineral Resources – September 30, 2020
Nexa Resources S.A. – Aripuanã Zinc Project

Classification	Tonnes (Mt)	Grade					Contained Metal				
		(% Zn)	(% Pb)	(% Cu)	(g/t Au)	(g/t Ag)	(000 t Zn)	(000 t Pb)	(000 t Cu)	(000 oz Au)	(Moz Ag)
Stratabound											
Measured	2.2	3.19	1.19	0.16	0.14	35.32	71	26	3	10	2.5
Indicated	3.5	2.71	0.90	0.08	0.14	23.05	95	32	3	16	2.6
M+I	**5.7**	**2.90**	**1.01**	**0.11**	**0.14**	**27.80**	**166**	**58**	**6**	**25**	**5.1**
Inferred	29.1	4.48	1.65	0.19	0.24	42.75	1,302	479	56	226	40.0
Stringer											
Measured	0.7	0.31	0.13	1.09	0.78	12.30	2	1	8	18	0.3
Indicated	1.7	0.06	0.04	0.67	1.04	7.83	1	1	11	55	0.4
M+I	**2.4**	**0.13**	**0.07**	**0.80**	**0.96**	**9.16**	**3**	**2**	**19**	**73**	**0.7**
Inferred	10.4	0.04	0.03	0.72	1.53	8.78	4	3	75	510	2.9
Total											
Measured	2.9	2.50	0.93	0.38	0.29	29.78	73	27	11	27	2.8
Indicated	5.2	1.86	0.63	0.27	0.43	18.17	96	32	14	71	3.0
M+I	**8.1**	**2.09**	**0.74**	**0.31**	**0.38**	**22.36**	**169**	**60**	**25**	**98**	**5.8**
Inferred	39.5	3.31	1.22	0.33	0.58	33.83	1,307	482	131	737	42.9

Notes:

1. The definitions for Mineral Resources in S-K 1300 were followed for Mineral Resources which are consistent with CIM (2014) definitions.
2. Mineral Resources are reported on a 100% Nexa attributable ownership basis.
3. Mineral Resources are reported using a US$45/t cut-off value for transverse longhole mining and longitudinal longhole retreat areas and US$55/t cut-off value for cut and fill areas.

4. The NSR is calculated based on metal prices: Zn: US$2,869/t (US$1.30/lb), Pb: US$ 2,249/t (US$1.02/lb); Cu: US$7,427/t (US$3.37/lb); Au: US$1,768/oz, and Ag: US$19.38/oz.
5. Metallurgical recoveries are accounted for in the NSR calculations based on metallurgical test work and are variable as a function of head grade. Recoveries at the LOM average head grades for stratabound material are 89.4% for Zn, 83.4% for Pb, 67.5% for Cu, 70.0% for Ag, and 70.0% for Au. Recoveries at the LOM average head grades for stringer material are 88.8% for Cu, 50.0% for Ag, and 50.0% for Au.
6. Mineral Resources are reported exclusive of Mineral Reserves within potentially mineable shapes.
7. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
8. Numbers may not add due to rounding.

The SLR QP is of the opinion that, with consideration of the recommendations summarized in this section, any issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

1.3.7 Mineral Reserve Estimates

The Aripuanã Mineral Reserves are based in three main orebodies, Arex, Link, and Ambrex. The main commodities produced are zinc, lead, copper, silver, and gold. The Mineral Reserve estimate for the Project as of September 30, 2020 is presented in Table 1-3.

Table 1-3: Summary of Mineral Reserves – September 30, 2020
Nexa Resources S.A. – Aripuanã Zinc Project

Deposit/Category	Tonnes (Mt)	Grade (% Zn)	(% Pb)	(% Cu)	(g/t Au)	(g/t Ag)
Arex						
Proven	4.21	2.97	1.07	0.65	0.45	33.83
Probable	1.10	1.99	0.69	0.75	0.75	23.97
Proven & Probable	**5.31**	**2.77**	**0.99**	**0.67**	**0.52**	**31.78**
Link						
Proven	1.37	4.63	1.73	0.13	0.27	37.78
Probable	5.34	3.95	1.32	0.22	0.32	32.31
Proven & Probable	**6.71**	**4.09**	**1.40**	**0.20**	**0.31**	**33.42**
Ambrex						
Proven	4.49	4.18	1.59	0.05	0.15	37.55
Probable	6.98	3.59	1.44	0.12	0.27	34.81
Proven & Probable	**11.47**	**3.82**	**1.50**	**0.09**	**0.22**	**35.88**
Total						
Proven	10.08	3.74	1.39	0.31	0.29	36.02
Probable	13.42	3.60	1.33	0.21	0.33	32.93
Proven & Probable	**23.50**	**3.66**	**1.36**	**0.25**	**0.31**	**34.25**

Notes:

1. The definitions for Mineral Reserves in S-K 1300 were followed for Mineral Reserves which are consistent with CIM (2014) definitions.
2. The Mineral Reserve estimate is reported on a 100% ownership basis.
3. Mineral Reserves are estimated at a break-even cut-off value of NSR = US$45.00/t processed. Some incremental material with values between US$40/t and US$45/t was included.
4. Mineral Reserves are estimated using an average long-term zinc price of US$1.13/lb Zn, a long-term lead price of US$0.89/lb Pb, a long-term copper price of US$2.93/lb Cu, a long-term silver price of $16.85/oz Ag, and a long-term gold price of US$1,538/oz Au.
5. Metallurgical recoveries are accounted for in the NSR calculations based on metallurgical test work and are variable as a function of head grade. Recoveries at the LOM average head grades for stratabound material are 89.4% for Zn, 83.4% for Pb, 67.5% for Cu, 70.0% for Ag, and 70.0% for Au. Recoveries at the LOM average head grades for stringer material are 88.8% for Cu, 50.0% for Ag, and 50.0% for Au.
6. A minimum mining width of 4 m was used.
7. Numbers may not add due to rounding.

Contained metal in the Mineral Reserves consists of 859,800 t Zn, 319,000 t Pb, 59,700 t Cu, 25.9 Moz Ag and 236,100 oz Au.

The SLR QP is not aware of any risk factors associated with, or changes to, any aspects of the modifying factors such as mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

1.3.8 Mining Methods

Currently, the Project is targeted on mining three main elongate mineralized zones, Arex, Link, and Ambrex, that have been defined in the central portion of the Project.

The Arex and Ambrex deposits are separate VMS deposits with differing mineral compositions in stratabound and stringer forms and complex geometric shapes.

The deposit geometry is amenable to a number of underground mechanized mining techniques including cut and fill and bulk stoping methods. A nominal production target of 6,065 tpd has been used as the basis for the mine production schedule.

Mining will be undertaken using conventional mechanized underground mobile mining equipment via a network of declines, access drifts, and ore drives. Access to the Arex, Link, and Ambrex deposits will be from separate portals, which will access the deposits from the most favourable topographic locations.

1.3.9 Processing and Recovery Methods

Based on the metallurgical test work program completed to date, the Aripuanã process flowsheet has been developed using conventional technologies for ore treatment and the recovery of copper, lead, and zinc as separate concentrates. Plant throughput is forecast to average 2.214 Mtpa of ROM ore over the LOM supplied from the Arex, Link, and Ambrex underground mines. The plant will treat blended mineralization at up to 6,300 tpd (dry basis), with the maximum achievable throughput being for ore consisting mainly of stratabound material. Key elements of the process flowsheet include primary crushing, SAG and ball milling with pebble crushing (SABC), talc pre-flotation, followed by sequential flotation of copper, lead, and zinc.

1.3.10 Infrastructure

The current infrastructure includes:

- Mine support: access roads to the mines, infrastructure, and paste fill plant (construction is ongoing)
- Processing plant: access roads, drainage systems, concrete structures, crushing circuit electrical and mechanical assembly, semi-autogenous grinding (SAG) and ball mill, thickener and tailings filter, pipe rack assembly and piping is currently under construction.
- Water supply and waste and tailings deposition: the raw water supply dam and overburden stockpile are expected to be completed in late 2020.
- Power supply: permanent 69 kV power line. Construction of the main substation and secondary substations is underway.
- Administrative areas: civil works for administration buildings has commenced.

The planned infrastructure for the Project includes:

- Three underground mines, accessed by three portals and three ramps
- Dry Stack TMF
- Engineered wetlands for water collection and treatment
- Power supply by transmission line connected to the national grid
- Water storage dam
- Access and site roads
- Maintenance shops
- Fuel storage

1.3.11 Market Studies

The principal commodities that will be produced at the Project are freely traded, at prices and terms that are widely known, so that prospects for sale of any production are virtually assured. Zinc and copper represent 69% of Aripuanã's gross revenue, while lead, silver, and gold contribute 31% of the revenue. Aripuanã zinc concentrate will be processed at Nexa's Três Marias and Juiz de Fora zinc refineries in Brazil (54%) and that not processed at Nexa's refineries will be sold on the open market (46%). Lead and copper concentrates will be sold on the open market. Sales contracts for the lead and copper concentrates from the Project have not been negotiated yet.

Market information is based on the industry scenario analysis prepared by Nexa's Market Intelligence team in July 2020 using information sourced from different banks and independent financial institutions.

1.3.12 Environmental Studies, Permitting and Plans, Negotiations, or Agreements with Local Individuals or Groups

The Project is located in the Amazon Biome, within the South-Amazonian Ecotone Corridor. The Project made efforts to reduce potential environmental and social impacts. The mining method and the overall footprint were optimized, and efforts were made to place infrastructure in areas already affected by anthropogenic activities.

The Project EIA was finalized in 2017 and the Project holds installation and operating approvals. The 2017 EIA concludes that the most significant Project impacts are those that will directly and indirectly affect, synergistically and cumulatively, vegetation cover and soils in the Permanent Preservation Areas and water resources, as well as changes in fauna communities, both terrestrial and aquatic, highlighting the relevance of local biodiversity, with species of flora and fauna of the Amazon biome, including endangered species. The EIA developed management and monitoring plans to address and monitor key indicators for the identified impacts. A key mitigation measure with regard to encroachment on the Permanent Preservation Areas will be the implementation of a compensation plan and programs aimed at connectivity of habitat.

The 2017 EIA described two Indigenous villages located approximately 10 km to 12 km from the Project: Arara do Rio Branco with an area of approximately 114,842 ha and Aripuanã with an area of approximately 750,649 ha. Consultation with Indigenous Peoples regarding Project impacts and mitigation were undertaken under the tutelage and consent of National Historical and Artistic Heritage Institute (IPHAN) with National Indian Foundation (FUNAI) during the preparation of the 2017 EIA. In 2018, Nexa commissioned a study on the Indigenous Component of the Indigenous Lands Aripuanã and Arara do Rio Branco. The study methods were developed based on a Terms of Reference issued by FUNAI and through consultation with the Indigenous Communities. The report identified and assessed potential impacts on the Indigenous Communities and their lands, considered the perspectives of the Indigenous Communities on the potential impacts, and developed management plans to mitigate these impacts.

The Project will produce two types of mineralized waste, tailings, and waste rock, which will require disposal in dedicated facilities, a TMF and a waste rock facility (WRF). A double lined storage facility with a leak detection system is required for both the TMF and WRF due to the potential for poor quality leachate to be generated at these facilities. At closure, the TMF and WRF will be capped with a clay layer and vegetated.

A Conceptual Mine Closure Plan has been developed for the Project. The main objective of the plan is to present proposals and solutions to be implemented before, during, and after mine closure in order to avoid, eliminate, or minimize long-term environmental liabilities and possible future obligations. The plan currently considers four alternatives for final land use. The first option is for the whole area to become a Conservation Unit. The other options would allow some of the area to become a Conservation Unit while the remaining areas will be used for (a) a technical school for biodiversity conservation and the development of local communities (b) industrial use and a technical school, and (c) agro-industrial use and an agricultural technical school.

These alternatives are being evaluated by Nexa, however, for the time being, all of the alternatives are being considered and have been costed in the financial closure plan.

Nexa adheres to international standards to provide best practices for public reporting on economic, environmental, and social impacts in order to help Nexa's shareholders and stakeholders understand Nexa's corporate contribution to sustainable development. Corporately, Nexa has made several commitments to improve community health and safety as well as the overall well-being of community members.

1.3.13 Capital and Operating Cost Estimates

Pre-production capital costs were estimated by Nexa using a combination of contracts already awarded (the greatest part of the commitments), quotations, and factored estimates. A new baseline capital cost estimate was completed in August 2020, with an estimated accuracy of ±5% and a base date of July 2020. The new estimate did not consider costs related to the COVID-19 pandemic, and Nexa will assess these costs separately at a later date.

Pre-production capital costs remaining at the start of 2021 are estimated to total US$234 million. Prior to the end of 2020, Nexa had forecast pre-production capital costs of US$228 million using actual costs incurred in the first half of 2020 and anticipated costs to be incurred during the remainder of 2020; these are summarized in Table 1-4. The main reasons for the difference between the 2020 forecast and the estimate at the start of 2021 are the postponement from 2020 to 2021 of certain infrastructure activities to allow for enhanced detailing without impacting the total Project capital cost, less horizontal development than planned in 2020, and better-than-planned mobilization of the operations team.

Table 1-4: Pre-Production Capital Costs Forecast Prior to the End of 2020
Nexa Resources S.A. – Aripuanã Zinc Project

Area	Category	Units	Initial Costs
Mine	Development	US$ million	25.2
	Mobile Equipment	US$ million	4.5
Plant & Infrastructure	Site Prep & Earthworks	US$ million	53.9
	Civil & Roadwork	US$ million	14.7
	Steelwork	US$ million	2.4
	Electrical	US$ million	12.6
	Instrumentation	US$ million	8.4
	Mechanical Equipment	US$ million	14.9
	Piping	US$ million	8.3
Subtotal Direct Costs		**US$ million**	**144.9**
Indirect Costs	EPCM	US$ million	7.2
	Temporary Services	US$ million	7.3
	Owner's Team	US$ million	10.2
	Other	US$ million	42.6
Subtotal Indirects		**US$ million**	**67.3**
Contingency		US$ million	16.0
Total Capital Cost		**US$ million**	**228.2**

Contingency comprises 7.6% of direct and indirect capital costs, which SLR considers to be reasonable for the current stage of the Project. A total cost of $312 million has been incurred up to the end of 2020.

Sustaining capital was estimated by Nexa, with the majority of the costs consisting of mine development and mobile equipment. Sustaining capital over the life of mine totals US$181.5 million.

Operating costs, averaging US$73 million per year at full production, were estimated for mining, processing, and general and administration (G&A). Operating cost inputs such as labour rates, consumables, and supplies were based on Nexa operating data. A summary of operating costs is shown in Table 1-5.

Table 1-5: Operating Cost Estimate
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	Total LOM (US$ millions)	Average Year (US$ millions/yr)	LOM Unit Cost (US$/t)
Mining	361	32.8	15.34
Processing	313	28.5	13.31
G&A	134	12.2	5.69
Total	**886**	**73.5**	**34.35**

2.0 INTRODUCTION

SLR Consulting Ltd (SLR) was retained by Nexa Resources S.A. (Nexa or the Company) to prepare an independent Technical Report Summary on the Aripuanã Zinc Project (Aripuanã or the Project), located in the state of Mato Grosso, Brazil. The purpose of this Technical Report Summary is to support the disclosure of updated Mineral Resource and Mineral Reserve estimates. This Technical Report Summary conforms to United States Securities and Exchange Commission (SEC) Modernized Property Disclosure Requirements for Mining Registrants as described in Subpart 229.1300 of Regulation S-K, Disclosure by Registrants Engaged in Mining Operations (S-K 1300) and Item 601 (b)(96) Technical Report Summary. SLR has prepared this amended Technical Report Summary to provide additional information about metallurgical recoveries and lead, silver, and gold markets, and to disclose the accuracy of the cost estimates. SLR notes that the effective date of the technical information contained herein remains September 30, 2021.

Nexa is a publicly traded company on the Toronto Stock Exchange (TSX) and the New York Stock Exchange (NYSE). It is a reporting issuer in all provinces and territories of Canada and is under the jurisdiction of the Ontario Securities Commission.

Nexa is a large-scale, low-cost, integrated zinc producer with over 60 years of experience developing and operating mining and smelting assets in Latin America. Nexa has a diversified portfolio of polymetallic mines (zinc, lead, copper, silver, and gold) and also greenfield projects at various stages of development in Brazil and Peru. In Brazil, Nexa owns and operates two underground mines, Vazante and Morro Agudo (Zn and Pb). It also operates two zinc smelters in Brazil (Três Marias and Juiz de Fora). In Peru, Nexa operates the El Porvenir (Zn, Pb, Cu, and Ag), Cerro Lindo (Zn, Cu, Pb, and Ag), and Atacocha (Zn, Cu, Pb, Au, and Ag) mines, as well as the Cajamarquilla zinc smelter near Lima. Nexa's development projects in Peru include Magistral, Shalipayco, Florida Canyon (JV with Solitario), Hilarión, and Pukaqaqa. In Brazil, Nexa is developing the Aripuanã Zinc Project (Zn, Pb, Cu, Au, and Ag), which is currently under construction.

The Project is 100% owned by Mineração Dardanelos Ltda. (Dardanelos), a wholly-owned subsidiary of Nexa.

To date, the focus of exploration activities on the Project has been the Arex, Link, Ambrex, and Babaçú deposits, which contain the current Mineral Resources and Mineral Reserves. A feasibility study (FS) was completed in 2018, and construction began in July 2019. Earthworks are complete, surface facilities are under construction, and underground development is underway, with mechanical completion expected in Q4 2021 and production scheduled to begin in 2022.

2.1 Site Visits

SLR visited the property between June 2 and 5, 2017 to review drill core, discuss project development plans, and review work on the Project to date.

SLR visited the Project site on January 30 to February 3, 2017. During the site visit, SLR reviewed logging and sampling methods, inspected core from drill holes, and held discussions with Nexa personnel.

2.2 Sources of Information

Technical documents and reports on the deposit were reviewed and obtained from Project personnel during subsequent meetings and discussions between SLR personnel and the Nexa Project Team. Discussions were held with the following people from the Nexa Project Team:

- Mr. Pierre Légaré, Aripuanã Project Manager
- Mr. Fernando Madeira Perisse, Technical Services Manager
- Mr. Thiago Nantes Teixeira, Mineral Resources and Mineral Reserves Committee
- Ms. Priscila Artioli, Mineral Resources and Mineral Reserves Committee
- Mr. Julio Souza Santos, Senior Geologist and Aripuanã Zinc Field Manager
- Mr. Jose Antonio Lopes, Resource Manager

- Dr. Rafael Moniz Caixeta, Geologist – Mineral Resources
- Ms. Vivian Tavares Kayser, Geologist – Resource Evaluation
- Mr. Patrick Carmo De Oliveira, Senior Mining Engineer
- Ms. Danielle Alves Ribeiro, Cost and Contract Management
- Ms. Lucia Maria Cabral De Goes, Process Engineering Manager
- Mr. Gustavo Farinelli Silva, Financial Planning Coordinator
- Mr. Tiago Alvarenga, Metallurgical Process Manager
- Mr. Pablo Pina, Technology Manager
- Ms. Gilmara Patrícia Barros Carneiro, Environmental Coordinator
- Ms. Aline Vilas Boas De Souza, Social Management Consultant
- Ms. Cristiane Holanda Moraes Paschoin, Social Management Consultant

This Technical Report Summary was prepared by SLR Qualified Persons (QP). The documentation reviewed, and other sources of information, are listed at the end of this report in Section 24 References.

2.3 List of Abbreviations

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

m	micron	kVA	kilovolt-amperes
mg	microgram	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	mi	mile
dia	diameter	min	minute
dmt	dry metric tonne	mm	micrometre
dwt	dead-weight ton	mm	millimetre
°F	degree Fahrenheit	mph	miles per hour
ft	foot	MVA	megavolt-amperes
ft^2	square foot	MW	megawatt
ft^3	cubic foot	MWh	megawatt-hour
ft/s	foot per second	oz	Troy ounce (31.1035 g)
g	gram	oz/st, opt	ounce per short ton
G	giga (billion)	ppb	part per billion
Gal	Imperial gallon	ppm	part per million
g/L	gram per litre	psia	pound per square inch absolute
Gpm	Imperial gallons per minute	psig	pound per square inch gauge
g/t	gram per tonne	RL	relative elevation
gr/ft^3	grain per cubic foot	s	second
gr/m^3	grain per cubic metre	st	short ton
ha	hectare	stpa	short ton per year
hp	horsepower	stpd	short ton per day
hr	hour	t	metric tonne
Hz	hertz	tpa	metric tonne per year
in.	inch	tpd	metric tonne per day
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 PROPERTY DESCRIPTION

3.1 Location

The Project is located in west-central Brazil, in the state of Mato Grosso, approximately 700 km northwest of the state capital Cuiabá and approximately 1,400 km northwest of the national capital Brasilia. The Project is approximately 2,529 km by rail and road to the Três Marias smelter and 2,831 km to the Juiz de Fora smelter, and 2,660 km to the port of Santos. The centre of the property is located at approximately 10°05'00"S Latitude and 59°25'00"W Longitude (Figure 3-1). The approximate Universal Transverse Mercator (UTM) co-ordinates of the centre of the currently defined mineralization are 226,000 mE and 8,888,000 mN, UTM zone 21L (South American 1969 datum), within the Aripuanã 1:250,000 topographic sheet (SC.21-Y-A).

3.2 Land Tenure

The Project consists of a contiguous block comprising one mining concession, two mining applications, one right to apply for mining concession, thirteen exploration authorizations (EAs), and three exploration applications covering a total area of 66,336.04 ha (Figure 3-2). All permits are wholly-owned by Dardanelos.

Table 3-1 lists all the subject concessions and relevant tenure information including concession names, tenement numbers, areas, titleholders, and phases.

In 2000, a joint venture between Anglo American Brasil Ltda. (Anglo American) and Karmin Exploration Inc. (Karmin) was formed to explore for base and precious metals in the area adjacent to the town of Aripuanã. Initially, Anglo American and Karmin held interests of 70% and 28.5% in the joint venture, respectively, with the remaining 1.5% held by SGV Merchant Bank (SGV). In 2004, the joint venture agreement was amended to allow Nexa's participation, with Nexa subsequently acquiring 100% of Anglo American's interest in the Project. In 2007, Karmin purchased SGV's interests, raising its participation to 30%, and in 2019, Nexa acquired Karmin and became the sole owner of the Project.

The Aripuanã concessions are in good standing with regards to Nexa's obligations under the Brazilian Mining code.

Table 3-1: Exploration Authorization Permits
Nexa Resources S.A. – Aripuanã Zinc Project

Tenement	Area (ha)	Phase	Holder
866051/2015	978.88	Exploration Authorization[1]	Mineração Dardanelos Ltda
866067/2017	226.73	Exploration Authorization	Mineração Dardanelos Ltda
866148/2017	9124.57	Exploration Authorization	Mineração Dardanelos Ltda
866229/2017	126.08	Exploration Authorization	Mineração Dardanelos Ltda
866292/2015	839.18	Exploration Authorization	Mineração Dardanelos Ltda
866293/2015	930.38	Exploration Authorization	Mineração Dardanelos Ltda
866727/2015	4388.50	Exploration Authorization	Mineração Dardanelos Ltda
866728/2015	6681.25	Exploration Authorization	Mineração Dardanelos Ltda
866729/2015	9186.52	Exploration Authorization	Mineração Dardanelos Ltda
866730/2015	9445.85	Exploration Authorization	Mineração Dardanelos Ltda
866812/2008	5453.30	Exploration Authorization	Mineração Dardanelos Ltda
866817/2016	4270.37	Exploration Authorization	Mineração Dardanelos Ltda

Tenement	Area (ha)	Phase	Holder
866941//2015	461.12	Exploration Authorization	Mineração Dardanelos Ltda
866173/1992	3639.88	Mining Concession[2]	Mineração Dardanelos Ltda
867381/1991	1000.00	Right to apply for mining concession	Mineração Dardanelos Ltda
866386/2003	412.20	Mining Application	Mineração Dardanelos Ltda
866565/1992	975.00	Mining Application	Mineração Dardanelos Ltda
866050/2015	331.51	Exploration Application	Mineração Dardanelos Ltda
866208/2013	415.61	Exploration Application	Mineração Dardanelos Ltda
866230/2017	7449.11	Exploration Application	Mineração Dardanelos Ltda

Notes:

1. Exploration Authorizations are valid for a maximum of three years, with a maximum extension equal to the initial period, issued at the discretion of the National Mining Agency (ANM).
2. Mining concessions are granted by the Brazilian Ministry of Mines and Energy, are renewable annually, and have no set expiry date.

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Figure 3-1: Location Map

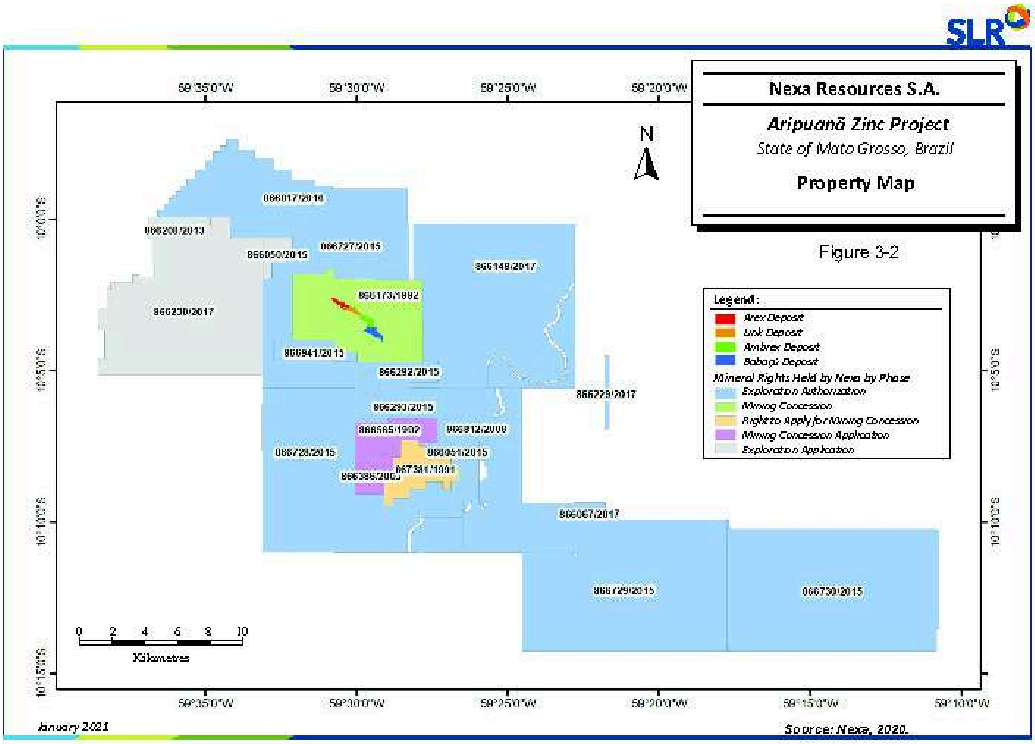

Figure 3-2: Property Map

3.2.1 Mineral Rights

Exploration and exploitation of mineral deposits in Brazil are defined and regulated by the 1967 Mining Code and overseen by the ANM. There are two main legal regimes under the Mining Code regulating Exploration and Mining in Brazil: Exploration Authorization ("Autorização de Pesquisa") and Mining Concession ("Concessão de Lavra").

Applications for an EA are made to the ANM and are available to any company incorporated under Brazilian law and maintaining a main office and administration in Brazil. EAs are granted following submission of required documentation by a legally qualified Geologist or Mining Engineer, including an exploration plan and evidence of funds or financing for the investment forecast in the exploration plan. An annual fee per hectare ranging from US$0.50/ha to US$ 1.00/ha, is paid by the holder of the EA to the ANM, and reports of exploration work performed must be submitted. During the period when a formal EA application has been submitted by a company for an area, but not yet granted, no exploration works are permitted. In this document, these areas are referred to as Exploration Applications.

EAs are valid for a maximum of three years, with a maximum extension equal to the initial period, issued at the discretion of the ANM. Annual fees per hectare increase by 50% during the extension period. After submission of a Final Exploration Report, the EA holder may request a mining concession. Mining concessions are granted by the Brazilian Ministry of Mines and Energy, have no set expiry date, and are valid until total depletion of mineral deposit. Concessions remain in good standing subject to submission of annual production reports and payments of royalties to the federal government.

Areas where the maximum extension of an EA has been reached, and a positive Final Exploration Report and mining concession request have not been submitted by the company, are designated with a status of "Public Offer". Prior to Decree nº9.406/2018, the public offer winner's decision was made considering the best technical proposal in terms of exploration activities and previous knowledge of the specific mineral right. At present, the winner is the company which has offered the highest amount of cash in an auction procedure.

3.2.2 Surface Rights

Surface rights can be applied for if the land is not owned by a third party. The owner of an EA is guaranteed, by law, access to perform exploration field work, provided adequate compensation is paid to third party landowners and the owner accepts all environmental liabilities resulting from the exploration work.

Nexa has purchased additional surface rights directly overlying the Arex, Link, Ambrex, and Babaçú deposits since 2012. Surface rights adjacent to the properties and necessary for mine development are currently being negotiated by Nexa. Table 3-2 describes the surfaces rights held while Figure 3-3 illustrates the surface rights currently held in relation to the mineral deposits.

Table 3-2: Surface Rights
Nexa Resources S.A. – Aripuanã Zinc Project

Real Estate Name	Property Certificate	Area (ha)	Mining Right DNPM
Sítio Esperança	3783	94.7197	866173/1992
Sítio Esperança	3784	89.1953	866173/1992
Sítio Serra Domada	85251	80.7838	866173/1992
Fazenda Boa Ventura	453	166.12	866173/1992
Sítio Maçaranduba	454	33.8	866173/1992
Sítio Água do Sapo	1944	22.8847	866173/1992
Sítio Bela Vista	1944	89.7449	866173/1992
Sítio Santo Antonio	1944	49.3244	866173/1992 866941/2015
Sítio Córrego Seco	2313	49.0975	866173/1992
Sítio São Roque	948	200	866173/1992
Sítio Mata Linda	1944	74.1747	866173/1992 866941/2015 866727/2015 866292/2015

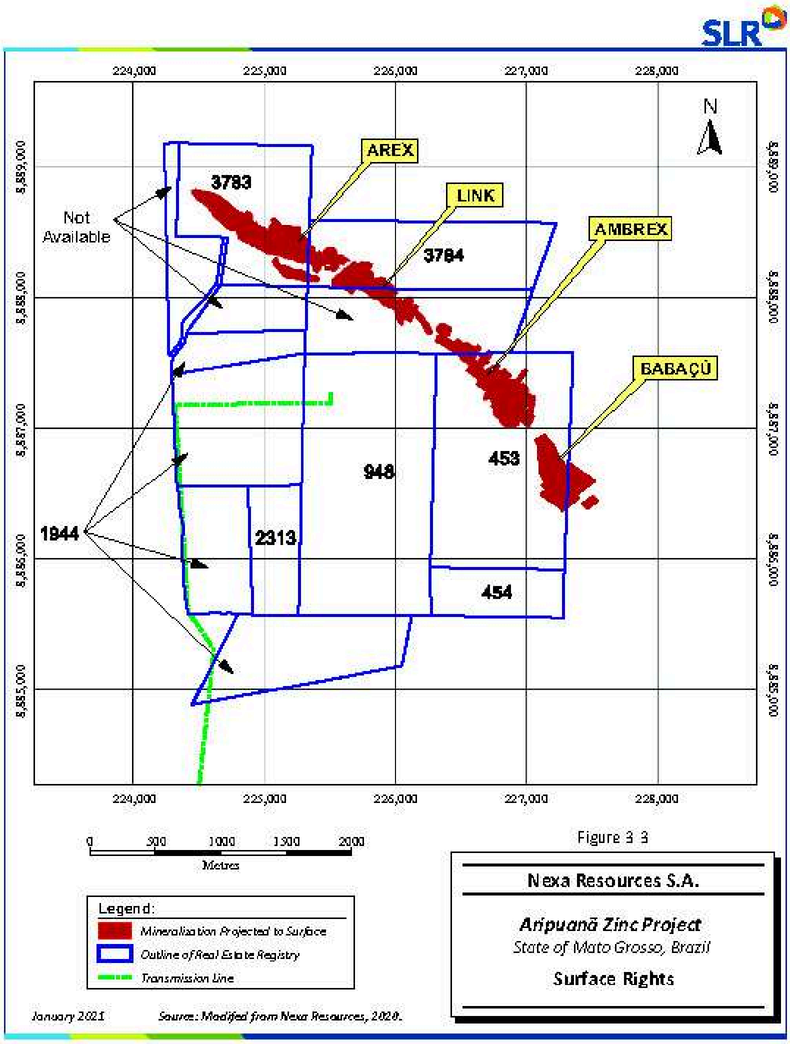

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Figure 3-3: Surface Rights

3.3 Encumbrances

SLR is not aware of any encumbrances to the property, including current and future permitting requirements and associated timelines, permit conditions, and violations and fines.

3.4 Royalties

Royalties applicable to the Project are detailed in Table 3-3.

Table 3-3: Royalty Data
Nexa Resources S.A. – Aripuanã Zinc Project

Receiver of Royalty		Arex	Ambrex	Other Deposits
Garimpeiros	Expedito 42.5% Divino 21.25% Joaquim 21.25% Neder 5% Zadir 5% Max 5%	-	2% Net Smelter Return (NSR) from the start of the first sale of concentrate	-
Luiz de Almeida		1.5% of net sales from the first sale of the mineral product	-	-
Anglo American[1]		2% NSR of 70% mining product of Zn, Pb, Cu, Au and Ag from the first of the beginning of the marketing of concentrates or June 13, 2013.		1.5% NSR of 70% of the mining product of Zn, Pb, Cu, Au and Ag

Notes:

1. Anglo American royalty is owed by Nexa only.

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

4.0 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

4.1 Accessibility

The Project is located in the northwest corner of the state of Mato Grosso, western Brazil, and is accessible from the town of Aripuanã via a 25 km unpaved road, which is well maintained in the dry season. Aripuanã can be accessed from the state capital, Cuiabá, via a 16 hour drive (935 km) on paved and unpaved roads BR-163/BR364, MT-160, MT-220, MT-170, MT-208, MT-418, and MT-206. The final 250 km between Cuiabá and Aripuanã are on unpaved roads, which are in poor condition and require substantial upgrades to ensure road access to site. The town of Aripuanã is also serviced by a paved airstrip suitable for light aircraft. There are no commercial flights travelling between Cuiabá and the town of Aripuanã and access to site is accomplished via a three-hour chartered flight.

Temporary roads link drill hole site locations within the Project area, with the main access gravel road from the town of Aripuanã.

4.2 Climate

The climate in the Project area is characterized by hot and humid weather, with distinct dry (April to September) and wet (October to March) seasons, as such it is classified as a "Tropical Savanna Climate" in the Köppen Climate Classification. The mean annual temperature is 24°C, with monthly average temperatures ranging between 20°C and 30°C. Average annual rainfall is 2,750 mm and annual average evaporation is 1,216 mm. Work can be carried out on the Project on a year-round basis.

4.3 Local Resources

The economic base in the town of Aripuanã is rooted in the extractive industries, predominantly timber, agriculture, and tourism. Although located in the Amazon district, deforestation has occurred and the area is defined mostly by plantations of rubber and soybeans, as well as artisanal mining operations. No skilled mining workforce exists in the district. The town of Aripuanã hosts a hospital and related medical facilities as well as primary and secondary schools.

4.4 Infrastructure

Infrastructure is limited at, and adjacent to, the Project. Infrastructure includes a core handling facility located in the town of Aripuanã. Multi-purpose storage sheds are located at the facility and a nursery for drill site and road reclamation is located on site. There are 270 km of unpaved roads on site, which are difficult to traverse during the wet season (October to March). Gas prices are very elevated in the region and there is a very high cost associated with road maintenance.

Services to the Project are provided by the town of Aripuanã, which includes accommodation, restaurants, and stores.

The Dardanelos Hydropower dam (261 MW) was completed at the town of Aripuanã in 2011, approximately 20 km from the Project. A thermal power plant next to the town of Aripuanã airport (Guaçu Power Plant), which uses woodchips and waste as fuel, has a generation capacity of 30 MW.

Numerous rivers occur close to the Project and water supply is not expected to be an issue.

4.5 Physiography

The Project lies between 250 MASL and 350 MASL, and comprises seven occurrences of mineralization: Arex, Link, Ambrex, Babaçú, Massaranduba, Boroca, Arpa, and Mocoto, over a 25 km strike length. The Arex, Ambrex, and Babaçú deposits are visible as three tree covered mounds on a steep ridge surrounded by flat ground. Vegetation is dense on the ridge but has been largely cleared in surrounding areas which are used primarily for agricultural purposes.

5.0 HISTORY

5.1 Prior Ownership

The following information is summarized from AMEC International (Chile) S.A. (AMEC, 2007).

Gold mineralization was discovered in the area during the 1700s by prospectors and a small fort was constructed to protect the portage at Aripuanã's Cachoeira de Andorinhas (Swallow Falls). No details of the extent of extraction of gold on the property during this time are available. Between 1979 and 1990, artisanal gold miners extracted gold from the district of Aripuanã, mostly through gold panning and small excavations. It is thought that at one time up to 2,000 artisanal gold miners were active in the district. One large pit, named Expedito's pit, was excavated during this time and is approximately 200 m deep.

Western Mining Corporation (WMC) held an exploration licence on the property between 1992 and 1994. No details of exploration work completed during this time are available.

Anglo American began exploration on the property in 1995. At the time, a small area including Expedito's Pit, now part of the Project, was held by Madison do Brasil (now Thistle Mining Inc.) and optioned to Ambrex Mining Corporation (now Karmin).

Dardanelos was created in 2000 to represent a joint venture, or "contract of association," between Karmin and Anglo American, with the intent of exploring for base and precious metals in areas adjacent to the town of Aripuanã. Anglo American and Karmin held 70% and 28.5% of Dardanelos, respectively, with the remaining interest (1.5%) owned by SGV.

In 2004, the initial agreement between Karmin and Anglo American was amended to allow the participation of Nexa Recursos Minerais S.A. (Nexa Brazil), a subsidiary of the Nexa. Nexa Brazil subsequently acquired 100% of Anglo American's interest in the Project. In 2007, Karmin purchased SGV Merchant Bank's interests, raising its participation to 30%.

In 2015, Compañía Minera Milpo S.A.A. (now Nexa Resources Peru S.A.A. - Nexa Peru), a subsidiary of the Company, acquired 7.7% of Nexa Brazil interests in Dardanelos.

In 2017, VM Holdings S.A. (VMH) rebranded to become Nexa Resources S.A. (Nexa or the "Company") and listed on the New York and Toronto stock exchanges.

In 2019, Nexa Brazil purchased Karmin's interests in Dardenelos and acquired Nexa Peru's interest in Dardanelos in 2020. Nexa Brazil is now the sole owner of the Project.

5.2 Exploration and Development History

Excluding drilling, the following exploration activities have been undertaken on the Project:

A SPECTREM airborne geophysical survey

- Geological mapping
- Ground geophysics
- LiDAR airborne survey
- Soil geochemistry

This work was carried out by Anglo American and Karmin between 1999 and 2002. Since 2004, exploration has been conducted by Nexa, and is described in more detail in Section 9, Exploration.

5.3 Historical Resource Estimates

Previous Mineral Resource estimates have been completed on the property by AMEC in 2007, and by Roscoe Postle Associates Inc. (RPA) in 2012 and 2017 for Karmin, the latter being subsequently updated for Nexa later in 2017.

These estimates are superseded by the Mineral Resource estimate presented in Section 11, Mineral Resource Estimates, of this Technical Report Summary.

These estimates are considered to be historical in nature and should not be relied upon, however, they do give an indication of mineralization on the property.

5.4 Past Production

Approximately 350,000 oz of gold are thought to have been extracted by artisanal miners during the 1979 and 1990 gold rushes. There has not been any formal production to date on the property.

6.0 GEOLOGICAL SETTING, MINERALIZATION, AND DEPOSIT

6.1 Regional Geology

The South American Platform is mainly composed of metamorphic and igneous complexes of Archean/Proterozoic age and makes up the continental interior of South America. The Platform consolidated during the Late Proterozoic to Early Paleozoic times in the course of the Brasiliano/Pan-African orogenic cycle during which the amalgamation of different continents and micro continents with the closure of several ocean basins led to the formation of the Supercontinent Gondwana. Archean and Proterozoic rocks are exposed in three major shield areas within the framework of Neoproterozoic fold belts (Guiana, Central Brazil, and Atlantic shields). The western continental margin of the South American Plate developed from at least Neoproterozoic to Early Paleozoic times and constitutes a convergent margin, along which eastward subduction of Pacific oceanic plates beneath the South American Plate takes place. Through this process, the Andean Chain, the highest non-collisional mountain range in the world, developed. The eastern margin of the South American Plate forms a more than 10,000 km long divergent margin, which has developed as a result of the separation of the South American Plate and the African Plate since the Mesozoic era through the opening of the South Atlantic and the break-up of Gondwana. The northern and southern margins of the South American Plate developed along transform faults in transcurrent tectonic regimes due to the collision of the South American Plate with the Caribbean and Scotia plates. The South American Plate reveals a long and complex geologic history (Engler, 2009). Figure 6-1 is a simplified geological map of Brazil.

The Project is underlain by Paleoproterozoic and Mesoproterozoic-aged (1.80 Ga to 1.55 Ga) lithologies belonging to the Río Negro-Juruena Province, one of six major geochronological provinces comprising the Amazonian Craton. The Río Negro-Juruena Province occupies a large portion of the western part of the Amazonian Craton (Figure 6-2) and includes volcano-sedimentary sequences, felsic plutonic-gneiss, and granitoids. Rift basins within the province are filled with continental platform molasse and marine sediments of Mesoproterozoic, Paleozoic, and Mesozoic age (Engler, 2009). It is a zone of complex granitization and migmatization. Regional metamorphism, in general, occurred in the upper amphibolite facies (Tassinari et al., 2010)

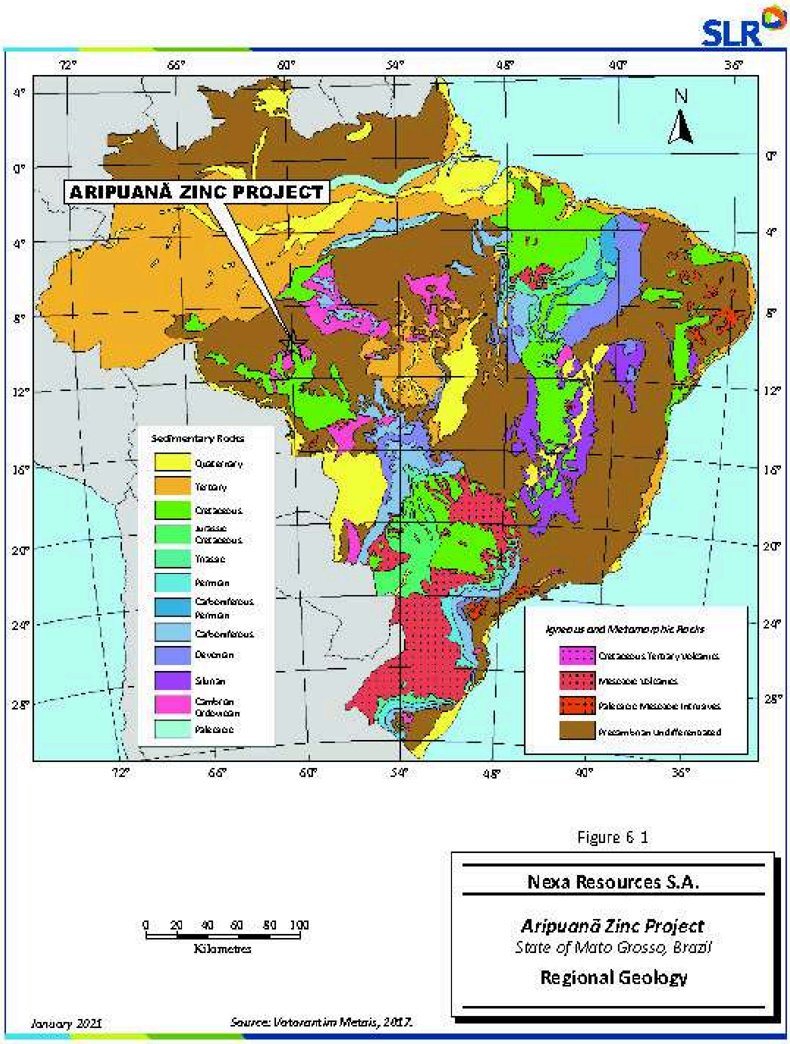

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Figure 6-1: Regional Geology

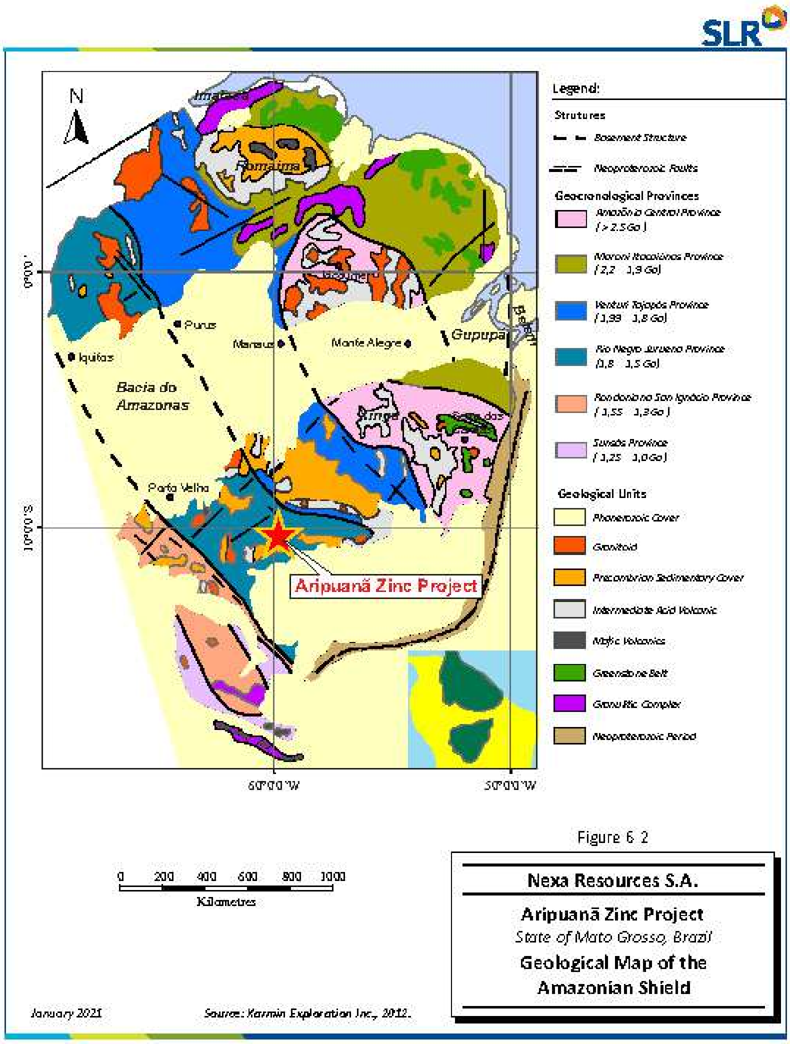

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Figure 6-2: Geological Map of the Amazonian Shield

6.2 Local Geology

The following is taken from Simon, Marinho and Lacroix (2007).

The Project area is underlain by a meta-volcano-sedimentary sequence known as the Aripuanã Sequence or the Roosevelt Group (RG), which is interpreted as a back-arc setting of the Tapajós arc. The Aripuanã Sequence exhibits greenschist facies grade regional metamorphism and has been intruded by late-stage A-Type Granites. The Aripuanã Sequence is associated with a major intracontinental suture, which defines the margin of the Caiabís graben in the south. The Aripuanã Sequence is bounded by granites and gneisses of the Xingu Complex in the north through interrupted tectonic contacts.

The Aripuanã Sequence comprises three major meta-volcano-sedimentary units:

- A basal unit, represented by felsic and intermediate flows with tuffaceous layers.
- An intermediate, transitional felsic volcanic unit.
- An upper sequence, represented by inter-layered meta-argillites, meta-tuffs, and meta-cherts.

These units form a broad semicircular shape surrounding the Rio Branco granite. The mineralized zones are located in the northeastern portion of the arc (Figure 6-3). Post-mineralization aged overthrust faults, dipping to the north and northeast, form complex imbricated sheets, which represent the most characteristic structural feature of the area. Typically, these sheets include portions of the volcanic units, and upper meta-sedimentary unit, although often the contact relationships are obscured by extreme deformation.

The lithological assemblage generally strikes northwest-southeast and dips between 35° and 70° to the northeast. Stratigraphic features have been offset by younger sinistral, east-west wrench faults that are traced by mapping and magnetic interpretation.

6.3 Property Geology

The following has been summarized from VMH (2016).

Stratigraphy over the property consists of meta-sediments, meta-volcanic and meta-pyroclastic rocks, and hydrothermally altered rocks at the interface between the meta-sediments and meta-volcanics. The meta-sediments comprise meta-mudstones, meta-siltstones, and carbonaceous meta-siltstone, while the meta-volcanics and meta-pyroclastics grade from rhyolite to dacite in composition. The hydrothermal zone occurs as stratabound when related to exhalative rocks or pipe like when related to the feeder zone. The stratabound portion of the hydrothermal zone has three main types of alteration, carbonate, tremolite, and sericitic. The feeder or stringer zone has three types of alteration, sericitic, phyllic (sericite + chlorite), and chloritic (+silicification). On surface, the hydrothermal alteration zone is strongly masked by tropical weathering, usually associated with gossans. Portions of the property have Phanerozoic alluvial cover.

Figure 6-4 illustrates a stratigraphic column of the area while Figure 6-5 illustrates a cross-section of the property geology.

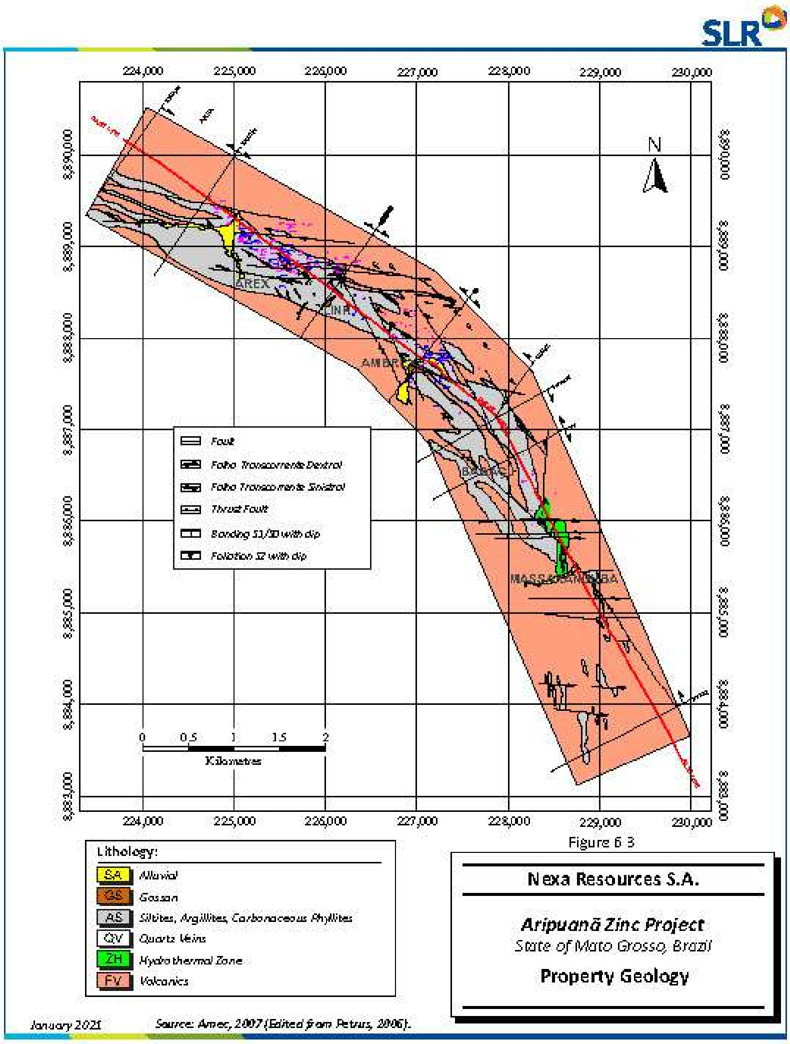

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Figure 6-3: Property Geology

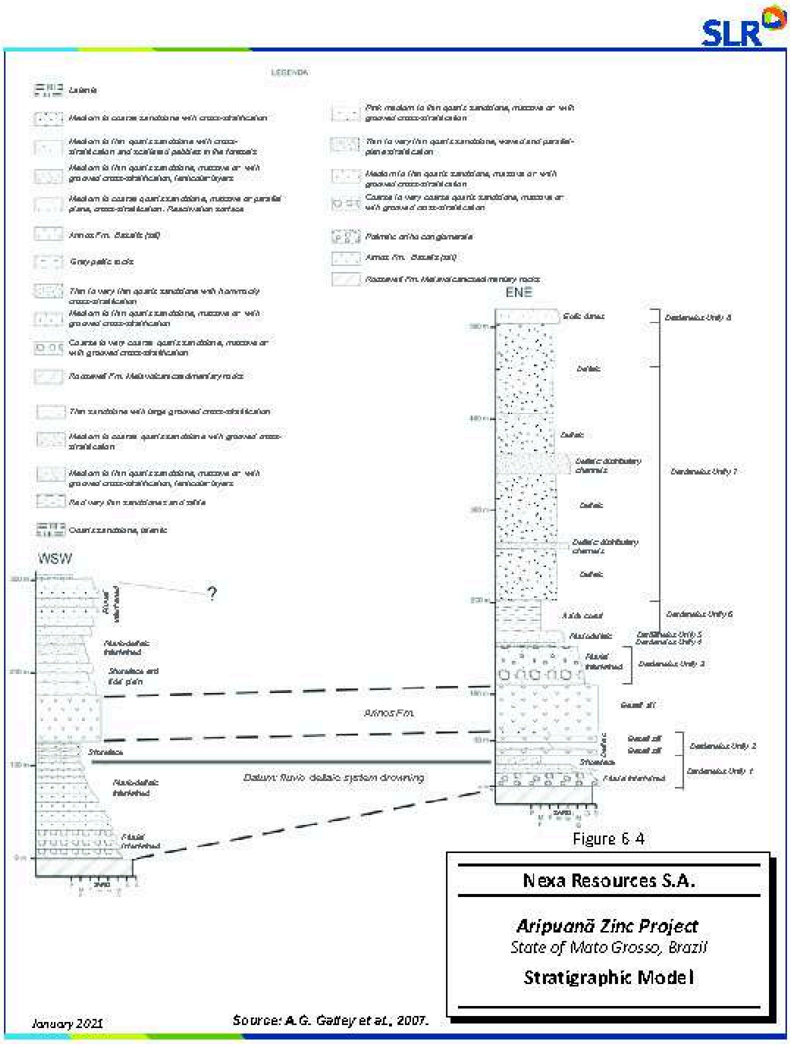

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Figure 6-4: Stratigraphic Column

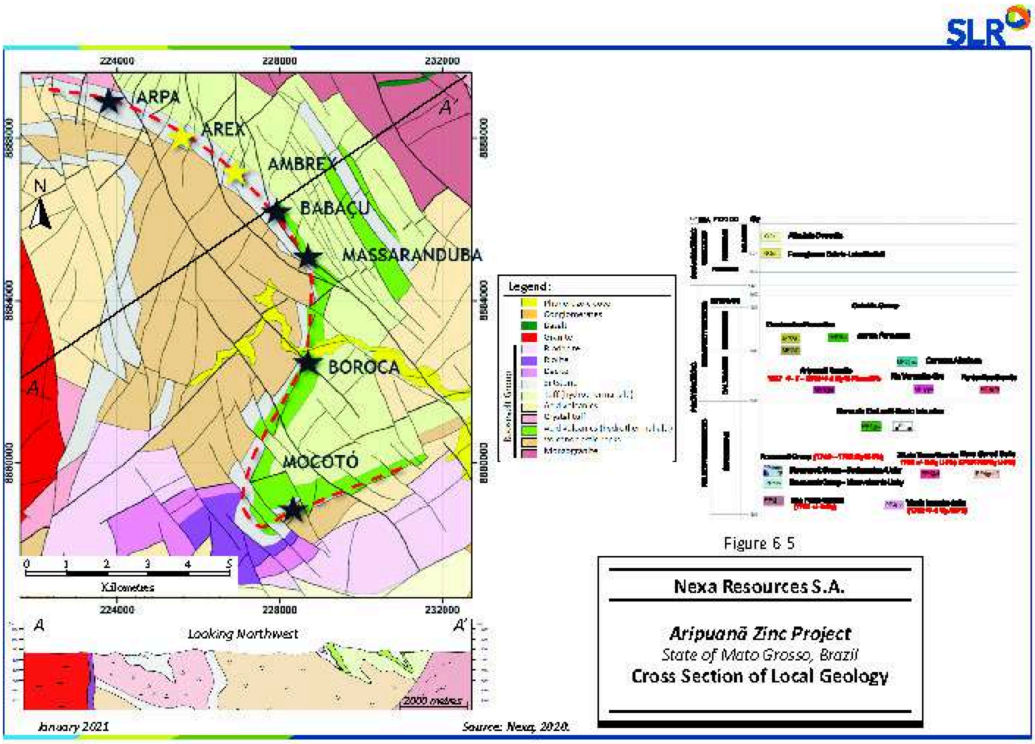

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Figure 6-5: Cross Section of Local Geology

6.4 Mineralization

Three main elongate mineralized zones, Arex, Link, Ambrex, and Babaçú, have been defined in the central portion of the Project. Limited exploration has identified additional, possible mineralized bodies including Massaranduba, Boroca, and Mocoto to the south and Arpa to the north.

Where outcropping, sulphide mineralization has been oxidized forming gossanous bodies which frequently mark the position of overthrust faults. These gossans are generally small and contain low levels of gold. They do not appear to be of economic interest at this time.

The individual mineralized bodies have complex shapes due to intense tectonic activity. Stratabound mineralized bodies tend to follow local folds, however, local-scale, tight isoclinal folds are frequently observed, usually with fold axes that are parallel to major reverse faults, causing rapid variations in dips. The Arex, Link, Ambrex, and Babaçú deposits are the best understood and are described below.

Hydrothermal alteration is commonly directly adjacent to the Arex, Link, Ambrex, and Babaçú deposits, and according to Leite et al. (2005, as cited in AMEC, 2007) presents a zonal and symmetrical standard:

- External zone: Sericite and muscovite in a fine-grained matrix with minor chlorite content. Where present, the low sulphide content is dominated by pyrrhotite.
- Intermediate zone: Transition of sericite to chlorite halo on stringer zones. Tremolite and chlorite alteration with minor carbonatization and silicification.
- Internal zone: Stringer zones are characterized by pervasive chlorite alteration accompanied by quartz veins. Sulphide content is dominated by chalcopyrite and pyrrhotite. Porphyroblastic magnetite and biotite locally substitutes within the sulphide matrix. The stratabound zones are dominated by tremolite, talc and carbonate alteration, accompanied by sphalerite, galena, and pyrite, with minor magnetite and fluorite. The stratabound zone may be brecciated.

6.4.1 Arex

Mineralization at the Arex deposit strikes at approximately 110° azimuth, extending over a 1,400 m strike length. Upper portions of the deposit tend to be near-vertical, while lower portions dip at 60° to the northeast. The Arex deposit is characterized by well-defined stringer and stratabound zones. Discrete lenses of stratabound and stringer mineralization, ranging from less than one metre to 15 m thick, interplay within a 100 m to 150 m wide zone, separated by barren, hydrothermally altered rocks. Mineralization comes close to outcropping at surface and extends to almost 500 m below surface. Discrete lenses may be continuous for up to 300 m down dip. The Arex deformation pattern is made of tight, foliation-parallel folds, and reverse faults which overthrust in the same direction. The Arex deposit presents strong dip variations that are often parallel to foliation and faults. In some areas, this may cause the stratabound and stringer mineralization to be parallel, despite its original perpendicular position.

6.4.2 Link

The Link deposit, first discovered in 2014, is interpreted to be the westward extension of the Ambrex deposit towards the Arex deposit. It is located approximately 300 m southeast of the Arex deposit and exhibits shape, mineralization, and alteration features similar to Ambrex, the largest deposit. Link mineralization strikes at approximately azimuth 125° and has a strike extent of approximately 450 m, based on current drilling. Mineralization thicknesses typically range between 10 m and 50 m, with a maximum of 150 m. Mineralization comes close to outcropping at surface and extends to almost 700 m below surface. The degree of folding at Link is gentler than at Arex and hosts well marked overthrust faults, which are parallel to metamorphic foliation. The orientation of the stratabound mineralization is generally parallel to the original bedding, while the stringer zone is often approximately perpendicular to the stratabound zone.

6.4.3 Ambrex

The Ambrex deposit represents the largest of the known mineralized zones on the Project that is included in the LOM plan. The Ambrex deposit is located approximately 1,300 m southeast of the Arex deposit. Ambrex mineralization strikes at approximately azimuth 125° and has a strike extent of approximately 1,050 m, based on current drilling. The dip varies from near vertical to 70° to the northeast. Mineralization thicknesses typically ranges between 10 m and 50 m, with a maximum of 150 m. The Ambrex deposit has an upper depth of 60 m below surface, with a lower depth of approximately 700 m. The degree of folding at Ambrex is gentler than at Arex and hosts well marked overthrust faults, which are parallel to metamorphic foliation. The orientation of the stratabound mineralization is generally parallel to the original bedding, while the stringer zone is often approximately perpendicular to the stratabound zone.

6.4.4 Babaçú

Located southeast of the Ambrex deposit, the Babaçú deposit is 1,300 m long and also dips to the northeast. The Babaçú deposit is interpreted to be similar in shape and style of mineralization to the Ambrex deposit.

6.5 Deposit Types

The following is summarized from VMH (2012c).

The Aripuanã polymetallic deposits are typical volcanogenic massive sulphide (VMS) deposits associated with felsic bimodal volcanism. Support for this model is based on the geometry of mineralization, host rocks, hydrothermal alteration, and sulphide paragenesis. The Aripuanã VMS deposits have been subsequently deformed and metamorphosed under greenschist facies conditions (Leyte, 2005 and Petrus, 2006, as cited in VMH, 2012c). Details observed at Aripuanã and consistent with VMS deposits are described below.

- Host rocks: All mineralized bodies are located on the upper levels of a felsic volcanic unit, in association with finely laminated exhalites, at or close to the contact with an overlying sedimentary unit.
- Mineralization zonality and predominant textures: Three types of mineralization are found at the Project, and are typical of VMS deposits elsewhere:
    - Stringer facies: Cu-Au bearing stringers in the footwall of the stratabound mineralization, containing chalcopyrite and pyrrhotite, with stockwork and breccia textures corresponding to hydrothermal feeder zones.
    - Proximal sulphide facies: mixed bodies of stratabound massive and disseminated Zn-Pb mineralization, overlying stringer mineralization.
    - Geochemical zonality. The Cu/Cu+Zn ratio is higher in the proximity of the copper rich feeder zones and decreases upward from the footwall and towards the distal zinc rich stratabound mineralization.

Facies associated with the feeder zones are located in the middle of the volcanic unit and are characterized by pyrrhotite and/or chalcopyrite stockworks in a zone of intense chloritic hydrothermal alteration. The sulphide association represents a feeder zone at higher temperature. There is Cu-Au association in these zones. Figure 6-6 presents a target model of the sequence.

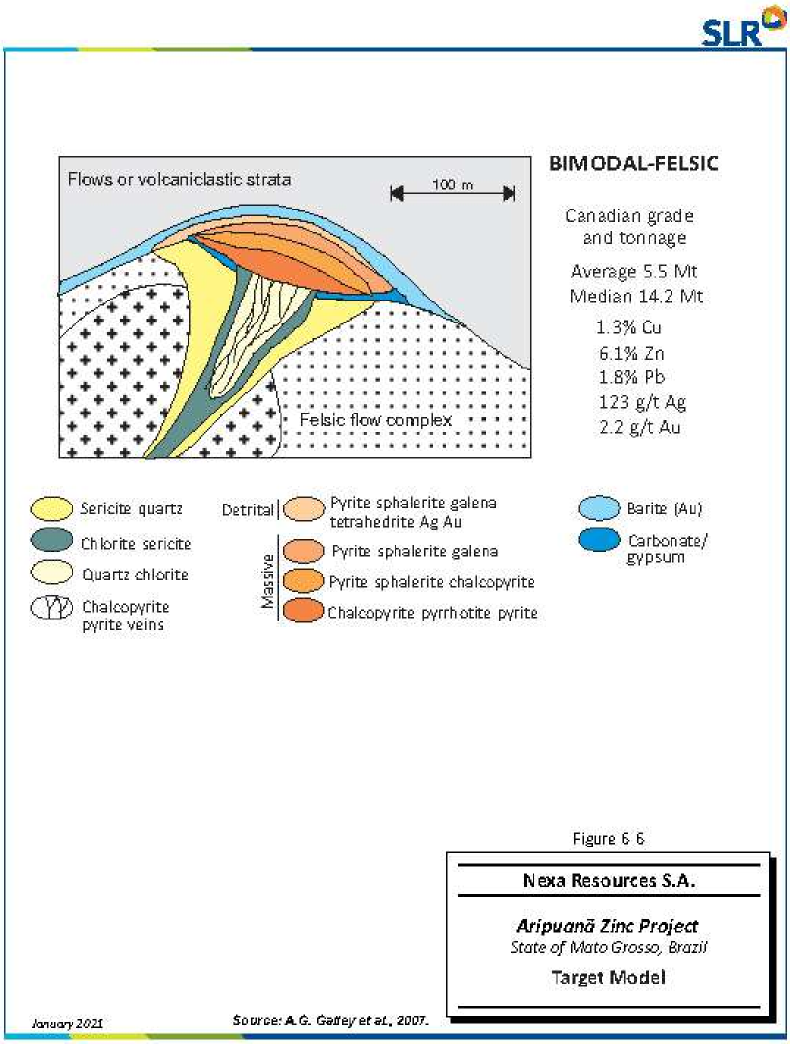

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Figure 6-6: Target Model

7.0 EXPLORATION

7.1 Exploration

7.1.1 1999 to 2002 Exploration

This section is summarized from VMH (2012a).

Geochemical and geophysical surveys, including a SPECTREM airborne geophysical survey, were conducted by Anglo American and Karmin between 1999 and 2002. The exploration program targeted 13 different areas on the property. Limited details are available on the exact date and operator of the various surveys conducted, however, the following information was recovered in the Anglo American database (Table 7-1).

Table 7-1: Anglo American and Karmin Exploration – 1999 to 2002
Nexa Resources S.A. – Aripuanã Zinc Project

		Geochemistry		Ground Geophysics				
Target	Geological Mapping	Stream Sediment	Soil	Gravimetry	Magnetic	IP	VLF	TDEM
Acampamento Velho	x	x	x	-	x	-	-	-
Arex	x	x	x	x	x	x	x	-
Ambrex	x	x	x	-	x	-	x	x
Babaçú	x	x	-	-	x	-	-	x
Bigode	x	x	x	-	x	-	x	-
Cafundo	x	x	x	-	x	-	x	x
Cone	x	x	x	-	x	-	-	-
Joao Paulo	x	x	x	-	x	-	-	-
Massaranduba	x	x	-	-	x	-	-	x
Mocotó-Boróca	x	x	x	-	x	-	x	x
Vaca II	x	x	x	-	x	-	-	-
Valdir	x	x	x	-	x	-	-	-
Vale dos Sonhos	x	x	x	-	-	-	-	x

Notes:

1. IP – Induced Polarization
2. VLF – Very Low Frequency
3. TDEM – time-domain electromagnetics

7.1.1.1 Geophysics

The airborne SPECTREM geophysical survey is an electromagnetic (EM) method developed by Anglo American in which EM, total field magnetic, and radiometric measurements are simultaneously taken from sensors inside, or towed behind, an aircraft. The survey was conducted in 2001 over 1,800 km^2.

No specific details are available with respect to ground geophysical methods.

7.1.1.2 Geochemistry

No details of sample procedures, quality assurance/quality control (QA/QC), or dates were available. Historically, 760 stream sediment samples and up to 32,000 soil samples with a wide distribution over 2,000 km^2 have been collected. Geochemical analyses were conducted by Nomos and Mineração Morro Velho (MMV) laboratories.

7.1.1.3 Geological Mapping

Geological mapping of the Project area was completed to varying levels of detail over the thirteen targets listed in Table 7-1 between 1999 and 2002.

7.1.2 Nexa Exploration

The following is taken from AMEC (2007) and VMH (2012b).

In 2004, Nexa became Project operator and commenced a detailed geological, geochemical, and geophysical exploration program, which included additional drilling described in later in this section.

Under contract from Nexa in 2005, Geoambiente Sensoriamento Remoto prepared a topographic map based on photogrammetric restitution of two pairs of Ikonos panchromatic images with one metre spatial resolution (173214-0/173214-3 and 173214- 1/173214-2), and with ground control on geodesic IBGE stations. Internal control points were surveyed using a differential global positioning system (DGPS). The topographic map has an area of 195 km^2 and 1:10,000 altimetric and 1:5,000 planimetric scales as well as five metre contour lines (plus additional one metre interpolations).

In 2004, Integração Geofísica compiled and integrated all previous geological, geophysical, and geochemical data to allow a more complete interpretation of the regional and local geology, and the identification of local exploration targets. A digital terrain model was prepared and integrated with airborne gamma-spectrometric (K-Th-U channels), magnetometric, and electromagnetic (time domain EM) survey data, soil geochemical surveys, regional and local geological information, including most of the data previously obtained by Anglo American and Karmin. As a result of this study, five groups of targets were identified in addition to Arex and Ambrex, and additional exploration was recommended.

In 2004, Nexa contracted Petrus Consultoria Geológica Limitada to conduct and/or supervise geological, geochemical, and geophysical exploration at the property. Between 2004 and 2007, additional exploration at the property included relogging of Anglo American/Karmin core, geological mapping, and geochemical surveys.

In 2007, a time domain, airborne EM survey was conducted by Fugro Airborne Surveys. The survey covered approximately 1.8 km^2, divided in four loops of 700 m x 500 m each, with readings on a 100 m x 20 m grid. The survey was flown over 14,290 m using a base frequency of 30 Hz. In addition, 3,860 m were surveyed at 3 Hz in order to detail the anomalies identified with the 30 Hz survey.

In 2008, exploration efforts consisted of evaluating regional targets. Work included detailed geological mapping and systematic rock, soil, and stream sediment geochemistry. Mobile metal ion (MMI) soil geochemical tests were completed on the Ambrex and Babaçú targets. Core from Arex and Ambrex was re-logged. Exploration drilling at Babaçú and in-fill drilling at Arex and Ambrex took place.

Extensive drilling took place on Arex and Ambrex in 2012, as well as additional metallurgical test work.

In 2013, ground magnetic surveying totalling approximately 138 line-km over the Poraquê, Arpa, Ambrex, Babaçú, Massaranduba, Boroca, and Mocotó targets was completed. Subsequently, a 12 line-km ground magnetic survey was completed over the Casagrande target. An extensive program of core re-sampling was completed comprising a total of 11,067 core and pulp analyses from 159 drill holes from Arex, Ambrex, Arpa, and Babaçú. A new structural model was developed based on LiDAR topography in the Arex-Ambrex area and the 1:25,000 scale geological map was updated.

In 2014, ground magnetic surveying totalling approximately 222.8 line-km over the Flanco W, Poraquê, Sombra, Mocotó Sul, Jibóia, and Casagrande targets was completed. A total of 991 soil samples were taken over the Somra and Casagrande targets and 25 gold panning samples were taken at the Flanco W, Mocotó Sul, Jibóia, Sombra, and Vaca-Bigode targets.

In 2015, a 1,584.2 line-km helicopter-borne, combined magnetic and electromagnetic (VTEM) survey was flown over four areas, namely Arex-Ambrex, Flanco W, Mocotó, and Casagrande Jibóia. Soil sampling at Flanco W and geological mapping and rock sampling at the Boróca and Mocotó target areas was undertaken. In-fill drilling at Arex and Ambrex was also completed.

In 2016 and 2017, initial exploration activities were not conducted at the Project, as Nexa target generation program is no longer based in joint venture (Nexa/Karmin) related properties. Although intense exploration was conducted at the Project in both, 2016 and 2017, it was totally based on drilling for upside resources at open extensions (2016) and infill drilling (2017), as detailed in the following sections.

The focus of exploration activities on the property has been the Babaçú deposit since 2018, where on-going drilling has been successful in upgrading this exploration target to an Inferred Mineral Resource.

The SLR QP notes that Nexa has been successful at delineating explorations targets and as demonstrated at Babaçú has been successful in converting them to Mineral Resources.

7.1.3 Exploration Target

7.1.3.1 Babaçú

Part of the Babaçú deposit has been converted to an Inferred Mineral Resource during 2020. The Babaçú deposit is not fully tested by drilling and is still open at depth and laterally from the current Mineral Resource outline where in SLR's view there is good potential to increase the Mineral Resource with more drilling.

Nexa has identified an area to the north west of the current Babaçú Mineral Resources and south east and down dip of the Ambrex deposit. Nexa has designated the name "Babaçú NW Exploration Target" to this area. Figure 7-1 shows the location of the Babaçú NW Exploration Target while Figure 7-2 shows a conceptual vertical cross section through the target. The cross-section is through line AB shown in Figure 7-1.

The Babaçú mineralized VMS horizon has been confirmed by drilling extending further northwest below the Ambrex deposit which is open at depth. Nexa envisages a new exploration target potential as given in Table 7-2. Grade ranges were defined based on Ambrex and Babaçú known resource grades. The tonnage range assumptions were based on geological continuity of the mineralized horizon, as follows: strike length ranging from 500 m to 700 m, depth continuity ranging between 350 m to 550 m, and average mineralization width of 20 m.

The ranges of potential quantities and grades of the exploration target are conceptual in nature, there has been insufficient exploration to define a Mineral Resource on Babaçú NW , and it is uncertain if further exploration will result in the estimation of a Mineral Resource. The exploration target therefore does not represent, and should not be construed to be, an estimate of a Mineral Resource.

Table 7-2: Babaçú NW Exploration Target Potential – September 30, 2020
Nexa Resources S.A. – Aripuanã Zinc Project

		Grade				
	Tonnes (Mt)	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**
Minimum	10	2	1	0.3	0.3	20
Maximum	20	4	2	0.7	1	50

SLR is of the opinion that the Babaçú NW Exploration Target exhibits good potential and recommends following up with additional step out drilling to convert the exploration target to Mineral Resources. The ranges of tonnage and grade of the exploration target could change as the proposed exploration activities are completed. Nexa plans on performing a 6,500 m infill drilling program at Babaçú during 2021 which will include drilling at the Babaçú NW Exploration Target.

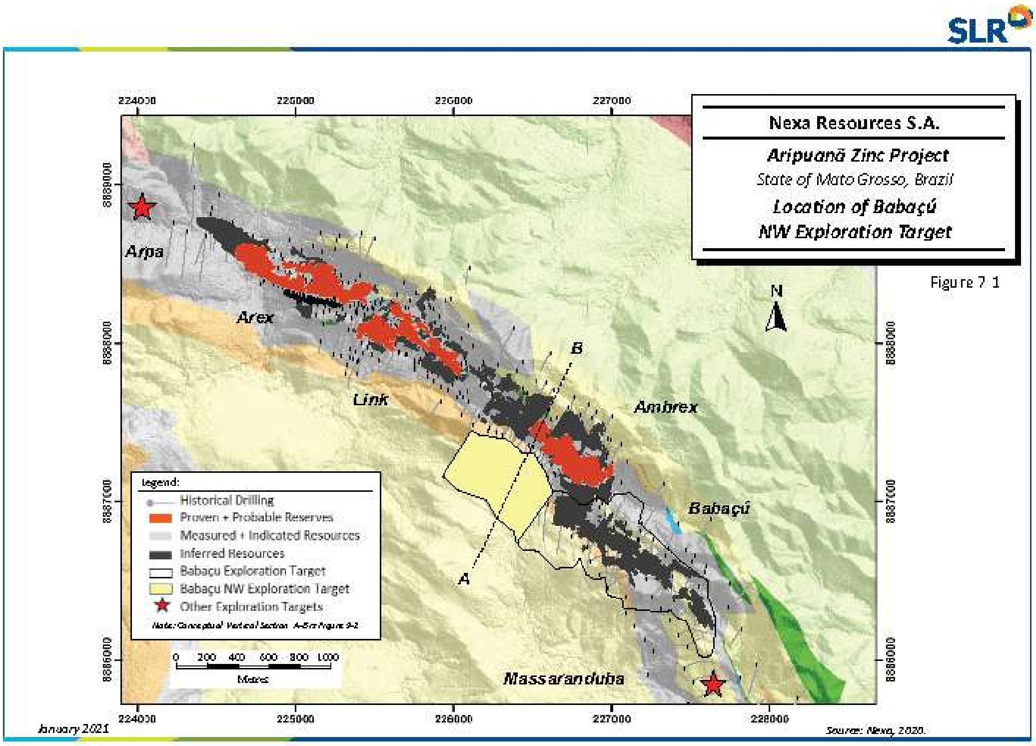


Figure 7-1: Location of Babaçú NW Exploration Target

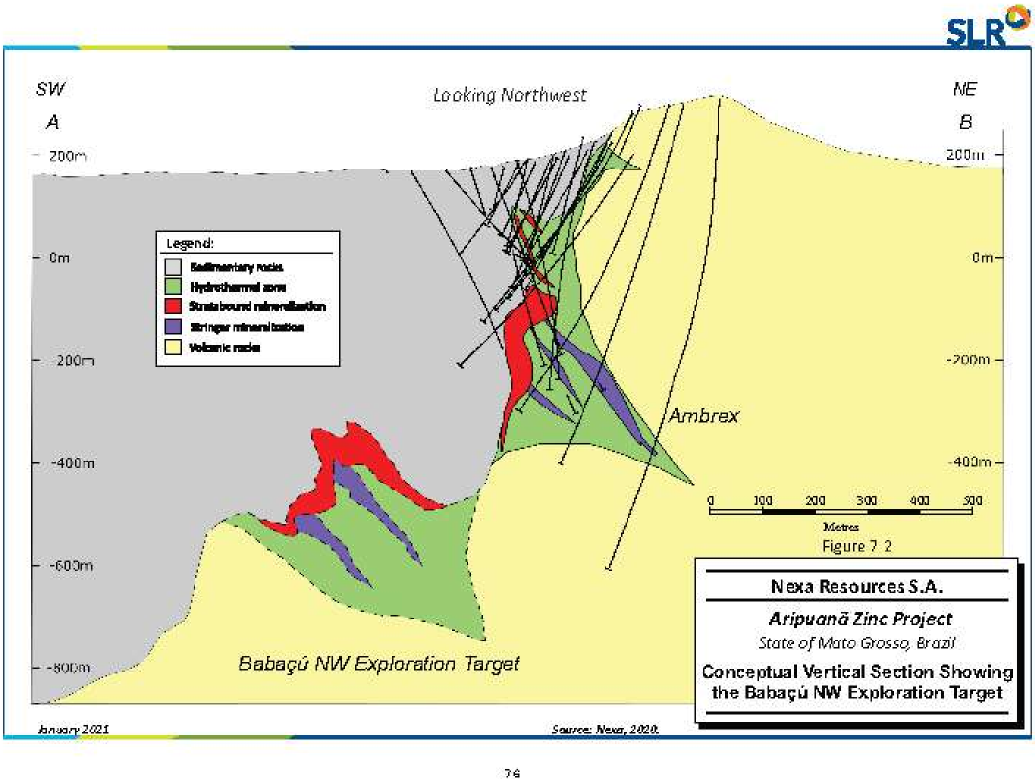


Figure 7-2: Conceptual Vertical Section Showing the Babaçú NW Exploration Target

7.2 Drilling

Drilling on the Project has been conducted in phases by several companies since 1993. Total drilling at the deposits with Mineral Resources, Arex, Link, Ambrex, and Babaçú, consists of 718 diamond drill holes totalling 229,654 m. Drilling at the other prospects on the property consists of 35 diamond drill holes totalling 13,886 m.

A drilling summary by deposit up to and including all drilling information available at May 19, 2020, is presented in Table 7-3.

Table 7-3: Drill Hole Database
Nexa Resources S.A. – Aripuanã Zinc Project

	Historical				Nexa (2004 to 2020)				Total	
Deposit	**No. DDH**	**Metres (m)**	**No. Perc.**	**Metres (m)**	**No. DDH**	**Metres (m)**	**No. Met.**	**Metres (m)**	**No. Holes**	**Metres (m)**
Arpa	0	-	-	-	9	5,359	-	-	9	5,359
Arex	50	14,682	19	1,329	220	38,085	20	2,536	309	56,631
Link	11	3,822	-	-	160	62,080	1	141	172	66,043
Ambrex	44	15,747	-	-	109	48,874	9	3,222	162	67,843
Babaçú	7	2,224	-	-	68	36,913	-	-	75	39,137
Massaranduba	8	2,184	-	-	18	6,343	-	-	26	8,527
Total	**120**	**38,659**	**19**	**1,329**	**584**	**197,654**	**30**	**5,899**	**753**	**243,541**

Notes:

1. DDH: Diamond drill hole
2. Perc: Percussion drill hole
3. Met: Metallurgical drill hole

7.2.1 Previous Drilling

This section is summarized from AMEC (2007).

Limited detail on the Anglo American and Karmin drilling campaigns is available. Both reverse circulation (RC) and diamond drilling was performed on site. Results of RC drilling have not been maintained in the current Nexa database. Diamond drill core diameter was HQ (63.5 mm) size at the collar and was reduced to NQ (47.6 mm) size downhole. The DDI Reflex Fotobor method was used for downhole survey measurements. Most holes were drilled with azimuths ranging from 180° to 220° and inclinations ranging from -50° to -70°. Drill core boxes are stored on site and are adequately labelled and ordered for efficiently locating and extracting the samples. Original drill reports are not available on site.

7.2.2 Recent Drilling

Drilling at the Project was conducted by Nexa from 2004 to 2008 and from 2012 to present. The main purpose of the 2004 to 2008 drill programs was to explore and delineate mineralization at the Project. Based on the success of these programs, from 2012 to present, the objective has been to improve confidence and support and upgrade the classification of the Mineral Resources at the Arex and Ambrex deposits.

Nexa drilled a total of 614 diamond drill holes totalling 203,553 m at Aripuanã from 2004 to March 2020, including 30 metallurgical drill holes totalling 5,599 m. Many drill holes were pre-collared using RC drill rigs, with diamond drill rigs used for drilling in mineralized zones.

May 19, 2020 is the cut-off date of the Mineral Resource database, as such all assay results received before this date have been considered in the Mineral Resource estimate.

Drill hole locations are spotted in the field using a hand-held GPS as well as measuring the distance to previous holes already surveyed using a total station. Small adjustments to the drill hole locations are made where necessary based on topographic relief and non-removable trees. The desired collar position, foresights, and backsights are marked by technicians using a Brunton compass for sighting the azimuth and a digital inclinometer for verifying the dip. Collar surveying is performed with a differential GPS upon completion of the drill hole and the departing collar azimuth is recorded using a total station (Figure 7-3). Casings are left in place. Downhole surveying is completed with Deviflex and Maxibor tools by the drilling company at three metre intervals downhole. Duplicate downhole surveys are performed on each hole. From 2014 onwards, Nexa has implemented core orientation for approximately 25% of the drilling using the Reflex ACT core orientation tool, and more recently Corefinder GTF.

Drill core is currently placed in plastic boxes and labelled at the rig site prior to transport. Previously, wooden core boxes were used. Drill core is transported by pick-up truck to the Nexa logging facility by the drill company employees, Servitec Sondagem Geologica. Geotechnicians measure drill core runs and note core interval length, core loss, and check core block runs. This information is then cross referenced to the driller's notes for discrepancies and amended where necessary. Rock Quality Designation (RQD) is measured and a resistance value (R0 to R4) is assigned based on rock hammer tests. No other geotechnical logging is performed on site. The core is photographed both wet and dry prior to mark-up by geologists.

All geological information is manually logged on paper logging sheets, and then hand entered into formatted Microsoft Excel sheets by the logging geologist. Lithology, rock unit, texture, alteration associated with the VMS, and regional alteration are recorded in logging sheets as text fields. The percentage of total sulphides, pyrite, pyrrhotite, chalcopyrite, sphalerite, and galena are recorded. Observations are noted where relevant. Digital logging sheets are imported into the Fusion database management program by the database manager. For oriented core, Nexa uses the vector collection method ((Tu) Top and (Bu) Base angle + distance between points (UD)).

SLR is of the opinion that the drilling and logging procedures meet industry standards. There are no drilling, sampling, or recovery factors that could materially impact the accuracy and reliability of the results.

The SLR QP notes that the drilling programs have been successful at converting exploration targets to Mineral Resources, at upgrading Mineral Resource categories, and confirming the geological interpretation and continuity of grade.

7.2.3 Hydrogeology - Hydrogeologic information

Nexa currently has a monitoring grid for surface and groundwater and a mathematical model for underground flow. No critical issue has been identified to date. Nexa plans on recalibrating the mathematical model for the underground flow and proposes expanding the monitoring grid by the second quarter of 2021.

7.2.4 Geotechnical Data

The available geotechnical data is summarized in Section 13.6.

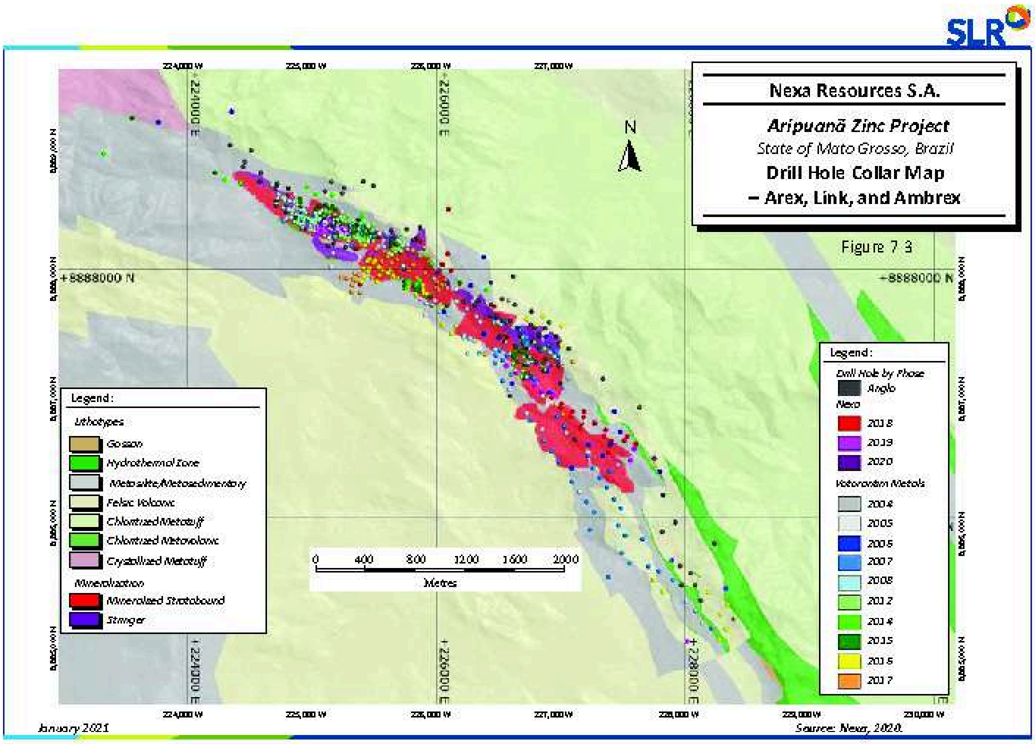


Figure 7-3: Drill Hole Collar Map – Arex, Link, and Ambrex

8.0 SAMPLE PREPARATION, ANALYSES, AND SECURITY

8.1 Sample Preparation and Analysis

8.1.1 Sample Method and Approach

The following sampling methods and approaches are in place for the Project. Core is sampled 10 m above and below visible mineralization. Samples respect geological contacts and vary from 0.5 m to 1.5 m in length depending on core recovery, length of the lithological unit, and mineralization. Geologists mark the samples using a felt pen on the core boxes and staple a sample tag wrapped in plastic to the box at the start of the sample.

Core is marked with red and blue lines to indicate where it is to be sampled and which half is to be assayed. Lines are drawn respecting the geological features such as layering to help minimize sampling bias. Prior to sampling, sample numbers are recorded in the Fusion data management system and cross-referenced with the interval depth downhole and the depth recorded in the database.

Sample core is cut into two halves by technicians with a diamond saw, returning half of the split core to the core box and submitting the other half for sample preparation and analysis. The geologist responsible for logging the drill hole defines the insertion of QA/QC samples including blanks, standards, and duplicates.

Each sample booklet contains four tags for each sample. One sample tag is stapled to the clear plastic sample bag and an additional sample is placed within the bag. One tag is attached to the core box while the remaining tag is left in the booklet for record keeping.

Samples are separated into batches of up to 250 samples from the same drill hole.

8.1.2 Density Analysis

Bulk density is determined by the water displacement method for each sample of drill core. Samples are dried and then weighed using a tared Adventurer Pro scale accurate to 0.1 g. The sample is then added to a polyvinyl chloride (PVC) tube containing a fixed amount of water. The displaced water is removed from the PVC tube into a pre-weighed 1,000 mL beaker. The weight and volume of displaced water is recorded by hand and then entered into a spreadsheet. Density values are calculated using both volume and weight of water. The technician compares the values to ensure that they are similar. Any discrepancy results in a repeat of the test. The weighted measurement is used in the final database.

Every tenth sample is also subject to an Archimedes density measurement. The Archimedes density results are kept on site and used as a QA/QC measure. The results of the Archimedes method are typically within 10% of the water displacement method.

8.1.3 Sample Preparation

Sample preparation was performed by the ACME Laboratories (ACME) preparation facility in Goiania, Brazil, from 2004 to 2007, and from 2007 on, by ALS Global. Both laboratories followed the same preparation procedure, described below.

The sample was logged in the tracking system, weighed, dried, and crushed to better than 70% passing a 2 mm screen. A split of up to 250 g was taken and pulverized to better than 85% passing a 75 µm screen. This sample preparation package was coded PUL-31 by ALS Global. Following preparation, samples were shipped to the sample analysis facility in Lima, Peru. ALS Global's preparation facility in Goiania is accredited to the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 9001:2008 standards and ALS Global is accredited to ISO 9001:2008 and ISO/IEC 17025:2005, for all relevant procedures.

Both laboratories are independent of Nexa and SLR.

In the SLR QP's opinion, the sample preparation methods are acceptable for the purposes of a Mineral Resource estimate.

8.1.4 Sample Analysis

Assays were processed by ACME from 2004 to 2007, and from 2007 on, by ALS Global, both independent laboratories. ALS Global's facilities in Lima are accredited to ISO 9001:2008 and ISO/IEC 17025:2005.

The following sample analysis was undertaken at the ACME facilities:

- **Gold Analysis**: Fire assay (50 g) standard fusion method with an atomic absorption spectrometry (AAS) finish. The lower limit of detection is 0.01 g/t Au.
- **Multi Element Analysis:** Aqua regia digestion with an AAS finish. Lower limits of detection are 0.001% for Pb, Zn, and Cu, 1 ppm Ag, and 0.01% Fe.

The following sample analysis is undertaken at the ALS Global facilities in Lima, Peru.

- **Gold Analysis:** Au-AA24. A 50 g fire assay standard fusion method with an AAS finish. The lower limit of detection is 0.005 ppm Au and the upper limit of detection is 10 ppm Au.
- **Gold Analysis:** Au-AA26. Gold analyses returned from Au-AA24 with a gold value above 10 ppm Au are re-assayed using a 50 g fire assay standard fusion method with an AAS finish. Upper limit of detection is 100 ppm Au.
- **Multi Element Analysis:** ME-ICP61. 33 multi element suite using four acid digestion and inductively coupled plasma atomic emission spectroscopy (ICP-AES) finish. The upper detection limit for Pb, Zn, and Cu is 1% and 100 ppm Ag.
- **Multi Element Analysis:** ME-AA62. Samples that return values above the upper limits in ME-ICP61 are re-assayed using ME-AA62. In ME-AA62, four acid digestion with an AAS finish of a 0.4 g sample is used. Lower limits of detection are 0.001% for Pb, Zn, and Cu, and 1 ppm Ag.
- **High Grade Zinc Analysis:** Zn-VOL70. Zinc analyses returned from ME-AA62 with a zinc content over 30% are re-analyzed by dissolving in hydrochloric acid and titrated with EDTA solution with Xylenol orange as an indicator.
- **High Grade Iron Analysis:** Fe-VOL51. Iron analyses returned from ME-ICP61 with iron content over 50% are re-analyzed by dissolving in hydrochloric acid and titration.

In the SLR QP's opinion, the sample analysis methods are acceptable for the purposes of a Mineral Resource estimate.

8.1.5 Database Management

Database management is performed by a dedicated onsite geologist under the supervision of the Project Geologist. Digital logging sheets prepared by the geologist are uploaded to the Fusion database management system. Original drill logs, structural logs, geotechnical logs, details of chain of custody, site reclamation, and drilling are stored on site in a folder, specific to a single drill hole. Folders are clearly labelled and stored in a cabinet in the office, which is locked during out of office hours.

Assay certificates of exploration and mine drill holes are mailed to the site by ALS Global and emailed to Nexa employees. Certificates are reviewed by Nexa personnel prior to uploading to Fusion.

8.2 Quality Assurance and Quality Control

Quality assurance (QA) consists of evidence to demonstrate that the assay data has precision and accuracy within generally accepted limits for the sampling and analytical method(s) used to provide confidence in a resource estimate or reporting assay results. Quality control (QC) consists of procedures used to ensure that an adequate level of quality is maintained in the process of collecting, preparing, and assaying the exploration drilling samples. In general, QA/QC programs are designed to prevent or detect contamination and allow assaying (analytical), precision (repeatability), and accuracy to be quantified. In addition, a QA/QC program can disclose the overall sampling-assaying variability of the sampling method itself.

8.2.1 QA/QC Protocols

Nexa has implemented an analytical QC and assurance program to ensure the reliability of exploration data. The program comprises of the insertion of certified reference material (CRMs or standards), blanks samples, and different types of duplicate samples into the sample stream. Table 8-1 lists the types of CRMs used by Nexa. From 2004 to 2008, three, commercially sourced CRMs, representing low, medium, and high grade zinc and lead were inserted at a rate of 5%. Copper, silver, and gold CRMs were not used. In 2012, two CRMs sourced from Nexa's sedimentary exhalative deposit (sedex) mine, Morro Agudo, were used on site. In June 2012, two property specific CRMs were generated and came into use on site. Standards were inserted in the overall sample stream of drill core at a rate of five standards in 100 samples.

Between 2012 and 2020 Nexa utilized 18 different standards:

- AP series: five certified standards from Aripuanã for Zn, Pb, Cu, and Ag
- MA series: two CRMs sourced from Morro Agudo for Zn only and certified by SGS Geosol
- L1, M1, H1: Low, medium, and high grade CRMs for Zn and Pb
- G series: three Geostats CRMs for Au
- GB series: one Intertek Group plc CRM for Zn, Pb, Cu and Ag
- BRAP series: Sourced from Centro Tecnologico de Referencia Sul Americano (CTRS) for Ag, Cu, Pb, Zn and S
- CTRS 900 series: sourced from CTRS for Au, Cu, S, Fe, Zn, Pb and Ag

Standards were inserted in the overall sample stream of drill core at a rate of approximately one standard for every 30 drill core samples.

Prior to 2012, blank material was river sand and sandstone sourced from the Aripuanã property. Subsequent to 2012, only coarsely crushed sandstone was used.

Data collected from QC samples comprises approximately 10% of all assay data. For each batch of 100 samples, Nexa inserts the following QC samples: five standards, two blanks, one field duplicate, one pulp duplicate, and one reject duplicate. Blanks are inserted in the sample stream at the end of visible mineralization, standards are randomly inserted within mineralized intervals, and pulp and reject duplicates are randomly inserted in both mineralized and unmineralized intervals. Coarse rejects are requested by Nexa from material before it is shipped back from the laboratory to Nexa's storage facility. Half core field duplicates are taken within mineralization.

Table 8-1: Certified Reference Materials
Nexa Resources S.A. – Aripuanã Zinc Project

CRM	Count	Zn (%)	SD	Pb (%)	SD	Cu (%)	SD	Ag (g/t)	SD	Au (g/t)	SD
AP0001	545	4.84	0.23	3.01	0.06	0.47	24	96	2	0.66	0
AP0002	550	9.15	0.31	6.15	0.09	1.44	0.06	207	6	1.12	0
APPD0003	832	2.89	0.08	1.09	0.04	1.22	0.02	43	1	-	-
APPD0004	833	7.71	0.18	4.04	0.07	0.35	0.01	127	3	-	-
APPD0005	529	1.509	0.043	0.56	0.01	6.83	0.12	58.1	2.3	-	-
G312-4	433	-	-	-	-	-	-	-	-	5.3	0.2
G909-1	452	-	-	-	-	-	-	-	-	1.02	0.1
GBM910-12	219	4.491	0.196	-	-	0.14	-	23.5	1.3	-	-
MA002	50	14.22	0.48	1.61	0.04	-	-	1.53	0.2	-	-

CRM	Count	Zn (%)	SD	Pb (%)	SD	Cu (%)	SD	Ag (g/t)	SD	Au (g/t)	SD
MA004	128	2.91	0.11	0.94	0.04	-	-	1.18	0.2	-	-
ZnPbH1*	120	7.69	0.18	4.82	0.15	-	-	-	-	-	-
ZnPbL1*	235	0.75	0.01	0.47	0.03	-	-	-	-	-	-
ZnPbM1*	217	2.83	0.07	0.99	0.05	-	-	-	-	-	-
CTRS0709	219	2.89	0.08	1.09	0.04	1.22	0.02	-	-	-	-
CTRS0710	218	7.71	0.18	4.04	0.07	0.346	0.007	-	-	-	-
G316-2	8	-	-	-	-	-	-	-	-	1.04	0.04
BRAPSTD001	16	9.34	0.26	4.04	0.1	0.312	0.009	104.01	2.26	-	-
BRAPSTD002	15	4.27	0.1	1.165	0.026	1.059	0.022	37.84	1.31	-	-

Notes:

1. SD = standard deviation

A QA/QC report is prepared monthly by the onsite database manager and reviewed by the Project Geologist, the report is also submitted to the head office for review. Sample batches that include samples identified as having failed performance gates are re-assayed by ALS Global at the request of Nexa. The failed control sample, as well as two shoulder samples from each side, are re-assayed and supersede the failed results in the database.

The SLR QP reviewed the sample preparation, analytical, and security protocols employed by Nexa and is of the opinion that they meet or exceed industry best practices. Based on this assessment, the SLR QP is of the opinion that assay data are sufficiently reliable for Mineral Resource estimation purposes.

8.2.2 Certified Reference Material

Results of the regular submission of CRMs (standards) are used to identify problems with specific sample batches and long-term biases associated with the primary assay laboratory. SLR reviewed the results from 18 different standards used from 2004 to 2020.

Nexa investigated the assays for APPD0005, as this CRM consistently reported values below the expected value and often below the three standard deviation threshold. Nexa removed this standard from circulation in 2019.

Figure 8-1 through Figure 8-3 chart 833 samples of CRM APPD0004 used for analyses on zinc, lead, and copper, respectively. Failure rates for the three elements are 16 (1.9%), 77 (9.2%) and 264 (31.6%) failures, respectively.

Failure rates for copper were unexpected and show a significant low bias compared to the expected value. SLR recalculated the mean and standard deviation of the copper samples and found that adjusting for the sample population mean only five (0.6%) of the samples failed.

SLR recommends that Nexa reevaluate other CRMs to adjust the means and standard deviations accordingly. SLR is of the opinion that the results of the CRMs support the use of the assays for a resource model.

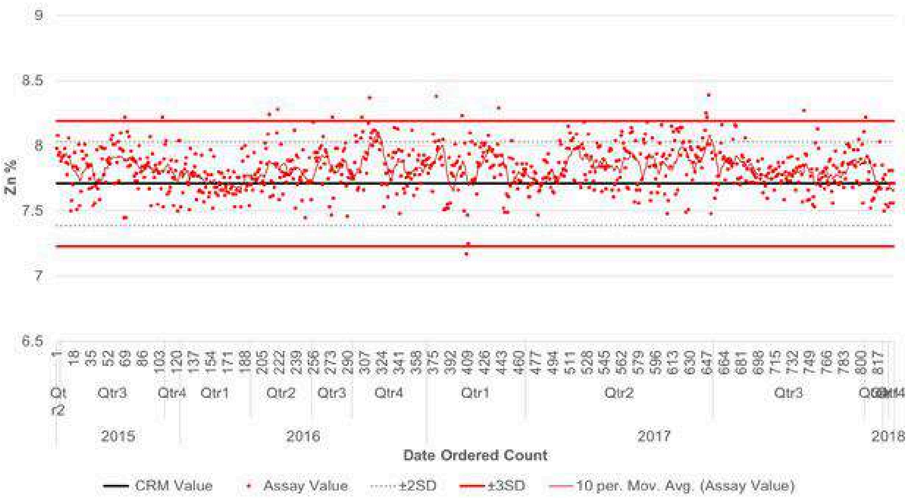


Figure 8-1: Control Chart for CRM AP0004: Zinc

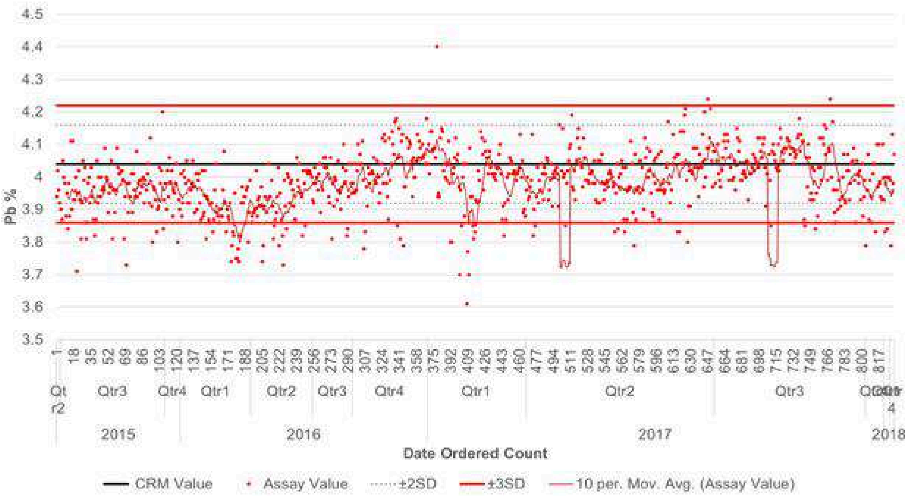


Figure 8-2: Control Chart for CRM AP0004: Lead

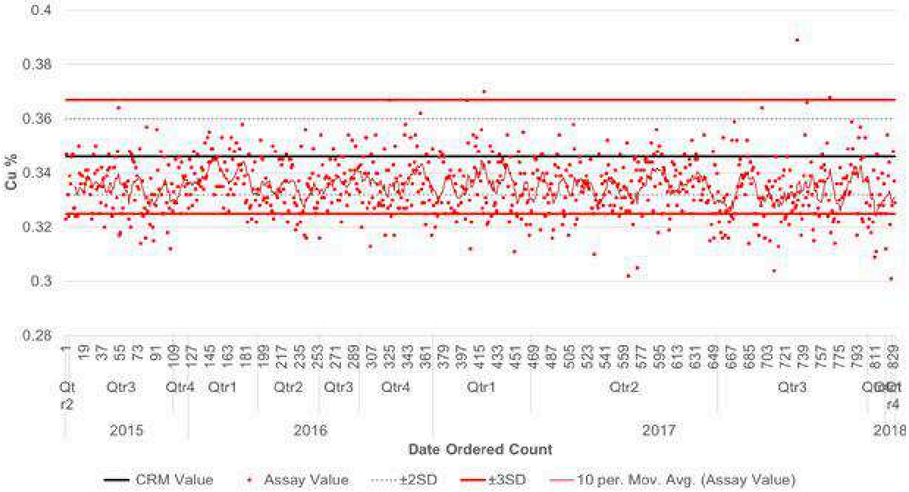


Figure 8-3: Control Chart for CRM AP0001: Copper

8.2.3 Blanks

SLR reviewed all analytical QC data from 2004 to 2020, these include the performance data of blanks, CRMs, as well as those of field, pulp, and coarse reject duplicates. The performance of blanks and CRMs was analyzed by charting the data on time series plots. Paired data (field duplicates, pulp duplicates, and coarse reject duplicates) were analyzed using bias charts, quantile-quantile, and relative precision plots.

Normal industry practice for the assessment of the performance of blank samples is to set a failure limit to ten times the detection limit. In the case of the zinc, lead, and copper grades of interest, ten times the detection limit is insignificant. While SLR used 20 times the detection limit in the past, Nexa considers five times the practical detection limit of 0.01%, which SLR accepted as equally reasonable in this study.

Prior to 2012, blank material was river sand and sandstone sourced from the property. After this date, only sandstone was used, however, Nexa does not distinguish these two materials in their database. The performance of blank samples is generally acceptable, and although zinc analyses yielded 1.4% of all assays above the limit of 0.05% Zn. The majority of these failures occurred prior to 2017. Lead and copper analyses failed in approximately 0.4% and 0.2% of samples, respectively. Figure 8-4 charts all the blank samples for zinc, lead, and copper. Based on this analysis, SLR is of the opinion that no systematic contamination of samples occurred during the sample preparation or analysis stages.

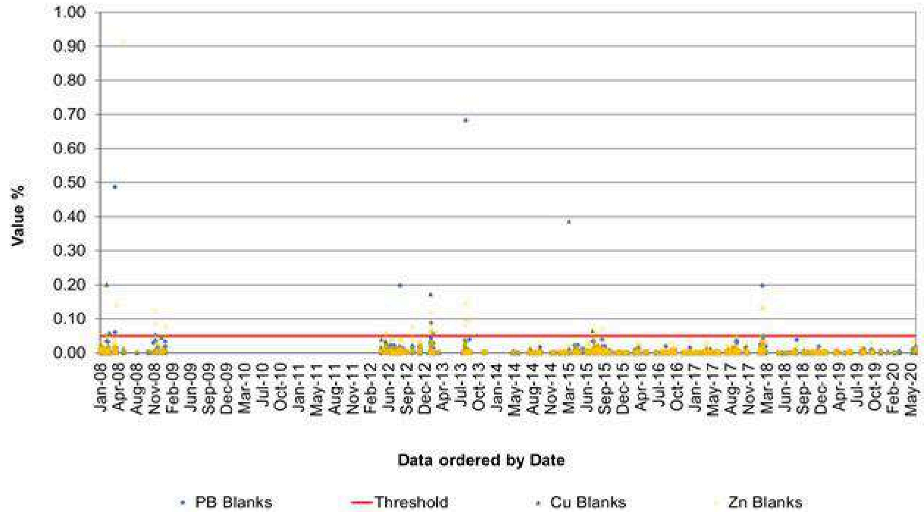


Figure 8-4: 2005 to 2020 Results of Blank Samples (Zinc, Lead, and Copper)

8.2.4 Duplicates

Duplicate samples help to monitor preparation and assay precision and grade variability as a function of sample homogeneity and laboratory error. The field duplicates include the natural variability of the original core sample, as well all levels of error including core splitting, sample size reduction in the preparation laboratory, sub-sampling of the pulverized sample, and the analytical error. Coarse reject and pulp duplicates provide a measure of the sample homogeneity at different stages of the preparation process (crushing and pulverizing).

SLR re-analyzed the duplicate data compiled by Nexa using basic statistics, scatter, quantile-quantile, and percent relative difference plots. A total of 7,683 sample pairs were analyzed between field, coarse, and pulp duplicates with no material issues found. Figure 8-5 through Figure 8-7 are selected duplicate results.

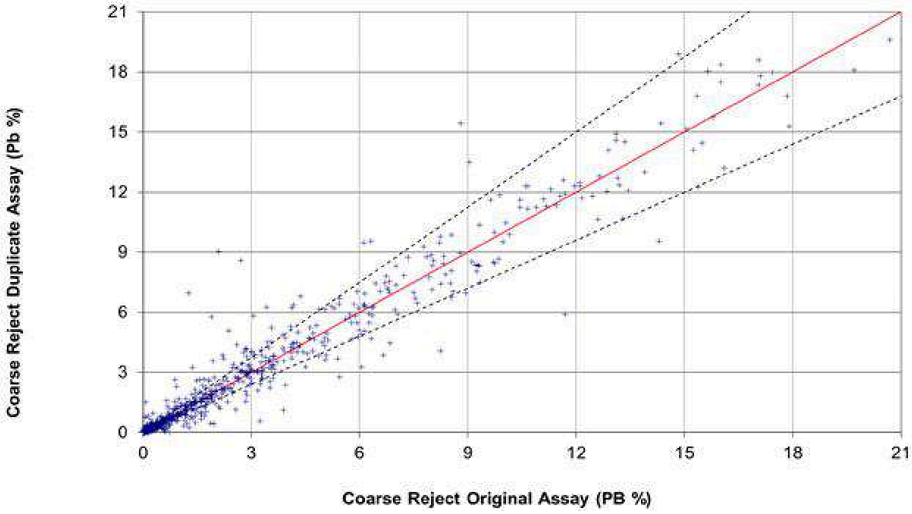


Figure 8-5: Analysis of Field Duplicate Data (Lead)

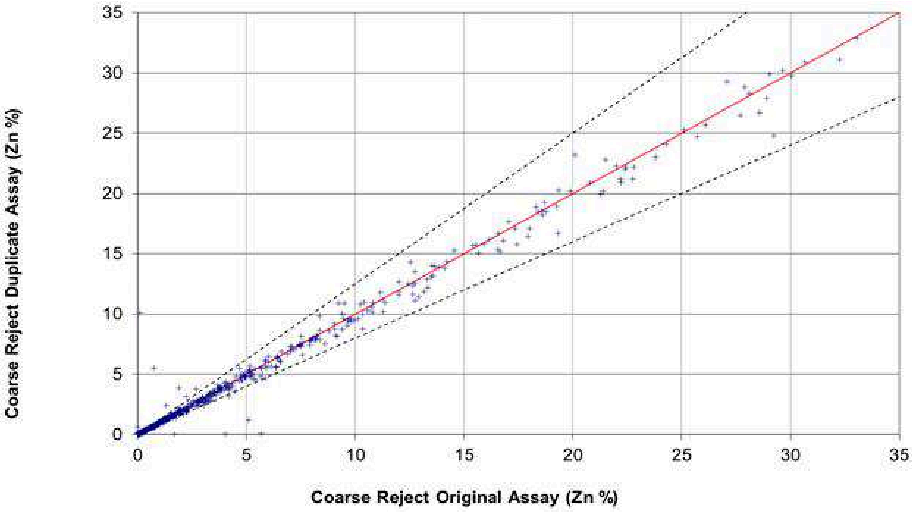


Figure 8-6: Analysis of Coarse Reject Duplicate Data (Zinc)

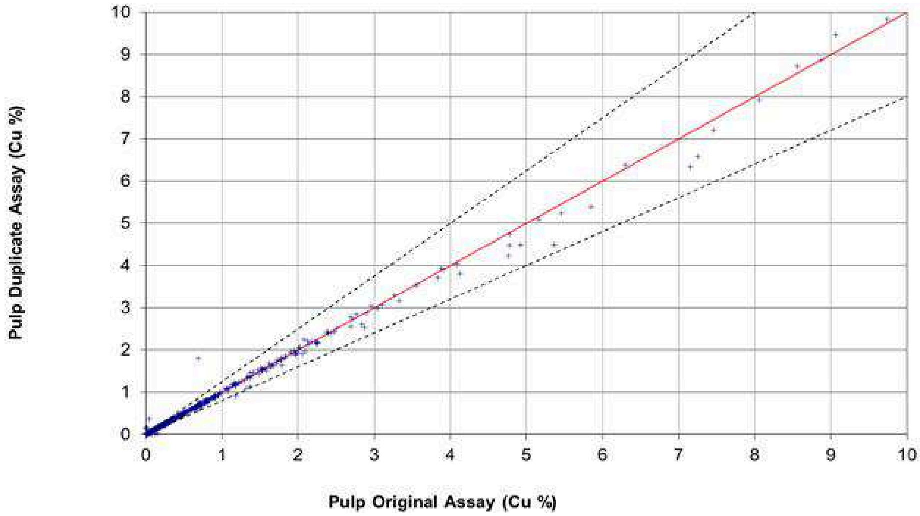


Figure 8-7: Analysis of Pulp Reject Duplicate Data (Copper)

Based on the analyses of available analytical QC data, the SLR QP is of the opinion that the exploration data is sufficiently reliable for mineral resource estimation purposes. A recalculation of the means and standard deviations for CRMs with high failure rates is recommended.

8.2.5 External Laboratory Checks

External laboratory check assays consist of submitting samples that were assayed at the primary laboratory (ALS) to a secondary laboratory CTRS and re-analyzing them by using the same analytical procedures.

Figure 8-8 plots 1,042 sample pairs of zinc assays that were submitted for reanalysis. The results show a low variation in the assay values with a correlation of over 99%.

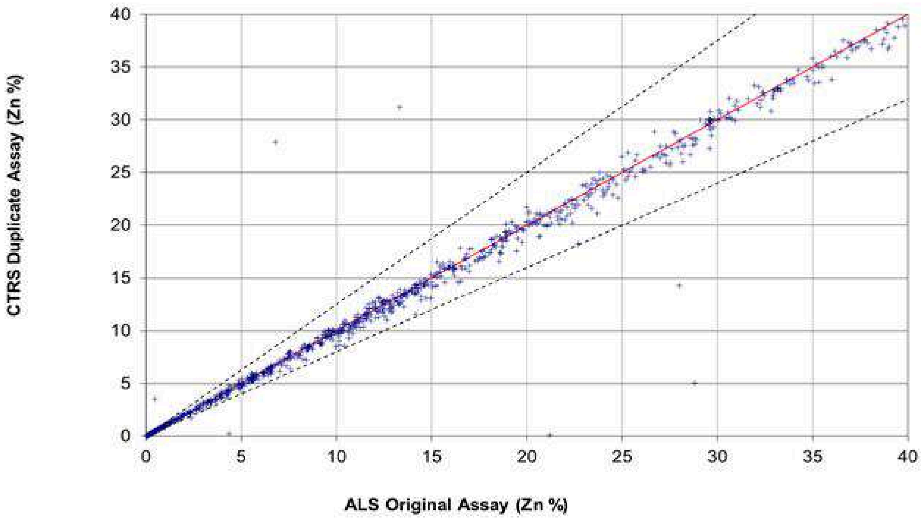


Figure 8-8: Analysis of External Laboratory Checks (Zinc)

8.3 Sample Security

Samples are shipped in rice bags by truck to the independent ALS Global preparation facility in Goiania, Brazil. ALS Global purchased the facility from ACME in 2007. Prior to 2007, all work was performed by ACME.

Drill core is stored at the onsite core storage facility, the grounds of which are locked at night and surrounded by a high fence. The storage facility is open at the sides and covered with a corrugated iron roof. Core storage inventory is maintained by onsite technicians. Pulp and coarse rejects are shipped back to the onsite facility by the laboratory where they are also stored with reference to individual sample locations.

8.4 Conclusions

The SLR QP is of the opinion that the data collected by Nexa has been validated thoroughly and that the implementation of QA/QC protocols are to industry standards. The data is suitable for the estimation of Mineral Resources and Mineral Reserves.

9.0 DATA VERIFICATION

9.1 Nexa

9.1.1 Validation of Anglo American Data

From 1993 to 1997, assays from 56 FEX series drill holes from the Anglo American drilling campaigns at Arex were completed by MMV and Nomos without the insertion of QA/QC samples into the sample stream. In 1997, for verification purposes, core was quartered over mineralized intervals and re-analyzed either at the same lab or at a secondary lab (MMV, Nomos, ACME, or ALS Chemex). It was noted that for Anglo American's Salobo Project in the Carajás mineral province, state of Pará, Brazil, Nomos was reporting significantly higher copper grades than MMV, however, MMV was comparable to ACME.

Based on this information, Nexa adopted the following strategy:

- Nomos assays were only used if MMV assays were not completed.
- If the re-assay was performed at the same laboratory, the lower grade set of results was used.

SLR notes that the FEX series drill holes represent approximately 5% of the composites within the mineralization wireframes and the issue mentioned only potentially impacts the stringer zone given that only the stringer zone contains copper values of interest. SLR is of the opinion that the impact of the overstated copper grades as presented above is not material to the Project.

9.1.2 Software Validation

Fusion and Seequent's Leapfrog Geo (Leapfrog) software is used to identify potential issues in the drill hole database. Checks for the following potential issues were carried out:

- Long sample lengths
- Strange maximum and minimum values
- Negative values
- Detection limit / zero values
- Rapid borehole deviations
- Sampling gaps
- Sampling overlaps
- Drill hole collars that do not match topography and underground openings

No significant errors were detected that would materially impact the Mineral Resource estimate.

9.2 SLR Audit of Drill Hole Database

9.2.1 Site Visit

SLR conducted site visits to the Project on several occasions. An SLR Senior Geologist, a QP, visited the Project between October 16 and 19, 2012. During this site visit, SLR verified the geology and assay results from holes FPAR339, FPAR273, and FPAR343 to information in Nexa's database. Drill hole contacts agreed with the logging results, and grades of zinc, lead, and copper were observed to correlate to sulphide content. Alteration was noted where present.

SLR visited the Project site between January 30 to February 3, 2017. During the site visit SLR reviewed logging and sampling methods, inspected core from drill holes, and held discussions with Nexa personnel. Subsequent to this visit, SLR visited the property between June 2 and 5, 2017. The purpose of the second visit was to review drill core, discuss project development plans, and review work on the Project to date.

9.2.2 Database Review

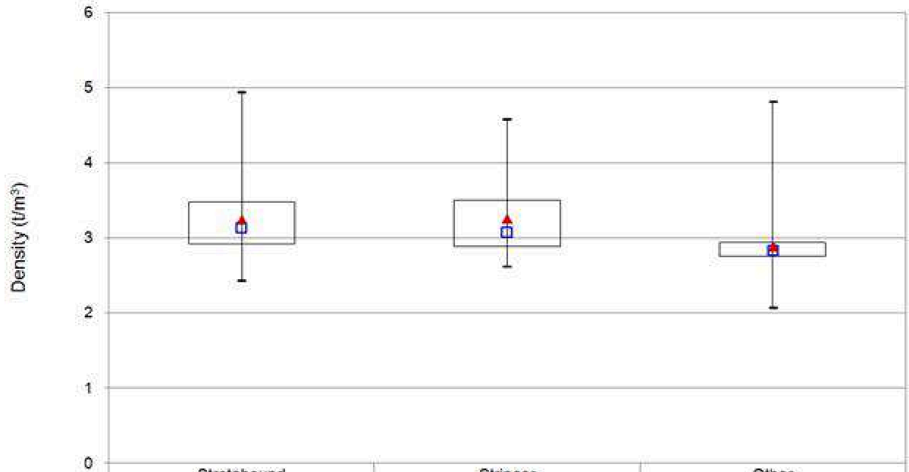
SLR has reviewed the drill hole database on various occasions. A summary of the data verification steps is given in Table 9-1.

Table 9-1: Summary of SLR Audits of the Resources Database
Nexa Resources S.A. – Aripuanã Zinc Project

Year	Task	Comments
2012	5% (20 holes) comparison between original logs and digital logs.	Two holes were identified as having errors and were corrected in the database.
	Compared holes FPAR2339, FPAR273 and FPAR343 to assay and litho logs.	Contacts agreed with logging and sulphide content correlated with assays results.
	5% check of assay certificates from ALS.	No major discrepancies found, accidental exclusion of 35% of silver values due to error in database script.
2015	18% check of assay certificates between 2012 and 2015 from ALS.	No major discrepancies found, silver scripting issue fixed.
2016	Examined density population for outliers.	Little variance within rock types and density values as expected. Some hydrothermal zone samples report high density values.
	Compared holes BRAPDD0055, BRAPDD0137 and BRAPDD0087 to assay and litho logs.	Contacts agreed with logging and sulphide content correlated with assays results.
2017	>6% check of assay certificates between 2015 and 2016 from ALS.	No major discrepancies found.
2018	Reviewed an error report provided by Nexa and generated by Datamine Studio RM (Datamine Studio) from the database text files	No major discrepancies found.
	Aggregated all assay certificates and compared finalized copper, lead, zinc, and silver values against the database using a routine in Microsoft Excel.	No significant errors found.
2020	A spot check on 3% of assay certificates between 2019 and 2020 from ALS.	No significant errors found.

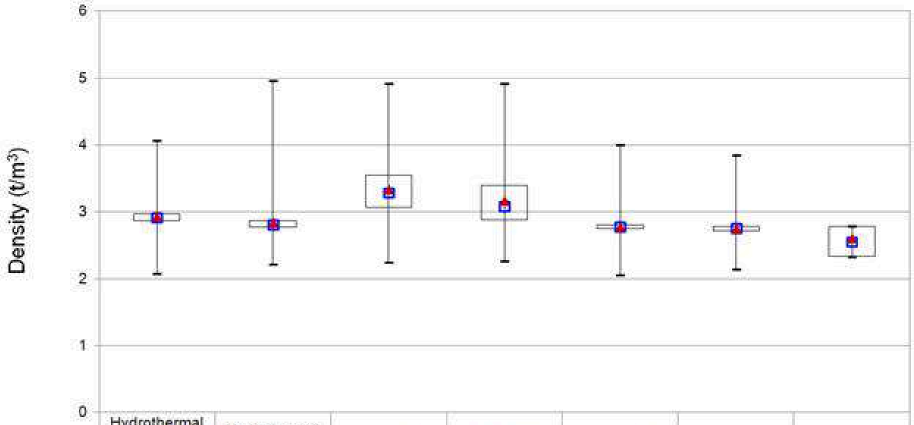
9.2.3 Density

SLR compared measured density values by rock units at Arex and Ambrex. Density values less than 2 t/m^3 (excluding oxide material) and greater than 5 t/m^3 were considered outliers based on cumulative distributions and removed from the database. Basic statistics of density data are displayed in the sequence. Samples designated as stratabound mineralization by logging geologists were found to have the highest density at both Arex and Ambrex, followed by stringer mineralization (Figure 9-1 and Figure 9-2). Little variance exists in any of the other rock units, however, some mineralized hydrothermal zone samples reported high density values.



	Stratabound	Stringer	Other
Q1	2.92	2.88	2.75
Min	2.43	2.62	2.07
Median	3.13	3.08	2.83
Mean	3.25	3.26	2.88
Max	4.95	4.58	4.82
Q3	3.47	3.50	2.93
NSamples	3463	160	6183

Figure 9-1: Density Measurements at Ambrex by Rock Unit



	Hydrothermal Breccia and Marble	Hydrothermal Zone	Stratabound	Stringer	Volcanics	Sedimentary	Oxide
Q1	2.87	2.77	3.06	2.88	2.75	2.71	2.33
−Min	2.07	2.21	2.25	2.26	2.05	2.14	2.33
□Median	2.92	2.80	3.28	3.08	2.77	2.75	2.56
▲Mean	2.94	2.84	3.34	3.17	2.77	2.75	2.61
−Max	4.07	4.96	4.91	4.91	4.00	3.85	2.78
Q3	2.97	2.86	3.54	3.39	2.80	2.78	2.78
NSamples	396	4796	1159	1194	3049	539	2

Figure 9-2: Density Measurements at Arex by Rock Unit

SLR is of the opinion that the data is suitable for the estimation of Mineral Resources and Mineral Reserves.

10.0 MINERAL PROCESSING AND METALLURGICAL TESTING

10.1 Introduction

Numerous metallurgical studies on the Project were carried out from 2005 to 2013 to identify the best processing option. The evolution of the key studies and the process technologies under consideration were documented by VM Holding S.A. (VMH, 2015) and previously reported by RPA (RPA, 2017 and RPA, 2018). It was determined through metallurgical test work that sequential flotation (Cu-Pb-Zn), rather than bulk flotation into a single concentrate, presented better economics due to higher recoveries and concentrate grades.

Additional test work on drill core from the Project was conducted by SGS GEOSOL Laboratórios (SGS GEOSOL) from May 2016 to January 2017 to provide experimental data to support engineering studies. Information on sample validation and additional metallurgical testing has largely been provided by Validaçao das Amostras Selecionadas para Teste Metalurgico (LCASSIS Consultoria em Recursos Minerais (LCASSIS), 2017), the SGS GEOSOL 2017 Report (SGS GEOSOL, 2017), and the Metallurgical Test work Report (Worley Parsons, 2017a).

Locked cycle test (LCT) work was also conducted in November 2017 by SGS GEOSOL to provide experimental data on the treatment of various types of mineralization, including, Link Stringer, Stringer Global, Link Stratabound, Ambrex Stringer, Ambrex Stratabound, and Strata Global. To the best of SLR’s knowledge, this test work program and the results were not compiled in a final report for review. The final results of this test work were used to define the process route selection.

Pilot studies were undertaken by SGS GEOSOL on Project mineralization and the results were reported in the 2018 Pilot Study (SGS GEOSOL, 2018).

Metallurgical data obtained from testing was integrated into the FEL3 process design by SNC-Lavalin Group Inc. (SNC-Lavalin) (SNC-Lavalin, 2018a and 2018b).

Subsequent to RPA’s 2018 Technical Report (RPA, 2018), pilot plant flotation test work commenced in 2020 using bulk samples at Nexa’s Vazante Mine pilot facility located in Mina Gerais State, Brazil. In addition, grinding and flotation test work was completed by SGS GEOSOL in 2020 (SGS GEOSOL, 2020)) on composites representing the first 11 quarters of processing plant feed. The 2020 test work utilized samples of blended ore (stringer and stratabound) based on a revised strategy of processing combined ore types rather than campaigning stratabound and stringer ores through the plant separately as had been previously planned. Independently, an evaluation of the grinding circuit included in the process design was completed by Mineral Processing Solutions (MinPro) in April 2020 (MinPro, 2020).

SGS GEOSOL is an independent laboratory in Vespasiano, Mato Grosso, Brazil, providing analytical and mineral processing test work services to the mining sector, and is certified to ISO 9001, ISO 14001, and ISO 17025.

10.2 Metallurgical Sampling

Three master composite samples representing the Arex Stratabound, Arex Stringer, and Ambrex Stratabound deposits were prepared from original drill core. These samples were subjected to comminution, flotation, rheology, settling, and filtration bench scale tests, as well as chemical and mineralogical characterization (SGS GEOSOL, 2017).

Shipments of samples for testing included:

- First shipment (May 2016) – 100 kg sample from the Arex body, material was combined to form a composite sample (75% Arex Stratabound, 25% Arex Stringer) for preliminary flotation test work in Phase 1 testing.
- Second shipment (July 2016) – 550 kg sample, core samples were combined to form three master composites: Arex Stringer, Arex Stratabound, and Ambrex Stratabound, which were used for optimization and definitive flotation tests.
- Variability Samples (July 2016) – 500 kg sample, core samples were combined to form ten Arex Stringer variability samples, ten Arex Stratabound variability samples, and eight Ambrex variability samples.

Detailed sample preparation for comminution was conducted by SGS GEOSOL to generate representative aliquots of material in specific size intervals for different types of tests. The material for comminution testing was sent to SGS Chile, while Bond Ball Mill Grindability testing was conducted at SGS GEOSOL in Brazil.

Material crushed to 2.0 mm was homogenized and separated into one-kilogram sub-samples, which were placed in plastic bags, sealed, and stored in a freezer for flotation test work.

Figure 10-1 and Figure 10-2 illustrate the location of the metallurgical samples selected relative to the Life of Mine (LOM) stopes and the representativeness of sampling in each deposit.

Samples for the 2018 SGS GEOSOL Pilot Study consisted of Arex and Ambrex Stratabound materials, and Arex Stringer materials, as well as dilution material. These samples were prepared individually and then composites were prepared of stringer and stratabound material totalling approximately 11 t. The samples were chosen from NQ core to be representative of the global grades of the Aripuanã deposit, as well as spatially representative and representative of the proportions of the different ore types. Dilution material from Ambrex STB and Arex STB was added to help achieve the target grades and deposit proportional representation.

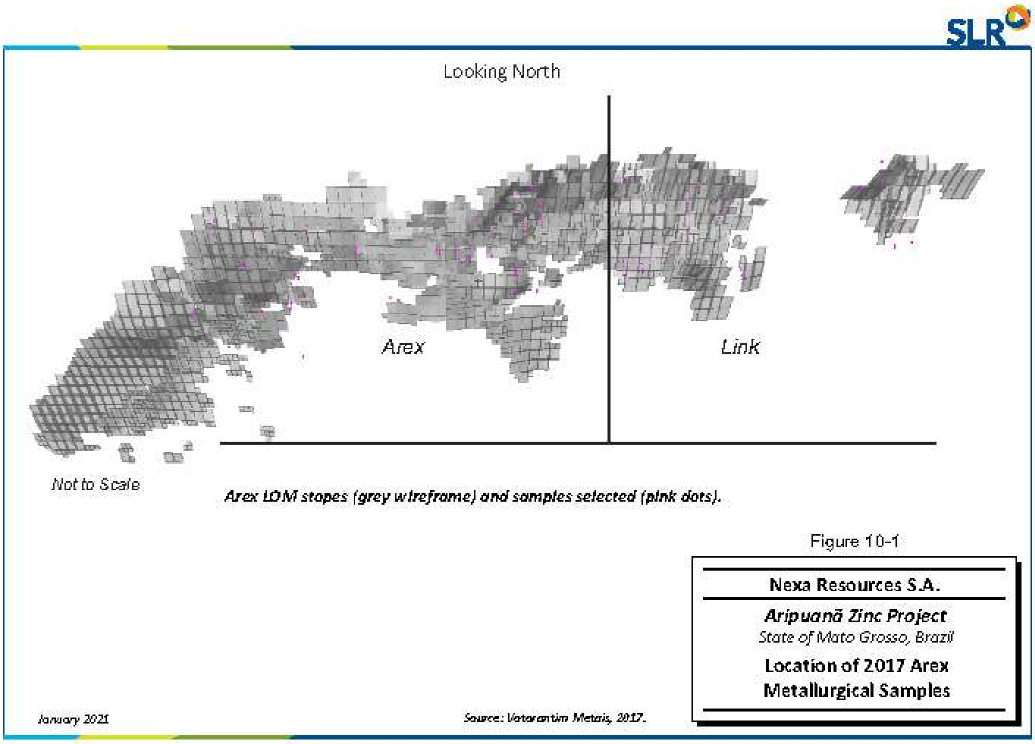


Figure 10-1: Location of 2017 Arex Metallurgical Samples

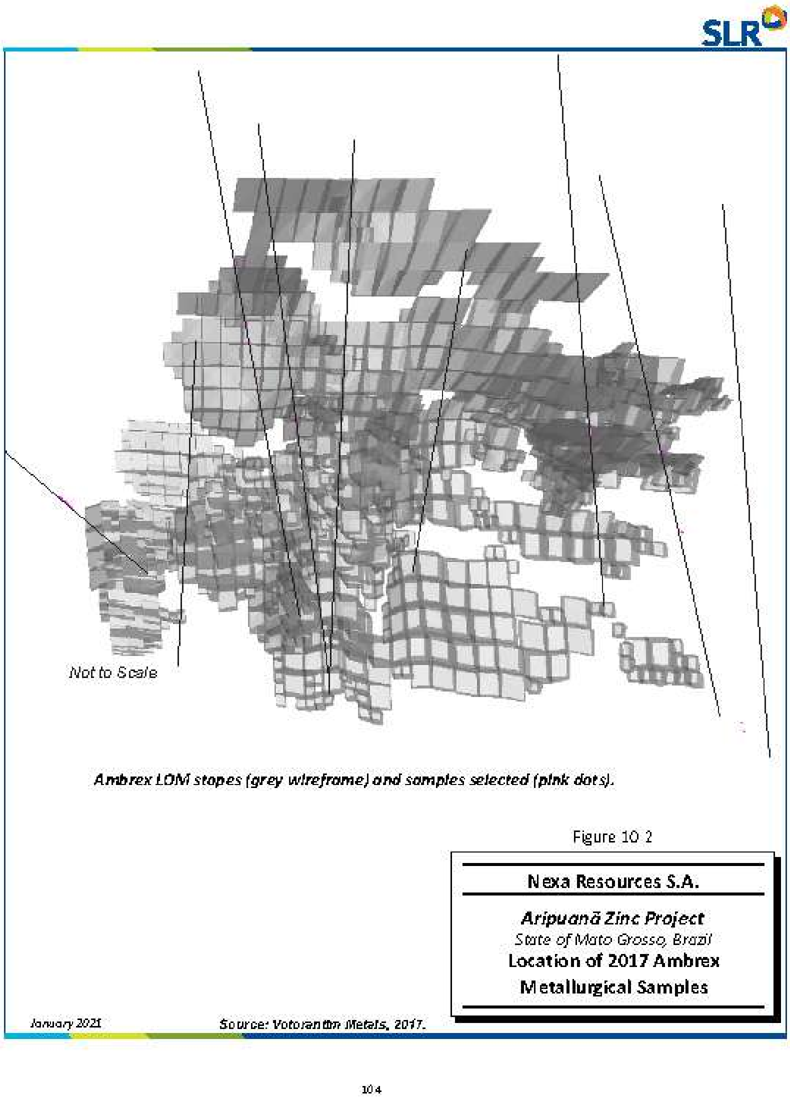


Figure 10-2: Location of 2017 Ambrex Metallurgical Samples

10.3 Metallurgical Testing

10.3.1 2016 Phase 1

The 2016 SGS GEOSOL metallurgical test program was carried out in two phases. In Phase 1, a single bulk master composite sample of Arex Stringer and Stratabound mineralization representing both deposits at a ratio of 75% stratabound to 25% stringer mineralization was tested. A total of 24 open circuit bench scale flotation tests and two LCTs were conducted using the blended composite sample. The purpose of the testing was to verify the primary grind size (as this has implications for the downstream backfill plant) and to confirm if treating a blended mineralization would result in good metallurgical performance when compared to treating the materials separately. Information on preliminary flotation test work is presented in detail in Appendix G of the SGS GEOSOL 2017 Report.

Preliminary test results indicated that a sequential flotation circuit with a short talc pre-flotation step followed by talc depression at a coarse primary grind size of 80% passing (P_{80}) 150 µm produced acceptable results (Table 10-1). The results were as follows:

- Final Cu concentrate: 30.3% Cu, 80.4% recovery.
- Final Pb concentrate: 45.4% Pb, 91.5% recovery (although zinc contamination of the lead concentrate was high).
- Final Zn concentrate: 56.3% Zn, 83.9% recovery.

Although parameters were not optimized, circuit conditions were identified for use in Phase 2. The overall results from LCTs were consistent with previous LCT results and the zinc and lead concentrate quality was found to be better than in previous tests. The blended composite of the Arex mineralization resulted in acceptable metallurgical performance in Phase 1 testing.

Table 10-1: Phase I – LCT 2 Results
Nexa Resources S.A. – Aripuanã Zinc Project

Product	Grade (%)						Recovery (%)					
	Cu	Fe	MgO	Pb	Zn	S	Cu	Fe	MgO	Pb	Zn	S
Calculated Feed	0.59	15.5	12.1	1.61	3.50	8.40	-	-	-	-	-	-
Talc Rougher Concentrate	0.57	14.9	11.0	1.60	3.80	7.59	9.52	1.43	4.14	1.17	0.70	1.31
Copper Recleaner Concentrate	30.3	29.0	0.59	1.50	4.66	33.4	80.43	2.95	0.08	1.39	1.86	6.68
Lead Recleaner Concentrate	0.62	12.9	1.88	45.4	11.6	20.8	3.48	2.77	0.55	91.50	9.85	8.84
Zinc Recleaner Concentrate	0.20	9.02	0.10	0.44	56.3	35.5	1.99	3.43	0.05	1.57	83.92	26.55
Final Tailings	0.09	15.1	12.2	0.10	0.19	4.91	14.09	90.86	99.32	5.54	4.38	57.93

10.3.2 2016 Phase 2

Phase 2 testing was comprised of a more comprehensive testing program undertaken on both blended and individual Arex and Ambrex materials, with variability testing conducted on the different lithologies (SGS GEOSOL, 2017). Test work consisted of comminution, flotation, mineralogy, thickening, filtration, and rheology testing. Bench scale flotation tests were conducted to establish circuit parameters for various mineralization blends prior to conducting LCTs. A series of LCTs were carried out on each master composite sample and various blends to optimize circuit performance and to evaluate the flowsheet configuration. Information on optimization flotation test work is presented in detail in Appendix H of the SGS GEOSOL 2017 Report. Optimum conditions from development test work were applied to testing various variability samples.

10.3.2.1 Comminution

A variety of comminution test work was completed, including:

- Crushing Work Index (CWi)
- Semi-Autogenous Grinding (SAG) Mill Comminution (SMC)
- SAG Power Index (SPI)
- Bond Work Index (BWi)
- Bond Abrasion Index (Ai)

Information on comminution test work is presented in detail in Appendix E of the SGS GEOSOL 2017 Report. A brief description of these tests and the results are summarized below.

10.3.2.1.1 CWi

The Bond Impact Work Index can be determined from the CWi test and used to calculate net power requirements for sizing crushers. Additionally, the CWi can be used to determine the required open side settings for jaw and gyratory crushers, or closed side settings for cone crushers to achieve a given product size. Table 10-2 summarizes the results of CWi testing. Arex Stringer mineralization is considered to be moderately hard, while Ambrex mineralization is classified as soft.

Table 10-2: CWi Results
Nexa Resources S.A. – Aripuanã Zinc Project

Sample	Maximum Impact Work Index (kWh/t)	Minimum Impact Work Index (kWh/t)	Average Impact Work Index (kWh/t)	Specific Gravity
Arex STB	18.47	4.39	9.13	3.31
Arex STR	18.81	4.83	9.32	2.93
Ambrex	10.91	3.87	6.35	3.67

Notes:

1. STB – Stratabound
2. STR – Stringer

10.3.2.1.2 SMC

SMC results are used to determine the drop weight index (DWi), which is a measure of the strength of the rock when broken under impact conditions. The DWi is directly related to the JK rock breakage parameters A and b, which can be used to estimate these parameters. The JKTech Abrasion Test determines the parameter, Ta, which characterizes the resistance of the particles to fracture by abrasion. If the value of Ta is low, then there is a higher resistance to abrasion. The results of the SMC testing are summarized in Table 10-3.

Table 10-3: SMC Results
Nexa Resources S.A. – Aripuanã Zinc Project

Sample	DWi (kWh/m^3)	A	b	A x b	SG	T_a
Arex STB	5.83	56.5	0.95	53.7	3.12	0.44
Arex STR	9.42	54.2	0.57	30.9	2.92	0.27
Ambrex	6.86	59.2	0.85	50.3	3.45	0.38

10.3.2.1.3 SPI

SPI is a measure of the hardness of an ore from a SAG or autogenous grinding (AG) perspective. The SPI test measures the energy required to perform a standard size reduction. SPI tests are aimed at determining SAG and ball mill power requirements.

SPI determinations were conducted for all master composite and variability samples (total of 30 samples) and the results are presented in Table 10-4. SGS Chile did not convert SPI minutes into power, therefore SPI values were not used in any comminution simulations. The results did not demonstrate a wide variation in hardness within the deposit. Samples were characterized as soft to moderate and the average SPI value for variability samples was 59.6 minutes.

Table 10-4: SPI Results
Nexa Resources S.A. – Aripuanã Zinc Project

Sample Number	Sample	SPI (minutes)
	Arex Stratabound (STB) Master Composite	47
	Arex Stringer (STR) Master Composite	88
	Ambrex Stratabound (STB) Master Composite	48
1	Arex STB Variability – High Sulphur	44
2	Arex STB Variability – Tremolite	55
3	Arex STB Variability – Pyrrhotite	80
4	Arex STB Variability – High Zinc	68
5	Arex STB Variability – Low Iron	47
6	Arex STB Variability – Low Zinc	52
7	Arex STB Variability – Pyrite	63
8	Arex STB Variability – Talc	39
9	Arex STB Variability – Chlorites	78
10	Arex STB Variability – Carbonates	44
11	Arex STR Variability – Low Iron	66
12	Arex STR Variability –Sulphur	81

Sample Number	Sample	SPI (minutes)
13	Arex STR Variability – High Pyrrhotite	71
14	Arex STR Variability – High Gold	79
15	Arex STR Variability – High Pyrite	67
16	Arex STR Variability – High Copper	78
17	Arex STR Variability – Talc	53
18	Arex STR Variability – High Iron	81
19	Arex STR Variability – Low Copper	69
20	Ambrex STB Variability – Low Zinc	46
21	Ambrex STB Variability – Carbonates	40
22	Ambrex STB Variability – Pyrrhotite	62
23	Ambrex STB Variability – Talc	50
24	Ambrex STB Variability – High Zinc	54
25	Ambrex STB Variability – Sulphides	55
26	Ambrex STB Variability – Pyrite	47
27	Ambrex STB Variability – Tremolite	40

10.3.2.1.4 BWi

BWi determinations were performed on master composites and all variability samples. A total of 31 BWi determinations were carried out using a closing screen size of 150 µm. Table 10-5 lists the BWi results. No major difference was noted between the master composites and the variability samples. The material was classified as moderate to soft based on the BWi results.

Table 10-5: BWi Results
Nexa Resources S.A. – Aripuanã Zinc Project

Sample Number	Sample	BWi (kWh/t)
	Arex STB Master Composite	10.6
	Arex STRMaster Composite	12.4
	Arex Mix	12.1
	Ambrex STB Master Composite	10.8 / 10.3
1	Arex STB Variability – High Sulphur	8.6
2	Arex STB Variability – Tremolite	9.9
3	Arex STB Variability – Pyrrhotite	12.1
4	Arex STB Variability – High Zinc	10.6
5	Arex STB Variability – Low Iron	8.9
6	Arex STB Variability – Low Zinc	11.8
7	Arex STB Variability – Pyrite	10.8
8	Arex STB Variability – Talc	9.9
9	Arex STB Variability – Chlorites	11.2
10	Arex STB Variability – Carbonates	11.8
11	Arex STR Variability – Low Iron	11.9
12	Arex STR Variability –Sulphur	12.4
13	Arex STR Variability – High Pyrrhotite	13.6
14	Arex STR Variability – High Gold	12.7
15	Arex STR Variability – High Pyrite	12.9
16	Arex STR Variability – High Copper	14.2
17	Arex STR Variability – Talc	14.1
18	Arex STR Variability – High Iron	14.6
19	Arex STR Variability – Low Copper	12.9
20	Ambrex STB Variability – Low Zinc	9.5
21	Ambrex STB Variability – Carbonates	9.9
22	Ambrex STB Variability – Pyrrhotite	11.1
23	Ambrex STB Variability – Talc	10.2
24	Ambrex STB Variability – High Zinc	10.3
25	Ambrex STB Variability – Sulphides	10.4
26	Ambrex STB Variability – Pyrite	9.1
27	Ambrex STB Variability – Tremolite	9.6

10.3.2.1.5 Ai

Ai can be used to determine steel media and liner wear in crushers, rod mills, and ball mills. The Ai test results are summarized in Table 10-6. The mineralization tested was classified as moderately abrasive.

Table 10-6: Ai Results
Nexa Resources S.A. – Aripuanã Zinc Project

Sample	Ai (g)
Arex Stratabound Master Composite	0.086
Arex Stringer Master Composite	0.1425
Ambrex Master Composite	0.1448

10.3.2.1.6 RWi

Bond rod mill work index (RWi) can be used to calculate net power requirements of the mill circuit, where the mill operates in closed circuit with a classifier. The RWi results are listed in Table 10-7.

Table 10-7: RWi Results
Nexa Resources S.A. – Aripuanã Zinc Project

Sample	RWi (kWh/t)
Arex Stratabound Master Composite	12.2
Arex Stringer Master Composite	15.4
Ambrex Master Composite	11.2

10.3.2.2 Flotation

Phase 2 flotation testing was conducted using master composite samples of the Arex Stratabound, Arex Stringer, and Ambrex Stratabound mineralization, as well as three Arex blended mineralization with varying ratios of stratabound to stringer material (75%:25%, 50%:50%, and 25%:75%). The main objective of the Phase 2 flotation testing was to determine the highest grade and recovery achievable for each sample under different reagent dosages and flotation times under a sequential flotation scheme (Cu-Pb-Zn). The Phase 2 flotation test program and results were documented in detail by SGS GEOSOL (SGS GEOSOL, 2017).

A simplified diagram of the sequential flotation process developed is illustrated in Figure 10-3.

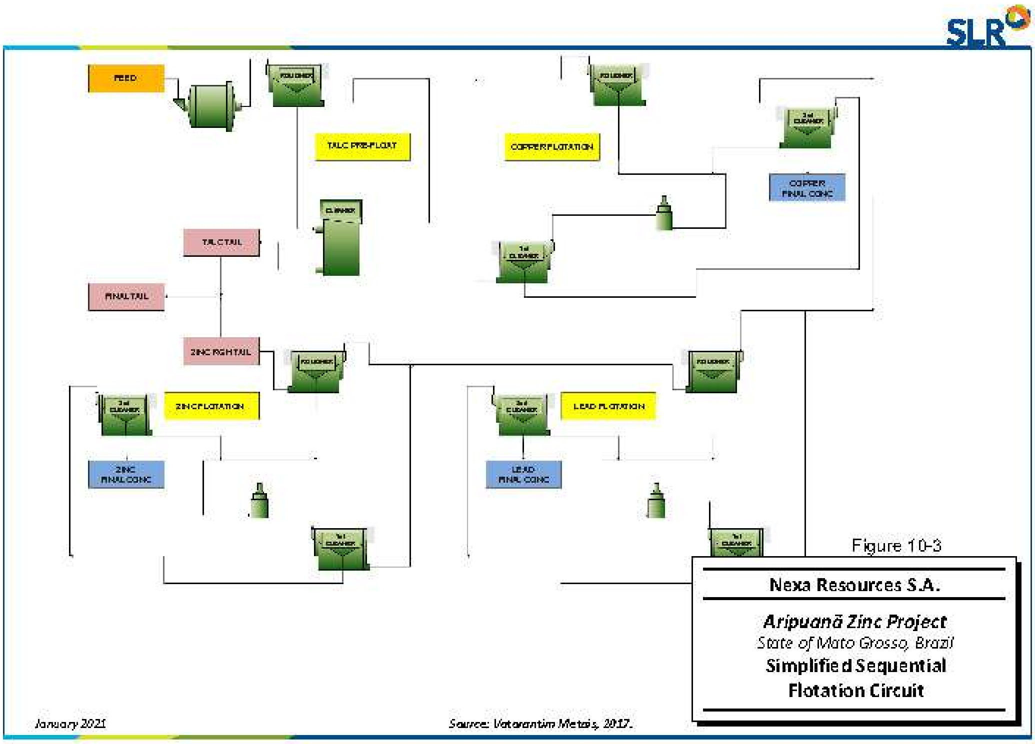
The optimization test work determined that the best LCT results in terms of concentrate grades and recoveries achieved were as follows (SGS GEOSOL, 2017):

- Arex Stratabound Master Composite: LCT 028
- Arex Stringer Master Composite: LCT 011 and LCT 025 (Cu flotation only)
- Arex Mixed (75% Stratabound, 25% Stringer): LCT 030
- Ambrex Stratabound Master Composite: LCT 029

The results from these LCTs are summarized in Table 10-8 to Table 10-14 and SGS GEOSOL's key findings were as follows:

- Master composites of Arex Stratabound and Ambrex Stratabound mineralization were similar in zinc and lead feed assays and flotation recovery, however, the Ambrex sample exhibited low copper concentrate grade and recovery.

- The Arex Stringer master composite sample was high in copper feed assay and the resulting copper concentrate was also high in grade and recovery. Zinc and lead concentrate grades and recovery were low as a result of their feed grades being low.
- The Arex Blended sample (75% Stratabound, 25% Stringer) exhibited the best flotation results:
  - Cu concentrate: 31.3% Cu, 76.9% recovery
  - Pb concentrate: 51.7% Pb, 82.4% recovery
  - Zn concentrate: 52.4% Zn, 83.9% recovery
- Cycles on the majority of LCTs were not stabilized, thus confirmation of the results would require additional testing. Separate water systems were recommended for the flotation circuits to help future LCTs achieve equilibrium.
- While flotation columns are preferred and widely accepted in industry for use in the final cleaning stage, column flotation testing was not carried out at the bench scale.



10-13

Figure 10-3: Simplified Sequential Flotation Circuit

Table 10-8: Summary of Key Optimization LCT Results
Nexa Resources S.A. – Aripuanã Zinc Project

LCT	Grade							Distribution							
	% Cu	% Pb	% Zn	% Mg	% Fe	ppm Au	ppm Ag	Wt.%	% Cu	% Pb	% Zn	% Mg	% Fe	% Au	% Ag
LCT 028 – Arex Stratabound Master Composite															
Calculated Feed	0.33	1.53	4.51	7.03	12.9	0.20	33.7	100	100	100	100	100	100	100	100
Talc Tail	0.04	0.73	2.30	11.6	8.21	-	-	17.5	2.11	8.36	8.92	28.9	11.1	-	-
Cu Final Conc.	26.7	3.63	7.16	0.79	31.7	11.3	1,068	0.86	69.5	2.05	1.37	0.10	2.11	49.7	27.2
Pb Final Conc.	0.81	60.6	8.39	0.54	5.89	1.53	852	2.01	4.92	79.8	3.74	0.15	0.92	15.6	50.7
Zn Final Conc.	0.26	0.54	48.6	0.98	9.38	0.24	40.0	7.64	6.01	2.70	82.5	1.06	5.55	9.34	9.06
Rougher Tail	0.08	0.15	0.22	6.81	14.4	-	-	72.0	17.4	7.08	3.5	69.8	80.3	-	-
LCT 011 – Arex Stringer Master Composite															
Calculated Feed	1.02	0.18	0.24	2.62	11.2	0.5	12.5	100	100	100	100	100	100	100	100
Talc Tail	Due to the low content of talc in feed, talc flotation was excluded from LCT circuit in this test														
Cu Final Conc.	25.4	2.68	4.45	0.43	33.1	13.5	253	3.85	95.7	55.8	71.8	0.64	11.4	93.3	77.7
Pb Final Conc.	1.93	10.7	3.85	1.69	31.7	4.65	210	0.67	1.26	38.6	10.8	0.43	1.89	6.3	11.2
Zn Final Conc.	0.46	0.20	4.89	3.80	17.5	0.31	12.0	0.48	0.21	0.50	9.5	0.67	0.72	0.29	0.44
Rougher Tail	0.03	0.01	0.02	2.71	10.1	-	-	95.0	2.79	5.14	7.97	98.3	86.0	-	-

LCT	Grade							Distribution							
	% Cu	% Pb	% Zn	% Mg	% Fe	ppm Au	ppm Ag	Wt.%	% Cu	% Pb	% Zn	% Mg	% Fe	% Au	% Ag
LCT 025 – Arex Stringer Master Composite (Copper Flotation Only)															
Calculated Feed	1.02	0.19	0.26	2.34	11.2	0.49	12.5	100	100	100	100	100	100	100	100
Talc Tail	Due to the low content of talc in feed, talc flotation was excluded from LCT circuit in this test														
Cu Final Conc.	26.7	1.84	2.63	0.54	36.2	13.8	252	3.73	98.1	35.4	37.5	0.87	12.1	93	75.1
Pb Final Conc.	Due to the low content of lead in feed, lead flotation excluded from LCT circuit in this test														
Zn Final Conc.	Due to the low content of zinc in feed, zinc flotation excluded from LCT circuit in this test														
Rougher Tail	0.02	0.13	0.17	2.41	10.2	-	-	96.3	1.89	64.6	62.5	99.1	87.9	-	-
LCT 030 – Arex Mixed (75% Stratabound, 25% Stringer)															
Calculated Feed	0.45	1.34	3.56	5.90	12.2	0.27	28.4	100	100	100	100	100	100	100	100
Talc Tail	0.06	0.64	1.56	11.8	8.28	-	-	13.1	1.75	6.22	5.73	26.1	8.88	-	-
Cu Final Conc.	31.3	1.14	3.45	0.28	35.2	14.4	660	1.10	76.9	0.93	1.06	0.05	3.17	58.4	25.5
Pb Final Conc.	1.45	51.7	10.4	0.49	12.0	2.8	741	2.14	6.95	82.4	6.26	0.18	2.11	22.0	55.8
Zn Final Conc.	0.31	0.81	52.4	0.66	9.65	0.3	44.0	5.69	3.95	3.43	83.9	0.63	4.51	6.32	8.81
Rougher Tail	0.06	0.12	0.14	5.52	12.7	-	-	78.0	10.5	6.97	3.1	73.1	81.3	-	-
LCT 009 – Ambrex Stratabound Master Composite															
Calculated Feed	0.08	1.89	4.36	5.38	17.0	0.18	36.7	100	100	100	100	100	100	100	100
Talc Tail	0.02	1.06	2.36	11.6	9.65	-	-	5.58	1.38	3.13	3.02	12.0	3.17	-	-
Cu Final Conc.	4.54	3.38	2.49	12.0	10.9	6.76	1,117	1.05	58.9	1.88	0.60	2.34	0.67	38.9	32.0
Pb Final Conc.	0.18	43.9	6.50	0.65	20.0	0.61	446	3.62	8.05	84.0	5.40	0.43	4.27	12.1	44.0
Zn Final Conc.	0.13	0.61	53.9	0.13	11.3	0.30	43.0	7.02	11.3	2.26	86.8	0.17	4.67	11.6	8.23
Rougher Tail	0.02	0.20	0.22	5.54	17.9	-	-	82.7	20.4	8.74	4.2	85.1	87.2	-	-

LCT	Grade							Distribution							
	% Cu	% Pb	% Zn	% Mg	% Fe	ppm Au	ppm Ag	Wt.%	% Cu	% Pb	% Zn	% Mg	% Fe	% Au	% Ag
LCT 029 – Ambrex Stratabound Master Composite															
Calculated Feed	0.07	1.64	4.39	5.11	20.5	0.18	36.7	100	100	100	100	100	100	100	100
Talc Tail	0.02	1.05	2.51	11.8	11.6	-	-	13.1	4.01	8.40	7.50	30.2	7.43	-	-
Cu Final Conc.	24.6	3.13	8.58	0.52	28.3	57.4	3,328	0.11	40.3	0.20	0.21	0.01	0.15	33.7	9.72
Pb Final Conc.	0.30	40.8	6.12	0.33	24.6	1.83	466	3.01	13.8	74.9	4.19	0.19	3.61	30.2	38.3
Zn Final Conc.	0.15	0.90	45.3	0.52	14.5	0.39	52.0	8.21	18.8	4.51	84.7	0.84	5.81	17.6	11.6
Rougher Tail	0.02	0.26	0.20	4.65	22.5	-	-	75.6	23.1	12.0	3.44	68.8	83.0	-	-

Table 10-9: LCT 028 Conditions and Results– Arex Stratabound Master Composite
Nexa Resources S.A. – Aripuanã Zinc Project

AREX STRATABOUND										
LCT 028 - SEQUENTIAL CIRCUIT										
FINAL CONCENTRATE - MASS BALANCED										
GRADE		Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm
COPPER		26,7	3,63	7,16	0,79	29,2	30,3	1,61	11,3	1068
LEAD		0,81	60,7	8,39	0,54	5,9	18,5	1,05	1,53	862
ZINC		0,26	0,54	48,6	0,98	9,4	32,8	2,11	0,24	40
RECOVERY		Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au %	Ag %
COPPER		77,7	1,94	1,37	0,09	2,0	3,5	0,07	49,7	27,2
LEAD		5,51	75,9	3,75	0,15	1,0	5,0	0,10	15,6	50,7
ZINC		6,72	2,57	82,7	1,03	5,8	33,9	0,76	9,34	9,1
TEST CONDITIONS										
SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	MIBC gpm^3	LIME gpt	pH	TIME min
TALC ROUGHER										
400	0	0	0	0	0	0	12,7	0	6,5	2
TALC CLEANER										
0	200	0	20	0	0	0	12,7	0	7,6	ESG
COPPER ROUGHER										
300	100	300	30	0	0	0	12,7	0	6,5	7
COPPER CLEANER										
50	30	75	10	0	0	0	12,7	275	11,5	1,5
COPPER RECLEANER										
0	0	0	0	0	0	0	12,7	7,5	11,5	0:45
LEAD ROUGHER										
150	50	300	0	17,5	0	0	12,7	125	9,62	7
LEAD CLEANER										
75	0	75	0	6	0	0	12,7	120	11	3
LEAD RECLEANER										
0	0	0	0	0	0	0	12,7	10	11	2,5
ZINC ROUGHER										
0	0	0	0	0	600	32,5	12,7	600	11	12
ZINC CLEANER										
0	0	0	0	0	300	7,5	12,7	125	11	4,5
ZINC RECLEANER										
0	0	0	0	0	0	0	12,7	15	11	3

Source: SGS GEOSOL, 2017

Table 10-10: LCT 011 Conditions and Results– Arex Stringer Master Composite
Nexa Resources S.A. – Aripuanã Zinc Project

AREX STRINGER

LCT 011 - SEQUENTIAL CIRCUIT

FINAL CONCENTRATE - MASS BALANCED

GRADE	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm
COPPER	23,0	2,87	4,93	0,43	32,0	34,4	1,41	13,5	253
LEAD	1,93	10,7	4,16	1,69	31,4	30,4	7,32	4,65	210
ZINC	0,46	0,21	4,90	3,80	17,5	8,0	19,30	0,31	12,0
RECOVERY	**Cu %**	**Pb %**	**Zn %**	**Mg %**	**Fe %**	**S %**	**Si %**	**Au %**	**Ag %**
COPPER	96,5	56,6	72,1	0,64	10,7	55,3	0,18	93,3	77,7
LEAD	1,40	36,6	10,6	0,43	1,8	8,5	0,16	6,30	11,2
ZINC	0,23	0,50	8,7	0,67	0,7	1,6	0,30	0,29	0,44

TEST CONDITIONS

Stage	SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	MIBC gpm^3	LIME gpt	pH	TIME min
TALC ROUGHER	0	0	0	0	0	0	0	0	0	nat	0
TALC CLEANER	0	0	0	0	0	0	0	0	0	0	0
COPPER ROUGHER	400	100	300	35	0	0	0	12,7	0	5,8	6
COPPER CLEANER	100	30	75	10	0	0	0	12,7	375	11,5	3
COPPER RECLEANER	0	0	0	0	0	0	0	12,7	30	11,5	2
LEAD ROUGHER	0	50	200	0	10	0	0	12,7	0	8,08	9
LEAD CLEANER	75	0	50	0	10	0	0	12,7	175	10,99	3
LEAD RECLEANER	0	0	0	0	0	0	0	12,7	0	11	2
ZINC ROUGHER	0	0	0	0	0	400	25	12,7	325	11	12
ZINC CLEANER	0	0	0	0	0	300	10	12,7	100	11	4
ZINC RECLEANER	0	0	0	0	0	0	0	12,7	10	11	2

Source: SGS GEOSOL, 2017

Table 10-11: LCT 025 Conditions and Results– Arex Stringer Master Composite
Nexa Resources S.A. – Aripuanã Zinc Project

AREX STRINGER										
LCT 025 - SEQUENTIAL CIRCUIT										
FINAL CONCENTRATE - MASS BALANCED										
GRADE		Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm
COPPER		25,1	1,80	2,51	0,70	34,9	1,5	29,7	13,8	262
LEAD		LEAD FLOTATION EXCLUDED FROM THE LCT CIRCUIT IN THIS TEST								
ZINC		ZINC FLOTATION EXCLUDED FROM THE LCT CIRCUIT IN THIS TEST								
RECOVERY		Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au %	Ag %
COPPER		98,1	32,9	34,2	0,99	10,8	55,9	99,8	93,0	75,1
LEAD		LEAD FLOTATION EXCLUDED FROM THE LCT CIRCUIT IN THIS TEST								
ZINC		ZINC FLOTATION EXCLUDED FROM THE LCT CIRCUIT IN THIS TEST								
TEST CONDITIONS										
SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	MIBC gpm³	LIME gpt	pH	TIME min
TALC ROUGHER										
0	0	0	0	0	0	0	0	0	0	0
TALC CLEANER										
0	0	0	0	0	0	0	0	0	0	0
COPPER ROUGHER										
400	100	300	20	0	0	0	12,7	0	6,3	6
COPPER CLEANER										
200	50	300	6	0	0	0	12,7	300	11,6	3
COPPER RECLEANER										
0	0	0	0	0	0	0	12,7	0	11,5	2
LEAD ROUGHER										
0	0	0	0	0	0	0	0	0	0	0
LEAD CLEANER										
0	0	0	0	0	0	0	0	0	0	0
LEAD RECLEANER										
0	0	0	0	0	0	0	0	0	0	0
ZINC ROUGHER										
0	0	0	0	0	0	0	0	0	0	0
ZINC CLEANER										
0	0	0	0	0	0	0	0	0	0	0
ZINC RECLEANER										
0	0	0	0	0	0	0	0	0	0	0

Source: SGS GEOSOL, 2017

Table 10-12: LCT 030 Conditions and Results– Arex Blended (75% Stratabound, 25% Stringer)
Nexa Resources S.A. – Aripuanã Zinc Project

AREX 75% STRATABOUND 25% STRINGER

LCT 030 - SEQUENTIAL CIRCUIT

FINAL CONCENTRATE - MASS BALANCED

GRADE	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm
COPPER	31,3	1,14	3,45	0,28	31,8	30,9	0,69	14,4	660
LEAD	1,46	50,7	10,4	0,49	12,3	21,9	1,17	2,78	741
ZINC	0,31	0,81	51,4	0,66	9,8	33,6	1,50	0,30	44
RECOVERY	**Cu %**	**Pb %**	**Zn %**	**Mg %**	**Fe %**	**S %**	**Si %**	**Au %**	**Ag %**
COPPER	76,6	0,97	1,11	0,05	2,78	5,93	0,03	58,4	25,5
LEAD	6,77	82,4	6,38	0,17	2,05	8,01	0,10	22,0	55,8
ZINC	3,85	3,50	84,0	0,59	4,35	32,8	0,36	6,32	8,80

TEST CONDITIONS

SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	MIBC gpm³	LIME gpt	pH	TIME min
TALC ROUGHER										
400	0	0	0	0	0	0	12,7	0	6,8	2
TALC CLEANER										
0	300	0	10	0	0	0	12,7	0	8	esg
COPPER ROUGHER										
200	50	200	7,5	0	0	0	12,7	0	7,1	6
COPPER CLEANER										
50	30	25	7,5	0	0	0	12,7	0	11,6	1
COPPER RECLEANER										
0	0	0	0	0	0	0	12,7	0	11,5	0,5
LEAD ROUGHER										
200	50	300	0	22,5	0	0	12,7	0	9,71	9
LEAD CLEANER										
50	30	75	0	10	0	0	12,7	0	11,03	2
LEAD RECLEANER										
0	0	0	0	0	0	0	12,7	0	11,1	45 s
ZINC ROUGHER										
0	50	0	0	0	300	32,5	12,7	0	11,2	12
ZINC CLEANER										
0	0	0	0	0	200	10	12,7	0	11,5	4
ZINC RECLEANER										
0	0	0	0	0	0	0	12,7	0	11,5	2

Source: SGS GEOSOL, 2017

Table 10-13: LCT 009 Conditions and Results– Ambrex Stratabound Master Composite
Nexa Resources S.A. – Aripuanã Zinc Project

AMBREX STRATABOUND

LCT 009 - SEQUENTIAL CIRCUIT

FINAL CONCENTRATE - MASS BALANCED

GRADE	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm
COPPER	4,54	3,38	2,49	12,0	10,9	8,89	19,2	6,76	1117
LEAD	0,18	44,9	6,50	0,64	19,0	26,7	1,10	0,61	446
ZINC	0,13	0,61	54,0	0,13	11,0	32,7	0,48	0,30	43
RECOVERY	**Cu %**	**Pb %**	**Zn %**	**Mg %**	**Fe %**	**S %**	**Si %**	**Au %**	**Ag %**
COPPER	66,9	1,74	0,56	2,10	0,62	0,67	1,22	35,2	28,9
LEAD	9,35	81,5	5,16	0,40	3,81	7,05	0,25	11,2	40,7
ZINC	12,8	2,11	81,6	0,15	4,18	16,4	0,21	10,5	7,47

TEST CONDITIONS

SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	MIBC gpm³	LIME gpt	pH	TIME min
TALC ROUGHER										
400	0	0	0	0	0	0	12,7	0	7,4	0,5
TALC CLEANER										
0	200	0	20	0	0	0	12,7	0	8,1	esg
COPPER ROUGHER										
200	50	0	12,5	0	0	0	12,7	0	11,5	9
COPPER CLEANER										
50	30	25	15	0	0	0	12,7	250	11,5	1
COPPER RECLEANER										
0	0	0	0	0	0	0	12,7	20	11,6	0,5
LEAD ROUGHER										
200	50	300	0	15	0	0	12,7	5	8,24	9
LEAD CLEANER										
50	0	50	0	10	0	0	12,7	225	11,2	2
LEAD RECLEANER										
0	0	0	0	0	0	0	12,7	0	11,03	1
ZINC ROUGHER										
0	0	0	0	0	300	32,5	12,7	375	11,1	12
ZINC CLEANER										
0	0	0	0	0	200	10	12,7	175	11,6	4
ZINC RECLEANER										
0	0	0	0	0	0	0	12,7	65	11,5	2

Source: SGS GEOSOL, 2017

Table 10-14: LCT 029 Conditions and Results– Ambrex Stratabound Master Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA
AMBREX STRATABOUND
LCT 029 - SEQUENTIAL CIRCUIT

FINAL CONCENTRATE

GRADE	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm
COPPER	24,6	3,13	8,58	0,52	28,3	31,5	1,12	57,4	3328
LEAD	0,30	40,8	6,12	0,33	24,6	32,1	0,79	1,83	466
ZINC	0,15	0,90	45,3	0,52	14,5	34,5	1,12	0,39	52,0
RECOVERY	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au %	Ag %
COPPER	40,3	0,20	0,21	0,01	0,15	0,21	0,01	33,7	9,72
LEAD	13,8	74,9	4,19	0,19	3,61	5,97	0,15	30,2	38,3
ZINC	18,8	4,51	84,7	0,84	5,81	17,5	0,56	17,6	11,6

TEST CONDITIONS

SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	MIBC gpm³	LIME gpt	pH	TIME min
TALC ROUGHER										
400	0	0	0	0	0	0	12,7	0	6,9	2
TALC CLEANER										
0	300	0	10	0	0	0	12,7	0	8	2
COPPER ROUGHER										
200	50	200	7,5	0	0	0	12,7	0	7,1	5
COPPER CLEANER										
50	30	25	7,5	0	0	0	12,7	45	11,6	1
COPPER RECLEANER										
0	0	0	0	0	0	0	12,7	0	11,5	0,5
LEAD ROUGHER										
200	50	300	0	22,5	0	0	12,7	100	9,71	9
LEAD CLEANER										
50	30	75	0	10	0	0	12,7	125	11,03	2
LEAD RECLEANER										
0	0	0	0	0	0	0	12,7	10	11	45 s
ZINC ROUGHER										
0	50	0	0	0	300	32,5	12,7	375	11,2	12
ZINC CLEANER										
0	0	0	0	0	200	10	12,7	225	11,5	4
ZINC RECLEANER										
0	0	0	0	0	0	0	12,7	50	11,5	2

Source: SGS GEOSOL, 2017

The metallurgical recoveries referenced by SNC-Lavalin in the process design criteria (SNC-Lavalin 2018b) for the feasibility study (FS) appear to be consistent with those calculated based on SGS GEOSOL 2017 test work:

- Copper recovery (Stringer) = 86.9%
- Copper recovery (Stratabound) = 67.5%
- Lead recovery (Stratabound) = 85.9%
- Zinc recovery (Stratabound) = 89.4%

The LOM economics were developed using relationships between head grade, concentrate grade, and recovery that were established based on the LCTs. The relationship between concentrate grade divided by the head grade is known as the enrichment ratio (Er), which is a function of the mass pull to the concentrate. In general, the recovery is stated as a relationship to head grade.

SLR notes that not all of the LCTs achieved equilibrium. Due to the low correlations between head grade and recovery in the LCTs, it was determined that the Er ratio would be used where applicable for recovery, and the 2018 pilot plant results would be used in other cases. Nexa determined that the pilot plant results better reflected recovery of stratabound zinc. If concentrates with grades lower than those achieved during testing can be marketed, the metallurgical recoveries used in the cash flow model are:

- Copper Recovery (Stringer) = 102.2014 – (0.4471 x Er), based on LCTs and with LOM Er of 34
- Copper Recovery (Stratabound) = 67.5% based on test work
- Lead Recovery (Stratabound) = exp[0.0608 x ln(1 - Er/79.31) + 4.4801] + 0.1, based on LCTs and LOM Er of 29.3
- Zinc Recovery (Stratabound) = 89.4% based the 2018 pilot plant test work

Based on a review of available metallurgical data, elevated levels of fluorine have been found in some of the concentrates. SLR is of the opinion that concentrate blending will result in final concentrates which contain acceptable levels of deleterious elements.

Optimum conditions from development test work were applied to flotation testing of different variability samples. Each variability sample was subjected to copper, lead, and zinc flotation via an open cleaner circuit (same configuration used for LCT, except that there was no recirculation of cleaner and recleaner tailings). Talc flotation was only performed on samples from Arex Stratabound or Ambrex Stratabound mineralization.

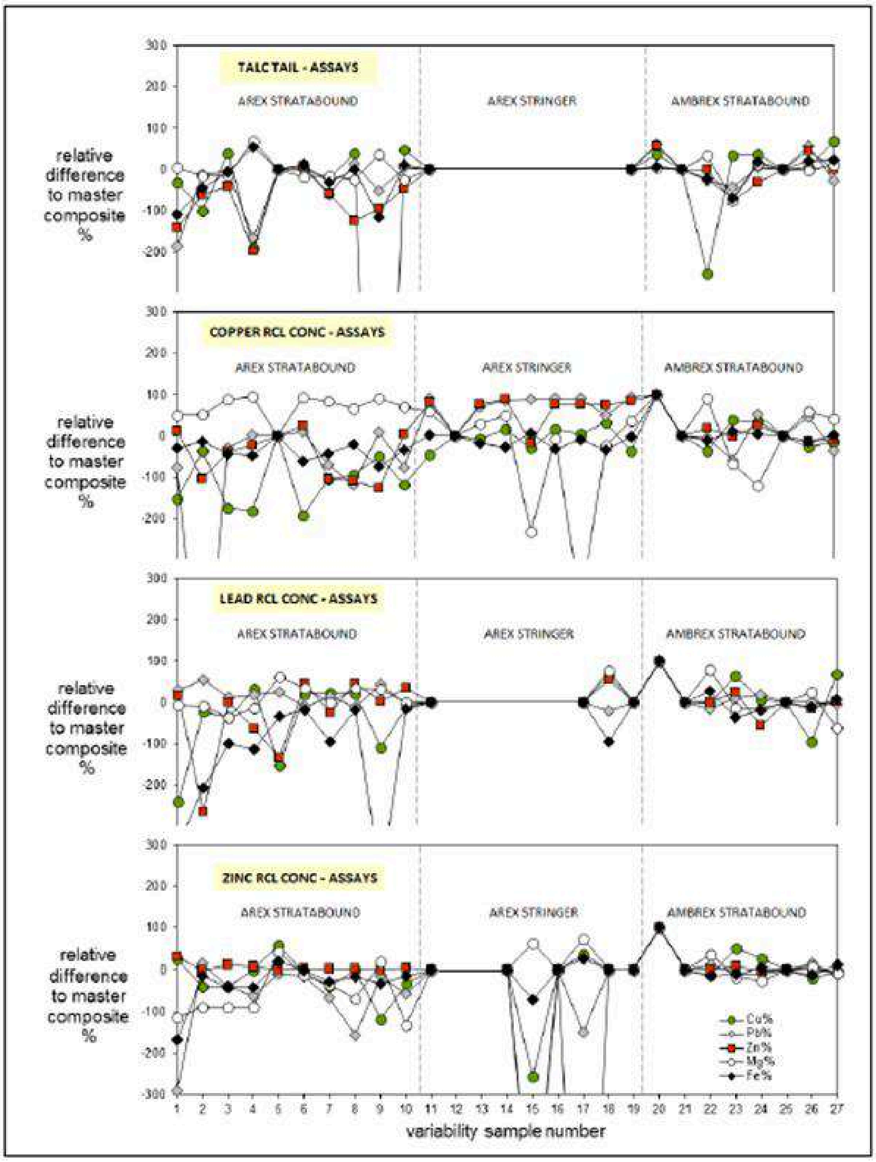
The results from variability flotation testing are presented in detail in Appendix I of the SGS GEOSOL 2017 Report. Figure 10-4 and Figure 10-5 illustrate the variation of metal assays in the flotation products. There are large variations in metal assay and metal distribution to the talc tail and recleaner concentrates. In the cases where the variation was negative, the results for the variability sample were below the result obtained for the respective master composite with the exception of zinc reported in the zinc recleaner concentrate.

10.3.2.3 Settling, Rheology, and Filtration

Settling and rheology test work on feed samples from master composites of the Arex and Ambrex individual materials and the Arex Mixed material was conducted at SGS Chile. Details of the test work program are presented in Appendix J of the SGS GEOSOL 2017 Report. The best settling results were obtained using 3 g/t of the BASF SE (BASF) Magnafloc 10 flocculant (Table 10-15). Rheology test work on the products from settling tests was also conducted using a Hake 550 viscometer (Figure 10-6 and Figure 10-7).

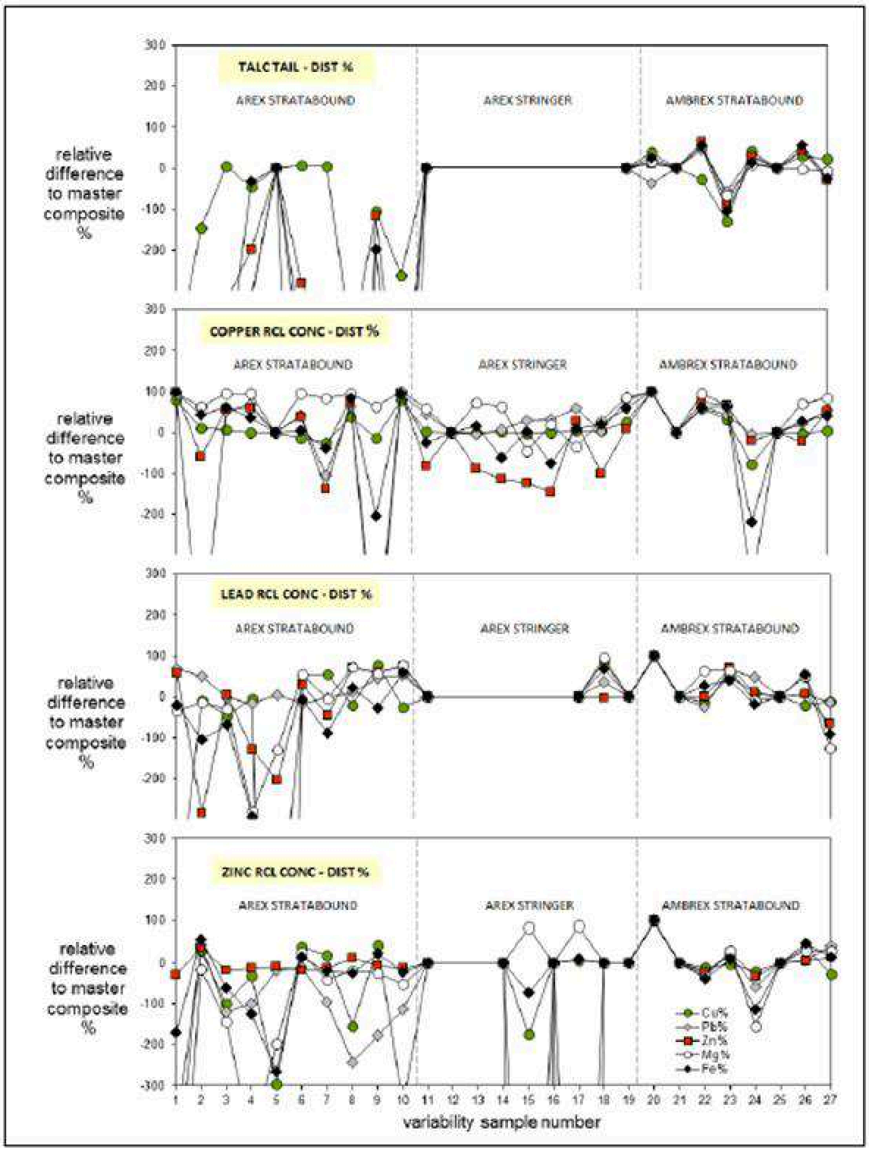
Table 10-15: Summary of Settling Tests Using Magnafloc 10 Flocculant (3 g/t)
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	Arex Stratabound	Arex Stringer	Arex Mixed (75% Stratabound, 25% Stringer)	Ambrex Stratabound
Initial % Solids	18	18	18	18
% Solids After Sedimentation	65	66	66	67
Settling Velocity (mm/s)	1.5	2	2	2
Unit Area (m^2/tph)	0.7	0.5	0.5	0.6
Yield Point No Shear (PA)	52	29	42	41
Yield Point Full Shear (PA)	1.7	0.6	2.3	2.3



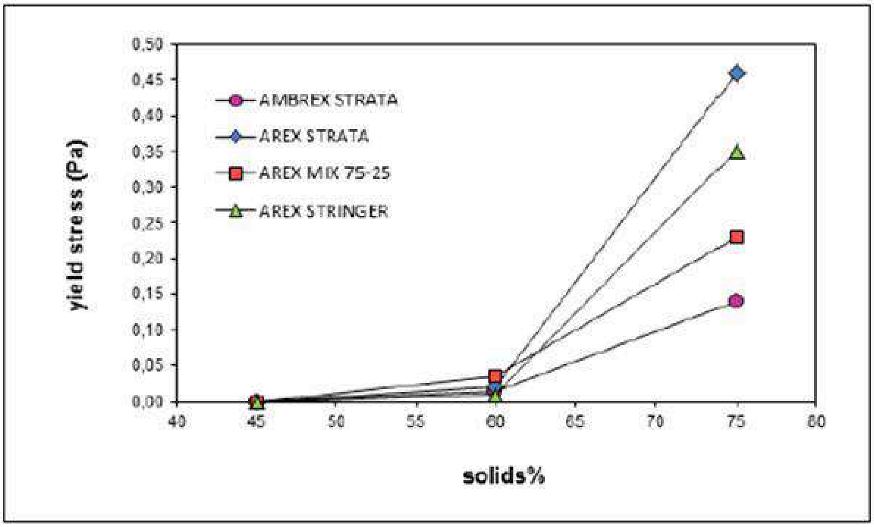
Source: SGS GEOSOL, 2017

Figure 10-4: Variation of Metal Assays in Flotation Products



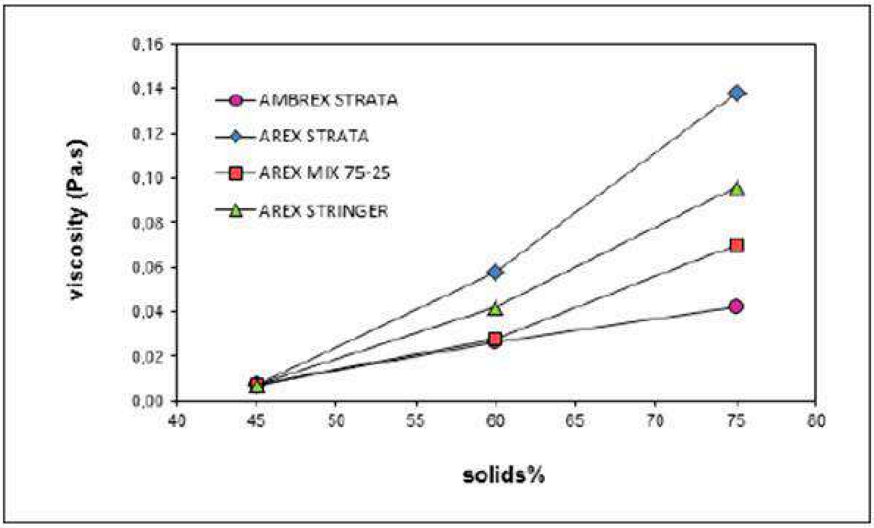
Source: SGS GEOSOL, 2017

Figure 10-5: Variation of Metal Distribution in Flotation Products



Source: SGS GEOSOL, 2017

Figure 10-6: Yield Stress versus Solids Percentage



Source: SGS GEOSOL, 2017

Figure 10-7: Viscosity versus Solids Percentage

Settling test work on flotation tailings from Arex Stratabound, Arex Stringer, and Arex Blended (75% Stratabound, 25% Stringer) mineralization was conducted by Andritz AG (Andritz). Details of the Andritz test work program are presented in Appendix K of the SGS GEOSOL 2017 Report. Filtration testing of the Ambrex Stratabound flotation tailings was also performed. The best settling results were obtained using the BASF Magnafloc 10 flocculant, resulting in 60% to 75% solids in the products. A summary of the filtration test work is presented in Table 10-16.

Table 10-16: Summary of Filtration Test Work Conducted by Andritz
Nexa Resources S.A. – Aripuanã Zinc Project

Operating Parameter	Arex Stratabound	Arex Stringer	Arex Mixed (75% Stratabound, 25% Stringer)	Ambrex Stratabound
Filtration Throughput – Dry Basis (tph)	211	211	211	211
Production Days per Year	365	365	365	365
Equipment Availability (%)	90	90	90	90
Pulp Density (t/m^3)	1.71	1.65	1.66	1.63
Feed Solids Content (%)	61	61	63	63
Cake Thickness (mm)	40	40	40	40
Cake Moisture (%)	7	9	9	7
Cake Solids Content (%)	93	91	91	93
Approximate Filtration Rate (kg/h·m^2)	104	94	92	94
Recommended Filter Press Model	Overhead	Overhead	Overhead	Overhead
Recommended Number of Units	2	2	2	2
Recommended Frame	2000/180	2000/180	2000/180	2000/180
Recommended Filter Fabric	Andritz 211k	Andritz 211k	Andritz 211k	Andritz 211k
Feed Pressure (bar)	6	6	6	6
Chamber Pressure (bar)	8	8	8	8
Chamber Size (mm)	2000x2000	2000x2000	2000x2000	2000x2000
Number of Chambers per Unit	146 to 152	162 to 168	166 to 168	162 to 168

In its FEL 3 study SNC-Lavalin relied on the FEL 2 data for estimation and sizing of equipment in the following areas:

- Concentrate filtration and thickening.
- Filtration and thickening reject talc.
- Thickening and filtration of final flotation tails.

10.3.3 Phase 2 (FEL 3)

LCT test work was also conducted in November 2017 to provide experimental data on the treatment of various types of mineralization, including: Link Stringer, Stringer Global, Link Stratabound, Ambrex Stringer, Ambrex Stratabound, and Stratabound Global. The results were evaluated based on stratabound and stringer material. To the best of SLR's knowledge, this test work program and the results have not been compiled in a final report for review, however, the data for LCT 004F2 (Stringer Global) has been considered in the FEL 3 process design for copper flotation (SNC-Lavalin, 2018a).

The results from this series of LCTs are summarized in Table 10-17 to Table 10-22.

Table 10-17: LCT 003F2 Conditions and Results – Link Stringer Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA LCT 003 EXP LINK STRINGER								
FINAL CONCENTRATE								
GRADE		Cu %	Pb %	Zn %	MgO %	Fe %	Au ppm	Ag ppm
COPPER		24.1	0.25	0.72	0.35	38.3	36.9	195
RECOVERY		Cu %	Pb %	Zn %	MgO %	Fe %	Au %	Ag %
COPPER		96.8	24.2	47.86	0.15	8.46	84.1	73.6
TEST CONDITIONS								
SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	pH	TIME min
TALC ROUGHER								
-	-	-	-	-	-	-	-	-
TALC CLEANER								
-	-	-	-	-	-	-	-	-
COPPER ROUGHER								
150	100	0	15	0	0	0	7.4	4.0
COPPER CLEANER								
150	25	50	7.5	0	0	0	10.5	1.5
COPPER RECLEANER								
0	0	0	0	0	0	0	10.5	0:45
LEAD ROUGHER								
-	-	-	-	-	-	-	-	-
LEAD CLEANER								
-	-	-	-	-	-	-	-	-
LEAD RECLEANER								
-	-	-	-	-	-	-	-	-
ZINC ROUGHER								
-	-	-	-	-	-	-	-	-
ZINC CLEANER								
-	-	-	-	-	-	-	-	-
ZINC RECLEANER								
-	-	-	-	-	-	-	-	-

Source: SGS GEOSOL, 2017

Table 10-18: LCT 004F2 Conditions and Results – Stringer Global Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA LCT 4 EXP STRINGER GLOBAL PP							
FINAL CONCENTRATE							
GRADE	Cu %	Pb %	Zn %	MgO %	Fe %	Au ppm	Ag ppm
COPPER	33,9	0,32	1,01	0,34	35,3	20,10	243
RECOVERY	Cu %	Pb %	Zn %	MgO %	Fe %	Au %	Ag %
COPPER	90,3	8,10	7,95	0,18	6,96	62,9	50,4

SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	pH	TIME min
TALC ROUGHER								
-	-	-	-	-	-	-	-	-
TALC CLEANER								
-	-	-	-	-	-	-	-	-
COPPER ROUGHER								
150	150	200	12,5	0	0	0	7	3,0
COPPER CLEANER								
150	100	150	5	0	0	0	10,5	2,0
COPPER RECLEANER								
0	0	0	0	0	0	0	11	1,0
LEAD ROUGHER								
-	-	-	-	-	-	-	-	-
LEAD CLEANER								
-	-	-	-	-	-	-	-	-
LEAD RECLEANER								
-	-	-	-	-	-	--	-	-
ZINC ROUGHER								
-	-	-	-	-	-	-	-	-
ZINC CLEANER								
-	-	-	-	-	-	-	-	-
ZINC RECLEANER								
-	-	-	-	-	-	-	-	-

Source: SGS GEOSOL, 2017

Table 10-19: LCT 005F2 Conditions and Results – Link Stratabound Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA LCT 005 EXP LINK STRATABOUND								
FINAL CONCENTRATE								
GRADE	Cu %	Pb %	Zn %	MgO %	Fe %	Au ppm	Ag ppm	
COPPER	26,9	2,97	7,2	1,71	26,8	59,7	2791	
LEAD	0,12	61,1	12,5	0,17	5,64	1,56	601	
ZINC	0,15	0,97	55,3	0,27	9,80	0,39	45,0	
RECOVERY	Cu %	Pb %	Zn %	MgO %	Fe %	Au %	Ag %	
COPPER	67,2	0,27	0,24	0,06	0,87	51,2	16,8	
LEAD	4,95	90,3	6,76	0,10	3,03	22,1	59,7	
ZINC	18,59	4,31	89,9	0,46	15,84	16,6	13,4	
TEST CONDITIONS								
SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	pH	TIME min
TALC ROUGHER								
400	0	0	0	0	0	0	6,4	2
TALC CLEANER								
0	200	0	10	0	0	0	7,6	3
COPPER ROUGHER								
300	75	200	15	0	0	0	6,4	6
COPPER CLEANER								
100	25	200	7,5	0	0	0	10,5	1,5
COPPER RECLEANER								
0	0	0	0	0	0	0	11	45 S
LEAD ROUGHER								
250	40	400	0	30	0	0	8,07	6
LEAD CLEANER								
75	0	200	0	6	0	0	8	3
LEAD RECLEANER								
0	0	0	0	0	0	0	9	1,5
ZINC ROUGHER								
0	0	0	0	0	600	30	11	8,5
ZINC CLEANER								
0	0	0	0	0	0	0	11	4,5
ZINC RECLEANER								
0	0	0	0	0	0	0	11	3

Source: SGS GEOSOL, 2017

Table 10-20: LCT 006F2 Conditions and Results – Ambrex Stringer Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA LCT 006 EXP AMBREX STRINGER							
FINAL CONCENTRATE							
GRADE	Cu %	Pb %	Zn %	MgO %	Fe %	Au ppm	Ag ppm
COPPER	34,4	0,38	1,2	0,16	34,4	32,82	271,22
LEAD	0,01	0,01	0,01	0,1	0,01	0,00	0,00
ZINC	0,01	0,01	0,0	0,10	0,01	0,00	0,00
RECOVERY	Cu %	Pb %	Zn %	MgO %	Fe %	Au %	Ag %
COPPER	90,1	4,2	4,28	0,07	4,53	38,7	45,1
LEAD	0,00	0,0	0,00	0,00	0,00	0,0	0
ZINC	0,00	0,00	0,0	0,00	0,00	0,0	0

TEST CONDITIONS								
SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	pH	TIME min
TALC ROUGHER								
-	-	-	-	-	-	-	-	-
TALC CLEANER								
-	-	-	-	-	-	-	-	-
COPPER ROUGHER								
150	100	0	12,5	0	0	0	7,1	3,5
COPPER CLEANER								
250	100	150	3,5	0	0	0	10,5	1,5
COPPER RECLEANER								
0	0	0	0	0	0	0	11	1
LEAD ROUGHER								
-	-	-	-	-	-	-	-	-
LEAD CLEANER								
-	-	-	-	-	-	-	-	-
LEAD RECLEANER								
-	-	-	-	-	-	-	-	-
ZINC ROUGHER								
-	-	-	-	-	-	-	-	-
ZINC CLEANER								
-	-	-	-	-	-	-	-	-
ZINC RECLEANER								
-	-	-	-	-	-	-	-	-

Source: SGS GEOSOL, 2017

Table 10-21: LCT 007F2 Conditions and Results – Ambrex Stratabound Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA
LCT 007 EXP
AMBREX STRATABOUND

FINAL CONCENTRATE

GRADE	Cu %	Pb %	Zn %	MgO %	Fe %	Au ppm	Ag ppm
COPPER	26,3	1,90	5,06	0,94	27,1	89,59	0,00
LEAD	0,56	53,4	8,01	0,53	12,9	1,30	783,38
ZINC	0,26	1,60	53,1	0,22	11,3	0,37	66,22
RECOVERY	Cu %	Pb %	Zn %	MgO %	Fe %	Au %	Ag %
COPPER	20,6	0,1	0,08	0,01	0,11	24,2	0,0
LEAD	16,41	77,5	4,56	0,15	1,94	13,124	49,2
ZINC	21,22	6,47	84,1	0,17	4,73	10,405	11,6

TEST CONDITIONS

SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	pH	TIME min
TALC ROUGHER								
400	0	0	0	0	0	0	7,78	3,5
TALC CLEANER								
0	200	0	5	0	0	0	7,98	3
COPPER ROUGHER								
300	75	200	15	0	0	0	7	5
COPPER CLEANER								
0	100	25	200	7,5	0	0	10,5	1
COPPER RECLEANER								
0	0	0	0	0	0	0	11	20 s
LEAD ROUGHER								
150	40	300	0	17,5	0	0	9	6
LEAD CLEANER								
75	0	250	0	7,5	0	0	9	1;15
LEAD RECLEANER								
0	0	0	0	0	0	0	9	50 s
ZINC ROUGHER								
0	0	0	0	0	600	30	11	7
ZINC CLEANER								
0	0	0	0	0	200	12,5	11	3,5
ZINC RECLEANER								
0	0	0	0	0	0	0	11	3

Source: SGS GEOSOL, 2017

Table 10-22: LCT 008F2 Conditions and Results – Strata Global Composite
Nexa Resources S.A. – Aripuanã Zinc Project

VOTORANTIM - ARIPUANA
LCT 008 EXP
STRATA GLOBAL PP

FINAL CONCENTRATE

GRADE	Cu %	Pb %	Zn %	MgO %	Fe %	Au ppm	Ag ppm
COPPER	32,6	1,48	3,91	0,21	31,0	23,7	1809
LEAD	0,55	56,0	8,99	0,47	11,4	1,27	864
ZINC	0,31	1,40	52,3	0,38	10,4	0,45	69
RECOVERY	Cu %	Pb %	Zn %	MgO %	Fe %	Au %	Ag %
COPPER	69,2	0,28	0,27	0,01	0,79	25,1	13,5
LEAD	9,26	83,5	4,92	0,12	2,31	10,7	51,2
ZINC	16,18	6,47	88,8	0,31	6,52	11,7	12,7

TEST CONDITIONS

SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	pH	TIME min
TALC ROUGHER								
400	0	0	0	0	0	0	8,12	3,5
TALC CLEANER								
0	200	0	5	0	0	0	8,05	3
COPPER ROUGHER								
300	75	200	17,5	0	0	0	6,9	6
COPPER CLEANER								
100	75	200	7,5	0	0	0	1,5	10
COPPER RECLEANER								
0	0	0	0	0	0	0	1	10,5
LEAD ROUGHER								
200	40	200	0	32,5	0	0	9	6
LEAD CLEANER								
75	0	200	0	10	0	0	9	1,5
LEAD RECLEANER								
0	0	0	0	0	0	0	9	50 s
ZINC ROUGHER								
0	0	0	0	0	450	30	11	8,5
ZINC CLEANER								
0	0	0	0	0	250	12,5	11	4,5
ZINC RECLEANER								
0	0	0	0	0	0	0	11	3

Source: SGS GEOSOL, 2017

10.3.4 SGS Pilot Studies

Pilot plant studies were undertaken by SGS GEOSOL in 2018 on samples of Arex and Ambrex mineralization to define the conditions and circuits for grinding and flotation of stringer and stratabound materials. The objective of the pilot plant studies was to produce chalcopyrite concentrate with a copper content of 27% to 28% and to produce lead and zinc concentrates containing approximately 55% Pb and 55% Zn.

Table 10-23 lists the average head grades of the two composite samples tested.

Table 10-23: 2018 Pilot Plant Samples
Nexa Resources S.A. – Aripuanã Zinc Project

Sample	Weight (t)	Cu (%)	Pb (%)	Zn (%)	Ag (ppm)	Au (ppm)
Stringer	6.0	0.82	0.11	0.31	13	0.92
Stratabound	7.5	0.17	1.93	5.50	47	0.33

The key findings from pilot testing were as follows:

- Stringer sample. A final copper concentrate was produced from a circuit consisting of rougher, cleaner, and recleaner flotation, following by cleaner scavenger column flotation. The copper concentrate contained approximately 24.1% Cu and copper recovery was 85.8%, however, high levels of Zn, MgO, and SiO2 (4.65%, 4.66% and 10.65, respectively) were reported as contaminants. Based on these results, additional metallurgical testing was required to improve the quality of the copper concentrate.
- Stratabound sample. Talc was rejected to a talc concentrate containing 27.2% MgO, and MgO recovery was 17.8%. Copper flotation consisted of a rougher-scavenger circuit, which produced a rougher concentrate of 3.63% Cu at 69.0% Cu recovery. The levels of Pb, Zn, and MgO in the rougher concentrate were 1.91%, 3.67% and 14.3%, respectively, however, the low copper content in the feed made it difficult to carry out the copper cleaner and recleaning stages. For lead and zinc flotation, rougher and scavenger flotation was carried out in mechanical cells followed by cleaner and recleaner flotation in column cells. A final lead concentrate was produced containing 62.1% Pb and a lead recovery of 80.3%, while a final zinc concentrate was produced containing 60.8% Zn and a zinc recovery of 87.5%.
- The Stratabound sample was found to be more friable than the stringer sample.

Information from pilot plant comminution and flotation testing was used by SNC-Lavalin in the estimation and sizing of process equipment in the FEL 3 study (SNC-Lavalin, 2018a), however due to the low copper content in stratabound material, data related to stratabound copper flotation and concentration needed further validation.

10.3.5 SGS Test Work on Quarterly Composites

From September 2019 to May 2020, SGS GEOSOL completed test work on quarterly composites (based on the FEL3 LOM plan) with the objective of optimizing flotation conditions and predicting the performance of the Aripuanã plant over the first two years of operation when processing ore consisting of both stratabound and stringer ore. Test work included chemical analysis, BWi and Ai determinations, open circuit flotation tests to confirm operating conditions using 22 variability samples including rougher and cleaner kinetics tests, and LCTs on nine quarterly samples.

Key observations and conclusions drawn from the test work included:

- The head assay of the quarterly samples dropped from Q4 2020 to Q3 2021 and then stabilized at approximately 0.3% Cu, 1.2% Pb, and 2.9% Zn. Gold assays ranged from 0.1 ppm Au to 0.9 ppm Au, and silver assays ranged from 14 ppm Ag to 83 ppm Ag.
- While BWi values ranged from 14.2 kWh/t to 16.4 kWh/t, higher than the range previously observed (10.0 kWh/t to 12.0 kWh/t), chemical analysis of the samples used for the BWi and Ai determinations indicated that the samples were waste material. Ai values ranged from 0.033 g to 0.140 g.

- Flotation of the variability and quarterly samples was more difficult than experienced previously, with higher losses of copper to the talc concentrate, high levels of iron sulphides in the final concentrates, and lower metal recoveries.
- The main variables determining flotation selectivity were identified as being the methyl isobutyl carbinol (MIBC) and sodium metabisulphite (SMBS) dosages, as well as rougher and cleaner residence times.
- Due to high copper losses to the talc concentrate when using a talc flotation circuit, as was similarly noted in the FEL3 design (rougher, scavenger, and cleaner stages), the circuit adopted for the LCTs on the quarterly samples incorporated reverse copper flotation from the talc concentrate. This was subsequently also adopted in the Aripuanã processing plant design of the talc circuit.
- Coarser regrinds of the rougher concentrates for copper, lead, and zinc (45 µm for copper and 75 µm for lead and zinc) resulted in improved recoveries with little effect on concentrate grades for copper and zinc, but a severe decrease in lead rougher concentrate grade.
- The LCTs indicated an accumulation of iron sulphides in the circulating loads that affected both copper and lead flotation performance.

Head assays of the quarterly composites are shown in Table 10-24.

Table 10-24: Head Assays – Quarterly Composites
Nexa Resources S.A. – Aripuanã Zinc Project

COMPOSITE	mass kg	Cu %	Pb %	Zn %	MgO %	Fe %	S %	SiO_2 %	Al_2O_3 %	TiO_2 %	MnO %	P_2O_5 %	K_2O %	CaO %	Au ppm	Ag ppm
2020-Q4	19,3	1,03	1,17	4,90	8,0	15,7	8,0	36,5	7,4	0,14	0,55	0,04	0,73	4,9	0,6	83
2021-Q1	21,2	0,09	2,64	3,95	5,5	5,2	3,8	60,8	9,1	0,20	0,11	0,01	2,77	0,8	0,2	35
2021-Q2	25,0	0,53	1,58	2,56	10,9	10,2	4,2	42,0	8,2	0,21	0,78	0,04	1,89	6,3	0,1	47
2021-Q3	19,6	0,17	0,53	3,29	11,8	6,1	3,2	33,5	4,0	0,11	1,08	0,02	0,41	14,5	0,1	25
2021-Q4	22,2	0,25	1,02	2,85	3,4	4,9	2,7	65,2	11,2	0,31	0,13	0,08	3,01	0,1	0,3	35
2022-Q1	25,0	0,25	1,33	3,52	5,7	10,1	7,8	57,3	7,6	0,14	0,17	0,01	1,56	0,9	0,4	22
2022-Q2	25,8	0,48	1,23	2,86	4,5	6,5	3,6	65,7	7,7	0,12	0,23	0,02	1,79	1,8	0,5	30
2022-Q3	20,0	0,06	1,00	2,20	2,1	4,4	2,6	69,9	10,4	0,25	0,08	0,05	2,89	0,1	0,1	14
2022-Q4	24,0	0,25	1,47	3,13	11,1	11,7	7,3	47,0	8,4	0,17	0,38	0,07	1,40	2,9	0,9	26
CERTIFICATES OF CHEMICAL ANALYSIS: BM1900687 BM1900699 BM1900726 BM1900792																

Source: SGS GEOSOL, 2020

Eleven LCTs were completed, nine on the composites representing the first nine quarters of production, and two on a composite made up of the nine quarterly composites. While the majority of LCTs did not achieve steady state, they did show that high recoveries of copper, lead, and zinc to concentrates with acceptable grades could be achieved when processing ore consisting of blends of stratabound and stringer ores. Results for the LCT using the blend of quarterly composites are shown in Table 10-25.

Table 10-25: Head Assays and Test Results – Quarterly Composite BLEND
Nexa Resources S.A. – Aripuanã Zinc Project

LCT 011 + T90 - GEOMET 2019 - FINAL BLEND										
FINAL CONCENTRATE										
GRADE	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au ppm	Ag ppm	
COPPER	24,5	2.01	2.66	0,46	32,1	36,0	1,51	10,5	488	
LEAD	0.38	47,9	10,70	0,43	12.5	23,6	1.97	2.4	534	
ZINC	0.18	1.12	46,9	1,22	12.0	29.0	7.97	0.4	55	
RECOVERY	Cu %	Pb %	Zn %	Mg %	Fe %	S %	Si %	Au %	Ag %	
COPPER	86,7	1,8	0,9	0.1	4,5	7.2	0,04	44,4	23	
LEAD	1.9	58,2	5,2	0.1	2.4	6.5	0.06	13,8	34	
ZINC	3.5	5.4	90,1	1,1	9,1	31,6	1,01	9,9	14	
TEST CONDITIONS										
MIBC BACKGROUND CONCENTRATION IN THE PROCESS WATER = 5 GPM3										
SMBS gpt	CMC gpt	ZnSO4 gpt	A3894 gpt	A3418 gpt	CuSO4 gpt	A208 gpt	extra MIBC gpt	LIME gpt	pH initial	TIME min
TALC ROUGHER										
600	0	0	0	0	0	0	4	0	6,6	04:00
PB-ZN PRE FLOAT										
60	0	50	0	0	0	0	0	0	6,7	04:00
COPPER PRE FLOAT										
0	200	0	10	0	0	0	0	0	7,3	02:00
COPPER ROUGHER										
300	100	200	14	0	0	0	0	0	7,1	06:00
COPPER CLEANER										
100	75	100	6	0	0	0	0	150	10,6	01:00
COPPER RECLEANER										
0	0	0	0	0	0	0	0	0	10,5	00:30
LEAD ROUGHER										
0	50	300	0	12,5	0	0	2	136	9,0	05:00
LEAD CLEANER										
0	25	200	0	8	0	0	0	40	9,7	01:00
LEAD RECLEANER										
0	0	0	0	0	0	0	0	0	9,2	00:30
ZINC ROUGHER										
0	0	0	0	0	300	23	0	1750	11,5	12:00
ZINC CLEANER										
0	0	0	0	0	200	8	0	250	11,5	02:30
ZINC RECLEANER										
0	0	0	0	0	0	0	0	5	11,5	01:00

Source: SGS GEOSOL, 2020

10.3.6 Grinding Circuit Simulations

MinPro conducted grinding circuit simulations in 2020 to evaluate the capacity of the FEL3 grinding circuit for stringer and stratabound ores. The simulations included base cases for stratabound and stringer ores separately, followed by scenarios consisting of ore blends in the following proportions:

- 85% Stratabound and 15% Stringer
- 70% Stratabound and 30% Stringer
- 50% Stratabound and 50% Stringer
- 30% Stratabound and 70% Stringer
- 15% Stratabound and 85% Stringer

MinPro used comminution data generated from earlier test work. This data is summarized in Table 10-26.

Table 10-26: Comminution Data Used for Grinding Circuit Simulations
Nexa Resources S.A. – Aripuanã Zinc Project

Amostras/*Blends*	*A*	*b*	*IQ*	t_a	Wi (kWh/t)	Massa específica (t/m^3)
Stringer	54,2	0,57	30,9	0,320	14,6	3,23
Stratabound	56,5	0,95	53,7	0,440	11,8	3,29
*0,85*Strata + 0,15*Stringer*	56,2	0,86	48,5	0,422	12,2	3,28
*0,70*Strata + 0,30*Stringer*	55,8	0,79	44,1	0,404	12,6	3,27
*0,50*Strata + 0,50*Stringer*	55,4	0,71	39,2	0,380	13,2	3,26
*0,30*Strata + 0,70*Stringer*	54,9	0,64	35,3	0,356	13,8	3,25
*0,15*Strata + 0,85*Stringer*	54,5	0,61	33,1	0,338	14,2	3,24

Source: MinPro, 2020

The BWi values used for the different ore types correspond to the highest results measured for the variability samples in the 2017 SGS GEOSOL test work, while the Axb values used were those measured for the Arex Stratabound and Arex Stringer master composites in the 2017 SGS GEOSOL test work. The MinPro 2020 simulations indicated that the base case throughput would be limited to 289 tph (6,300 tpd) for stratabound ore and 216 tph (4,730 tpd) for stringer ore. For blends of stratabound and stringer ore the circuit would have throughput capacities that fell between the base case capacities. In addition, MinPro concluded that the stratabound ore throughput was ball mill limited, while the stringer ore throughput was SAG mill limited. MinPro also noted that the grinding circuit throughput would be reduced in circumstances where the pebble crusher is not in use and that this would be more marked for ore blends with greater proportions of stringer ore.

SLR calculated grinding circuit throughput using 75th percentile values for ore hardness / competency and estimates that throughput for stringer ore of up to 5,000 tpd can be achieved, which agrees with the project design criteria.

10.4 Summary

To process Aripuanã zinc mineralization, separate material types were identified during characterization. Due to different recovery kinetics during bench testing, and lower zinc and lead grades, it was initially decided to process stringer and stratabound ores separately and to by-pass lead and zinc flotation circuits during the processing of stringer mineralization. Blending of stratabound and stringer ore however demonstrated that acceptable recoveries of copper, lead, and zinc to concentrates with saleable grades could be achieved while processing these blends.

For the FEL3 study, SNC-Lavalin referenced supporting SGS GEOSOL data from LCT 004F2 (Stringer Global) and pilot test FT-03 (Stratabound Global) to develop the process design criteria and flowcharts. Historical FEL2 data was used for estimation and sizing of equipment for concentrate, reject talc, and final flotation tailings filtration and thickening.

Copper concentrate grades and recoveries for stringer materials in pilot scale testing were below targets and required further study. Pilot plant testing of stratabound mineralization successfully demonstrated that lead and zinc concentrates could be produced at saleable metal grades. LCTs conducted by SGS GEOSOL in 2019/2020 on composites representing quarterly mine production of stratabound and stringer ores combined demonstrated that saleable copper, lead, and zinc concentrates could be produced. Although recoveries were generally acceptable, these, as well as concentrate grades, require confirmation since many of these LCTs did not reach steady state. Pilot plant studies using bulk blended samples (stratabound and stringer ore) drawn from the ROM stockpile at Aripuanã were continuing at the time of writing this Technical Report Summary and SLR has not had the opportunity to review results from this testing.

During the 2019/2020 open cycle flotation tests leading up to the LCTs on quarterly samples based on the FEL3 LOM plan, difficulties were experienced with copper losses to the talc concentrate while using a talc circuit similar to that in the FEL3 design. Further test work indicated that reverse flotation of copper from the talc concentrate could recover copper initially reporting to the talc concentrate, and this configuration was used for the LCTs and is suggested for the processing plant. This configuration would require only redirection of certain streams and the addition of reagents already in use, while using the equipment already included in the design. Most of the LCTs did not reach equilibrium, and recovery and concentrate grade values derived from earlier test work that have been used in project cash flow calculations need to be confirmed by completing the ongoing pilot test work at Nexa's Vazante Mine using bulk blended ore samples simulating the processing of stringer and stratabound material together.

Grinding circuit simulations indicated that throughput would be limited to 289 tph (6,300 tpd) for stratabound ore and 216 tph (4,730 tpd) for stringer ore. For blends of stratabound and stringer ore the circuit would have throughput capacities in between the base case capacities. Grinding circuit throughput will be reduced in circumstances where the pebble crusher is not in use, with these reductions being more marked for ore blends with greater proportions of stringer ore. SLR estimates that stringer ore throughput of up to 5,000 tpd can be achieved for ore corresponding to the 75^{th} percentile ore hardness values determined in test work.

In SLR's opinion the metallurgical test work is adequate for the estimation of Mineral Resources and Mineral Reserves.

11.0 MINERAL RESOURCE ESTIMATES

11.1 Summary

The block models were completed by Nexa personnel using Datamine Studio, and Leapfrog. Wireframes for geology and mineralization were constructed in Leapfrog based on geology sections, assay results, lithological information, and structural data. Assays were capped to various levels based on exploratory data analysis and then composited to one-metre lengths. Wireframes were filled with blocks measuring 5 m by 5 m by 5 m for Arex, Link, and Ambrex, and 10 m by 5 m by 5 m for Babaçú with sub-celling at wireframe boundaries. Blocks were interpolated with grade using ordinary kriging (OK) and inverse distance cubed (ID^3). Block estimates were validated using industry standard validation techniques. Classification of blocks was based on distance-based criteria.

The SEC definitions for Mineral Resources in S-K 1300 were used for Mineral Resource classification which are consistent with Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards for Mineral Resources and Mineral Reserves (CIM (2014) definitions).

The Mineral Resource estimate for the Project was completed by Nexa in two separate block models:

- Arex, Link, and Ambrex – dated May 19, 2020
- Babaçú – dated January 10, 2020

The Arex, Link, and Ambrex estimate represents an update to the existing block model, incorporating the additional drill holes completed in each area.

An initial Inferred Mineral Resource estimate for Babaçú was disclosed in early 2020 with an effective date of December 31, 2019. Additional assay results were received in December 2019 and were used to update the block model in January 2020. The classification was also revised in the updated block model.

Underground Mineral Resources are reported exclusive of Mineral Reserves within potentially mineable shapes generated using the Deswik Stope Optimizer (DSO), envisaging bulk longhole stoping and cut and fill mining methods (Figure 11-1). A summary of the Aripuanã Mineral Resources, effective September 30, 2020, is provided in Table 11-1 and a summary of Mineral Resources by type and area in Table 11-2. Nexa used a long-term forecast of the R$/US$ exchange rate of $3.67 in conversion of costs and metal prices between Brazilian Reais and US dollars.

Table 11-1: Summary of Mineral Resources – September 30, 2020
Nexa Resources S.A. – Aripuanã Zinc Project

		Grade					Contained Metal				
Classification	**Tonnes (Mt)**	**(% Zn)**	**(% Pb)**	**(% Cu)**	**(g/t Au)**	**(g/t Ag)**	**(000 t Zn)**	**(000 t Pb)**	**(000 t Cu)**	**(000 oz Au)**	**(Moz Ag)**
						Stratabound					
Measured	2.2	3.19	1.19	0.16	0.14	35.32	71	26	3	10	2.5
Indicated	3.5	2.71	0.90	0.08	0.14	23.05	95	32	3	16	2.6
M+I	**5.7**	**2.90**	**1.01**	**0.11**	**0.14**	**27.80**	**166**	**58**	**6**	**25**	**5.1**
Inferred	29.1	4.48	1.65	0.19	0.24	42.75	1,302	479	56	226	40.0
	Stringer										
Measured	0.7	0.31	0.13	1.09	0.78	12.30	2	1	8	18	0.3
Indicated	1.7	0.06	0.04	0.67	1.04	7.83	1	1	11	55	0.4
M+I	**2.4**	**0.13**	**0.07**	**0.80**	**0.96**	**9.16**	**3**	**2**	**19**	**73**	**0.7**
Inferred	10.4	0.04	0.03	0.72	1.53	8.78	4	3	75	510	2.9
	Total										
Measured	2.9	2.50	0.93	0.38	0.29	29.78	73	27	11	27	2.8
Indicated	5.2	1.86	0.63	0.27	0.43	18.17	96	32	14	71	3.0
M+I	**8.1**	**2.09**	**0.74**	**0.31**	**0.38**	**22.36**	**169**	**60**	**25**	**98**	**5.8**
Inferred	39.5	3.31	1.22	0.33	0.58	33.83	1,307	482	131	737	42.9

Notes:

1. The definitions for Mineral Resources in S-K 1300 were followed for Mineral Resources which are consistent with CIM (2014) definitions.
2. Mineral Resources are reported on a 100% Nexa attributable ownership basis.
3. Mineral Resources are reported using a US$45/t cut-off value for transverse longhole mining and longitudinal longhole retreat areas and US$55/t cut-off value for cut and fill areas.
4. The NSR is calculated based on metal prices: Zn: US$2,869/t (US$1.30/lb), Pb: US$ 2,249/t (US$1.02/lb); Cu: US$7,427/t (US$3.37/lb); Au: US$1,768/oz, and Ag: US$19.38/oz.
5. Metallurgical recoveries are accounted for in the NSR calculations based on metallurgical test work and are variable as a function of head grade. Recoveries at the LOM average head grades for stratabound material are 89.4% for Zn, 83.4% for Pb, 67.5% for Cu, 70.0% for Ag, and 70.0% for Au. Recoveries at the LOM average head grades for stringer material are 88.8% for Cu, 50.0% for Ag, and 50.0% for Au.
6. Mineral Resources are reported exclusive of Mineral Reserves within potentially mineable shapes.
7. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
8. Numbers may not add due to rounding.

The SLR QP has performed a detailed review of the Mineral Resource estimate completed by Nexa, including the support data. The SLR QP is of the opinion that the Mineral Resource estimate has been completed to a high standard and is suitable to support the estimation of Mineral Reserves.

The SLR QP is of the opinion that, with consideration of the recommendations summarized in Section 1 and Section 23, any issues relating to all relevant technical and economic factors likely to influence the prospect of economic extraction can be resolved with further work.

Table 11-2: Mineral Resources by Type and Area – September 20, 2020
Nexa Resources S.A. – Aripuanã Zinc Project

Stratabound											
		Grade					Contained Metal				
Area	Tonnes (Mt)	(% Zn)	(% Pb)	(% Cu)	(g/t Au)	(g/t Ag)	(000 t Zn)	(000 t Pb)	(000 t Cu)	(000 oz Au)	(Moz Ag)
Arex											
Measured	1.4	3.32	1.25	0.21	0.14	38	44.9	16.9	2.8	6.3	1.6
Indicated	0.2	2.45	0.90	0.22	0.14	23	5.3	1.9	0.5	1.0	0.2
M+I	1.6	3.20	1.20	0.21	0.14	36	50.2	18.9	3.3	7.3	1.8
Inferred	1.3	4.05	1.38	0.45	0.26	28	54.0	18.4	5.9	11.3	1.2
Link											
Measured	0.4	3.70	1.41	0.13	0.19	44	14.5	5.5	0.5	2.4	0.6
Indicated	1.5	2.83	0.90	0.10	0.16	24	43.6	13.9	1.6	7.8	1.2
M+I	1.9	3.00	1.01	0.11	0.16	28	58.1	19.4	2.1	10.2	1.7
Inferred	2.9	3.15	0.85	0.40	0.32	27	90.7	24.6	11.5	29.8	2.5
Ambrex											
Measured	0.5	2.41	0.83	0.03	0.08	21	11.3	3.9	0.2	1.1	0.3
Indicated	1.8	2.65	0.90	0.04	0.12	23	46.4	15.8	0.7	6.8	1.3
M+I	2.2	2.60	0.89	0.04	0.11	22	57.7	19.7	0.9	8.0	1.6
Inferred	10.6	6.20	2.07	0.08	0.37	53	657.1	219.4	8.9	124.7	18.0
Babaçú											
Measured											
Indicated											
M+I											
Inferred	14.3	3.50	1.52	0.21	0.13	40	500.5	216.4	29.9	60.4	18.3

Area	Tonnes (Mt)	Stringer Grade (% Zn)	(% Pb)	(% Cu)	(g/t Au)	(g/t Ag)	Contained Metal (000 t Zn)	(000 t Pb)	(000 t Cu)	(000 oz Au)	(Moz Ag)
Arex											
Measured	0.7	0.31	0.13	1.09	0.78	12	2.2	0.9	7.7	17.6	0.3
Indicated	0.4	0.07	0.04	0.44	0.75	5	0.3	0.2	1.9	10.4	0.1
M+I	1.1	0.22	0.10	0.84	0.77	10	2.5	1.1	9.5	28.1	0.3
Inferred	1.6	0.02	0.03	0.45	2.67	7	0.4	0.5	7.0	133.2	0.4
Link											
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	0.7	0.06	0.07	0.92	1.35	10	0.4	0.4	6.1	29.1	0.2
M+I	0.7	0.06	0.07	0.92	1.35	10	0.4	0.4	6.1	29.1	0.2
Inferred	2.7	0.06	0.03	0.95	1.09	11	1.5	0.9	25.7	94.8	0.9
Ambrex											
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	0.6	0.04	0.02	0.56	0.88	7	0.2	0.1	3.1	15.8	0.1
M+I	0.6	0.04	0.02	0.56	0.88	7	0.2	0.1	3.1	15.8	0.1
Inferred	5.5	0.03	0.02	0.65	1.54	6	1.5	1.2	35.7	269.3	1.1
Babaçú											
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	-	-	-	-	-	-	-	-	-	-	-
M+I	-	-	-	-	-	-	-	-	-	-	-
Inferred	0.7	0.14	0.12	1.02	0.62	25	0.9	0.8	6.7	13.0	0.5

Notes:

1. The definitions for Mineral Resources in S-K 1300 were followed for Mineral Resources which are consistent with CIM (2014) definitions.
2. Mineral Resources are reported on a 100% Nexa attributable ownership basis.
3. Mineral Resources are reported using a US$45/t cut-off value for transverse longhole mining and longitudinal longhole retreat areas and US$55/t cut-off value for cut and fill areas.
4. The NSR is calculated based on metal prices: Zn: US$2,869/t (US$1.30/lb), Pb: US$ 2,249/t (US$1.02/lb); Cu: US$7,427/t (US$3.37/lb); Au: US$1,768/oz, and Ag: US$19.38/oz.
5. Metallurgical recoveries are accounted for in the NSR calculations based on metallurgical test work and are variable as a function of head grade. Recoveries at the LOM average head grades for stratabound material are 89.4% for Zn, 83.4% for Pb, 67.5% for Cu, 70.0% for Ag, and 70.0% for Au. Recoveries at the LOM average head grades for stringer material are 88.8% for Cu, 50.0% for Ag, and 50.0% for Au.
6. Mineral Resources are reported exclusive of Mineral Reserves within potentially mineable shapes.

7. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
8. Numbers may not add due to rounding.

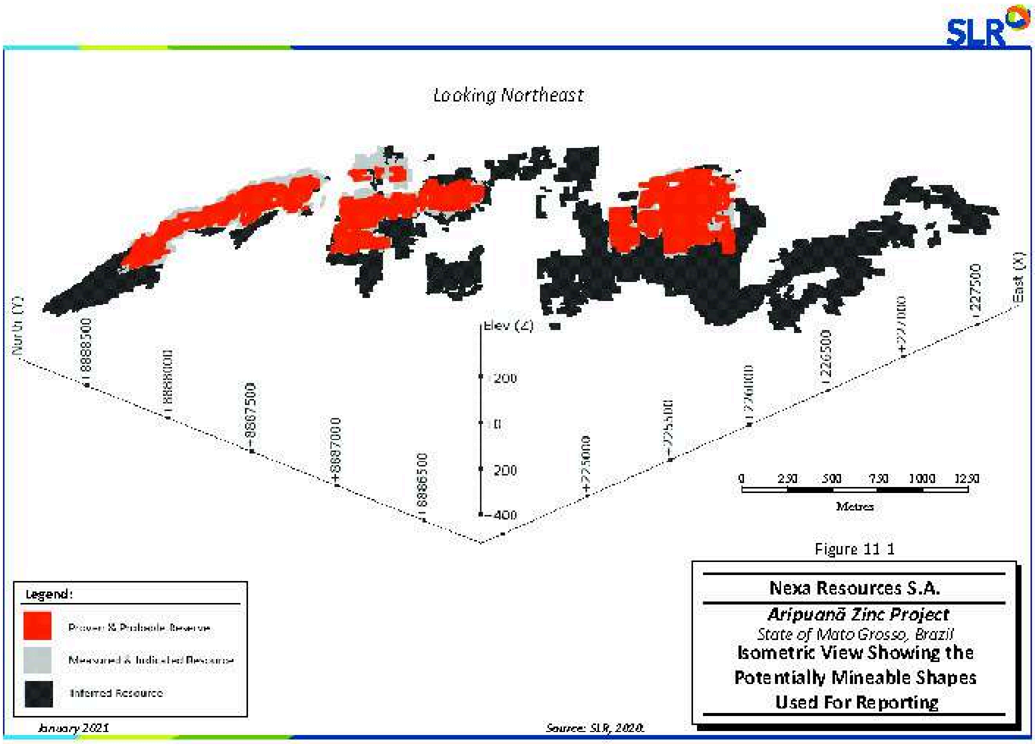


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Figure 11-1: Isometric View Showing the Potentially Mineable Shapes Used for Reporting

11.2 Comparison with Previous Estimate

The previous estimate for Arex, Link, and Ambrex was effective as of December 31, 2019 but was based on the December 31, 2018 block model, which had remained unchanged between year-ends 2018 and 2019. The previous estimate for Babaçú is dated December 31, 2019. Differences between the previous and the current estimates can be attributed to the following:

- A 2.7 Mt decrease in the Mineral Reserves from the previous estimate. This item had the most significant impact on the exclusive Mineral Resource report.
- Revisiting of the classification at Babaçú as well as inclusion of a small number of additional assays received during December 2019, which resulted in a 9% increase to the Inferred stratabound tonnes at Babaçú.
- The use of DSO potentially mineable shapes for resource reporting which had the impact of increasing tonnes.
- Changes in NSR calculations and cut-off values. Changes to prices and metallurgical recoveries adopted.
- Additional drilling and an update to the Arex and Link wireframes (only a minor impact).

SLR notes that there is only a minor difference between the previous and current Arex, Link, and Ambrex block models due to the small amount of additional drilling at the Project.

Table 11-3 presents the comparison with previous Mineral Resources estimates.

Table 11-3: Comparison with Previous Mineral Resource Estimates
Nexa Resources S.A. – Aripuanã Zinc Project

30-Sep-20

Stratabound

		Grade					Metal Content				
Arex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1.6	3.20	1.20	0.31	0.14	36.00	50.2	18.9	3.3	7.1	1.80
Inferred	1.3	4.05	1.38	0.45	0.26	28	54.0	18.4	5.9	11.3	1.20
Link	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1.9	3.00	1.01	0.11	0.16	28.000	58.1	19.4	2.1	10.2	1.70
Inferred	2.9	3.15	0.85	0.40	0.32	27	90.7	24.6	11.5	29.8	2.50
Ambrex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	2.2	2.60	0.89	0.04	0.11	22.00	57.7	19.7	0.9	8.0	1.60
Inferred	10.6	6.20	2.07	0.08	0.37	53	657.1	219.4	8.9	124.7	18.00
Babaçu	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
Inferred	14.3	3.50	1.52	0.21	0.13	40	500.5	216.4	29.9	60.4	0.0

Stringer

		Grade					Metal Content				
Arex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1.1	0.22	0.10	0.84	0.77	10.00	2.5	1.1	9.5	28.1	0.30
Inferred	1.6	0.02	0.03	0.46	2.67	7	0.4	0.6	7.0	133.2	0.40
Link	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	0.7	0.06	0.07	0.92	1.35	10	0.4	0.4	6.1	29.1	0.20
Inferred	2.7	0.06	0.03	0.95	1.09	11	1.5	0.9	25.7	94.8	0.90
Ambrex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	0.6	0.04	0.02	0.56	0.88	7	0.2	0.1	3.1	15.8	0.10
Inferred	5.5	0.03	0.02	0.65	1.54	6	1.5	1.2	35.7	269.3	1.10
Babaçu	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
Inferred	0.7	0.14	0.12	1.02	0.62	25	0.9	0.8	6.7	13.0	0.0

31-Dec-19

Stratabound

		Grade					Metal Content				
Arex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	0.9	3.82	1.27	0.19	0.16	39	34.3	11.4	1.8	4.5	0.0
Inferred	1.3	5.80	2.08	0.24	0.41	31	76.1	27.3	3.1	17.1	0.0
Link	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1.1	3.63	1.15	0.10	0.17	26	39.3	12.4	1.1	6.0	0.0
Inferred	2.7	4.19	1.19	0.52	0.42	36	112.0	31.8	13.8	35.8	0.0
Ambrex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1.7	3.01	0.93	0.05	0.11	22	51.1	15.8	0.8	6.1	0.0
Inferred	10.1	6.73	2.71	0.06	0.32	62	681.4	274.3	6.5	105.3	0.0
Babaçu	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
Inferred	15.8	3.64	1.46	0.14	0.09	41	575.5	230.2	21.8	47.8	0.0

Stringer

		Grade					Metal Content				
Arex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1.1	0.17	0.08	0.97	1.21	11	1.8	0.9	10.5	42.3	0.0
Inferred	1.5	0.04	0.06	0.68	4.11	10	0.6	0.7	10.0	195.4	0.0
Link	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	0.6	0.05	0.05	0.73	1.14	9	0.3	0.3	4.7	23.4	0.0
Inferred	2.7	0.05	0.03	0.93	1.15	11	1.4	0.9	25.6	101.6	0.0
Ambrex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	0.3	0.43	0.09	0.75	0.90	10	1.2	0.3	2.2	8.4	0.0
Inferred	4.8	0.07	0.05	1.11	1.55	11	3.5	2.3	52.8	237.5	0.0
Babaçu	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
Inferred	0.0	0.00	0.00	0.00	0.00	0	0.0	0.0	0.0	0.0	0.0

Differences (2020/2019)

Stratabound

		Grade					Metal Content				
Arex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	78%	-16%	-6%	8%	-10%	25%	46%	65%	89%	63%	116%
Inferred	-1%	-30%	-34%	91%	-36%	-10%	-29%	-33%	91%	-34%	-8%
Link	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	76%	-17%	-12%	13%	-7%	7%	48%	56%	100%	70%	86%
Inferred	9%	-25%	-29%	-23%	-23%	-23%	-19%	-23%	-17%	-17%	-17%
Ambrex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	30%	-14%	-5%	-17%	-2%	1%	13%	25%	10%	31%	34%
Inferred	5%	-8%	-24%	24%	14%	-14%	-4%	-20%	37%	18%	-10%
Babaçu	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
Inferred	-9%	-4%	4%	52%	38%	-1%	-13%	-6%	37%	26%	-11%

Stringer

		Grade					Metal Content				
Arex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	1%	33%	22%	-13%	-36%	-11%	39%	23%	-10%	-34%	-24%
Inferred	8%	-47%	-40%	-33%	-35%	-29%	-29%	-33%	-30%	-32%	-15%
Link	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	9%	14%	43%	26%	19%	11%	18%	27%	30%	24%	8%
Inferred	-1%	14%	-11%	2%	-6%	0%	4%	-2%	1%	-7%	-7%
Ambrex	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
M+I	106%	-91%	-79%	-26%	-2%	-27%	-84%	-64%	41%	88%	11%
Inferred	16%	-59%	-59%	-41%	-1%	-44%	-57%	-48%	-32%	13%	-32%
Babaçu	**Tonnes (Mt)**	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**	**Zn (kt)**	**Pb (kt)**	**Cu (kt)**	**Au (koz)**	**Ag (Moz)**
Inferred	-										

11.3 Net Smelter Return Cut-Off Value

An NSR value was assigned to blocks for the purposes of validation of the geological interpretation and resource reporting. NSR is the estimated dollar value per tonne of mineralized material after allowance for metallurgical recovery and consideration of smelter terms, including revenue from payable metals, treatment charges, refining charges, price participation, penalties, smelter losses, transportation, and sales charges.

Input parameters used to develop the NSR calculation have been derived from metallurgical test work on the Project, smelter terms from comparable projects, and information provided by Nexa. These assumptions are dependent on the processing scenario and will be sensitive to changes in inputs from further metallurgical test work. Key assumptions are listed below.

Metal prices and exchange rate:

- US$2,868/t Zn
- US$2,249/t Pb
- US$7,427/t Cu
- US$1,768/oz Au
- US$19.38/oz Ag
- R$3.67:US$1.00

Nexa reviewed supply and demand projections for zinc, lead, and copper, as well as consensus long-term (10 year) metal price forecasts. SLR verified that Nexa's selected metal prices for estimating Mineral Reserves are in line with independent forecasts from banks and other lenders, which reflect the averages of the prices forecast for the next ten years. Prices selected for Mineral Resource estimation are 15% higher, which is in line with typical industry practice.

Metallurgical recoveries are based on preliminary metallurgical testing and are summarized by mineralization type:

11.3.1 Stratabound

Copper Concentrate:

- 20% Ag recovery to copper concentrate
- 50% Au recovery to copper concentrate
- 67.5% Cu recovery to copper concentrate grading 27% Cu

Lead Concentrate:

- 20% Au recovery to lead concentrate
- 50% Ag recovery to lead concentrate
- 83.4% Pb recovery to lead concentrate grading 61% Pb

Zinc Concentrate

- 89.4% Zn recovery to zinc concentrate grading 49% Zn

11.3.2 Stringer

Copper Concentrate:

- 63% Au recovery to copper concentrate
- 50% Ag recovery to copper concentrate
- 88.8% Cu recovery to copper concentrate grading 27% Cu

Standard smelting and refining charges were applied to the various concentrates. It has been assumed that the concentrates would be marketed internationally.

For the purposes of developing an NSR cut-off value, a total unit operating cost of US$45.00/t of mineralization for longhole stoping and longitudinal longhole retreat areas, and US$55.00/t for cut and fill was estimated, which included mining, processing, and general and administration (G&A) expenses. It should be noted that there are no cut and fill reserves in the mine plan, the method has been included on a conceptual basis for reporting of shallow dipping resources not captured due to the limitations of the longhole stoping parameters. A small part of the resources is related to cut and fill DSO shapes.

11.4 Topography

A LiDAR topographic survey was completed over the Project in 2008. The resulting digital terrain surface (DTM) was made available in AutoCAD Drawing Exchange (DXF) and Datamine. The surface has been validated using survey control points and drill hole collars.

At Nexa's request, the coordinate system was changed from SAD69 to SIRGAS2000, which is the official DATUM of Brazil. For drill holes that were already in the database, the original coordinates were stored, and new columns were created for the transformed coordinates. Survey pickups for new drill holes are measured in the SIRGAS2000 coordinate system.

11.5 Arex, Link, and Ambrex

11.5.1 Resource Database

The resource database contains drilling information and analytical results up to March 30, 2020. Information received after this date was not used in the Mineral Resource estimate. The database comprises 643 drill holes for a total of 194,262.54 meters of drilling. A total of 124 drill holes were completed by Karmin/Anglo American prior to Nexa's involvement in the Project (pre-2004). These 124 drill holes were internally reviewed and found to be acceptable to support Mineral Resource estimation.

Nexa maintains the resource database in Datamine Fusion. Data were amalgamated, parsed as required, and imported into Datamine Studio and Leapfrog.

For the purpose of the Mineral Resource Estimate, a total of 56 drill holes were excluded from the database. The drill holes excluded either lacked information, were historic RC drilling or were drilled for the purpose of metallurgical testing.

The SLR QP is of the opinion that the drill hole database is valid and suitable to estimate Mineral Resources for the Project.

11.5.2 Geological Interpretation

Wireframes of the stratabound and stringer mineralization for Arex, Link, and Ambrex were constructed within the lithology at a cut-off grade of 0.6% Zn for stratabound zones and 0.5% Cu in the stringer zones (Figure 11-2). Wireframe construction was completed using Leapfrog. Nexa also prepared a litho-structural model to support the mineralized wireframes. This model incorporated local lithology, hydrothermal alteration, weathering profile and cross-cutting faults that influence the geometry of the mineralization. A zone of discontinuous remobilized stratabound mineralization within a fault zone in the upper sector of Ambrex was also modelled and assigned to stratabound mineralization. In zones where stratabound and stringer mineralization intersected, samples that satisfied the cut-off grade criteria for both ore types were included as stratabound. Some drill hole intercepts below the cut-off grade were included to maintain geological continuity.

Mineralization at Arex strikes at approximately 110° azimuth, extending over a 1,400 m strike length. Thin lenses of intermingling stratabound and stringer mineralization within two principal limbs dip from ten degrees to 60° to the northeast are modelled to join in some areas near surface. The main Arex mineralized zone comes close to outcropping at surface and is characterized by tightly folded, well defined stringer and stratabound zones. Individual lenses range from less than one metre to 15 m in thickness and are generally from two metres to seven metres thick. The Arex mineralization zone has an overall thickness of approximately 125 m, and individual lenses are separated by barren, hydrothermally altered rock from one metre to tens of metres thick. The main mineralization is delineated between two steeply dipping faults.

The Link deposit is located southeast along strike from Arex over a strike length of approximately 850 m, with an approximate overlap with Arex of 100 m occurring to the northwest. Link mineralization bears a close similarity to Ambrex in that the stringer zone occurs at a high angle to the stratabound zone. The Link stratabound mineralization comes close to surface and extends to a depth of 500 m below surface while the Link stringer zone mineralization begins approximately 200 m below surface and extends to a depth of approximately 400 m below surface.

The Ambrex deposit is located a further 100 m southeast of Link. Mineralization strikes at approximately 125° and has a known strike extent of approximately 1.05 m based on current drilling. Ambrex is dominated by stratabound mineralization, with smaller, less well-defined stringer mineralization found perpendicular on the east side. Ambrex stratabound mineralization above the Gossan Fault Zone dips at approximately 40º to the southeast. At depth, the Ambrex mineralization is folded and dips from near vertical to 70° to the southwest. Ambrex has an upper depth of 60 m below surface, but generally is 100 m below surface. The deepest mineralization intersection within the Ambrex model is over 700 m below surface and the deposit remains open at depth. Ambrex stratabound mineralization is well defined and follows stratigraphy. Ambrex stringer mineralization crosses stratigraphy following structural features and is less well defined due to unfavourable drilling angles.

The stratabound mineralization lenses range from one metre to 30 m thick, with an average thickness of approximately nine metres while the stringer zone thickness ranges from one metre to 20 m with an average of approximately five metre thickness.

SLR's review of the mineralized wireframes included a comparison of the geological model cross sections and level plans prepared by on-site geologists, drill hole information, and a NSR value calculated from drill hole assays. Assumptions used in the NSR calculation are described under Net Smelter Return Cut-Off Value in this section. SLR is of the opinion that the wireframes have been completed to a high standard and are suitable for Mineral Resource and Mineral Reserve estimation. SLR did note that in minor areas at Ambrex poorly angled holes with respect to the mineralization contacts were driving the interpretation and possibly inflating the volumes. SLR recommends infilling areas where poorly angled drill holes are driving the geological interpretation.

Stratabound and stringer mineralization were modelled individually at the three deposits and were named according to the nomenclature set out in Table 11-4.

Table 11-4: Comparison with Previous Mineral Resource Estimates
Nexa Resources S.A. – Aripuanã Zinc Project

Area	Ore Type	Number of Lenses	Name Range
Arex	Stratabound	17	100+
	Stringer	18	200+
Link	Stratabound	15	300+
	Stringer	14	400+
Ambrex	Stratabound	18	500+
	Stringer	13	600+

Figure 11-3 to Figure 11-5 present the Arex, Link, and Ambrex geological models, respectively.

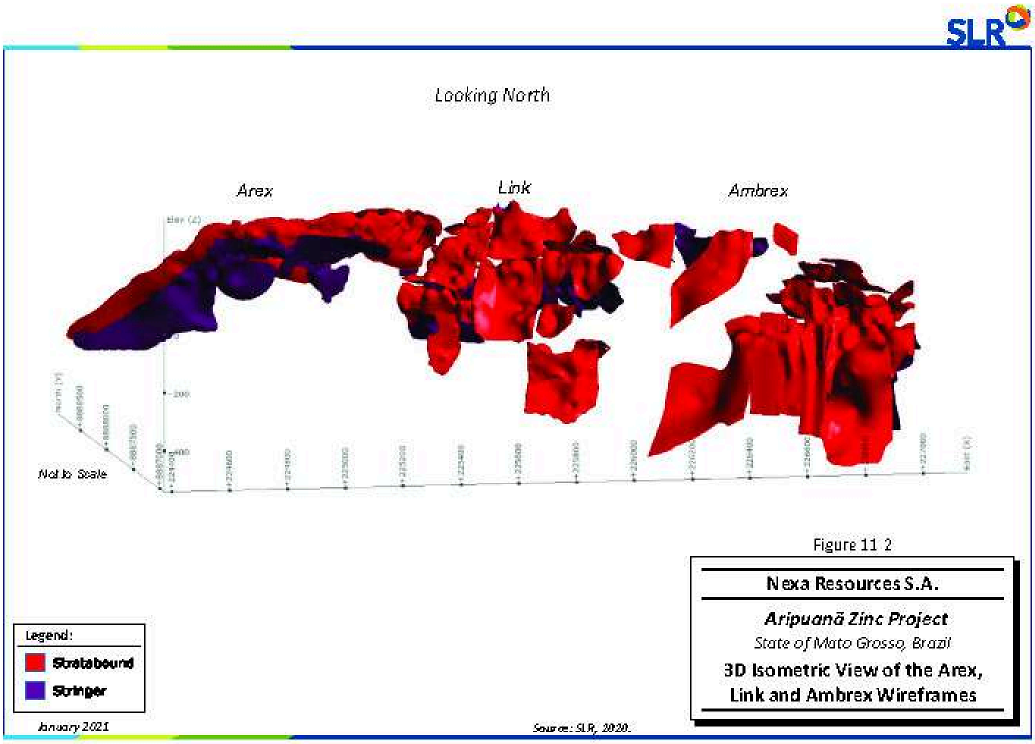

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Figure 11-2: 3D Isometric View of the Arex, Link, and Ambrex Wireframes

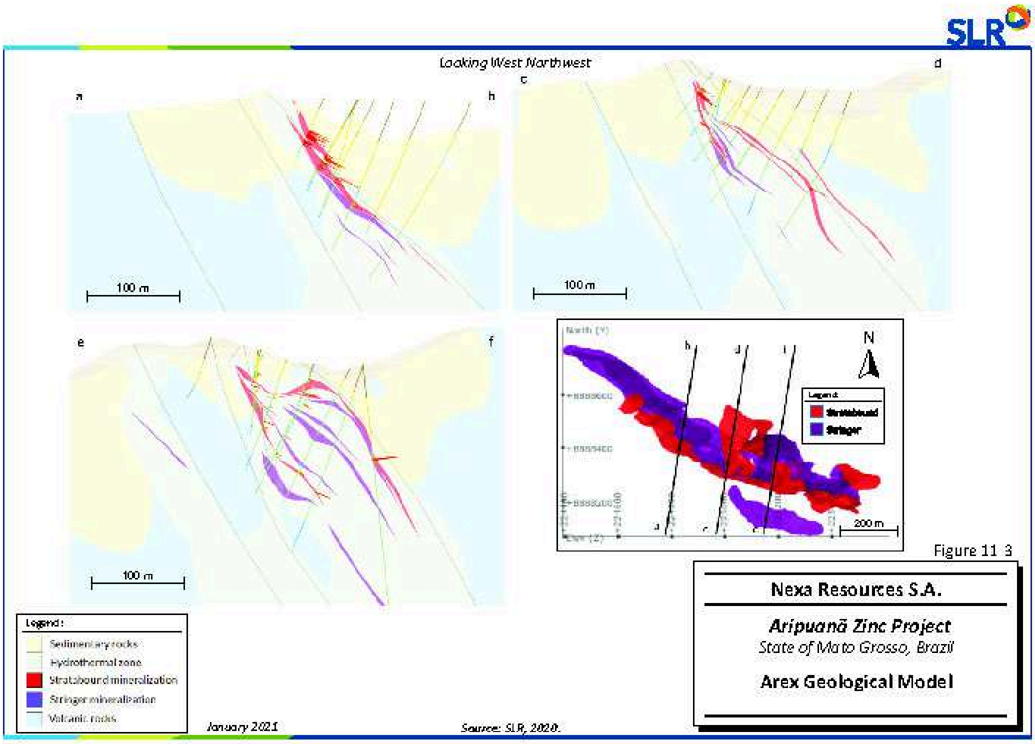

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Figure 11-3: Arex Geological Model

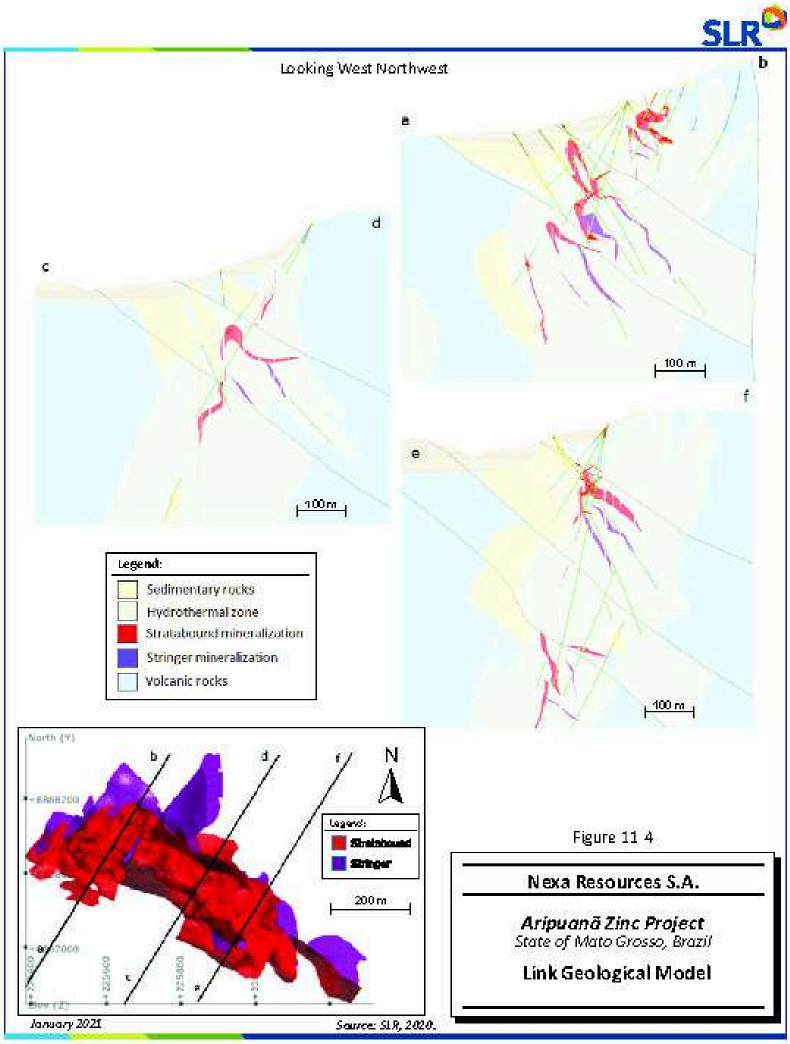

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Figure 11-4: Link Geological Model

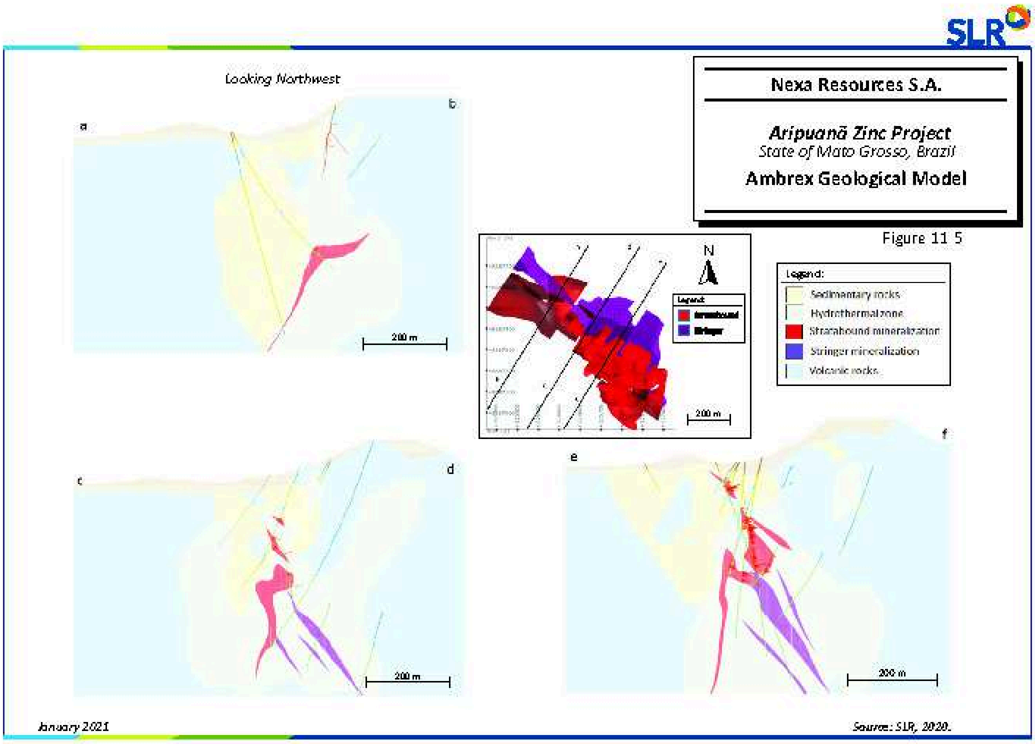

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Figure 11-5: Ambrex Geological Model

11.5.3 Treatment of High Grade Assays

Nexa applied high grade capping to zinc, lead, copper, gold, and silver assays in order to limit the influence of a small amount of extreme values located in the upper tail of the metal distributions. Log probability plots were inspected for each domain in isolation and a high grade cap was applied where significant inflections or population breaks occurred. Examples of these can be seen in Figure 11-6 and Figure 11-7. No capping was performed in the hydrothermal zone and for the variables iron, sulphur, magnesium, and density. Raw assays were capped prior to compositing. High grade capping was not required for all elements and some domains did not require capping for any element. The capping grades applied to each domain is shown in Table 11-5. The basic statistics of capped and uncapped sample populations is summarized by area and ore type in Table 11-6.

SLR has reviewed the capped and uncapped sample distributions for all elements and all domains and concludes that the values used are appropriate for this deposit.

Table 11-5: Arex, Link, and Ambrex Grade Capping Levels
Nexa Resources S.A. – Aripuanã Zinc Project

Arex

Body	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
100	—	—	—	—	120
101	—	—	0.45	—	—
102	3	—	0.04	—	—
103	—	4	—	—	80
104	3	—	—	—	—
105	30	13	—	—	500
106			No capping required		
107			No capping required		
108	—	10	—	—	100
109	—	—	1	1	—
110	—	—	—	—	100
111	—	—	—	—	130
112			No capping required		
113			No capping required		
114			No capping required		
115			No capping required		
116	—	—	8	6	800
117	—	—	—	8	1000
200	8	—	—	10	—
201			No capping required		

Link

Body	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
300	40	21	11	12.5	—
301	25	—	—	—	160
302	—	5	—	—	105
303	40	18	1.5	4.2	230
304	45	—	—	5	—
305			No capping required		
306	13	5	—	5	—
307	—	—	—	—	300
308			No capping required		
309	10	—	—	—	30
310	40	17	1.5	3	—
311	17	10	2	3	—
312			No capping required		
313	—	—	0.7	2	600
314			No capping required		
315			No capping required		
400			No capping required		
401	0.1	—	—	—	—
402	0.8	2	—	—	—
403	2	2.2	16	18	—

Ambrex

Body	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
500	27	12	0.4	1	210
501	40	15	0.2	—	600
502	—	—	—	—	40
503			No capping required		
504	10	—	—	—	—
505	20	—	—	0.9	—
506	10	1.5	—	—	30
507	—	—	0.2	1.5	—
508	—	—	0.5	—	—
509	5	3	—	—	45
510	4	—	—	—	—
511	20	6	0.5	0.7	—
512	—	17	—	—	560
513	25	10	0.5	—	260
514	30	10	0.2	0.5	—
515	—	—	—	2	—
516	15	8	0.2	0.9	130
517	—	—	1.2	2.3	—
518	—	—	0.6	1.8	300
600			No capping required		

Arex

Body	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
202	5	—	6	11	—
203	2	—	—	10	—
205	—	—	3.3	2	40
206	—	—	0.8	—	—
207	—	—	4.3	11	—
208	—	—	5	7	—
209			No capping required		
210			No capping required		
211			No capping required		
212			No capping required		
213	—	—	—	10	150
214	14	—	—	25	200
215	—	—	5	—	—
216	8	—	—	9	110
217	—	—	—	8	125
218	—	—	3	—	15

Link

Body	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
404	—	—	10	8.5	—
405	—	—	—	4.5	—
406			No capping required		
407	—	—	3	8.5	35
408	0.25	—	—	—	—
409	—	—	—	2.5	—
410	—	—	—	6	100
411	—	—	3.5	10	—
412	—	—	—	8	—
413	—	1	—	6	30
414			No capping required		

Ambrex

Body	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
601	—	—	3.5	3	40
602	—	—	—	25	—
603			No capping required		
604	1.6	—	6.5	25	75
605			No capping required		
606	2	0.7	6	—	—
607	—	—	4	3	—
608	1.5	1.6	3	10	—
609	—	—	5	—	60
610	0.2	0.4	—	2	35
611	—	—	6	3	—
612	—	3	—	—	60
613	—	1	—	—	—

Table 11-6: Arex, Link, and Ambrex Uncapped versus Capped Assay Statistics
Nexa Resources S.A. – Aripuanã Zinc Project

						Uncapped					Capped					
Area	Type	Grade	Count (m)	Sampled	Minimum	Maximum	Mean	Stdev	Variance	CV	Maximum	Mean	Stdev	Variance	CV	Metal Loss
Arex	Stratabound	Zn (%)	2916	2885	0.0025	45.34	5.02	7.07	49.96	1.41	45.34	5.01	7.06	49.83	1.41	0%
		Pb (%)	2916	2885	0.0001	35.33	1.8	3.1	9.62	1.73	35.33	1.79	3.08	9.46	1.72	0%
		Cu (%)	2916	2885	0.0001	16.57	0.36	1.15	1.33	3.2	14.03	0.36	1.11	1.24	3.13	-1%
		Au (g/t)	2916	2643	0.0025	25.74	0.25	0.84	0.71	3.34	8.01	0.24	0.61	0.37	2.55	-5%
		Ag (g/t)	2916	2879	0.005	2180	48.61	102.8	10568.23	2.11	1000	47.55	93.68	8776.08	1.97	-2%
	Stringer	Zn (%)	2297	2271	0.0001	21	0.25	1.25	1.57	5.05	18.65	0.24	1.19	1.43	4.95	-3%
		Pb (%)	2297	2271	0.0001	27.5	0.09	0.66	0.44	7.01	27.5	0.09	0.66	0.44	7.01	0%
		Cu (%)	2297	2271	0.0001	20.7	1.36	2.39	5.73	1.76	20.7	1.34	2.37	5.6	1.76	-1%
		Au (g/t)	2297	2253	0.0025	150	1.52	6.08	36.98	4.01	138.9	1.28	3.97	15.77	3.11	-16%
		Ag (g/t)	2297	2263	0.005	536	14.76	30.61	937.25	2.07	200	14.07	25.65	657.98	1.82	-5%
Link	Stratabound	Zn (%)	4791	4780	0.0038	50.38	4.52	7.3	53.32	1.62	45	4.5	7.23	52.27	1.61	0%
		Pb (%)	4791	4780	0.0002	28.2	1.61	3.01	9.08	1.87	22.99	1.6	2.97	8.83	1.85	-1%
		Cu (%)	4791	4780	0.0001	19.24	0.16	0.82	0.67	5.08	11	0.15	0.73	0.53	4.76	-5%
		Au (g/t)	4791	4647	0.0025	22.7	0.27	0.92	0.84	3.35	12.5	0.26	0.74	0.54	2.86	-6%
		Ag (g/t)	4791	4763	0.005	829	39.02	77.19	5957.55	1.98	789	38.7	75.82	5748.69	1.96	-1%
	Stringer	Zn (%)	1517	1515	0.0001	35.51	0.14	1.43	2.04	10.41	3.2	0.06	0.18	0.03	3.32	-60%
		Pb (%)	1517	1515	0.0001	14	0.06	0.51	0.26	7.98	4.95	0.05	0.28	0.08	5.48	-20%
		Cu (%)	1517	1515	0.0001	52.36	0.85	2.66	7.07	3.13	18.11	0.77	1.61	2.58	2.1	-10%
		Au (g/t)	1517	1515	0.0025	68.9	1.08	2.87	8.24	2.66	21.3	0.98	1.82	3.31	1.85	-9%
		Ag (g/t)	1517	1514	0.005	211	9.13	20.34	413.71	2.23	211	8.67	17.83	318.07	2.06	-5%

						Uncapped					Capped					
Area	Type	Grade	Count (m)	Sampled	Minimum	Maximum	Mean	Stdev	Variance	CV	Maximum	Mean	Stdev	Variance	CV	Metal Loss
Ambrex	Stratabound	Zn (%)	5642	5607	0.002	60.9	4.85	6.38	40.71	1.32	46.9	4.81	6.26	39.15	1.3	-1%
		Pb (%)	5642	5607	0.0001	42.81	1.81	3.16	10	1.75	42.81	1.79	3.09	9.54	1.72	-1%
		Cu (%)	5642	5607	0	4.03	0.06	0.15	0.02	2.43	1.2	0.05	0.08	0.01	1.53	-10%
		Au (g/t)	5642	4506	0	6.22	0.19	0.35	0.12	1.8	4.13	0.19	0.31	0.09	1.65	-3%
		Ag (g/t)	5642	5607	0.05	1300	42.97	84.61	7159.02	1.97	1240	42.24	80.71	6514.6	1.91	-2%
	Stringer	Zn (%)	1722	1719	0.0004	25.5	0.11	0.87	0.76	7.79	5.79	0.07	0.31	0.1	4.34	-36%
		Pb (%)	1722	1719	0.0001	7.95	0.06	0.37	0.13	5.86	3.96	0.05	0.24	0.06	4.55	-16%
		Cu (%)	1722	1719	0.0004	11.1	0.7	1	1.01	1.43	6.5	0.69	0.93	0.87	1.35	-2%
		Au (g/t)	1722	1709	0.0025	96.7	1.19	4.27	18.24	3.6	25	1.03	2.42	5.84	2.36	-14%
		Ag (g/t)	1722	1719	0.005	605	8.98	18.56	344.51	2.07	116	8.62	12.27	150.58	1.42	-4%

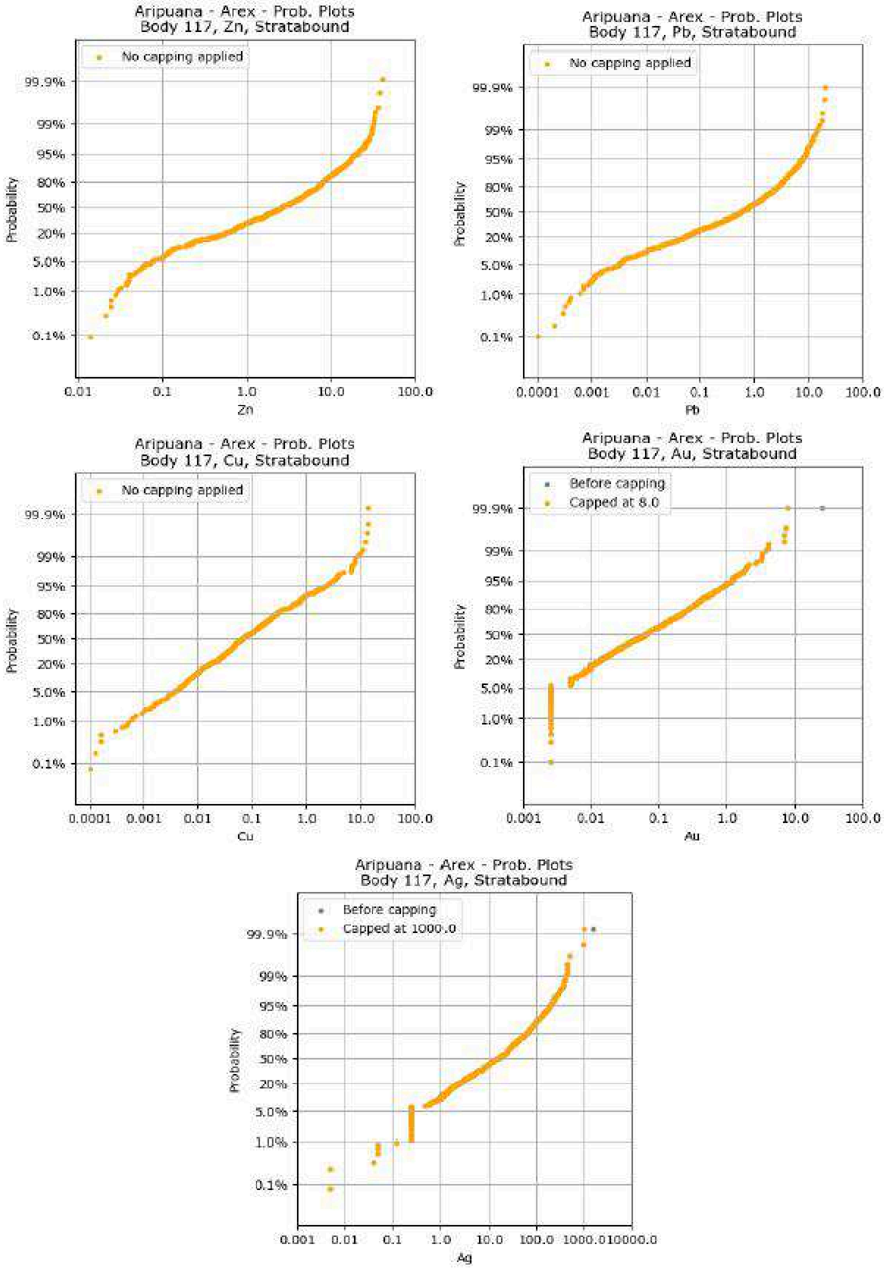

Figure 11-6: Capping Analysis for Body=117 (Arex)

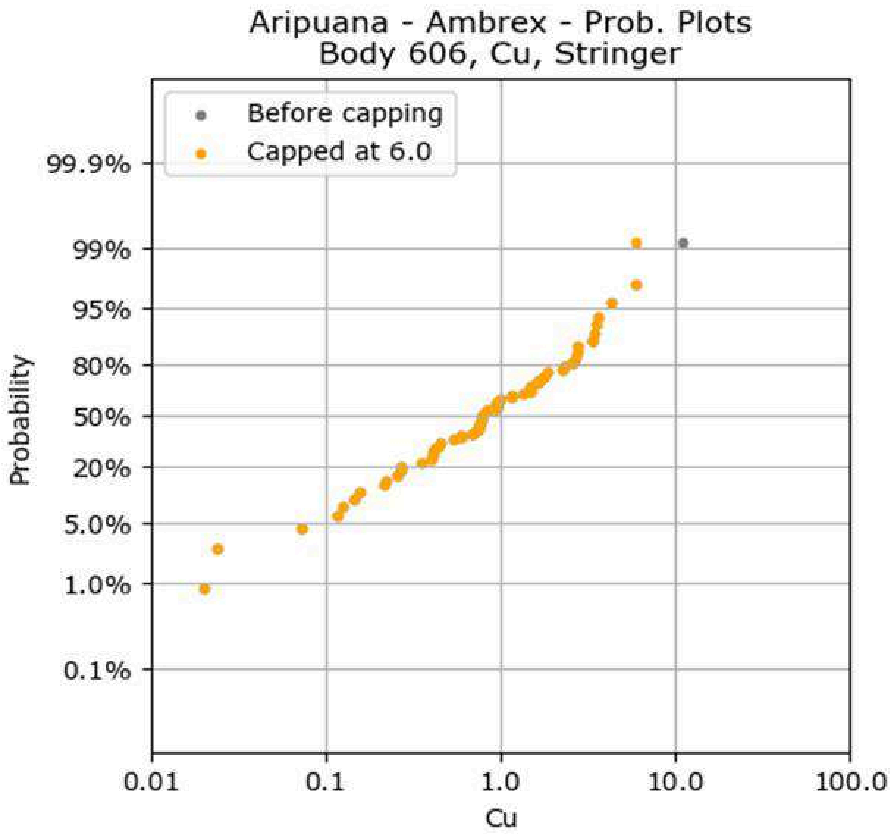

Figure 11-7: Cu Capping Analysis for Body=606 (Ambrex Stringer)

11.5.4 Compositing

Nexa composited the capped assays to one metre, which corresponds to the dominant sampling length for the deposit. Composites were weighted by length and unsampled core intervals were ignored. Gold was sampled to a lesser extent than other economic variables.

The basic statistics for the composites is provided in Table 11-7 and a comparison between raw assay and composite lengths is shown in Figure 11-8.

SLR recommends investigating the impact of weighting the composites by density.

Table 11-7: Arex, Link, and Ambrex Composite Statistics
Nexa Resources S.A. – Aripuanã Zinc Project

Area	Type	Grade	Count (m)	Sampled	Minimum	Maximum	Mean	Stdev	Variance	CV
Arex	Stratabound	Zn (%)	2428	2377	0.0028	44.42	5.01	6.29	39.62	1.26
		Pb (%)	2428	2377	0.0001	28.3	1.79	2.75	7.56	1.54
		Cu (%)	2428	2377	0.0001	12.35	0.36	1.03	1.05	2.88
		Au (g/t)	2428	2167	0.0025	8	0.24	0.55	0.3	2.29
		Ag (g/t)	2428	2372	0.005	764	48	85	7294	1.8
	Stringer	Zn (%)	1962	1909	0.0001	17.89	0.24	1.08	1.18	4.5
		Pb (%)	1962	1909	0.0001	11.27	0.09	0.53	0.28	5.64
		Cu (%)	1962	1909	0.0001	20.44	1.34	2.19	4.81	1.63
		Au (g/t)	1962	1892	0.0025	124.73	1.28	3.58	12.85	2.81
		Ag (g/t)	1962	1903	0.005	200	14	24	576	1.71
Link	Stratabound	Zn (%)	4064	4043	0.0041	42.63	4.5	6.61	43.71	1.47
		Pb (%)	4064	4043	0.0003	21	1.6	2.7	7.28	1.68
		Cu (%)	4064	4043	0.0001	11	0.15	0.7	0.49	4.56
		Au (g/t)	4064	3926	0.0025	12.5	0.26	0.69	0.47	2.67
		Ag (g/t)	4064	4031	0.005	620	39	69	4755	1.78
	Stringer	Zn (%)	1288	1284	0.0001	2.18	0.06	0.17	0.03	3.06
		Pb (%)	1288	1284	0.0001	4.79	0.05	0.26	0.07	5.2
		Cu (%)	1288	1284	0.0002	16	0.77	1.48	2.2	1.94
		Au (g/t)	1288	1284	0.0025	18	0.98	1.66	2.74	1.68
		Ag (g/t)	1288	1283	0.005	161	9	16	263	1.87
Ambrex	Stratabound	Zn (%)	5030	4963	0.0022	46.78	4.81	5.81	33.8	1.21
		Pb (%)	5030	4963	0.0004	29.53	1.79	2.81	7.91	1.57
		Cu (%)	5030	4963	0.0001	1.2	0.05	0.08	0.01	1.45
		Au (g/t)	5030	3919	0.0025	3.55	0.19	0.29	0.08	1.55
		Ag (g/t)	5030	4963	0.1	1035	42	74	5440	1.75
	Stringer	Zn (%)	1538	1535	0.0004	4.56	0.07	0.29	0.08	4.05
		Pb (%)	1538	1535	0.0001	3.26	0.05	0.22	0.05	4.2
		Cu (%)	1538	1535	0.0005	6.05	0.69	0.84	0.7	1.22
		Au (g/t)	1538	1526	0.0025	25	1.03	2.1	4.43	2.05
		Ag (g/t)	1538	1535	0.005	116	9	11	127	1.31

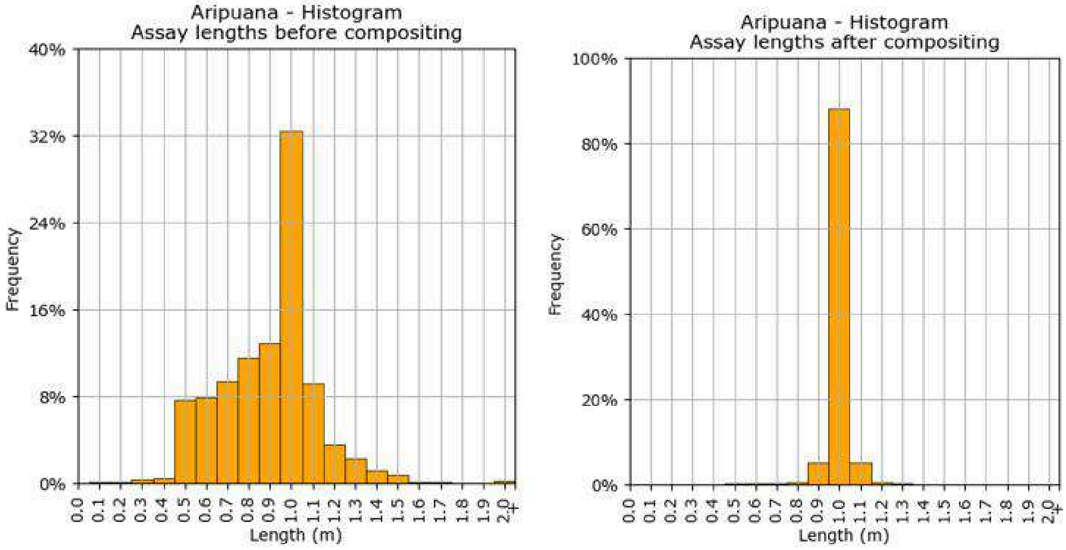

Figure 11-8: Comparison of Histograms for Assay and Composite Length – Arex, Link, and Ambrex

11.5.5 Exploratory Data Analysis

Nexa performed exploratory statistical analysis including boundary, bivariate and univariate statistical analysis.

Given the large quantity of individual wireframes, Nexa divided the wireframe domains into groups based on the geological continuity: stratabound and stringer for Arex, Link, and Ambrex.

The bivariate analysis results show strong correlations between stratabound Pb-Zn, Pb-Ag and Cu-Au, while for stringer mineralization, good correlations between Cu-Ag and Fe-S exist. In general, stratabound and stringer mineralization iron and sulphur show strong correlations. The results are consistent with the deposit type.

Figure 11-9 presents the correlation matrices by type and area.

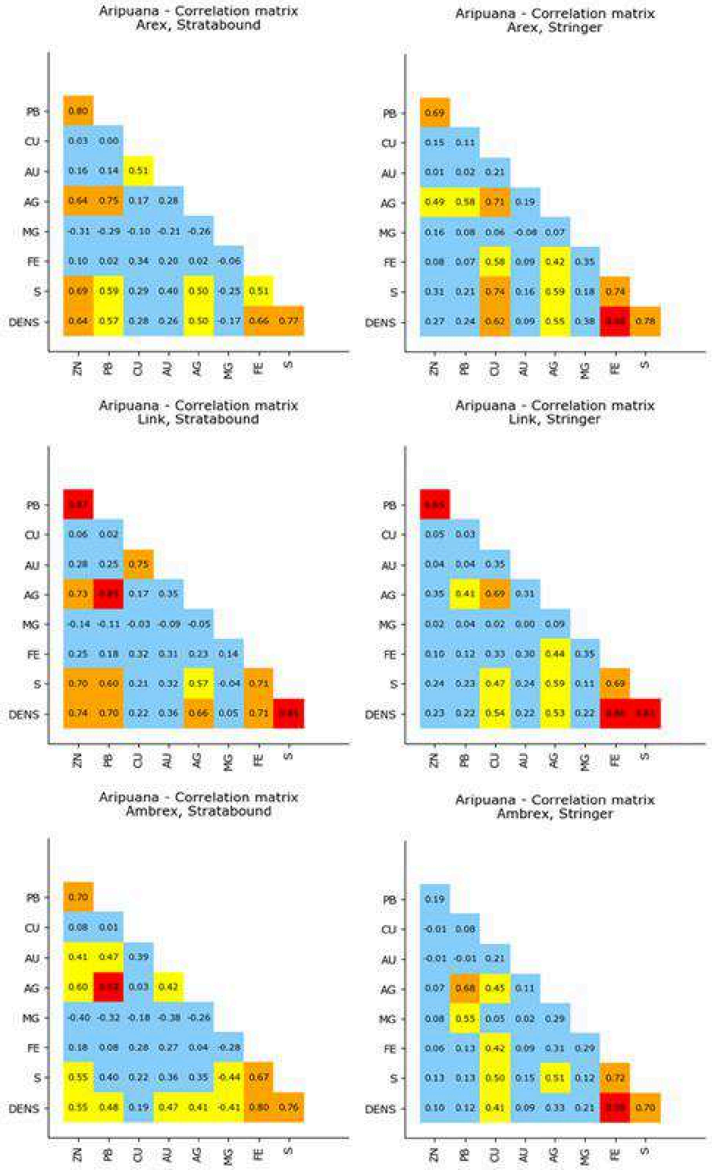

Figure 11-9: Correlation Matrices by Type and Area – Arex, Link, and Ambrex

11.5.6 Variography

Experimental correlograms (plotted as variograms) were fit for zinc, lead, copper, gold, silver, and density to each group – stratabound and stringer for Arex, Link, and Ambrex. Nexa correlograms are shown in in Figure 11-10 and Figure 11-11. Table 11-8 shows the parameters used.

The correlograms were completed using an open-source Python program developed by Nexa personnel which collects sample pairs as a function of the variable orientation. The major, semi-major, and minor directions are defined prior to experimental variography by local anisotropy angles. Each sample pair has a unique rotation depending on the local anisotropy defined. SLR is of the opinion that this methodology is suitable for the style of mineralization.

It should be noted that the major and semi-major directions are expressed as a 90° tolerance angle within the plane resulting in identical variograms for the two directions.

Table 11-8: Arex, Link, and Ambrex Correlogram Parameters
Nexa Resources S.A. – Aripuanã Zinc Project

				Structure 1				Structure 2			
			Nugget	Range X	Range Y	Range Z	C1	Range X	Range Y	Range Z	C2
Arex	Stratabound	Zn	0.1	8	8	3	0.6	50	50	12	0.3
		Pb	0.1	8	8	3	0.6	50	50	20	0.3
		Cu	0.1	8	8	4	0.4	50	50	10	0.5
		Au	0.05	5	5	2	0.6	30	30	7	0.35
		Ag	0.1	10	10	8	0.55	100	100	20	0.35
		Dens	0.1	10	10	6	0.6	100	100	10	0.3
	Stringer	Zn	0.1	10	10	2	0.5	40	40	5	0.4
		Pb	0.1	10	10	4	0.6	40	40	8	0.3
		Cu	0.1	10	10	5	0.5	40	40	15	0.4
		Au	0.1	5	5	2	0.65	55	55	6	0.25
		Ag	0.1	5	5	8	0.5	55	55	15	0.4
		Dens	0.1	10	10	8	0.4	60	60	15	0.5

				Structure 1				Structure 2			
			Nugget	Range X	Range Y	Range Z	C1	Range X	Range Y	Range Z	C2
Link	Stratabound	Zn	0.1	10	10	8	0.55	55	55	15	0.35
		Pb	0.1	10	10	7	0.55	55	55	15	0.35
		Cu	0.05	10	10	6	0.5	35	35	10	0.45
		Au	0.05	8	8	4	0.55	40	40	10	0.4
		Ag	0.05	8	8	4	0.6	65	65	18	0.35
		Dens	0.1	8	8	8	0.45	65	65	20	0.45
	Stringer	Zn	0.1	7	7	4	0.75	50	50	6	0.15
		Pb	0.1	8	8	4	0.7	40	40	6	0.2
		Cu	0.1	5	5	5	0.5	60	60	15	0.4
		Au	0.1	5	5	3	0.5	50	50	8	0.4
		Ag	0.05	8	8	4	0.6	100	100	12	0.35
		Dens	0.1	15	15	5	0.3	40	40	8	0.6
Ambrex	Stratabound	Zn	0.1	10	10	8	0.5	40	40	13	0.4
		Pb	0.1	8	8	7	0.5	55	55	18	0.4
		Cu	0.1	8	8	5	0.5	45	45	10	0.4
		Au	0.1	10	10	10	0.4	75	75	16	0.5
		Ag	0.1	10	10	8	0.5	75	75	20	0.4
		Dens	0.1	8	8	7	0.4	45	45	25	0.5
	Stringer	Zn	0.1	8	8	3	0.65	50	50	13	0.25
		Pb	0.1	8	8	7	0.6	55	55	10	0.3
		Cu	0.1	8	8	4	0.55	25	25	8	0.35
		Au	0.1	8	8	2	0.7	80	80	5	0.2
		Ag	0.1	7	7	7	0.6	40	40	10	0.3
		Dens	0.1	10	10	8	0.3	80	80	10	0.6

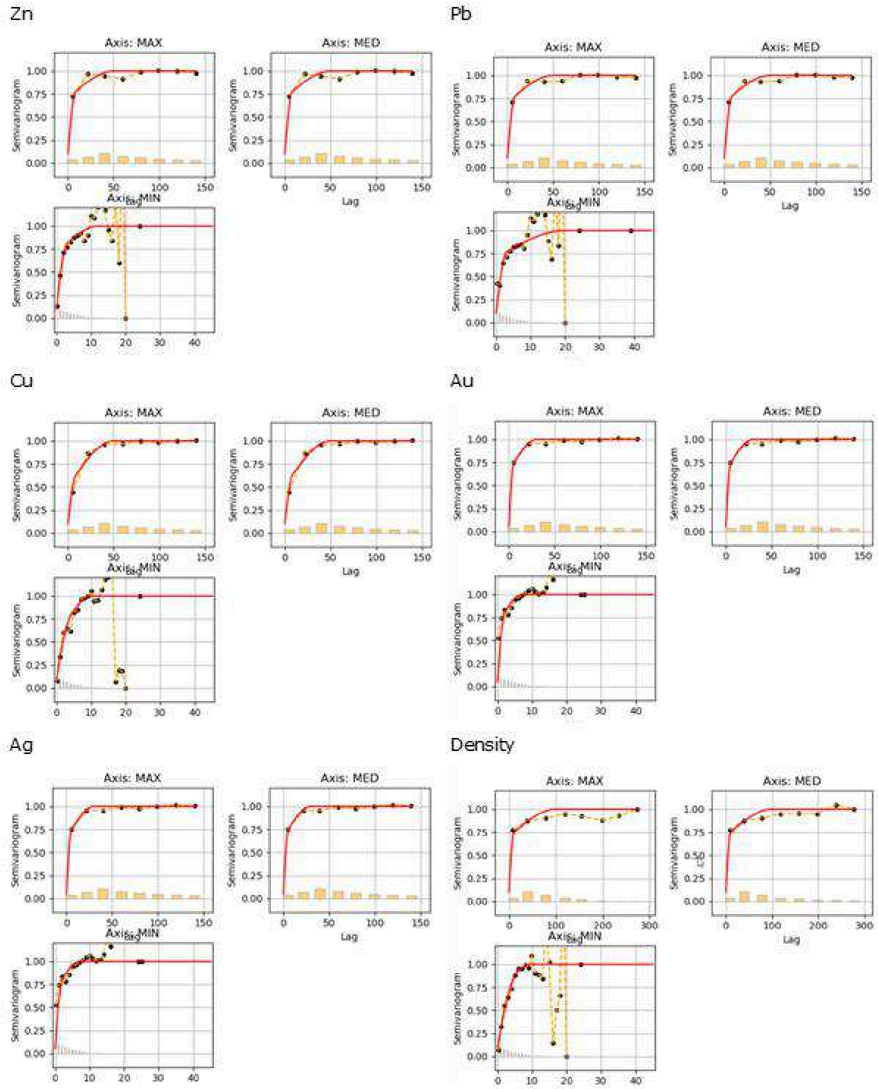

Figure 11-10: Arex Stratabound Correlograms (Plotted as Variograms)

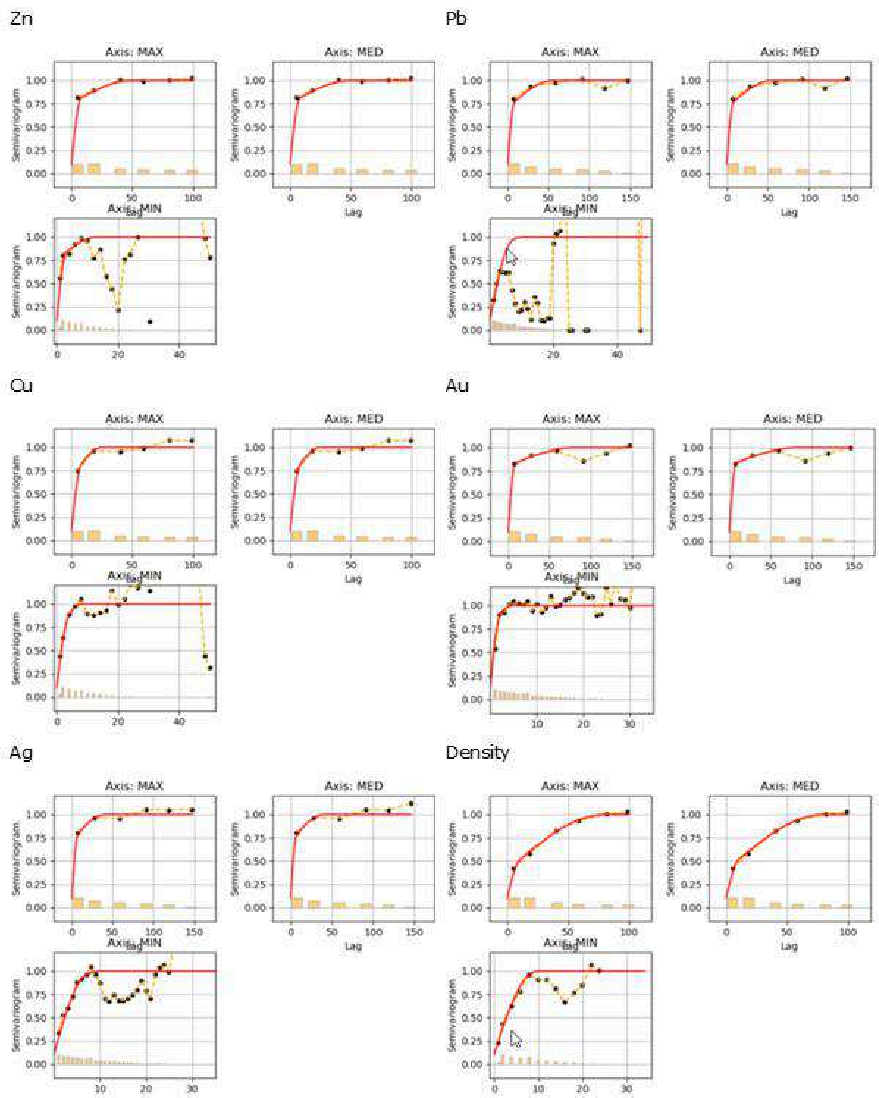

Figure 11-11: Ambrex Stringer Correlograms (Plotted as Variograms)

11.5.7 Block Model

Arex, Link, and Ambrex wireframes were filled with blocks in Datamine Studio. The final block model covers the three areas. The block model was sub-celled at wireframes boundaries with parent cells measuring 5.0 m by 5.0 m by 5.0 m and minimum sub-cell sizes of 1.0 m by 1.0 m by 1.0 m. The block model setup is given in Table 11-9.

The block size is appropriate for the drill spacing and proposed mining method and is suitable to support the estimation of Mineral Resources and Mineral Reserves. Comparisons between wireframe and block model volumes are reasonable.

Table 11-9: Arex, Link, and Ambrex Block Model Setup
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	X	Y	Z
Origin (m)	223,872	8,885,560	-760
Block Size (m)	5	5	5
Number of Blocks	852	745	229

11.5.8 Interpolation Strategy

Grades were interpolated into blocks on a parent cell basis using OK. ID^3 was used for groups that did not yield interpretable variograms. Variables zinc, lead, copper, gold, silver, iron, sulphur, magnesium, and density are interpolated, and estimates are not density weighted.

Search ellipsoids were oriented based on dynamic anisotropy angles extracted from the mineralization wireframes. The interpolation strategy is based on Quantitative Kriging Neighbourhood Analysis (QKNA) of previous updates and is designed to avoid oversmoothing of block grades as a result of the OK runs with low relative nugget effects of 5% or 10%. The search strategy is given in Table 11-10.

Table 11-10: Arex, Link, and Ambrex Sample Selection Strategy
Nexa Resources S.A. – Aripuanã Zinc Project

	Search Ranges			Octant Search				Pass 1			Pass 2			Pass 3		
Orebody	X	Y	Z	Used	Minimum Octants	Min per Octant	Max per Octant	Minimum Samples	Maximum Samples	Search Expansion	Minimum Samples	Maximum Samples	Search Expansion	Minimum Samples	Maximum Samples	Max per hole
100, 101, 102, 103, 104, 105 106, 107, 108 109, 110, 111 112, 113, 114 115, 116, 117	30	30	8	No	2	1	10	6	15	2	6	15	10	2	25	5
200, 205, 206 208, 211, 214 215, 216, 217 218	30	30	10	No	2	1	10	6	15	2	6	15	15	4	15	5
210, 212	30	30	10	No	2	1	10	3	15	2	2	15	25	2	15	5
207	30	30	10	No	2	1	10	6	15	2	6	15	25	6	25	5
209	20	20	5	No	2	1	10	3	15	2	6	15	10	6	15	5
201, 202 203, 213	30	30	10	No	2	1	10	6	15	2	6	15	15	4	15	5
300, 301, 302 303, 304, 305 306, 307, 308 309, 310, 311 312, 313, 314 315, 500, 501 502, 503, 504 505, 506, 507 508, 509, 510 511, 512, 513 514, 515, 516 517, 518	30	30	8	Yes	2	1	4	4	10	2	4	10	10	1	10	3

	Search Ranges			Octant Search				Pass 1			Pass 2			Pass 3		
Orebody	X	Y	Z	Used	Minimum Octants	Min per Octant	Max per Octant	Minimum Samples	Maximum Samples	Search Expansion	Minimum Samples	Maximum Samples	Search Expansion	Minimum Samples	Maximum Samples	Max per hole
400, 401, 402 403, 404, 405 406, 407, 408 409, 410, 411 412, 413, 414 600, 601, 602 603, 604, 605 606, 607, 608 609, 610, 611 612, 613	30	30	8	No	2	1	4	4	10	2	4	10	10	1	10	8
1000	20	20	10	No	1	1	4	1	5	2	1	5	2	1	5	—

11.5.9 Classification

Definitions for resource categories used in this report are those defined by SEC in S-K 1300. Mineral Resources are classified into Measured, Indicated, and Inferred categories.

Blocks were classified as Measured, Indicated, and Inferred based on drill hole spacing requirements determined from global variograms for the stratabound and stringer domains for each deposit. Figure 11-12 provides examples for Arex and Ambrex. Flagging of the blocks by drill hole spacing was done by using a search pass with dimensions as described in Table 11-11 and capturing at least three drill holes.

The first pass involved a numerical classification as described of blocks followed by a post processing of the classification to remove isolated blocks classified as Measured or Indicated.

The classification criteria for each area are listed in the Table 11-11 and the global variograms for Arex and Ambrex, used as a basis for the classification scheme, are shown in Figure 11-12. Figure 11-13 shows a 3D perspective with the final classification designation.

The classification of the Mineral Resource estimate was applied as follows:

- Measured: Measured blocks were defined, using criteria as defined in Table 11-11, and supported with data of a low level of uncertainty as follows:
  - Drilling, sampling, and sample preparation and assay procedures follow industry standards and best practices.
  - Reliability of sampling data. Excellent database integrity and representativity based on SLR's independent data verification and validation, as well as no significant bias observed in QA/QC analysis results.
  - Confidence in interpretation and modelling of geological and estimation domains. The drillholes spacing is sufficient to confirm the location and continuity of grade and has been confirmed by underground mapping in places at Arex.
  - Good agreement of visual assessments of the geometries of mineralized domain in relation to drill hole spacing. While the deformation has led to complex geometries at Arex, Link, and Ambrex, the drill spacing is sufficient to confirm the locations and continuity of grade.
  - Geology and grade continuity. Based on drilling and underground mapping, trend analysis and variography, Arex, Link and Ambrex show good geology and grade continuity.
  - Confidence in estimation of block grades for the main metals. Block grades correlate well with composite data, statistically and spatially, locally and globally.
  - Acceptable bulk density representativity. Sufficient density measurements have been taken over the entire deposit.
  - Well supported drilling spacing criteria. Based on three drill holes and reasonable ranges of the variograms.
- Indicated: Indicated blocks were defined, using criteria as defined in Table 11-11, and supported with data of a low and/or medium level of uncertainty as follows:
  - Drilling, sampling, and sample preparation and assay procedures follow industry standards and best practices.
  - Reliability of sampling data. Excellent database integrity and representativity based on SLR's independent data verification and validation, as well as no significant bias observed in QA/QC analysis results.

- Confidence in interpretation and modelling of geological and estimation domains. While the deformation has led to complex geometries at Arex, Link and Ambrex, the drill spacing is sufficient to assume the locations and continuity of grade.
- Good agreement of visual assessments of the geometries of mineralized domain in relation to drill hole spacing.
- Geology and Grade Continuity. Based on drilling and underground mapping, trend analysis and variography, Arex, Link and Ambrex show good geology and grade continuity.
- Confidence in estimation of block grades for the main metals. Block grades correlate well with composite data, statistically and spatially, locally and globally.
- Acceptable bulk density representativity. Sufficient density measurements have been taken over the entire deposit.
- Well supported drilling spacing criteria. Based on three drill holes and reasonable ranges of the variograms for the indicated category.

- Inferred: Inferred blocks were defined, using criteria as defined in Table 11-11 and supported with data of a low and/or medium and/or high level of uncertainty as follows:
  - Drilling, sampling, and sample preparation and assay procedures s follow industry standards and best practices.
  - Reliability of sampling data: Excellent database integrity and representativity based on SLR's independent data verification and validation, as well as no significant bias observed in QA/QC analysis results.
  - Confidence in interpretation and modelling of geological and estimation domains. Link and Ambrex have more complex geometries and extrapolation of the interpretations into these areas supported by wider drill hole spacing is implied.
  - Good agreement of visual assessments of the geometries of mineralized domain in relation to drill hole spacing. Arex has a relatively well defined geometries while, Ambrex and Link interpretations are implied from areas of tighter drill hole spacing.
  - Geology and grade continuity. Based on drilling and underground mapping, trend analysis and variography, the deposits show good geology and grade continuity. The location and continuity of grade is more complex in Ambrex and Link.
  - Confidence in estimation of block grades for the main metals. Block grades correlate reasonably well with composite data, statistically and spatially, locally and globally.
  - Acceptable bulk density representativity. Sufficient density measurements have been taken over the entire deposit.
  - Infill drilling is required to determine continuity of mineralization in areas of wide drill spacing in order to upgrade Inferred Resources to Indicated. Inferred drilling spacing was defined based on reasonable ranges of the variogram.

Table 11-11: Nexa Search Ellipse Ranges for Classification Criteria - Arex, Link, and Ambrex
Nexa Resources S.A. – Aripuanã Zinc Project

Area	Type	Measured	Indicated	Inferred
Arex	Stratabound	25 m x 25 m	50 m x 50 m	100 m x 100 m
	Stringer	20 m x 20 m	50 m x 50 m	100 m x 100 m
Link	Stratabound	20 m x 20 m	50 m x 50 m	100 m x 100 m
	Stringer	15 m x 15 m	35 m x 35 m	100 m x 100 m
Ambrex	Stratabound	20 m x 20 m	50 m x 50 m	100 m x 100 m
	Stringer	15 m x 15 m	30 m x 30 m	100 m x 100 m
Minimum DDH in ellipse[1]	All	3	3	-

Note:

1. Minimum DDH in ellipse refers to the isotropic search ellipsoid used to flag the distances in the blocks

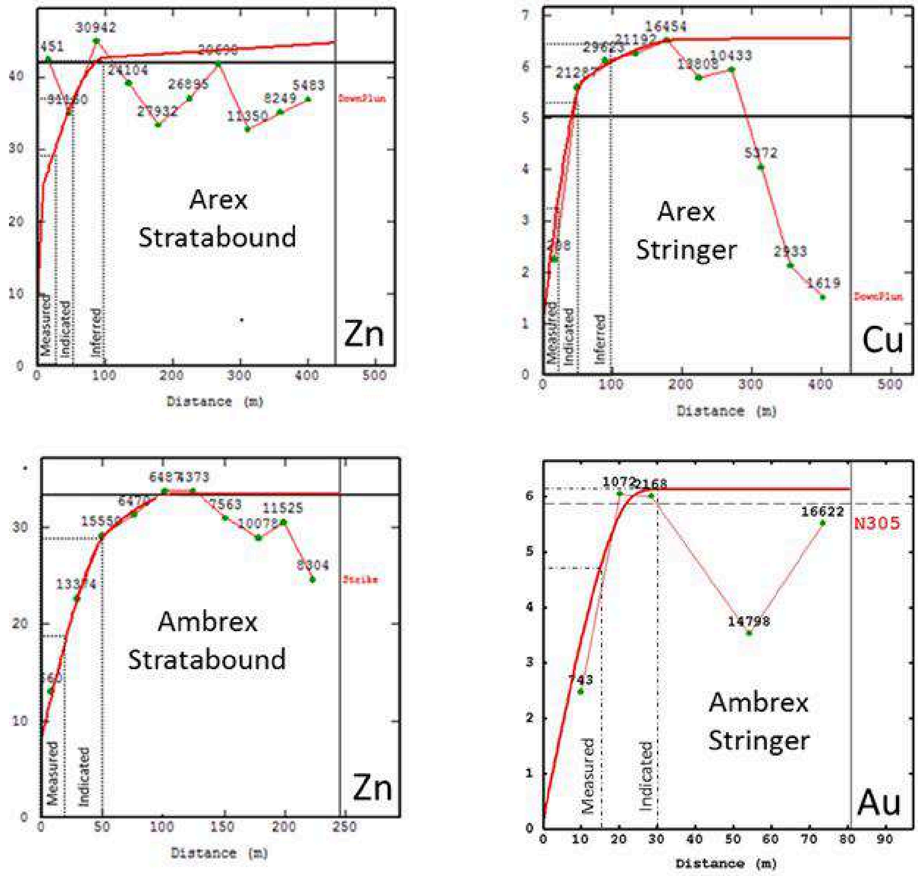

Figure 11-12: Global Variograms Used for Classification Criteria - Arex and Ambrex

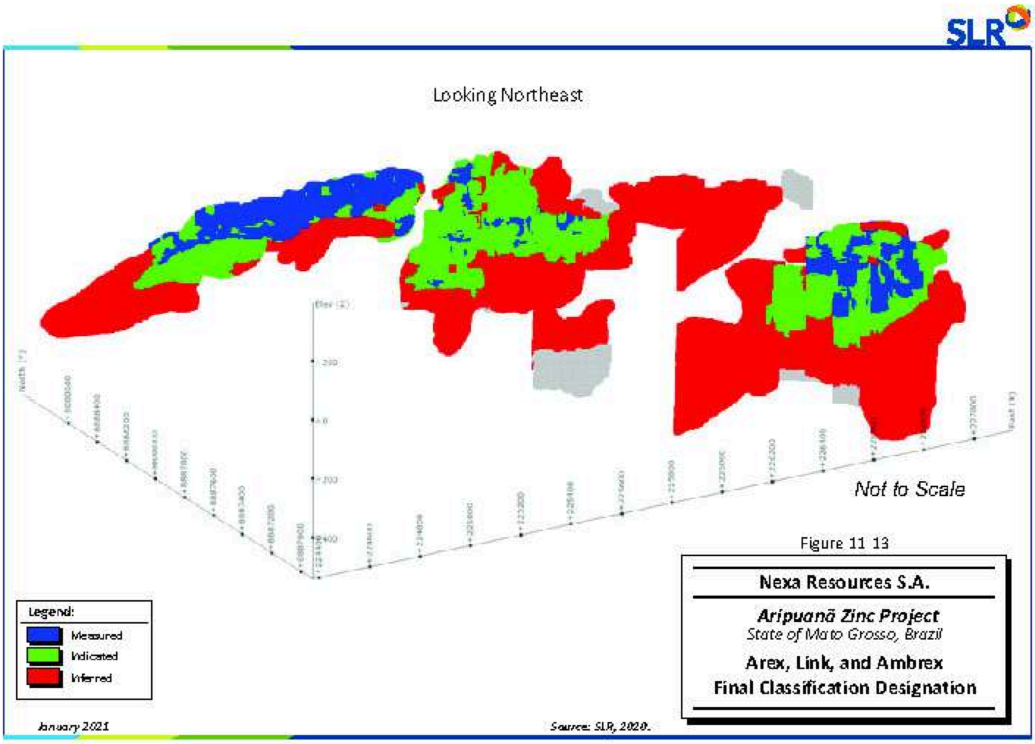

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Figure 11-13: Arex, Link, and Ambrex Final Classification Designation

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11.5.10 Block Model Validation

A number of validation steps were performed by Nexa and SLR including:

- Comparison between OK and NN mean grades (Figure 11-14 and Figure 11-15).
- Swath plots (Figure 11-16 and Figure 11-17).
- Visual inspection of composites versus block grades (Figure 11-18 to Figure 11-20)

For many of the variables, areas and mineralization types, there is good agreement between the NN and OK means. Similar trends are observed on the swath plots. Some significant discrepancies are observed for OK versus NN for zinc, lead, and silver for zones 108 and 313.

In SLR's opinion, the validation performed by Nexa and SLR are typical industry standard validation techniques and in general, the results presented suggest the that the block model has been completed to a high standard, in line with industry best practices.

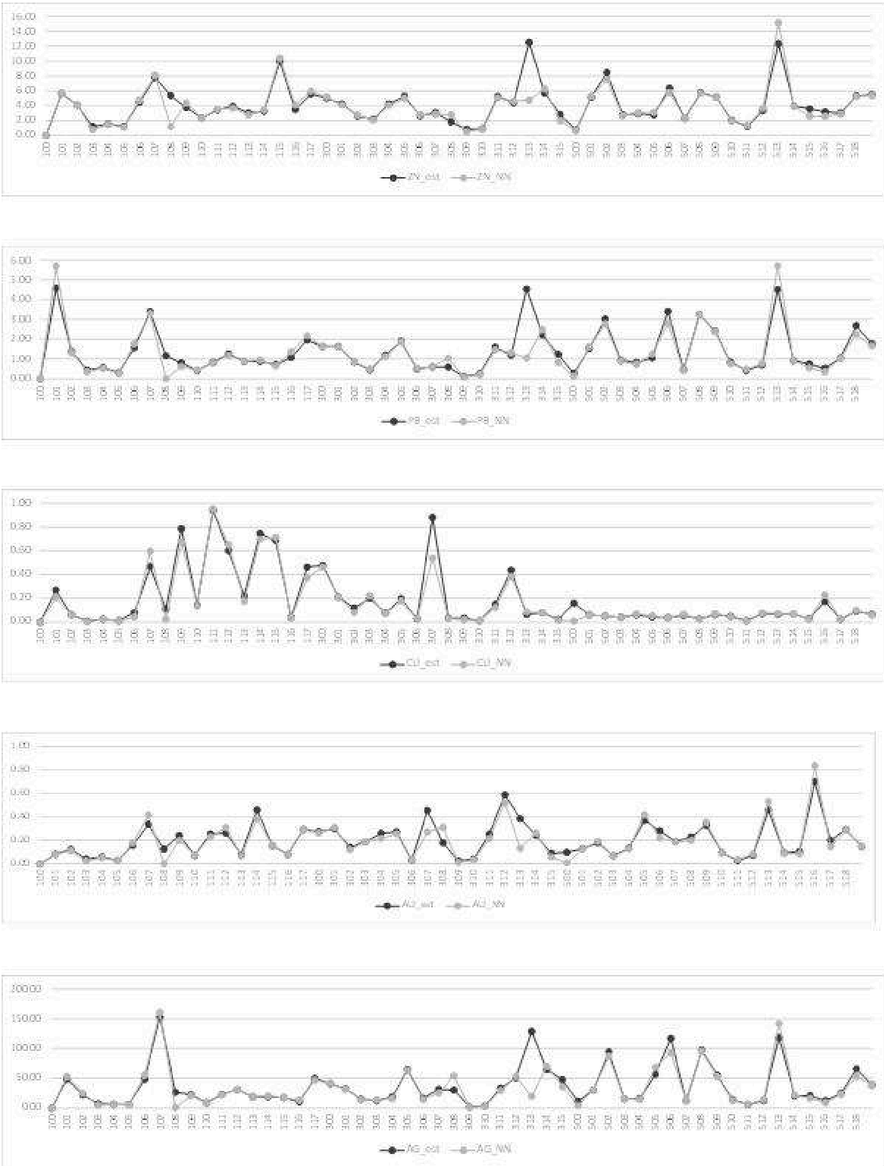

Figure 11-14: Comparison Between OK and NN Means (Stratabound) - Arex, Link, and Ambrex

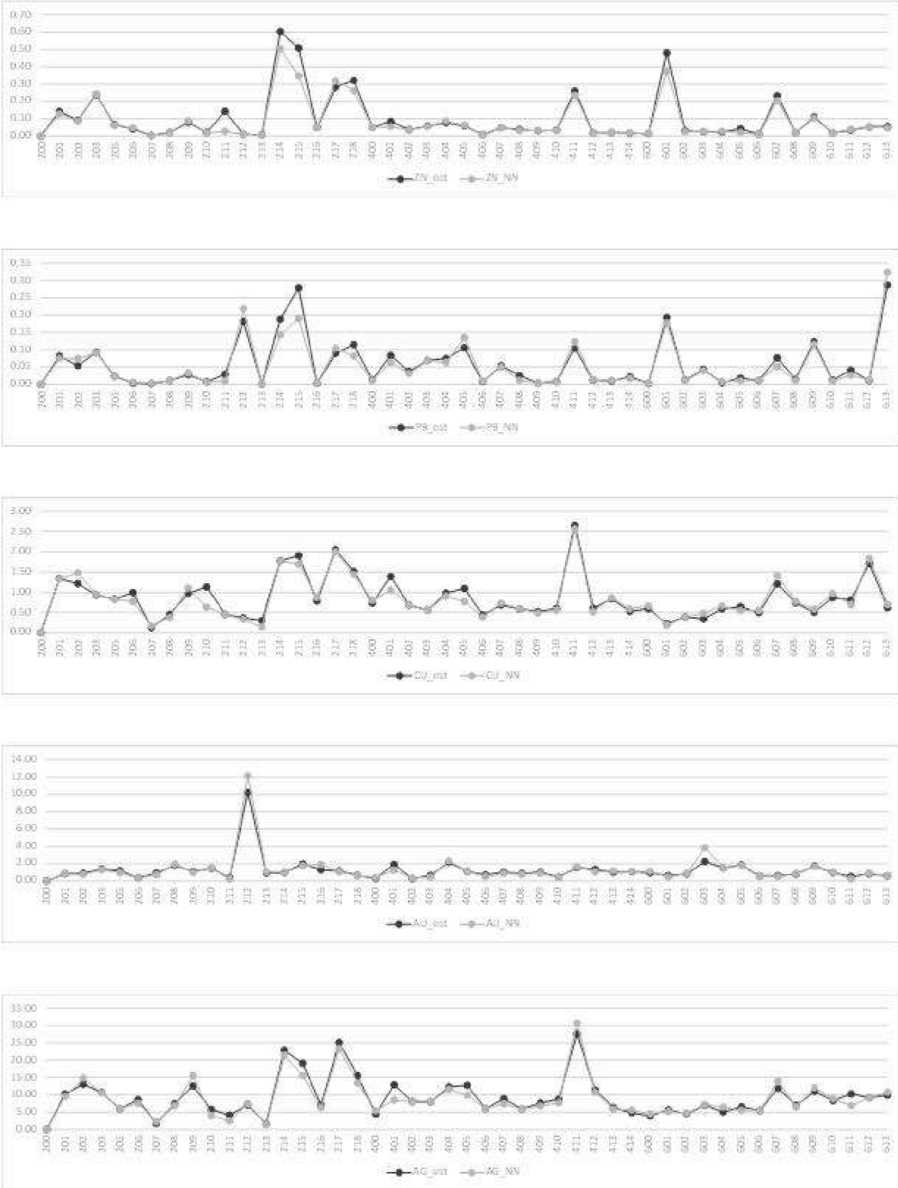

Figure 11-15: Comparison Between OK And NN Means (Stringer) - Arex, Link, and Ambrex

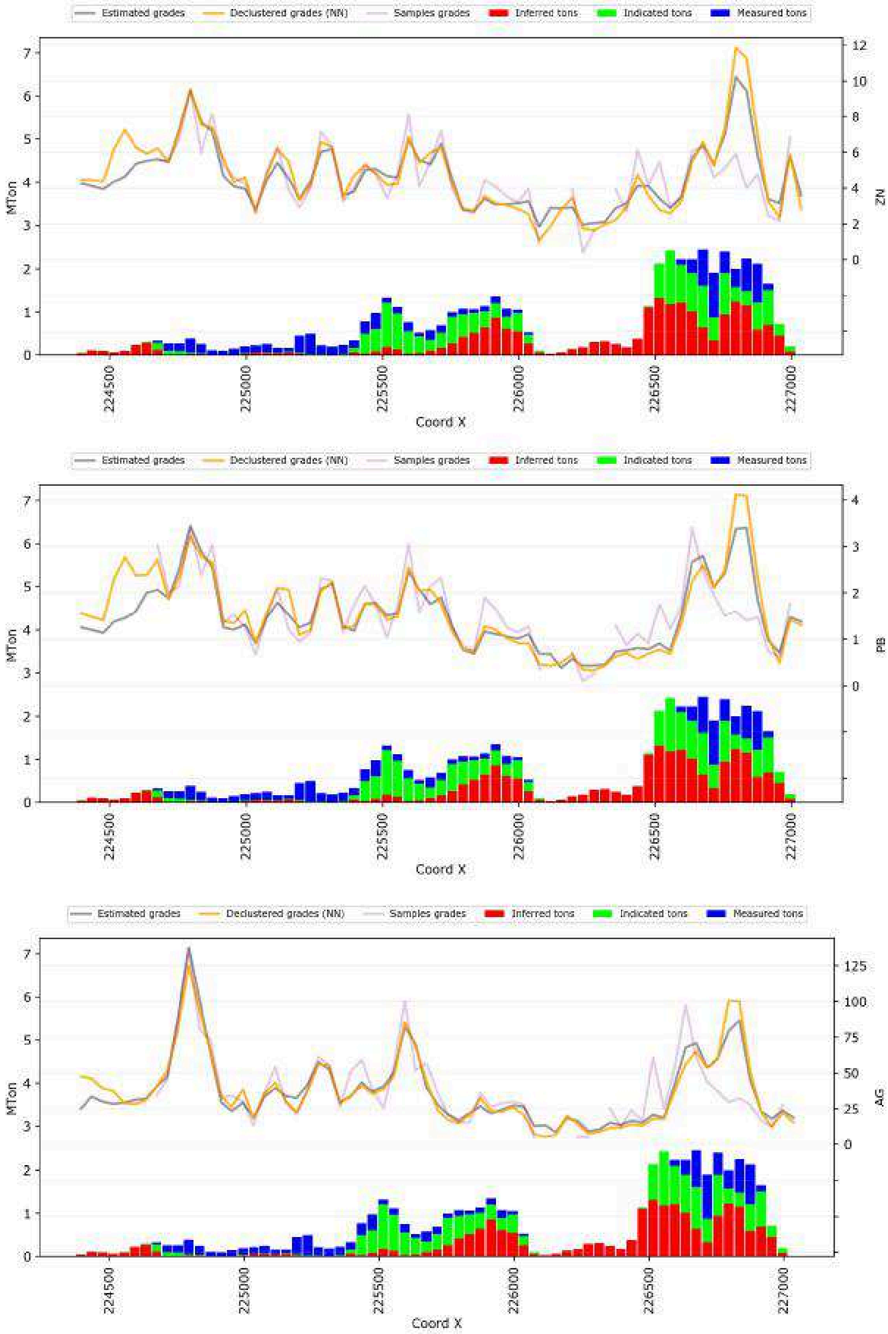

Figure 11-16: Swath Plot – Stratabound – Easting

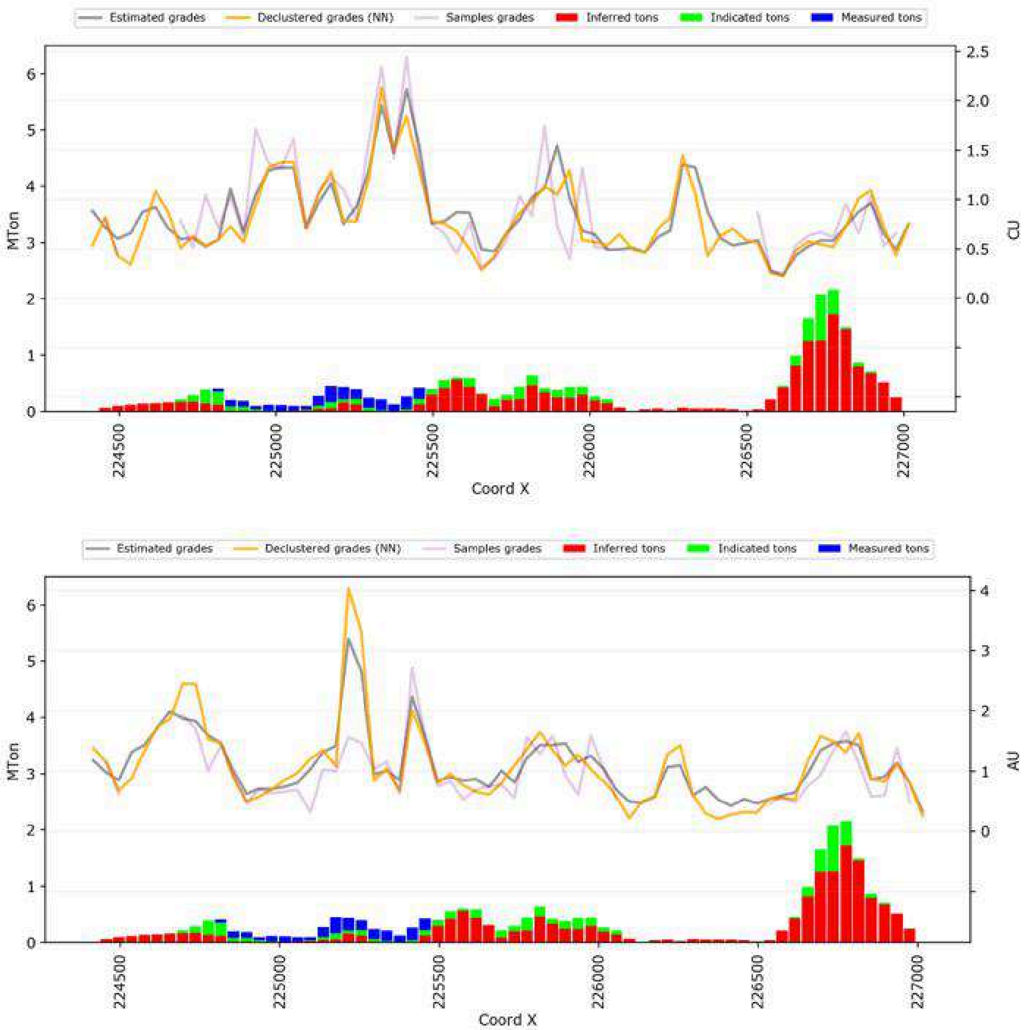

Figure 11-17: Swath Plot – Stringer – Easting

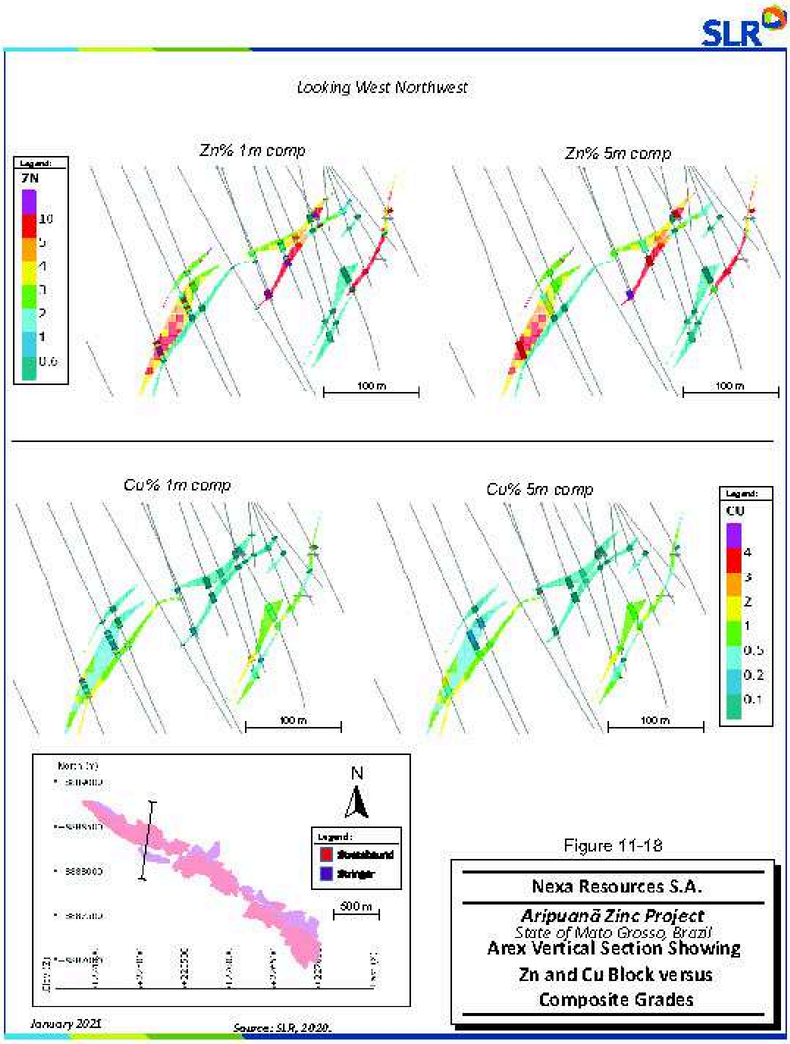

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Figure 11-18: Arex Vertical Section Showing Zn and Cu Block versus Composite Grades

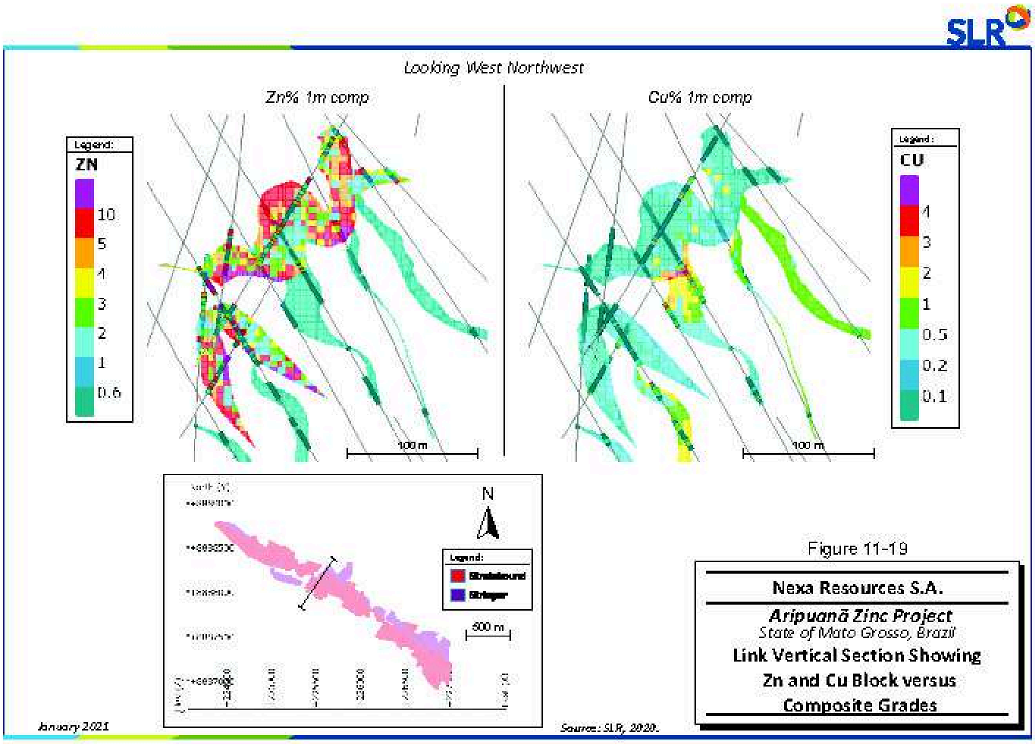

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Figure 11-19: Link Vertical Section Showing Zn and Cu Block versus Composite Grades

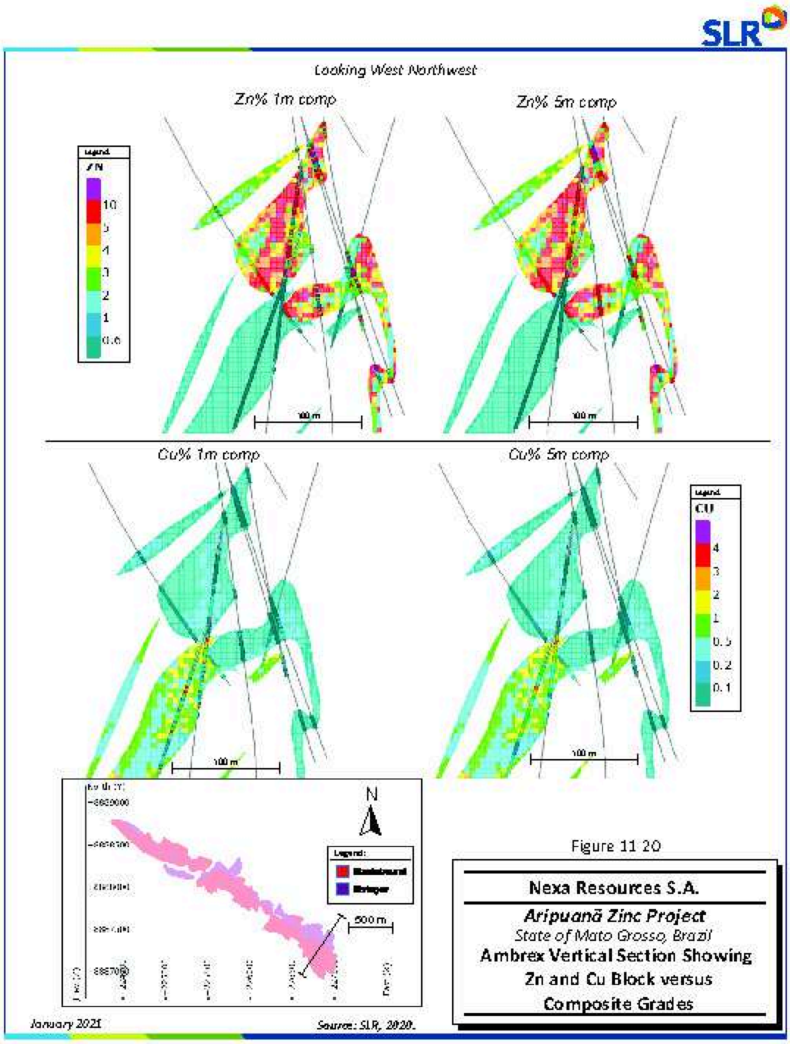

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Figure 11-20: Ambrex Vertical Section Showing Zn and Cu Block versus Composite Grades

11.6 Babaçú

11.6.1 Resource Database

The resource database contains drilling information and analytical results up to December 31, 2019. Information received after this date was not used in the Mineral Resource estimate. The database used comprises Babaçú and Ambrex drilling. There is a total of 44 drill holes intersecting the Babaçú mineralization (26,889 m).

Nexa maintains the resource database in Datamine Fusion. Data were amalgamated and parsed as required and imported into Datamine Studio and Leapfrog. Despite the changes of the database coordinates datum during 2019 (from SAD69 to SIRGAS2000 - zone 21S), the Babaçú model was still made using the SAD69 datum.

Section 9 describes the resource database verification steps carried out by Nexa and SLR. SLR is of the opinion that the drill hole database is valid and suitable to estimate Mineral Resources for the Project.

11.6.2 Geological Interpretation

Wireframes of the stratabound and stringer mineralization at Babaçú were constructed considering geology at a cut-off grade of 0.6% Zn (or Pb) in the stratabound zones and 0.5% Cu in the stringer zones in Leapfrog (Figure 11-21). Samples with both zinc and copper grades above cut-off grades were considered to be stratabound type mineralization. Some drill hole intercepts with grades below cut-off grade were included to maintain geological continuity. The mineralization wireframes follow a similar interpretation to the Ambrex deposit.

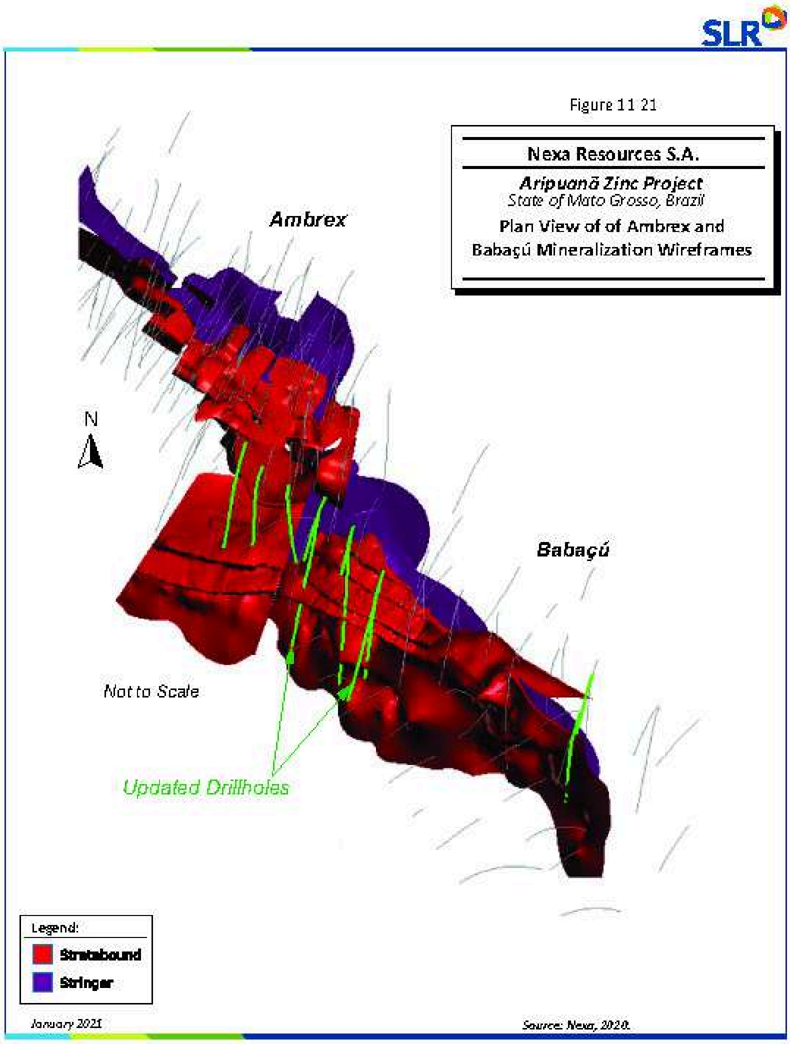

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Figure 11-21: Plan View of Ambrex and Babaçú Mineralization Wireframes

11.6.3 Capping of High Grades

Nexa applied high grade capping to Zn, Pb, Cu, Au, and Ag assays in order to limit the influence of a small amount of extreme values located in the upper tail of the metal distributions. Log probability plots were inspected for stratabound and stringer wireframes and capping grades were selected according to inflections on log probability plots (Figure 11-22). A summary of capping grades used and capped versus uncapped statistics are provided in Table 11-12 and Table 11-13.

SLR reviewed the capping levels utilized by Nexa and is of the opinion that, in general, the capping grades are reasonable.

Table 11-12: Babaçú Grade Capping Levels
Nexa Resources S.A. – Aripuanã Zinc Project

	Capping Values – Mineralized Domains				
Domain	**Zn (%)**	**Pb (%)**	**Cu (%)**	**Au (g/t)**	**Ag (g/t)**
Stratabound	30	13	2	1	300
Stringer	3	3	9	6	250

Table 11-13: Babaçú Uncapped versus Capped Assay Statistics
Nexa Resources S.A. – Aripuanã Zinc Project

					Uncapped					Capped					
Type	**Grade**	**Count**	**Sampled**	**Minimum**	**Maximum**	**Mean**	**Stdev**	**Variance**	**CV**	**Maximum**	**Mean**	**Stdev**	**Variance**	**CV**	**Metal Loss**
Stratabound	Zn (%)	2227	2227	0.0013	42.04	2.96	5.19	26.98	1.76	30	2.93	5.06	25.64	1.73	-1%
	Pb (%)	2227	2227	0.0002	51.83	1.16	2.86	8.21	2.48	13	1.08	2.15	4.62	2	-7%
	Cu (%)	2227	2227	0.0001	13.85	0.14	0.53	0.28	3.68	2	0.12	0.33	0.11	2.69	-16%
	Au (g/t)	2227	2073	0.0025	6.87	0.11	0.32	0.1	3.02	1	0.09	0.18	0.03	1.96	-16%
	Ag (g/t)	2227	2227	0	1150	31.83	71.21	5070.5	2.24	300	29.4	53.02	2811.1	1.8	-8%
Stringer	Zn (%)	550	550	0.0009	9.03	0.2	0.7	0.49	3.45	3	0.17	0.42	0.17	2.43	-15%
	Pb (%)	550	550	0.0001	23.48	0.21	1.11	1.24	5.35	3	0.16	0.42	0.18	2.7	-25%
	Cu (%)	550	550	0.0004	18.65	1.02	1.7	2.88	1.66	9	0.99	1.45	2.12	1.47	-3%
	Au (g/t)	550	550	0.0025	34.1	0.62	1.77	3.12	2.84	6	0.55	0.96	0.93	1.76	-12%
	Ag (g/t)	550	550	0.03	607	25.07	48.81	2382.5	1.95	250	23.99	40.83	1667	1.7	-4%

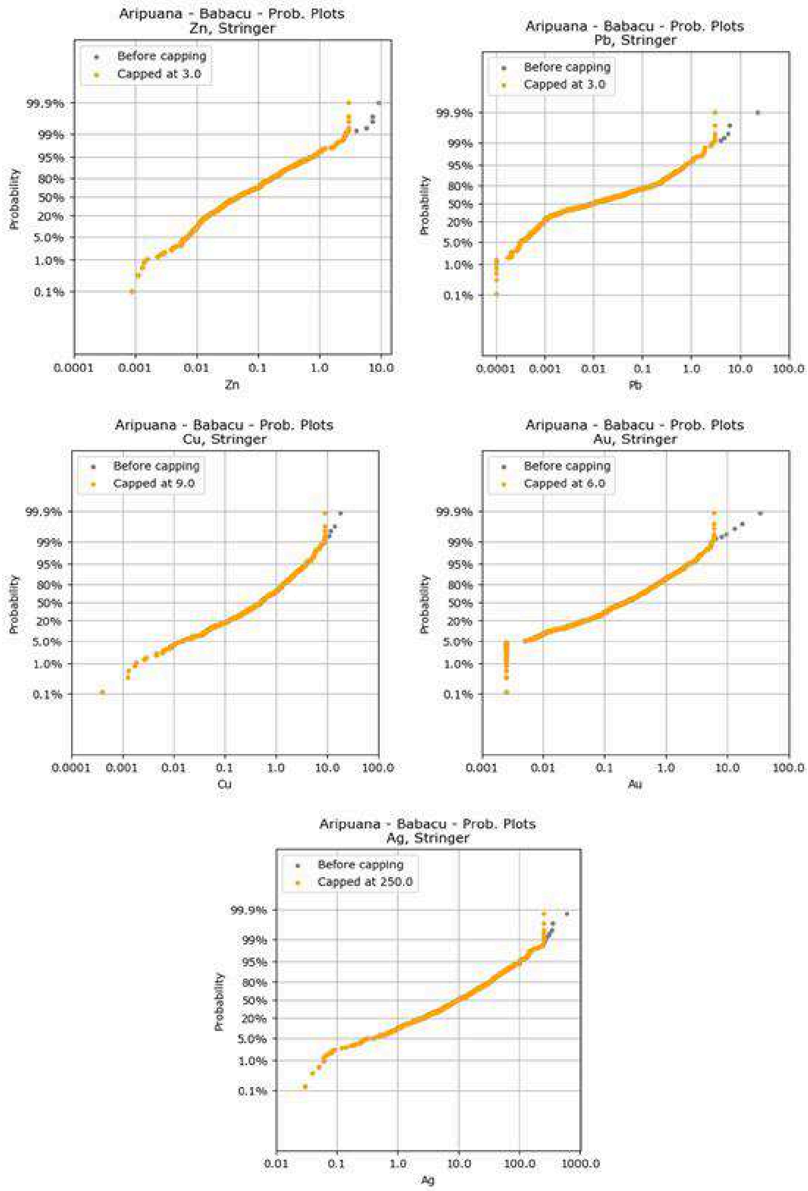

Figure 11-22: Babaçú Capping Analysis for Stringer

11.6.4 Compositing

Nexa composited the capped assays to one metre, which corresponds to the dominant sampling length for the deposit. Composites were weighted by length (Figure 11-23).

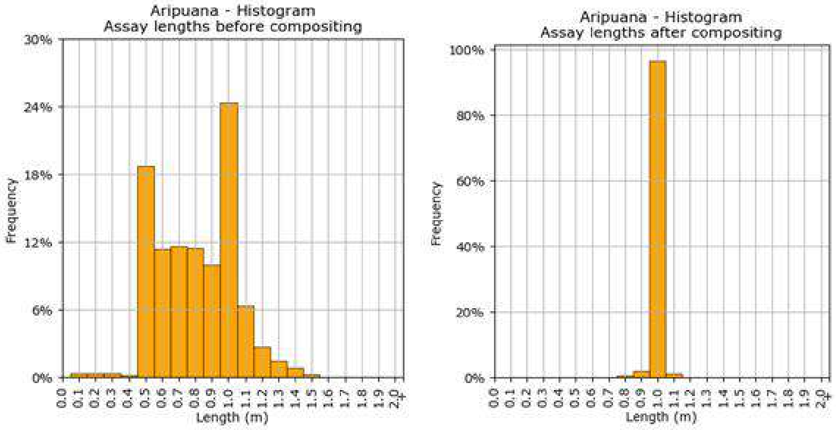

Figure 11-23: Histograms for Assay (Left) and Composite (Right) Lengths - Babaçú

11.6.5 Exploratory Data Analysis

Nexa performed exploratory statistical analysis including bivariate and univariate statistical analysis. The univariate statistics for the composites are provided in Table 11-14.

The bivariate analysis results show strong correlations for stratabound Pb-Zn, Pb-Ag, and Cu-Au mineralization and good correlations for stringer Cu-Ag mineralization.

Figure 11-24 presents the correlation matrices by type and area.

Table 11-14: Babaçú Composite Statistics
Nexa Resources S.A. – Aripuanã Zinc Project

					Uncapped					Capped					
Type	Grade	Count	Sampled	Minimum	Maximum	Mean	Stdev	Variance	CV	Maximum	Mean	Stdev	Variance	CV	Metal Loss
Stratabound	Zn (%)	1792	1792	0.0013	40.16	2.96	4.73	22.38	1.6	30	2.93	4.6	21.19	1.57	-1%
	Pb (%)	1792	1792	0.0002	40.79	1.16	2.47	6.1	2.14	13	1.08	1.92	3.67	1.78	-7%
	Cu (%)	1792	1792	0.0001	9.17	0.14	0.47	0.22	3.27	2	0.12	0.3	0.09	2.5	-16%
	Au (g/t)	1792	1646	0.0025	4.58	0.11	0.28	0.08	2.6	1	0.09	0.16	0.03	1.81	-16%
	Ag (g/t)	1792	1792	0.0202	730	31.83	62.14	3861	1.95	300	29.4	47.26	2233.14	1.61	-8%
Stringer	Zn (%)	439	439	0.001	8.63	0.2	0.64	0.41	3.14	3	0.17	0.39	0.15	2.26	-15%
	Pb (%)	439	439	0.0001	18.33	0.21	0.98	0.96	4.7	2.74	0.16	0.37	0.14	2.4	-25%
	Cu (%)	439	439	0.0004	17.23	1.02	1.55	2.39	1.51	9	0.99	1.32	1.75	1.34	-3%
	Au (g/t)	439	439	0.0025	22.27	0.62	1.44	2.06	2.31	4.97	0.55	0.84	0.71	1.53	-12%
	Ag (g/t)	439	439	0.04	425.95	25.07	44.91	2017.11	1.79	250	23.99	37.96	1440.79	1.58	-4%

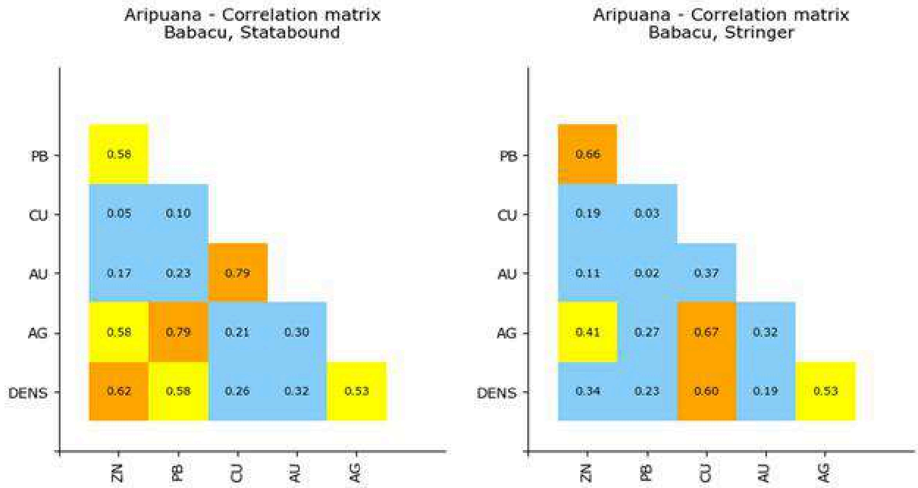

Figure 11-24: Correlation Matrices by Mineralization Type - Babaçú

11.6.6 Block Model

Babaçú wireframes were filled with blocks in Datamine Studio RM. The final block model covers both zones. The block model was sub-celled at wireframes boundaries with parent cells measuring 10 m by 5 m by 5 m and minimum sub-cell sizes of 1.25 m by 1.00 m by 0.50 m. The block model setup and a description of the block model attributes are given in the sequence (Table 11-15).

The block size is appropriate for the drill spacing and proposed mining method and is suitable to support the estimation of Mineral Resources and Mineral Reserves. Comparisons between wireframe and block model volumes are good.

Table 11-15: Babaçú Block Model Setup
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	X	Y	Z
Origin (m)	226,350	8,885,950	-900
Block Size (m)	10	5	5
Number of Blocks	165	300	250

11.6.7 Interpolation Strategy

Grades were interpolated into blocks on a parent cell basis using ID³. Variables Zn, Pb, Cu, Au, Ag, and density are interpolated, and estimates are not density weighted.

Search ellipsoids were oriented based on dynamic anisotropy angles extracted for the mineralization wireframes. The estimation strategy is summarized in Table 11-16.

Table 11-16: Babaçú Sample Selection Strategy
Nexa Resources S.A. – Aripuanã Zinc Project

Pass Number	Search Ranges (m)			Selection Criteria		
	X	Y	Z	Minimum Samples	Maximum Samples	Max per hole
1	20	20	10	6	15	5
2	50	50	25	6	15	5
3	100	100	50	6	15	5
4	250	250	100	1	12	-

11.6.8 Classification

Definitions for resource categories used for Babaçú are those defined by the SEC for Mineral Resources in S-K 1300.

Babaçú blocks were classified as Inferred only due to large drill hole spacing in the area. The Inferred classification criteria are based on a drilling grid of 100 m. A large proportion of blocks were left unclassified due to the large drill spacing and complex structural context.

Figure 11-25 presents the final classification designation.

The classification of the Mineral Resource estimate was applied as follows:

- Inferred: Inferred blocks were defined, based on a drilling grid of 100 m, and supported with data of a low and/or medium and/or high level of uncertainty as follows:
  - Drilling, sampling, and sample preparation and assay procedures s follow industry standards and best practices.
  - Reliability of sampling data: Excellent database integrity and representativity based on SLR's independent data verification and validation, as well as no significant bias observed in QA/QC analysis results.
  - Confidence in interpretation and modelling of geological and estimation domains. Babaçú has a complex geometry and extrapolation of the interpretations in in areas of wider drill hole spacing is implied.
  - Good agreement of visual assessments of the geometries of mineralized domain in relation to drill hole spacing. Babaçú interpretations are implied from areas of wider drill hole spacing.
  - Geology and grade continuity. Based on drilling, trend analysis and variography, the deposit shows good geology and grade continuity. The location and continuity of grade is implied by the current drilling pattern.
  - Confidence in estimation of block grades for the main metals. Block grades correlate reasonably with composite data, statistically and spatially, locally and globally.
  - Acceptable bulk density representativity. Sufficient density measurements have been taken over the entire deposit.
  - Infill drilling is required to determine continuity of mineralization in areas of wide drill spacing in order to upgrade Inferred Resources to Indicated. Inferred drilling spacing was defined based on reasonable distances.

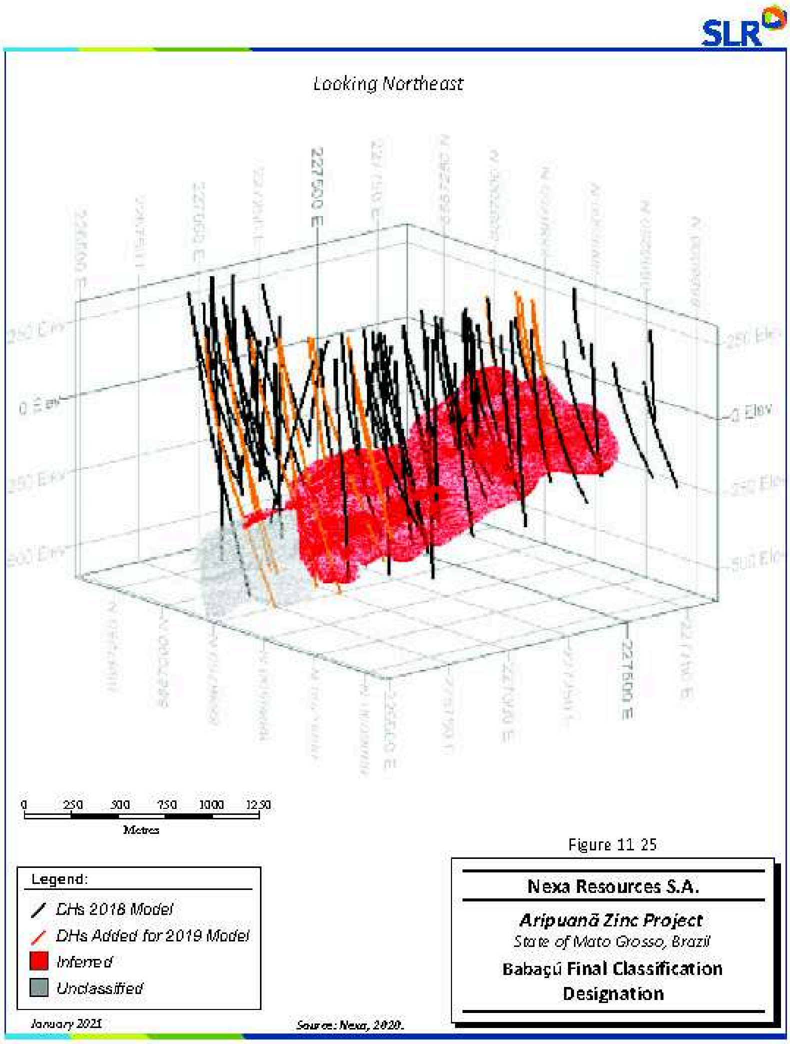

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Figure 11-25: Babaçú Final Classification Designation

11.6.9 Block Model Validation

A number of validation steps were performed by Nexa including:

- Comparison between ID³ and NN mean grades (Table 11-17).
- Swath plots (Figure 11-26 to Figure 11-30).
- Visual inspection of composites versus block grades (Figure 11-31 and Figure 11-32).

In SLR's opinion, the validation was performed using typical industry standard validation techniques and in general, the results presented are suitable for an Inferred Mineral Resource.

Table 11-17: Comparison Between ID³ and NN Means - Babaçú
Nexa Resources S.A. – Aripuanã Zinc Project

Domain	Grade	Estimate Mean	NN Mean	Est./NN
Inferred Stratabound	Zn (%)	2.99	2.97	100.7%
	Pb (%)	1.24	1.34	93.0%
	Cu (%)	0.18	0.16	108.4%
	Au (g/t)	0.11	0.10	106.5%
	Ag (g/t)	34.1	35.3	96.7%
Unclassified Stratabound	Zn (%)	3.82	3.99	95.7%
	Pb (%)	1.65	1.94	84.9%
	Cu (%)	0.18	0.18	97.9%
	Au (g/t)	0.13	0.13	100.1%
	Ag (g/t)	36.5	41.7	87.4%
Unclassified Stringer	Zn (%)	0.18	0.18	98.0%
	Pb (%)	0.14	0.14	102.0%
	Cu (%)	1.33	1.32	100.8%
	Au (g/t)	0.80	0.78	102.2%
	Ag (g/t)	32.6	32.0	101.8%

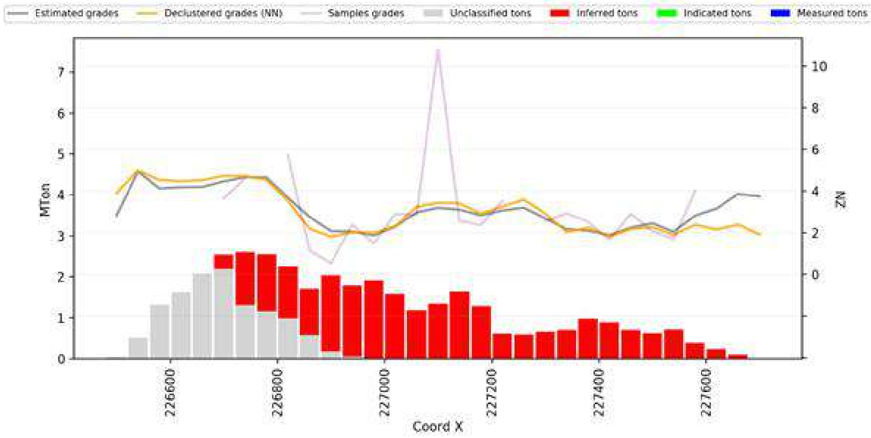

Figure 11-26: Babaçú Zn Stratabound Swath Plot – Easting

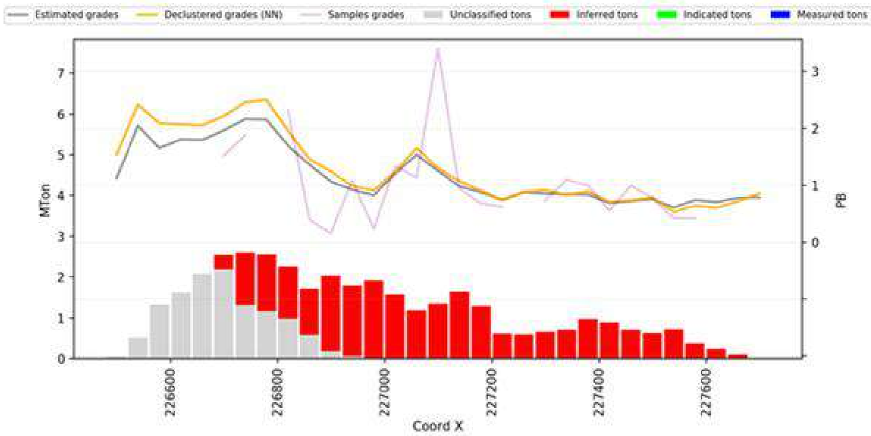

Figure 11-27: Babaçú Pb Stratabound Swath Plot – Easting

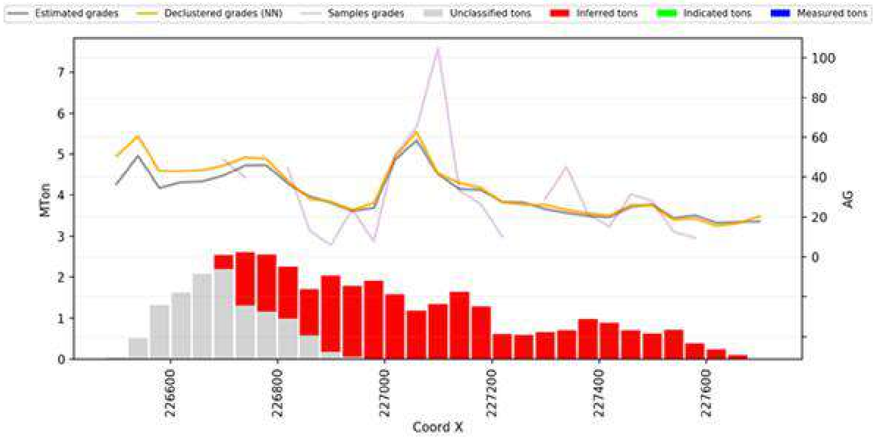

Figure 11-28: Babaçú Ag Stratabound Swath Plot – Easting

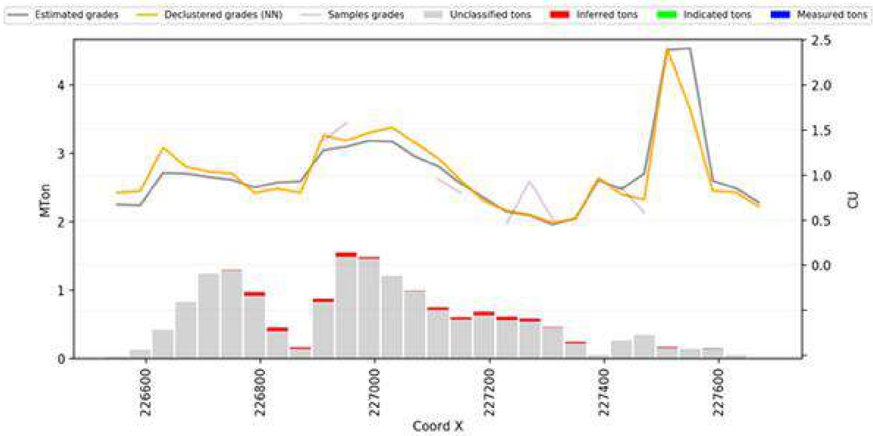

Figure 11-29: Babaçú Cu Stringer Swath Plot – Easting

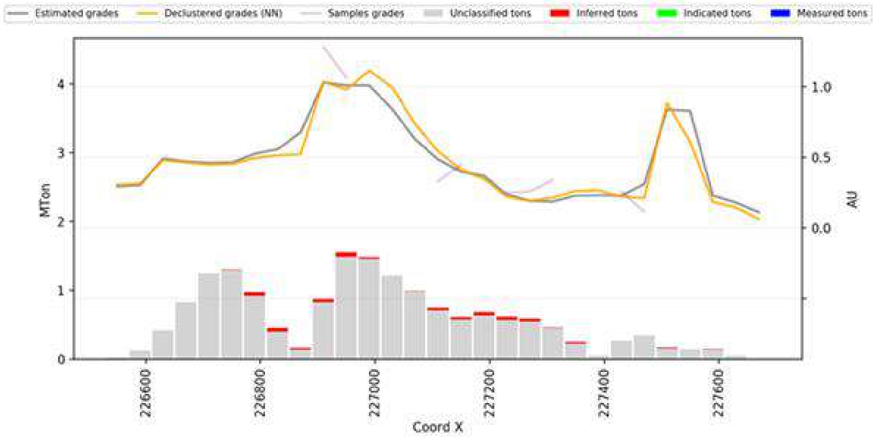

Figure 11-30: Babaçú Au Stringer Swath Plot – Easting

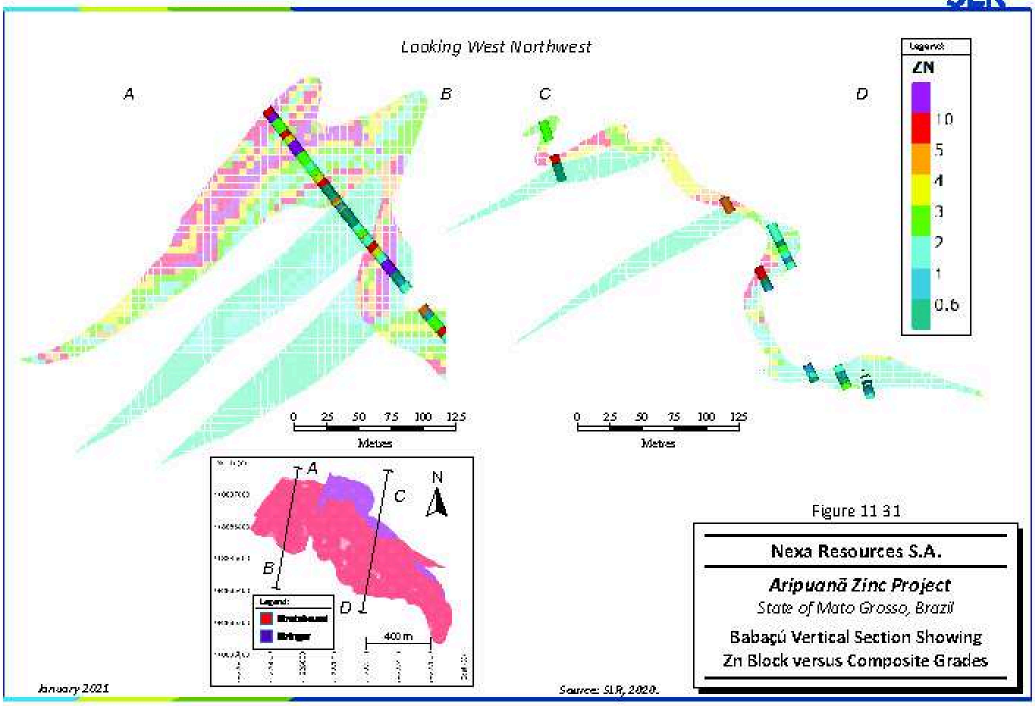

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Figure 11-31: Babaçú Vertical Sections Showing Zn Block versus Composite Grades

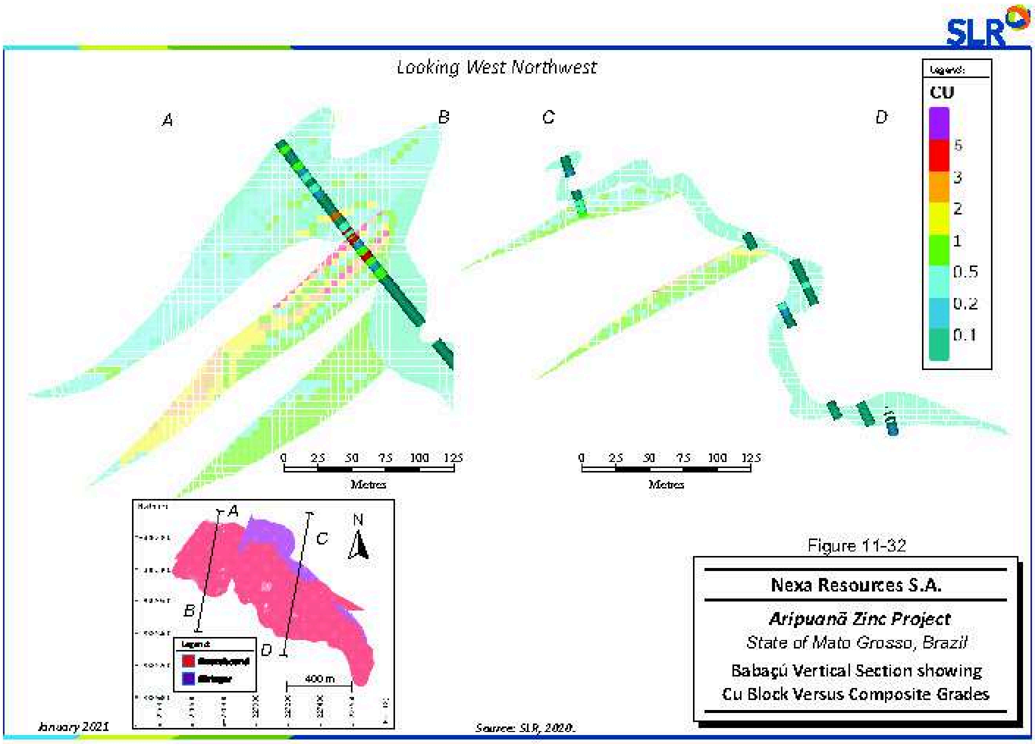

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Figure 11-32: Babaçú Vertical Sections Showing Cu Block versus Composite Grades

11.7 Risks and Uncertainties to Mineral Resources

Based on SLR's review of the Aripuanã Mineral Resource estimate, the following risks have been identified:

- Inflation of wireframe volumes due to poorly angled holes at Ambrex.
- Metal price volatility, lower long-term metal prices would result in a decrease in Mineral Resources.
- Variability in grade may result in variances in the reconciliation results during production.
- The classification is currently based theoretical criteria and will need to be refined with experience during mining.

Many of the risks and uncertainties related to the Mineral Resources can be resolved by additional drilling and reconciliation once commercial production is achieved.

12.0 MINERAL RESERVE ESTIMATES

12.1 Summary

The Mineral Reserves were estimated by Nexa and reviewed by SLR.

The Aripuanã Mineral Reserves are based in three main orebodies, Arex, Link, and Ambrex. The main commodities produced are zinc, lead, copper, silver, and gold. The Mineral Reserve estimate for the Project as of September 30, 2020 is presented in Table 12-1.

Table 12-1: Summary of Mineral Reserves – September 30, 2020
Nexa Resources S.A. – Aripuanã Zinc Project

Deposit/Category	Tonnes (Mt)	Grade				
		(% Zn)	(% Pb)	(% Cu)	(g/t Au)	(g/t Ag)
Arex						
Proven	4.216	2.97	1.07	0.65	0.45	33.83
Probable	1.101	1.99	0.69	0.75	0.75	23.97
Proven & Probable	**5.317**	**2.77**	**0.99**	**0.67**	**0.52**	**31.78**
Link						
Proven	1.370	4.63	1.73	0.13	0.27	37.78
Probable	5.342	3.95	1.32	0.22	0.32	32.31
Proven & Probable	**6.713**	**4.09**	**1.40**	**0.20**	**0.31**	**33.42**
Ambrex						
Proven	4.495	4.18	1.59	0.05	0.15	37.55
Probable	6.982	3.59	1.44	0.12	0.27	34.81
Proven & Probable	**11.477**	**3.82**	**1.50**	**0.09**	**0.22**	**35.88**
Total						
Proven	10.082	3.74	1.39	0.31	0.29	36.02
Probable	13.425	3.60	1.33	0.21	0.33	32.93
Proven & Probable	**23.507**	**3.66**	**1.36**	**0.25**	**0.31**	**34.25**

Notes:

1. The definitions for Mineral Reserves in S-K 1300 were followed for Mineral Reserves which are consistent with CIM (2014) definitions.
2. The Mineral Reserve estimate is reported on a 100% Nexa attributable ownership basis.
3. Mineral Reserves are estimated at a break-even cut-off value of NSR = US$45.00/t processed. Some incremental material with values between US$40/t and US$45/t was included.
4. Mineral Reserves are estimated using an average long-term zinc price of US$1.13/lb Zn, a long-term lead price of US$0.89/lb Pb, a long-term copper price of US$2.93/lb Cu, a long-term silver price of $16.85/oz Ag, and a long-term gold price of US$1,538/oz Au.

5. Metallurgical recoveries are accounted for in the NSR calculations based on metallurgical test work and are variable as a function of head grade. Recoveries at the LOM average head grades for stratabound material are 89.4% for Zn, 83.4% for Pb, 67.5% for Cu, 70.0% for Ag, and 70.0% for Au. Recoveries at the LOM average head grades for stringer material are 88.8% for Cu, 50.0% for Ag, and 50.0% for Au.
6. A minimum mining width of 4 m was used.
7. Numbers may not add due to rounding.

Contained metal in the Mineral Reserves consists of 859,800 t Zn, 319,000 t Pb, 59,700 t Cu, 25.9 Moz Ag and 236,100 oz Au.

Nexa reviewed supply and demand projections for zinc, lead, and copper, as well as consensus long-term (10 year) metal price forecasts. SLR verified that Nexa's selected metal prices for estimating Mineral Reserves are in line with independent forecasts from banks and other lenders.

The SLR QP is not aware of any risk factors associated with, or changes to, any aspects of the modifying factors such as mining, metallurgical, infrastructure, permitting, or other relevant factors that could materially affect the Mineral Reserve estimate.

12.2 Dilution

The dilution that has been applied is related to the selected mining method. The two main mining methods used at Aripuanã are longitudinal longhole retreat (bench stoping) and transverse longhole mining (vertical retreat mining or VRM) with primary and secondary stope extraction. Dilution is applied on a percentage basis, with no grade applied to the diluting material. The dilution for each method is summarized in Table 12-2.

Table 12-2: Dilution
Nexa Resources S.A. – Aripuanã Zinc Project

Item	Percent Dilution (%)
Development	0
Bench Stope	15
Primary VRM	5
Secondary VRM	12

In SLR's opinion, it is better to apply dilution as a hanging wall/footwall distance, rather than a global percentage (as has been done here). The percentage approach applies too much dilution to larger stopes and not enough to smaller stopes.

SLR reviewed the impact of applying this method to the Mineral Reserves, and observed the following:

- The application of this method has little impact on VRM stopes – the stope size is fairly constant.
- To check the impact on Bench Stopes, a dilution of 1.25 m was applied to each side (which results in the global percentage of 15% dilution at the average width of eight metres).
- Bench Stopes range from four metres wide to 15 m wide.
- Applied to narrower stopes (four metres to six metres wide, or the bottom 18% of the range), this gives 31.6% to 20.8% dilution (higher than average, as expected).
- Applied to wider stopes (13 m to 15 m wide, or the top 18% of the range), this gives 8.3% to 9.7% dilution (lower than average, as expected).
- The groups are fairly well balanced – 20% of stopes are narrow, 24% are wide. There is no significant skew here to introduce a bias to the total.

- The higher dilution would cause 14 narrow stopes to drop below an NSR of $40/t, however, they remain within the range of the incremental cut-off.
- SLR did not observe any instances where wider stopes were rejected because they have too much dilution at 15% but may meet cut-off criteria at 8% to 10% dilution.

Based on the above, SLR concludes that using percentage dilution may introduce small inaccuracies to some individual stope estimates, however, it has little impact on the overall estimate.

SLR has reviewed the impacts of changes to the dilution estimate. While increasing dilution could render some reserves below cut-off grade, the proportion is relatively low and overall the Mineral Reserves are relatively insensitive to dilution fluctuations.

12.3 Extraction

The extraction ratio is related to the mining method and is applied on a percentage basis. The amount of extraction for each method is presented in Table 12-3.

Table 12-3: Extraction Percentage
Nexa Resources S.A. – Aripuanã Zinc Project

Item	Extraction (%)
Development	100
Bench Stope	90
Primary VRM	90
Secondary VRM	85

Mineral Reserve tonnage and metal content are affected in direct proportion to variations in extraction.

12.4 Cut-off Value

The NSR cut-off value was determined using the Mineral Reserve metal prices, metal recoveries, transport, treatment, and refining costs, as well as mine operating cost. Metal prices are based on Nexa's projections. Nexa's long term price model uses multiple variables including supply (mine and refined), demand, cost drivers, capital cost, and other key elements. The long-term prices derived are in line with the consensus annual forecasts for the next ten years from independent banks and financial institutions.

The cut-off value used for the Mineral Reserves is based on an NSR value. The NSR formula is:

$$NSR = (\text{Total Operating Cost})/(\text{Tonnes Processed})$$

The two main types of mineralization in the deposit are stratabound and stringer. These two types of mineralization have different processing characteristics, and as a result, different parameters are used to calculate their respective NSR value. Cut-off and NSR parameters used to calculate the NSR value are summarized in Table 12-4. The break-even NSR cut-off value is approximately US$34.35/t. First-pass mine design used a cut-off value of $US45/t, to allow for uncertainty around exchange rates (break-even cut-off NSR plus a US$10/t margin). Upon review of the results, a limited number of stopes with NSR values down to US$40.00/t were included for continuity.

NSR factors are applied directly to the design based on the Net Revenue by Metal as presented in Table 12-4.

Table 12-4: NSR DATA
Nexa Resources S.A. – Aripuanã Zinc Project

Item	Units	Stratabound	Stringer
Net Metallurgical Recovery			
Zn	%	89.4	0
Pb	%	83.3	0
Cu	%	59.3	87.8
Au	%	70	63
Ag	%	76	50
Cu Concentrate Payable %			
Cu	%	96.7	
Au	%	90	
Ag	%	90	
Pb Concentrate Payable %			
Pb	%	95	
Au	%	95	
Ag	%	95	
Zn Concentrate Payable %			
Zn	%	85	
Au	%	0	
Ag	%	70	
Charges			
Logistics and TC			
Zn Concentrate	US$/t conc	$363	
Pb Concentrate	US$/t conc	$340	
Cu Concentrate	US$/t conc	$334	
Integrated Zn			
Conversion Cost	US$/t Zn prod	$414	
Premium	US$/t Zn Prod	$233	
Refining Cost			
Au in Pb conc	US$/oz	$10.00	
Au in Cu conc	US$/oz	$8.00	
Ag in Pb conc	US$/oz	$1.00	
Ag in Cu conc	US$/oz	$0.50	
Royalty NSR			
Arex & Link Royalties	%	4.9	

Item	Units	Stratabound	Stringer
Ambrex Royalties	%	5.4	
Net Revenue by Metal			
Zn	%	61	0
Pb	%	15	0
Cu	%	6	58
Au	%	6	40
Ag	%	12	3
Operating Costs			
Mining	US$/t proc	$15.34	
Process and Tailings	US$/t proc	$13.31	
G&A	US$/t proc	$5.69	

13.0 MINING METHODS

13.1 Summary

Currently, Aripuanã is focused on mining three main elongated mineralized zones, Arex, Link, and Ambrex, that have been defined in the central portion of the Project.

The Arex, Link, and Ambrex deposits are separate VMS deposits with differing mineral compositions in stratabound and stringer forms and complex geometric shapes.

The deposit geometry is amenable to a number of underground mechanized mining techniques including cut and fill and bulk stoping methods. A nominal production target of 6,065 tpd has been used as the basis for the mine production schedule.

Mining will be undertaken using conventional mechanized underground mobile mining equipment via a network of declines, access drifts, and ore drives. Access to the Arex, Link, and Ambrex deposits will be via separate portals, which will access the deposits from the most favourable topographic locations.

13.2 Mine Design

The mine design has been based on using modern mobile trackless equipment with independent decline accesses into the Arex, Link, and Ambrex deposits.

The three deposits will be accessed from three independent surface cut and cover portals and ramps designed at a gradient of 14% to be driven with an arched profile and cross-sectional area (CSA) of 27 m^2 to accommodate the selected major equipment. The main loading and hauling equipment will be 12.5 t class load haul dump units (LHD) combined with 35.5 t class haul trucks.

Main mining sublevels will be spaced 75 m apart, with stope sublevels placed at 25 m spacing. The upper sublevel in each level will contain a five metre sill pillar. The two mining methods will be longitudinal retreat longhole mining, and VRM with primary and secondary sequencing. Backfilling of stopes will be completed using paste fill, cemented rockfill, and rockfill.

Figure 13-1 shows the mine design for the entire Project, while Figure 13-2 to Figure 13-4show the mine design for each separate deposit.

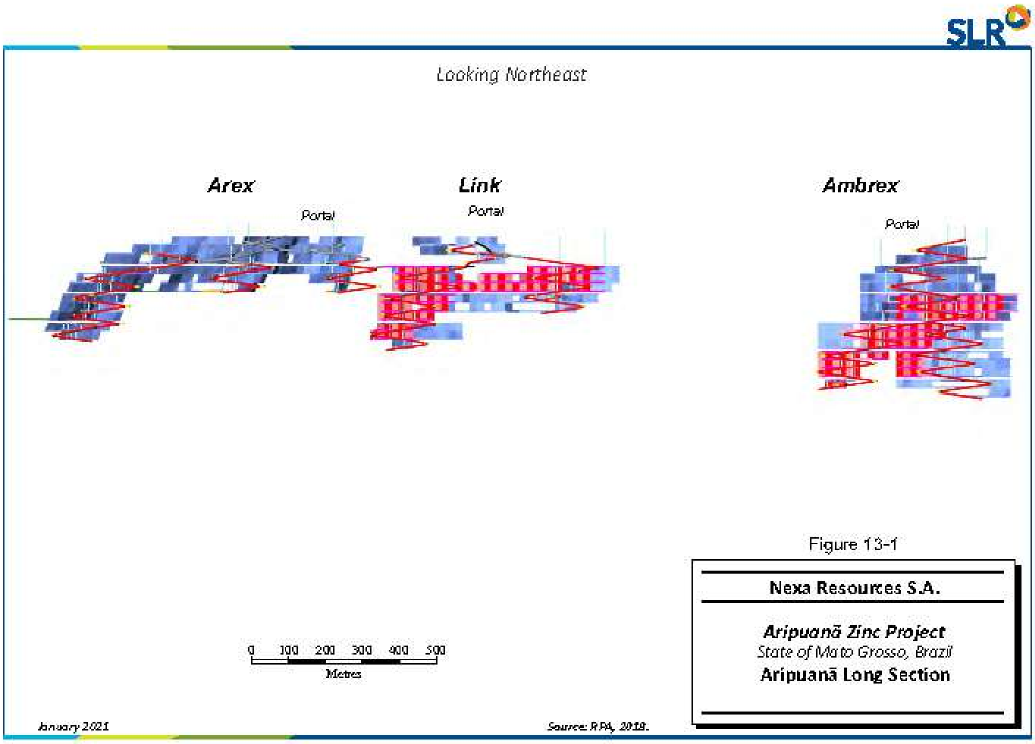

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Figure 13-1: Aripuanã Long Section

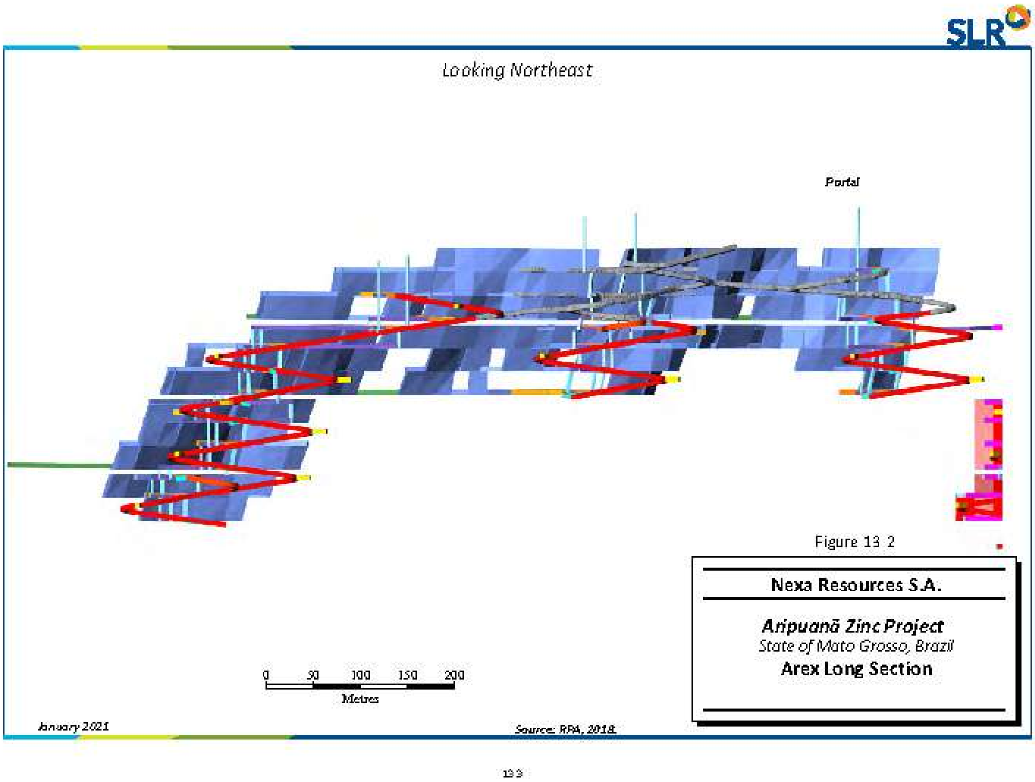


Figure 13-2: Arex Long Section

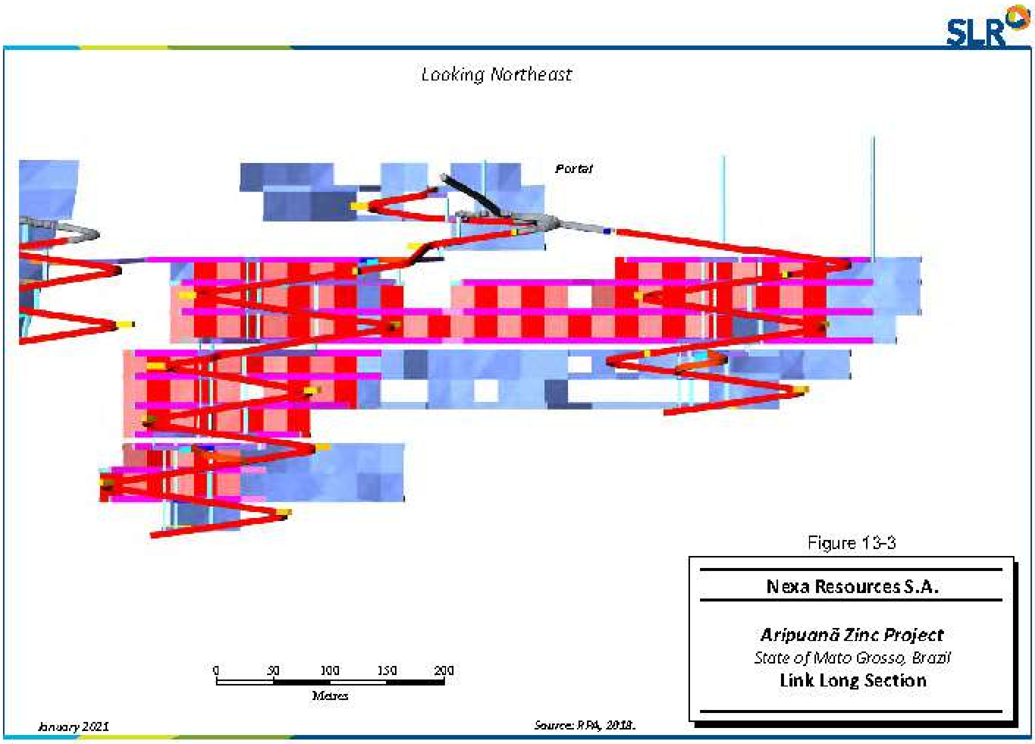
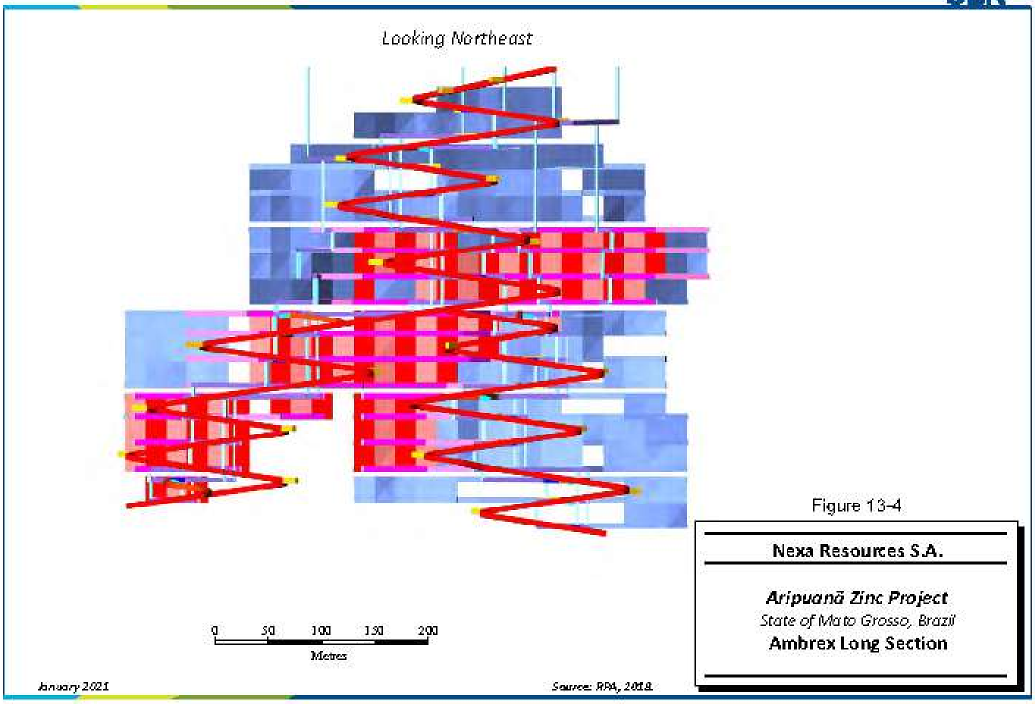


Figure 13-3: Link Long Section



13-5

Figure 13-4: Ambrex Long Section

Material movement at Aripuanã will be completed via ramps using haulage trucks. Primary development consists of ramps and raises. Secondary development consists of cross cuts, level access, footwall drives, ore drives, and all infrastructure development (sumps, remucks, etc.).

Table 13-1 presents the development dimensions used in the current mine design.

Table 13-1: Development Dimensions
Nexa Resources S.A. – Aripuanã Zinc Project

Activity	Type	Dimensions (m)
	Raisebore	3.1 diameter
Primary Development	Ramps	5.0 x 5.5
	Sublevels	
	Cross Cuts	
	Footwall Drives	
	Ore Drives	
Secondary Lateral Development	Sumps, pumps, elec.	5.0 x 5.5

13.3 Mining Method

A nominal production target of 6,065 tpd (2.2 million tonne per annum (Mtpa)) has been used as the basis for the Aripuanã production schedule.

Nexa has undertaken a number of mining method option studies, which have selected a combination of longitudinal longhole retreat stoping (bench stoping) for narrow zones and VRM for thicker zones of the deposits. To increase the extraction ratio, a primary and secondary stoping sequence will be used in the VRM areas with cemented paste fill used to backfill stopes. Finished longhole retreat stopes will be backfilled with rockfill.

The primary mining method selected for the Arex deposit is longitudinal retreat mining. The majority of the Link and Ambrex deposits will be mined using VRM, with longitudinal longhole retreat mining utilized in minor areas. The tonnage split between VRM and bench stoping is approximately 60:40.

An estimate of the potentially mineable tonnage has been generated based upon the estimated Mineral Resources. The estimate includes both Measured and Indicated Mineral Resources. DSO was used to generate stope shapes to a minimum dip of 50°. A Minimum Mining Width (MMW) of four metres has been applied.

No hanging wall or footwall dilution was added in the DSO analysis, however, it was accounted for in the mine scheduling.

13.4 Underground Mining Fleet

The main underground mining fleet is listed below in Table 13-2. The fleet will be mainly sourced from Sandvik AB, Normet Group Oy, and Volvo Group.

13.5 Labour

The Aripuanã Zinc Project will see an increase of personnel on site as the project ramps up. Table 13-3 below shows the personnel ramp up over the life of mine.

Table 13-2: Main Underground Mining Fleet
Nexa Resources S.A. – Aripuanã Zinc Project

			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Scaler	Arex	Arex - Scaler	-	0.6	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-
	Link	Link - Scaler	-	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Ambrex	Ambrex - Scaler	-	-	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0
	Total	Total - Scaler	-	1.0	1.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	2.0
Robolt	Arex	Arex - Robolt	-	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-
	Link	Link - Robolt	-	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Ambrex	Ambrex - Robolt	-	-	0.5	1.0	2.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0	1.0
	Total	Total - Robolt	-	1.0	1.0	3.0	4.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	2.0
Jumbo	Arex	Arex - Jumbo	-	0.6	0.5	1.0	1.1	2.0	1.1	1.2	1.0	1.0	1.0	1.0	-
	Link	Link - Jumbo	-	-	-	1.3	1.2	1.1	2.0	1.2	2.0	2.0	1.0	1.0	1.0
	Ambrex	Ambrex - Jumbo	-	-	0.5	1.3	1.8	1.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Total	Total - Jumbo	-	1.0	1.0	4.0	5.0	4.0	5.0	4.0	5.0	5.0	4.0	4.0	3.0
Truck 30t	Arex	Arex - Truck 30t	-	1.0	0.7	1.0	1.3	1.7	1.8	1.9	1.7	1.2	0.8	0.1	-
	Link	Link - Truck 30t	-	-	-	2.2	1.7	1.7	1.8	2.2	2.0	1.8	1.3	2.0	1.1
	Ambrex	Ambrex - Truck 30t	-	-	0.4	2.2	3.0	2.5	2.3	2.2	2.7	3.3	4.4	4.0	5.1
	Total	Total - Truck 30t	-	1.2	1.2	6.0	6.0	6.0	6.0	7.0	7.0	7.0	7.0	7.0	7.0
Truck 45t	Arex	Arex - Truck 45t	1.0	2.3	2.7	3.0	3.2	2.3	2.1	2.6	1.9	1.6	1.7	3.8	-
	Link	Link - Truck 45t	-	1.8	3.0	4.0	3.1	1.9	3.1	3.2	2.7	2.9	3.3	1.7	2.6
	Ambrex	Ambrex - Truck 45t	-	-	-	0.1	0.7	2.3	2.4	1.9	3.9	4.1	4.1	4.0	6.6
	Total	Total - Truck 45t	2.0	5.0	6.0	8.0	7.0	7.0	8.0	8.0	9.0	9.0	10.0	10.0	10.0
LHD R1700	Arex	Arex - LHD R1700	-	0.7	0.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.2	-

			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
	Link	Link - LHD R1700	-	-	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Ambrex	Ambrex - LHD R1700	-	-	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.1	1.1	1.1	1.1
	Total	Total - LHD R1700	-	1.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
LHD R2900	Arex	Arex - LHD R2900	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-
	Link	Link - LHD R2900	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Ambrex	Ambrex - LHD R2900	-	-	-	0.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1
	Total	Total - LHD R2900	1.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	2.0
Fandrill	Arex	Arex - Fandrill	1.0	2.0	2.0	1.3	2.0	1.0	1.0	1.0	1.0	0.7	0.7	0.8	-
	Link	Link - Fandrill	0.9	2.0	3.0	3.0	2.0	2.0	1.3	2.0	1.0	2.0	1.2	0.6	0.6
	Ambrex	Ambrex - Fandrill	-	-	0.1	1.0	1.0	1.3	2.0	2.0	1.7	1.8	2.0	2.0	3.0
	Total	Total - Fandrill	2.0	4.0	5.0	5.0	5.0	4.0	4.0	5.0	4.0	5.0	4.0	3.0	4.0
Cabolt	Arex	Arex - Cabolt	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-
	Link	Link - Cabolt	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Ambrex	Ambrex - Cabolt	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.2
	Total	Total - Cabolt	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Table 13-3: Site Personnel
Nexa Resources S.A. – Aripuanã Zinc Project

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Mine		39	118	273	450	456	456	456	461	461	452	452	451	451	451.0
Plant			15	168	171	171	171	171	169	169	171	171	171	171	171.0
G&A	13	36	53	87	95	95	95	95	87	87	92	92	92	92	92.0
Total	**13**	**75**	**186**	**528**	**716**	**722**	**722**	**722**	**717**	**717**	**715**	**715**	**714**	**714**	**714**

13.6 Geotechnical Considerations

The studies related to the Project's geomechanical context were initially developed by the consulting firm BVP Engineering, having been detailed, at a later stage, by the consulting firm Walm Engineering (Walm), during the conceptual design stage.

The available geomechanical data prepared by Walm indicates that, in general, good ground conditions are anticipated in the Aripuanã underground. Nevertheless, geomechanical information is continuously updated by means of mapping of underground exposures during development and geotechnical core logging.

The geomechanical characterization of the three targets Arex, Link and Ambrex is based upon the tridimensional geomechanical model developed by Walm and is summarized below.

13.6.1 Arex

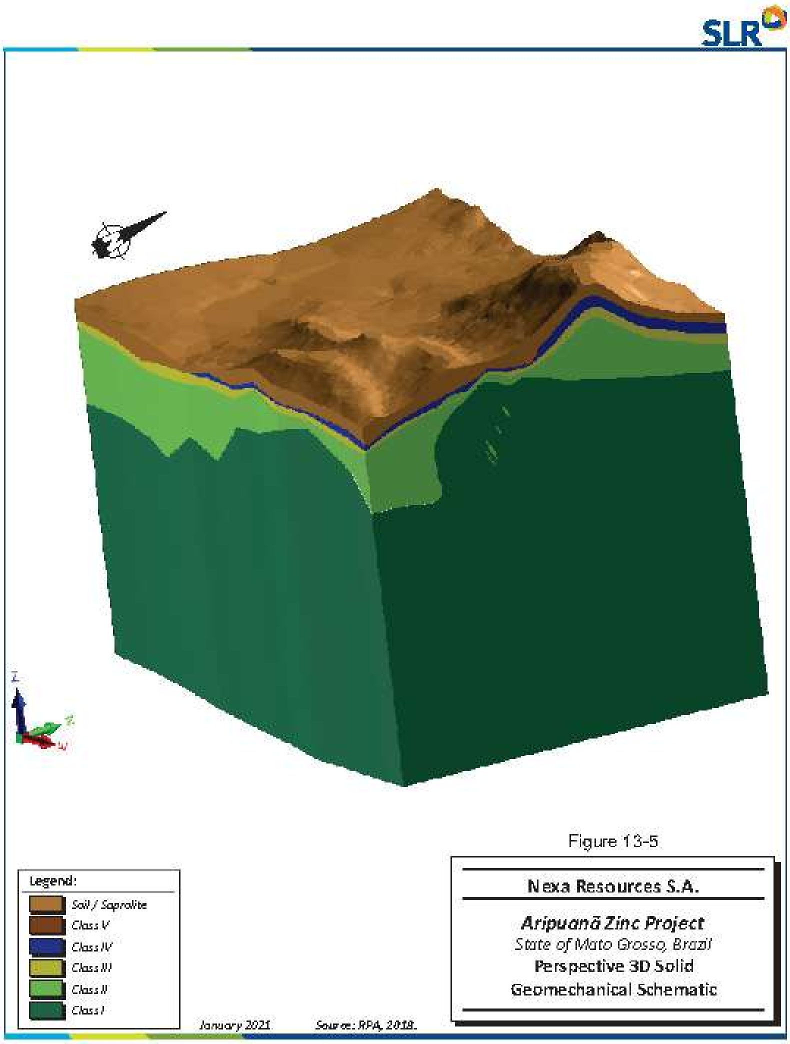
Geomechanical characterization was performed using the Bieniawski (1989) Rock Mass Rating (RMR) classification system and indicated good (Class II) to very good (Class I) geomechanical domains, consisting of strong to very strong intact rock, slightly weathered to unweathered rock walls and slightly to moderately jointed rock masses. Good rock masses are located far from the influence of superficial weathering. They are composed of strong intact rock and show a low degree of jointing, exhibiting some or no degree of weathering. The top of the unweathered rock layer is normally at a depth of 50 m to 70 m, usually below the weathered rock mass (Class III). The thickness of rock mass Class II varies from 80 m to 300 m. Rock mass Class I consists of strong rock material and shows unweathered discontinuities and low degree of jointing and is situated immediately below rock mass Class II.

The fair rock mass (Class III), which consists of moderately strong rock material and exhibits moderately weathered discontinuities and a moderate degree of jointing, occurs predominantly at shallow depths, however, it may occur as discontinuous thin lenses within rock masses of higher geomechanical quality (Classes I and II). These small lenses are related to the degree of jointing of the rock mass and/or to lower intact rock strength and may also be associated with faults and shear zones of brittle behavior. In general, its thickness varies from 5 m to 17 m, in the form of continuous layers.

The poor and very poor rock masses (Classes IV and V) and the soil/saprolite layer are situated at shallow depths, close to the surface, and represent the weathering profile over the rock masses of better geomechanical quality. Classes IV and V are in the form of 10 m to 15 m thick lenses. The soil/saprolite layer is 35 m thick on average and becomes thicker within flat topography regions.

In general, the geomechanical classification, obtained from the developed model, indicates that this region of the Project consists, mostly, of rock masses Class II (RMR ≈ 70) and Class III (RMR ≈ 54), prevailing Class II. Data from laboratory tests revealed that the uniaxial compressive strength of the intact rock is approximately 100 MPa to 250 MPa and therefore is classified as R5 (very strong) according to the International Society for Rock Mechanics (ISRM).

As a result of this work, a 3D geomechanical model was developed by Walm using Micromine software to present the 3D distribution of the rock mass classes within the Arex target region. This 3D geomechanical model was prepared by linking vertical geomechanical sections, generating solids and surfaces. Figure 13-5 presents a view of the geomechanical model for the Arex orebody. Similar models were also generated for Link and Ambrex.



13 11

Figure 13-5: Perspective 3D Solid Geomechanical Schematic

13.6.2 Link

Geomechanical characterization was performed using the RMR classification system and indicated good (Class II) to very good (Class I) geomechanical domains, consisting of strong to very strong intact rock, slightly weathered to unweathered rock walls and slightly to moderately jointed rock masses. They are composed of strong intact rock and show a low degree of jointing, exhibiting some or no degree of weathering. The top of the unweathered rock layer is normally at a depth of 40 m to 90 m, and usually below the weathered rock mass (Class III). The thickness of rock mass Class II varies from 125 m to 480 m. Class I is situated immediately below the Class II rock mass and their interface usually occur at z = -225 m.

Rock mass Class III is found at shallow depths, normally below rock masses Class IV, and at medium to large depths. Initially, it is characterized as a transition from weathering to fresh/unweathering rock and consist of moderately weathered rock material, exhibiting moderate to high strength and moderate degree of jointing. In general, its thickness varies from two metres to 34 m, in the form of continuous layers.

The poor and very poor rock masses (Classes IV and V) and the soil/saprolite layer are situated at shallow depths, close to the surface, and represent the weathering profile over the rock masses of better geomechanical quality. The soil/saprolite layer covers the entire studied region and are 30 m thick on average, becoming thicker within flat topography regions. Class V is two metres to 30 m thick and may be up to 52 m thick locally. Class IV is in the form of thinner layers, normally 10 m thick, as discontinuous lenses of restrict occurrence within the studied region.

13.6.3 Ambrex

Geomechanical characterization was performed using the classification system RMR and indicated good (Class II) to very good (Class I) geomechanical domains, consisting of strong to very strong intact rock, slightly weathered to unweathered rock walls and slightly to moderately jointed rock masses. The top of the unweathered rock layer is normally at a depth of 37 m to 80 m, usually below the weathered rock mass (Class III). The thickness of rock mass Class II varies from 150 m to 600 m. Class I is situated immediately below the Class II rock mass and their interface usually occur at z = -200 m.

Class III constitutes the main transition level to fresh/unweathered rock. It is found at shallow depths, normally below rock masses Class IV, and at medium to large depths. As a transition layer from weathering to fresh/unweathered rock, it consists of moderately weathered rock material, exhibiting moderate to high strength and moderate degree of jointing. In general, its thickness varies from five metres to 45 m, in the form of continuous layers, within the entire body extent.

The poor and very poor rock masses (Classes IV and V) and the soil/saprolite layer are situated at shallow depths, close to the surface, and represent the weathering profile over the rock masses of better geomechanical quality. The soil/saprolite layer covers the entire studied region and are 30 m thick on average, becoming thicker within flat topography regions. Class V occurs in the form of five metre to 40 m thick continuous layers and is situated within the transition zone from soil/saprolite to rock masses Classes IV and III. Class IV is in the form of approximately regular thin layers, approximately 10 m thick within the central region of the body, or, more rarely, as isolated/negligible lenses below Class V layers.

In general, the geomechanical classification, obtained from the developed model, indicates that this region of the Project consists, mostly, of rock masses Class II (RMR ≈ 71) and Class III (RMR ≈ 54), prevailing Class II. Data from laboratory tests revealed that the uniaxial compressive strength of the intact rock is around 100 MPa to 250 MPa and therefore is classified as R5 (very strong) according to the ISRM.

13.6.4 Assumptions for Mining

To ensure stability, there will be no stopes designed within Class III or poorer rock masses, thereby leaving these portions as an integral part of the crown pillar. Currently, numerical modelling, using the Finite Element Method (FEM), is being applied to optimize ore recovery. The studies also comprise an update of the tridimensional geotechnical model with focus on providing accurate data for the numerical model.

The firm REDE Engenharia e Sondagem S/A carried out in-situ stress measurement, applying the Fracture Pressurization Method (FPM), in order to investigate the stress state prior to excavation. From the results, it was possible to conclude that the initial stress state is defined as it follows:

βH = 123° (major horizontal stress direction)

KH = 1.92 (major horizontal/vertical stress ratio)

Kh = 1.44 (minor horizontal/vertical stress ratio)

This information will be used as input data in numerical models for underground stability analysis. As stoping progresses, this data will be calibrated.

13.6.5 Sequencing

For the geotechnical stability analysis of the Arex, Link, and Ambrex stopes, assumptions were made pertaining to the selected mining methods, longhole retreat mining (Bench Stoping) and primary/secondary sublevel stoping (VRM), excavation design, and data from geotechnical core logging, which was used as the basis of the underground mine tridimensional geomechanical model.

The VRM extraction sequence will be bottom up in both primary and secondary stopes. On each level, the primary stopes will be mined upwards from the bottom sublevel. The optimization of stoping sequences will be evaluated by numerical modelling and the success of paste fill operations will ensure flexibility regarding primary and secondary stopes extraction. There is potential to optimize the extraction sequence as part of the detailed mine design and scheduling, and as more data is acquired.

In bench stoping areas, stopes are to be retreat mined and backfilled with rockfill after completion of extraction.

13.6.5.1 Arex

For the Arex mining method selection process, five metre to 20 m wide mineralized zones at depths from zero metres to 700 m have been considered. The average dip of the orebody is virtually uniform for the entire mineralization, being usually vertical or subvertical, with a minimum dip of approximately 60°. Therefore, bench stoping was selected for the majority of this target, with few portions to be mined using the VRM method where the orebody becomes wider.

Sill and rib pillars have been designed for a number of scenarios, which involve mining panels of 75 m between levels and 25 m between sublevels by bench stoping. The results obtained from the studies demonstrated very good ore recovery, varying from 80% to 96%, considering rib pillar recovery.

The applied empirical methods and numerical modelling suggest that stopes will be geotechnically stable and, therefore, there will be no need for systematic cable bolt reinforcement of the excavation wall. Localized cable bolting may be required to address specific situations.

13.6.5.2 Link

For the Link mining method selection process, five metre to 80 m wide mineralized zones at depths from 100 m to 600 m have been considered, thereby putting the mineralization at shallow to intermediate depths. The average dip of the orebody is relatively steep, with a minimum dip of approximately 73°. Given the wider thickness of the orebody, VRM was selected as the primary mining method for this target. The success of production operations using VRM is related to the paste fill system, which will enable stope backfilling and, therefore, full ore recovery.

Sill and rib pillars have been designed for a number of scenarios, which involve mining panels of 75 m between levels and 25 m between sublevels by bench stoping, and panels of 25 m between levels, with no sublevels, by VRM. The results obtained from the studies demonstrated very good ore recovery, varying from 86% to 95%, considering mining of primary and secondary stopes.

The applied empirical methods and numerical modelling suggest that stopes will be geotechnically stable and, therefore, there will be no need for systematic cable bolt reinforcement of the excavation wall. Localized cable bolting may be required to address specific situations.

13.6.5.3 Ambrex

For the Ambrex mining method selection process, five metre to 100 m wide mineralized zones at depths from 100 m to 750 m have been considered, thereby putting the mineralization at shallow to intermediate depths. The average dip of the orebody is relatively steep, with a minimum dip of approximately 73°. Given the wider thickness of the orebody, VRM was selected as the primary mining method for this target. The success of production operations using VRM is related to the paste fill system, which will enable stope backfilling and, therefore, full ore recovery.

Sill and rib pillars have been designed for a number of scenarios, which involve mining panels of 75 m between levels and 25 m between sublevels by bench stoping, and panels of 25 m between levels, with no sublevels, by VRM. The results obtained from the studies demonstrated a very good ore recovery, varying from 86% to 95%, considering mining of primary and secondary stopes.

The applied empirical methods and numerical modelling suggest that stopes will be geotechnically stable and, therefore, there will be no need for systematic cable bolt reinforcement of the excavation wall. Localized cable bolting may be required to address specific situations.

13.7 Ventilation

The ventilation system for the Arex, Link, and Ambrex orebodies is a pull system which uses a combination of axial and centrifugal fans which can be modified for future growth. Fresh air and exhaust raises are located in the level access in each orebody. As a result, mining on the levels is ventilated using auxiliary fans and ventilation ducting. Regulators will control the air flow on each level for the fresh air and exhaust access.

The design of the ventilation system complies with the Brazilian mining regulations which require the calculation of fresh air flow based on the following:

- The maximum number of personnel and underground equipment.
- Consumption of explosives used.
- Monthly tonnages produced.

The three criteria are shown in Figure 13-6.

a) Calculation of fresh air flow as a function of the maximum number of people or machines combustion engines with diesel oil

Qt = Q1 x Q2 x n1 + n2 (m^3 / min)

At where :
QT = total flow of fresh air in m3 / min.
Q1 = amount of air per person in m3 / min.
(In coal mines = 6.0 m3 / min;. In other mines = 2.0 m3 / min.)
n1 = number of people in work shift
Q 2 = 3.5 m 3 / min./cv (horsepower) of the diesel engines
n2 = total number of horsepower diesel engines in operation

b) Calculation of fresh air flow as a function of consumption of explosive

QT = 0.5 x [m^3 / min]
t

At where:
QT = total flow of fresh air in m3 / min.
A = total amount in kilograms of explosives used for blasting
aeration time t = (re) in the front minutes

c) fresh air flow rate calculation according to the disassembled monthly tonnage

QT = qx T (m^3 / min)
At where:
QT = total flow of fresh air in m3 / min.
q = air flow in m3 / minute to 1,000 tons per month removed
(Up to 180 m3 / min / 1,000 tons per month)
T = production in tons per month removed.

Figure 13-6: Ventilation Requirements

The auxiliary fans selected for the Project will provide 37 m^3/s of ventilation over up to 165 m using 1.4 m diameter ducting and 1.2 m diameter, 150 hp fans. Fans can be stacked together to allow the ventilation to be projected. In order to provide sufficient air for a truck and LHD, two sets of ducting and fans will be required in the areas which do not have flow through ventilation.

13.8 Backfill

The process plant will produce tailings quantities of approximately 90% of the plant feed. Tailings will be dry stacked on surface or used as backfill for underground voids. It is planned that backfill be placed as consolidated paste fill with the specifications as outlined in Table 13-4. The strengths achieved by consolidated paste fill meet the geomechanical requirements for primary and bench stopes.

Table 13-4: Backfill Specification
Nexa Resources S.A. – Aripuanã Zinc Project

Description	Units	Consolidated Paste Fill
Solids	% solid	76%
Water	% solid	24%
Cement	% solid	4%
Density	g / cm³	2.1

In general, waste rock will be used as backfill for bench stoping areas and the remaining waste generated will be hauled to the surface and placed in waste dumps.

13.9 Production Schedule

The production schedule for the Project is summarized in Table 13-5. A nominal target of 6,065 tpd was used in preparing the mining schedule, with feed to the plant consisting of campaigns of stratabound and stringer material types, managed via stockpiling.

The deposits support a production rate of 2.2 Mtpa, with average annual metal production of:

- Zinc: 72,700 t.
- Lead: 25,200 t.
- Copper: 3,600 t.
- Silver: 1.85 Moz (contained in copper and lead concentrates); and
- Gold: 14,300 oz (contained in copper and lead concentrates).

This average annual production is equivalent to 122,000 t zinc per annum (tpa), after converting other metals based on net revenue.

Table 13-5: Production Schedule
Nexa Resources S.A. – Aripuanã Zinc Project

Aripuanã Project	Mining Plan UNITS	Mining Plan TOTAL	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028	Year 11 2029	Year 12 2030	Year 13 2031	Year 14 2032
MINING															
Underground															
Operation Days			30.0	100.0	365	365	365	365	365	365	365	365	365	365	365
Tonnes mined per day			1,325	3,478	3,589	5,891	6,050	5,908	5,931	6,073	6,260	6,250	6,062	6,155	5,170
Production	**000 tonnes**	**23,507**	**40**	**348**	**1,310**	**2,150**	**2,208**	**2,157**	**2,165**	**2,217**	**2,285**	**2,281**	**2,213**	**2,247**	**1,887**
Stratabound	000 tonnes	21,030	20	246	1,027	1,874	2,091	1,710	1,743	2,020	2,246	2,258	1,898	2,120	1,777
Stringer	000 tonnes	2,477	20	102	283	276	118	446	422	197	39	23	315	126	110
Grade															
Zn Grade	%	3.66%	1.6%	2.9%	3.2%	3.8%	3.9%	3.5%	3.6%	3.6%	4.0%	3.9%	3.3%	3.7%	3.8%
Pb Grade	%	1.36%	0.4%	1.1%	1.2%	1.3%	1.4%	1.3%	1.3%	1.3%	1.6%	1.4%	1.3%	1.4%	1.4%
Cu Grade	%	0.25%	0.9%	0.5%	0.7%	0.4%	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.2%	0.1%	0.1%
Ag Grade	oz/t	1.10	0.49	0.85	1.04	1.04	1.17	1.17	1.11	1.21	1.28	1.01	0.95	1.04	1.11
Au Grade	oz/t	0.01	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01
Contained Metal in ROM															
Zn	000 tonnes	860	0.6	10.1	42.5	81.5	85.6	75.5	77.1	79.6	91.6	88.2	73.0	82.5	71.9
Pb	000 tonnes	319	0.2	3.8	15.3	28.8	30.4	28.3	28.5	28.7	36.6	31.3	28.4	32.4	26.3

Aripuanã Project		Mining Plan UNITS	Mining Plan TOTAL	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028	Year 11 2029	Year 12 2030	Year 13 2031	Year 14 2032
	Cu	000 tonnes	60	0.4	1.9	9.5	9.7	6.1	7.4	6.2	7.1	2.2	1.6	3.4	2.3	2.0
	Ag	000 oz	25,887	19.4	296.4	1,364.1	2,233.5	2,575.9	2,528.8	2,407.4	2,689.8	2,925.9	2,314.3	2,102.1	2,335.1	2,094.1
	Au	000 oz	236	0.6	4.8	25.6	30.0	20.4	28.5	24.3	21.3	14.2	10.8	24.7	16.1	14.7
PROCESSING																
Mill Feed		**000 tonnes**	**23,507**			**1,698**	**2,150**	**2,208**	**2,157**	**2,165**	**2,217**	**2,285**	**2,281**	**2,213**	**2,247**	**1,887**
Head Grade																
	Zn	%	3.66%			3.14%	3.79%	3.87%	3.50%	3.56%	3.59%	4.01%	3.87%	3.30%	3.67%	3.81%
	Pb	%	1.36%			1.14%	1.34%	1.38%	1.31%	1.31%	1.30%	1.60%	1.37%	1.28%	1.44%	1.40%
	Cu	%	0.25%			0.69%	0.45%	0.27%	0.35%	0.29%	0.32%	0.10%	0.07%	0.15%	0.10%	0.10%
	Ag	oz/t	1.10			0.99	1.04	1.17	1.17	1.11	1.21	1.28	1.01	0.95	1.04	1.11
	Au	oz/t	0.01			0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01
Net Recovery																
	Zn Recovery	%	89.1%			88.4%	89.2%	89.3%	88.9%	89.1%	88.4%	89.3%	89.4%	89.3%	89.2%	89.3%
	Pb Recovery	%	83.0%			82.0%	83.5%	82.5%	83.5%	84.1%	80.7%	84.6%	81.9%	83.2%	83.5%	83.1%
	Cu Recovery	%	71.0%			77.9%	75.7%	70.3%	77.8%	78.0%	75.5%	47.8%	29.3%	62.1%	47.8%	48.5%
	Ag Recovery	%	75.2%			74.0%	75.0%	75.6%	74.7%	74.9%	74.9%	75.9%	75.9%	75.1%	75.6%	75.7%
	Au Recovery	%	67.4%			66.5%	67.5%	68.4%	66.2%	66.6%	67.6%	69.4%	69.4%	66.3%	68.5%	68.0%

Aripuanã Project	Mining Plan UNITS	TOTAL	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028	Year 11 2029	Year 12 2030	Year 13 2031	Year 14 2032
Concentrate Production															
Zn															
Concentrate	**000 tonnes**	**1,380**	**-**	**-**	**84.81**	**130.96**	**137.61**	**121.03**	**123.67**	**126.80**	**147.47**	**142.04**	**117.48**	**132.60**	**115.75**
Zn grade	%	55.50%	0.00%	0.00%	55.50%	55.50%	55.50%	55.50%	55.50%	55.50%	55.50%	55.50%	55.50%	55.50%	55.50%
Ag grade	oz/t	1.09	-	-	1.10	0.98	1.10	1.19	1.12	1.22	1.19	0.98	1.04	1.04	1.07
Pb															
Concentrate	**000 tonnes**	**461**	**-**	**-**	**27.56**	**41.76**	**43.58**	**41.12**	**41.63**	**40.30**	**53.93**	**44.54**	**41.05**	**47.11**	**38.06**
Pb grade	%	57.50%	0.00%	0.00%	57.50%	57.50%	57.50%	57.50%	57.50%	57.50%	57.50%	57.50%	57.50%	57.50%	57.50%
Ag grade	oz/t	27.36	-	-	28.16	25.72	29.05	29.16	27.70	31.90	27.01	25.91	24.73	24.38	27.20
Au grade	oz/t	0.07	-	-	0.11	0.09	0.07	0.06	0.06	0.07	0.05	0.04	0.06	0.05	0.06
Cu Concentrate I	**000 tonnes**	**72**	**-**	**-**	**16.53**	**10.72**	**2.67**	**11.22**	**9.88**	**7.68**	**1.02**	**0.54**	**6.84**	**2.42**	**2.07**
Cu grade	%	30.00%	0.00%	0.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
Ag grade	oz/t	5.94	-	-	3.86	3.98	8.16	5.81	5.12	7.71	6.26	5.65	5.25	7.88	5.62
Au grade	oz/t	0.89	-	-	0.59	0.62	1.07	0.86	0.76	0.61	0.75	1.12	1.21	0.91	1.29
Cu Concentrate II	**000 tonnes**	**70**	**-**	**-**	**13.95**	**13.65**	**11.56**	**8.07**	**6.17**	**10.20**	**2.54**	**1.05**	**0.23**	**1.25**	**1.09**
Cu grade	%	30.00%	0.00%	0.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%	30.00%
Ag grade	oz/t	313.82	-	-	22.26	31.48	43.81	59.44	74.73	50.44	229.54	437.64	1,755.64	368.61	378.43
Au grade	oz/t	4.24	-	-	0.56	0.71	0.69	0.81	1.00	0.68	2.56	4.66	25.09	5.06	4.79

Aripuanã Project	Mining Plan UNITS	TOTAL	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028	Year 11 2029	Year 12 2030	Year 13 2031	Year 14 2032
Recovered Metal															
Zn	000 tonnes	766.0			47.1	72.7	76.4	67.2	68.6	70.4	81.8	78.8	65.2	73.6	64.2
Pb	000 tonnes	264.9			15.8	24.0	25.1	23.6	23.9	23.2	31.0	25.6	23.6	27.1	21.9
Cu	000 tonnes	42.4			9.1	7.3	4.3	5.8	4.8	5.4	1.1	0.5	2.1	1.1	1.0
Ag	000 oz	19,476.8			1,243.5	1,675.3	1,946.3	1,888.0	1,803.3	2,013.5	2,220.4	1,757.3	1,578.9	1,764.8	1,585.4
Au	000 oz	159.1			20.7	20.3	14.0	18.9	16.1	14.4	9.8	7.5	16.4	11.0	10.0

14.0 PROCESSING AND RECOVERY METHODS

14.1 Process Description

The Aripuanã process flowsheet has been developed through metallurgical test work and the use of conventional technologies for the treatment and recovery of copper, lead, and zinc as separate concentrates. Plant throughput is planned to be 2.214 Mtpa of run of mine (ROM) ore from the Arex, Link, and Ambrex underground mines. Two main ore types are present at Aripuanã, stratabound and stringer, that have different hardnesses and therefore different throughput rates. Stratabound material, however, will make up the majority of the ore to be processed (approximately 89%) and the feed blend to the plant is expected to peak at 21% stringer material during Year 5. Estimated processing rates for the two ore types individually based on hardness are approximately 5,000 tpd (dry basis) for stringer material and 6,300 tpd (dry basis) for stratabound material. Throughput for the blended ore is estimated as a weighted average of the throughputs of the two ore types. A simplified process flowsheet is presented in Figure 14-1. Key elements of the process flowsheet include primary crushing, a SAG mill followed by a ball milling and pebble crushing (SABC) circuit, talc pre-flotation, and sequential flotation of copper, lead, and zinc for stratabound mineralization, and copper flotation for stringer mineralization (Table 14-1).

Table 14-1: Key Process Design Criteria
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	Units	Design Value
Throughput		
Operating Schedule	d/a	365
Annual	Mt	2.26
Daily – Stratabound Ore	t	6,300
Daily – Stringer Ore	t	5,000
Utilization		
Primary Crusher	%	75
Grinding and Flotation	%	91
Ore Characteristics		
Head Grade – Stratabound	% Cu	0.18
	% Pb	1.96
	% Zn	5.39
Head Grade – Stringer	% Cu	0.91
	% Pb	0.10
	% Zn	0.31
Comminution		
CWi (Stringer)	kWh/t	9.32
SMC Axb (Stringer)		30.9
BWi (Stringer)	kWh/t	12.4
Ai (Stratabound)	g	1.5
Crushing		
Crusher Max Feed Size	mm	600

Parameter	Units	Design Value
Product Size (P_{100})	mm	140
Product Size (P_{80})	mm	118
Grinding		
SAG Mill		
Ball Fill	%	14 to 18
Transfer Size (T_{80})	mm	1.7 to 2.0
Pebbles Generated	%	19 to 28
Pebble Crusher		Yes
Ball Mill		
Mill Fill	%	35 to 40
Circulating Load	%	250 to 300
Product Size (P_{80})	µm	149
Flotation		
Recovery - Stratabound	% Cu	67.6
	% Pb	84.8
	% Zn	89.5
Recovery - Stringer	% Cu	86.9
Talc Flotation Cell Type		Columns
Feed Density	% solids	27
Copper Flotation Cell Type		Tank cells/columns
Feed Density	% solids	27 to 30
Regrind (P_{80})	µm	45
Lead Flotation Cell Type		Tank cells/columns
Feed Density	% solids	45
Regrind (P_{80})	µm	75
Zinc Flotation Cell Type		Tank cells/columns
Feed Density	% solids	43
Regrind (P_{80})	µm	75
Concentrate		
Copper Concentrate Grade	% Cu	30
Lead Concentrate Grade	% Pb	62
Zinc Concentrate Grade	% Zn	58
Concentrate Moisture Content	%	10
Tailings		
Tailings Disposal Type		Dry stack
Tailings Thickener Underflow Density	% solids	65

Parameter	Units	Design Value
Tailings Filter Cake Moisture Content	%	10
Paste Backfill Density	% solids	76
Cement Addition	%	4 to 6

Source: SNC-Lavalin, 2019

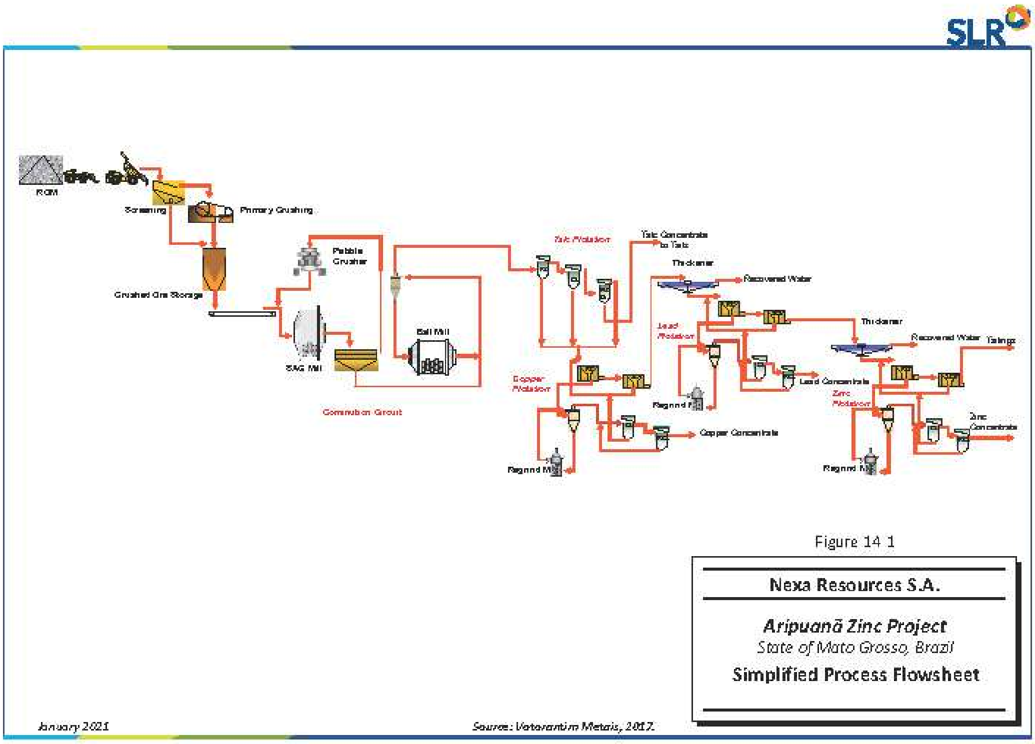


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Figure 14-1: Simplified Process Flow Sheet

14.1.1 Comminution

ROM material will be trucked from the underground mine to the ROM stockpiles near the primary crushing area. ROM material will be directly discharged into the 80 t capacity (two truckloads) primary crusher dump hopper or held temporarily in four stockpiles based on mineralization type and grade (approximately 7,000 t each, one stringer stockpile and three mixed stockpiles of different grades) and recovered later by front end loader. A static grizzly on top of the dump hopper with 600 mm by 600 mm openings will prevent oversize material from reaching the discharge of the hopper. Discharge of ROM material from the dump hopper will be via apron feeder, which will discharge to a vibrating grizzly with an aperture of 130 mm. Oversize material from the grizzly will feed the primary (jaw) crusher while undersize will bypass the crusher.

The crusher product, with a top size of 140 mm, will be collected on a conveyor belt together with the fines from the apron feeder and grizzly undersize. A metal detector will remove scrap metal from the crushed ore that could damage downstream conveyors and equipment. The conveyor will feed the crushed ore bin with a capacity of 2,500 t. Two additional crushed ore bins may be added at a later stage if required that would bring the combined capacity to 9,100 t. Two variable speed apron feeders per bin will withdraw the crushed product from the bins and deliver it to the grinding circuit via conveyor belt. A belt scale on the conveyor will control the speed of the apron feeders, and as a result the feed rate to the grinding circuit. The grinding circuit will consist of a conventional SAG mill, ball mill, and pebble crusher (SABC configuration). Both grinding mills will have variable speed drives to allow for process optimization over a range of ore competencies and hardnesses.

A double-deck vibrating screen at the discharge of the SAG mill will separate SAG mill discharge into screen oversize (scats and pebbles) and screen undersize. Scats will be separated from the pebbles by belt magnets, leaving the pebbles to be recycled to the SAG mill feed conveyor via the pebble crusher, or directly to the SAG mill feed conveyor when the pebble crusher is undergoing maintenance. Screen undersize will discharge to the grinding circuit pump sump together with the ball mill discharge.

SAG mill discharge screen undersize material and ball mill discharge will be pumped to a set of hydrocyclones that will classify the material into oversize and undersize. The hydrocyclone underflow (oversize) material will return to the ball mill while the hydrocyclone overflow (undersize) with P_{80} 150 µm will be transferred to the flotation feed pump box. An online particle size analyzer will provide periodic measurement of the hydrocyclone overflow stream. A trommel screen on the ball mill discharge will remove scats and the slurry will be combined with the SAG mill discharge screen undersize and recirculated as feed to the hydrocyclones.

14.1.2 Flotation

Flotation will be conducted sequentially, i.e., the production from the comminution circuit will pass through four independent circuits in sequence. The first flotation circuit is for talc and light mineral flotation (mainly minerals containing magnesium) to remove naturally hydrophobic minerals and prevent them from contaminating the sulphide concentrates or interfering with sulphide flotation. Due to the high content of light minerals in stratabound mineralization, these minerals must be removed prior to sulphide flotation, however, since stringer mineralization contains only minor amounts of these minerals, processing of stringer ore only would generally by-pass the talc flotation step as the minor talc content can be depressed with carboxymethyl cellulose (CMC). The flotation circuits for the recovery of copper, lead, and zinc follow talc flotation.

Hydrocyclone overflow slurry will be conditioned prior to being fed to the talc flotation circuit, which consists of three column flotation stages: rougher, cleaner, and reverse copper flotation. Reagents added to the conditioning tank for talc flotation include MIBC as a frother and SMBS as a depressant of iron sulphides (pyrite and pyrrhotite). The talc rougher concentrate will be cleaned in the second column, with the cleaned concentrate reporting to the reverse copper flotation column where talc will be depressed with CMC while copper in the talc concentrate is recovered and reports to downstream sulphide flotation. The final talc concentrate will be combined with the sulphide flotation tailings for disposal. The talc flotation tailings containing copper, lead, and zinc minerals (including copper recovered from the talc concentrate during reverse copper flotation), will proceed to the copper flotation circuit.

Prior to copper rougher flotation, talc flotation tailings will be conditioned in two tanks in series where reagents will be added, including:

- A3894 (dialkyl thionocarbamate, copper collector)
- Zinc sulphate (sphalerite depressant)
- SMBS (iron sulphide depressant)
- MIBC (frother)
- CMC (talc depressant)
- Lime (pH control)

Prior to conditioning and cleaner flotation, copper rougher flotation concentrate will be reground in a vertical stirred mill to P_{80} 45 µm to increase sulphide liberation and promote cleaner stage recovery. Two stages of cleaning in column cells will produce the final copper concentrate. Copper rougher-scavenger concentrate will be recycled to the rougher flotation feed, while copper rougher-scavenger flotation tailings will feed the lead flotation circuit (stratabound or blended ore). If processing stringer ore, however, the rougher-scavenger flotation tailings can be pumped directly to tailings dewatering. Cleaner circuit tailings are recycled to the copper rougher feed.

Copper rougher-scavenger flotation tailings will be thickened prior to being pumped to the lead flotation circuit. Lead and zinc flotation are only necessary for stratabound mineralization as the stringer ore contains only very low concentrations of lead and zinc minerals. The lead flotation circuit is similar to the copper flotation circuit, however, the quantity of flotation cells and the collector used are different. The reagents used for lead flotation include:

- Aerophine 3418A (dialkyl dithiophosphinate collector for lead)
- Zinc sulphate (sphalerite depressant)
- SMBS (iron sulphide depressant)
- Lime (pH control)
- CMC (talc depressant)
- MIBC (frother).

Prior to lead rougher flotation, the feed slurry will be conditioned with the aforementioned reagents in two tanks in series. The lead circuit consists of rougher flotation, rougher concentrate regrinding to P_{80} 75 µm, rougher-scavenger flotation, and two-stage cleaner flotation. The product from the lead cleaner flotation circuit will be the final lead concentrate. The lead rougher-scavenger flotation tailings will be pumped to feed the zinc flotation circuit.

The zinc flotation circuit is similar to the copper and lead flotation circuits, however, the quantity of flotation cells and some of the reagents used are different. Lead rougher-scavenger flotation tailings will be thickened prior to being pumped to the zinc flotation circuit. The reagents used for zinc flotation include:

- AERO 208 or A208 (dialkyl dithiophosphate collector for zinc)
- Copper sulphate (sphalerite activator)
- Lime (pH regulator)
- MIBC (frother)

Prior to zinc rougher flotation, the feed slurry will be conditioned with the aforementioned reagents in two tanks in series. The zinc circuit consists of rougher flotation, rougher concentrate regrinding to P_{80} 75 µm, rougher-scavenger flotation, and two-stage cleaner flotation. The product from the zinc cleaner flotation circuit will be the final zinc concentrate. Zinc rougher-scavenger flotation tailings will be pumped to tailings dewatering for disposal.

14.1.3 Thickening and Filtration

Thickening and filtration will be performed on flotation concentrates and tailings. Three concentrates (copper, lead, and zinc) will be produced, with each thickened and filtered separately. Tailings generated from flotation will consist of talc concentrate and sulphide flotation tailings, which are also thickened separately, then combined and filtered.

The copper, lead, and zinc concentrate slurries will be pumped to storage tanks feeding pressure filters dedicated to each concentrate, which will reduce the moisture to approximately 10%. The filtered copper, lead, and zinc concentrates will fall by gravity into segregated covered storage areas. The copper and zinc concentrates will be reclaimed by front end loader and loaded into trucks for shipping. Lead concentrate will be reclaimed by front end loader and loaded into containers for shipping. All filtrates will be recovered for re-use in their respective flotation circuits. Excess filtrate and concentrate thickener overflow will be discharged to an engineered wetland treatment system and can then be recycled to the processing plant as make-up water as required or discharged.

Sulphide flotation tailings will be thickened and filtered in three pressure filters and combined with filtered talc concentrate prior to disposal. The sulphide flotation tailings thickener underflow will be filtered to produce a filter cake with approximately 10% moisture that is suitable for dry stacking in two stockpiles (capacity of approximately 5,200 t each). This stockpiled material will be recovered by front end loader and loaded into trucks for transport to the dry stack tailings dump or the paste backfill plant. Filtrates from the pressure filters will be pumped to a recovered water pond and reclaimed for return to the process.

14.1.4 Backfill

The backfill plant of the Project will serve the Arex, Link, and Ambrex mines. Talc concentrate will be combined with flotation tailings and mixed with cement to produce a paste backfill with approximately 76% solids by mass. Backfill will be provided to the underground mines as required.

14.1.5 Recovered and Make-Up Water Systems

The water system is designed to maximize water recovery and recirculation. Water from tailings thickener overflow and tailings filtration will be pumped to a recovered water pond with a two-day retention capacity. After treatment with hydrogen peroxide, the water is pumped to a 600 m^3 recovered water tank, which will receive make-up water as required.

Make-up water will be collected from a storage pond close to the processing facilities and will be pumped to a 400 m^3 make-up water tank. This water will be used as make-up for recovered water and for specific uses including feed for the water treatment station, pump seal water, fire suppression, vacuum pump seal water, reagent preparation, potable water, and feed to various points in the plant circuit.

14.1.6 Reagent Preparation

14.1.6.1 AERO 3894

AERO 3894 will be supplied as a liquid product at 100% concentration in sealed 200 L drums. The solution from the drums will be transferred to a storage tank and distributed without dilution to talc and copper flotation.

14.1.6.2 AEROPHINE 3418A and AERO 208

AEROPHINE 3418A and AERO 208 will be supplied as liquid products at 100% concentration in sealed 200 L drums and will have identical preparation systems. Solutions will be transferred to storage tanks and distributed without dilution to lead and zinc flotation.

14.1.6.3 Sodium Metabisulphite

SMBS will be supplied in one metric tonne bags and delivered to a storage hopper. A screw feeder will transfer the material from the storage hopper to an agitated mix tank where the SMBS will be dissolved in water to reach a concentration of 5% w/w. The solution will be transferred to a storage tank and pumped at required dosages to talc, copper, and lead flotation.

14.1.6.4 Copper Sulphate

Copper sulphate will be supplied in one metric tonne bags and delivered to a storage hopper. A screw feeder will transfer copper sulphate from the storage hopper to an agitated mix tank where the copper sulphate will be dissolved in water to reach a concentration of 5% w/w. The solution will be transferred to a storage tank and pumped at required dosages to zinc flotation.

14.1.6.5 Zinc Sulphate

Zinc sulphate will be supplied in one metric tonne bags and delivered to a storage hopper. A screw feeder will transfer the material from the storage hopper to an agitated mix tank, where the copper sulphate will be dissolved in water to reach a concentration of 10%. The solution will be transferred to a storage tank and pumped at required dosages to copper and lead flotation.

14.1.6.6 Methyl Isobutyl Carbinol

MIBC will be supplied in liquid form at 100% concentration in sealed 200 L drums. The frothing agent will be transferred by pump to storage and then distribution tanks. The frother will be added in separate lines to various flotation stages. MIBC will be added to maintain froth stability as required in all flotation stages.

14.1.6.7 Carboxymethyl Cellulose

CMC will be supplied in 500 kg bags and delivered to a storage hopper. A screw feeder will transfer the material from the storage hopper to an agitated mix tank where it will be dissolved in water to reach a concentration of 2% w/w. The solution will be transferred to a storage tank and pumped at required dosages to talc, copper, and lead flotation.

14.1.6.8 Hydrated Lime

Hydrated lime will be supplied in bulk by truck and pneumatically transferred to storage silo. The silo will be vented through a de-dusting system comprised of exhaust fan and bag filter that will capture dust generated during the transfer process. Lime will be transferred to a covered mixing tank using a rotary valve and screw feeder, then mixed with water to prepare a concentrated slurry containing 5% w/w. Lime slurry will be pumped to a lime loop and delivered to various process stages at required dosages to control circuit pH.

14.1.6.9 Cement

Cement will be supplied in bulk by truck and pneumatically transferred to storage silos. The silos will be vented through de-dusting systems comprised of exhaust fans and bag filters that will capture dust generated during the transfer process. Cement will be transferred using a rotary valve and screw feeder to a backfill re-slurrying tank and delivered to an agitated slurry mix tank. Backfill slurry will be pumped to the mine via a pipeline along the access road from the plant to the mine.

14.1.6.10 Flocculant (BASF Magnafloc 10)

Flocculant will be supplied as a solid and delivered in 25 kg sealed bags and transferred to a storage hopper. Material will be transferred from the storage hopper by screw feeder to an agitated tank and a 0.25% w/w suspension will be prepared. The prepared solution will be pumped to a storage tank and distributed to the thickeners.

14.1.7 Compressed Air Systems

A dedicated compressed air system will be provided for the pressure filters for each type of concentrate. One or more compressors, with a stand-by unit, will be available for each filtration system. These compressors will be screw type, air cooled, oil free, and at a pressure of 7.0 kg/cm^2.

An exclusive small-size compressor will be installed, without a standby unit, to generate dry, oil free air for the laboratory.

Screw compressors will be installed, with one standby unit, to generate dry oil free air for the beneficiation plant and workshop service and instrumentation air.

Dedicated blowers will be installed, with one standby unit, to generate low pressure, oil free air (approximately 0.4 kg/cm^2) for flotation (tank cells).

14.1.8 Dust Suppression System

The dust suppression system for primary crushing and the crushed ore storage silos will consist of a central unit with air extraction and filtration systems, as well as piping and spray nozzles for water suppression of dust at conveyor transfer points.

14.1.9 Drainage

A drainage system has been devised throughout the operational area, to capture and contain the following:

- Process area spillage – restricted to process facility buildings. The aim is to contain discharges and overflows that may occur during processing. The effluent will be contained by bunded containment areas, collected in sumps, and returned to the production process.
- Industrial spillage – restricted to areas within the industrial unit and entrance gate areas, which may result from pipe failures or accidental discharges and other spillage. This collection system will be routed to the emergency drainage and/or effluent treatment station. A water, oil, and grease separation system will be installed in the workshop and in areas with industrial effluents.
- Rain – aimed at collecting rainwater in areas without risk of contamination, which can be disposed of in the hydrographic network without treatment.
- Emergency drainage – aimed at controlling emergency situations related to liquid effluents and industrial spillage and installed in appropriate locations so as to prevent pollution of the local drainage network.

14.1.10 Effluent Treatment

All effluent (process, stockpile drainage, and precipitation) will be directed to engineered wetlands for passive treatment prior to discharging the water to the receiving environment.

14.2 Labour

Process plant personnel were estimated to be 171 people, including plant management, metallurgical staff, supervisors and operators, and maintenance personnel.

15.0 INFRASTRUCTURE

15.1 Planned Infrastructure

The planned infrastructure at the Project includes:

- Dry stack tailings storage facility (TSF)
- Power supply
- Water storage dam
- Access and site road
- Maintenance shops
- Fuel storage

15.2 Waste Management

The overall waste management strategy for the Project is largely taken from reports by SNC Lavalin (2020a and 2020b). This follows previous work by Worley Parsons (2017a and 2017b). The current waste management strategy includes the following aspects:

- Production of tailings generated by the processing of zinc, lead, and copper from underground mining at the Project.
- Adoption of dry stack (filtered) tailings for surface disposal and cemented paste backfill for underground disposal.
- Tailings production for surface disposal over 13 years is estimated at a total of 6.34 million cubic metres (Mm^3) with 4.49 Mm^3 in the dry season and 1.87 Mm^3 in the wet season.
- Waste rock production for surface disposal of 1.33 Mm^3 over 13 years.
- A double lined tailings management facility (TMF) with associated surface runoff collection ponds and access roads.
- A double lined waste rock storage facility and associated surface runoff collection ponds and access roads.

15.3 Waste Production

15.3.1 Tailings Production

Approximately 6.3 Mm^3 of tailings will require secure surface disposal over a period of 13 years. In accordance with a regulatory commitment, a minimum of 50% of the tailings must be disposed of in underground mine workings and plans for tailings disposal as cemented paste backfill have been considered. The tailings to be stored on surface will be in accordance with the filtered dry stack method of disposal. If properly filtered, tailings can be spread and compacted in lifts similar to typical earth embankment construction. A basic level design and management of the initial dry stack facility has been considered.

15.3.2 Tailings Properties

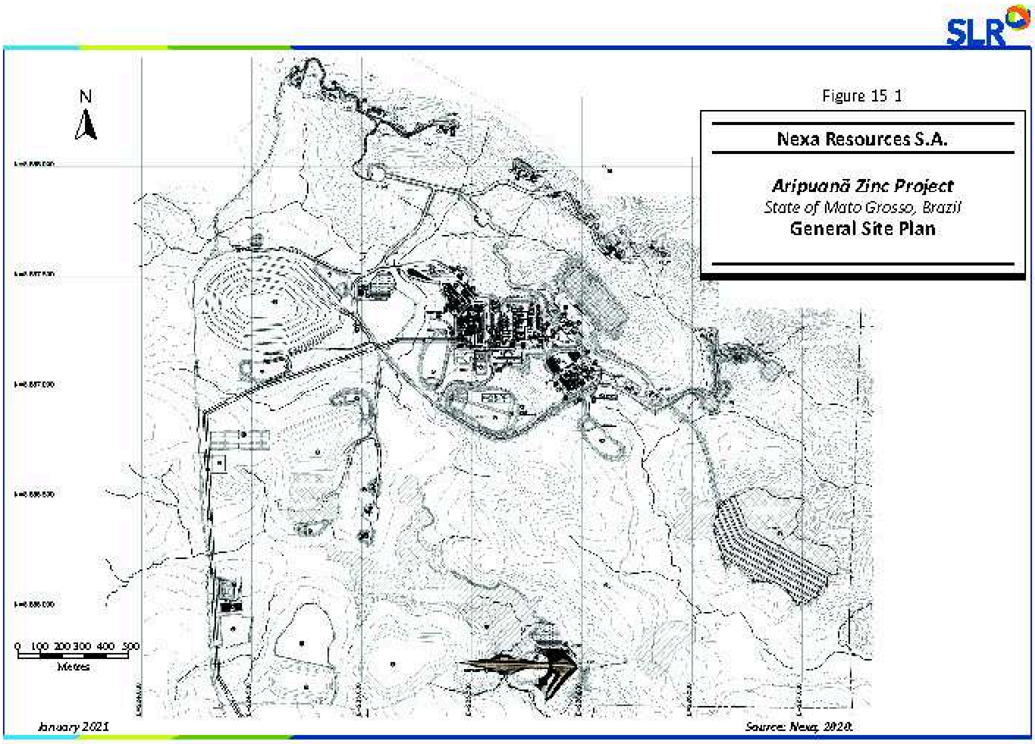
The tailings are prone to acid drainage and were classified as Class I according to the Brazilian waste classification standard NBR ABNT 10.004/2004. The technical standards that govern the disposal of Class 1 waste, specify the provision of a double liner system and the use of a leakage detection system. The design has therefore followed the guidelines of NBR 13,028 (ABNT, 2017) and NBR 10,157 (ABNT, 1987) which are for hazardous landfill projects.

A laboratory test program to determine the geotechnical properties of the tailings was also completed by Pattrol Investigacoes Geotecnicas Ltda. (2018). The specific gravity of the tailings samples was 2.9 g/cm^3 to 3.2 g/cm^3.

15.3.3 Tailings Management Facility Design

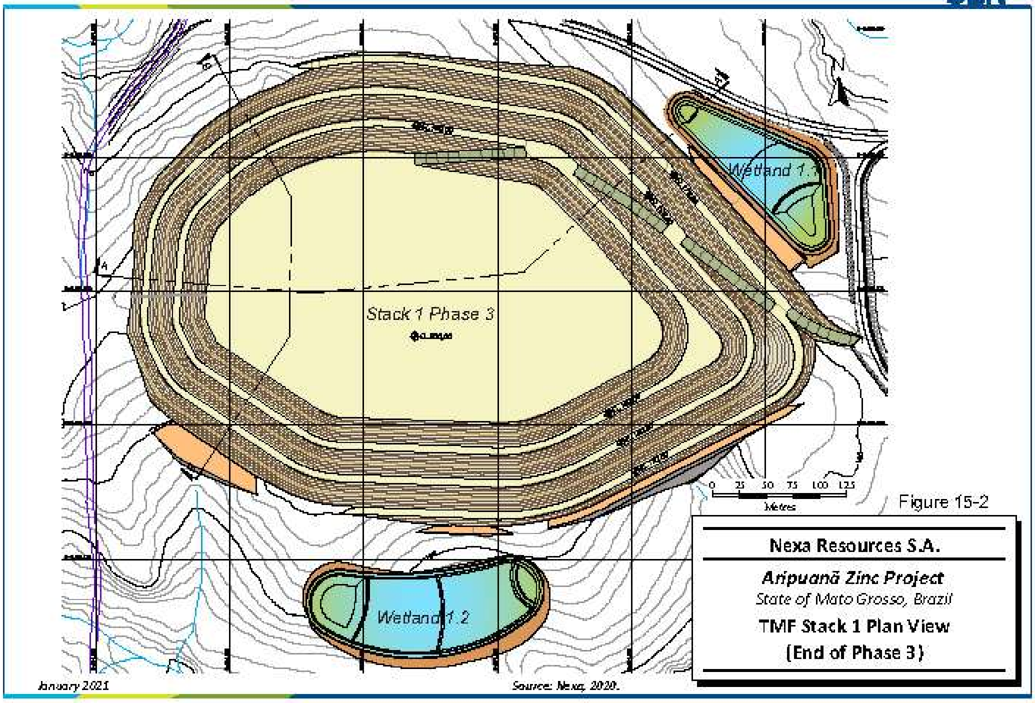
Twelve sites were considered by the proponent for above ground tailings deposition in a trade-off study. Option 10A, to the west of the proposed processing plant, is the preferred site for an initial TMF as shown in the site layout in Figure 15-1 (Stack 1 – "PDR 1"). Future tailings storage will be provided by Stack 4 which is to the southeast of the plant. The processing plant site would be centrally located with the Arex deposit to the north and the Ambrex deposit to the east. The water supply dam is located at the south end of the lease area. Excess waste rock will be disposed of to the southwest of the plant at Stack 2.1. Topsoil, excess waste rock, and waste soil will be stockpiled to the southwest of the water supply reservoir.

A plan view of the TMF is shown in Figure 15-2.



15 3

Figure 15-1: General Site Plan



15-4

Figure 15-2: TMF Stack 1 Plan View (End of Phase 3)

Stack 1 is designed for a total capacity of approximately 4.4 Mm^3. The TMF will have a footprint of 25.5 hectares and a maximum height of 59 m. An average external slope of 3 (horizontal) to 1 (vertical) will be maintained with the facility constructed in 10 m high lifts, 7 m wide benches, and 2.3 (horizontal) to 1 (vertical) intermediate slopes. Access roads and ramps will have a minimum width of 10 m.

Stack 1 is located on local high ground with no upstream catchment area and therefore does not have diversion channels. A perimeter rectangular concrete channel will collect and drain runoff to two effluent management ponds (wetlands). The monitoring and instrumentation plan for Stack 1 will consist of the installation of water level meters, piezometers, survey monuments, and monitoring wells. Monitoring wells are mandatory for this type of landfill, according to NBR 10.157 (ABNT, 1987) and must be installed around the pile to check for possible contamination of groundwater in the region, especially in the event of a liner failure.

The foundation preparation and installation of the double lining system (as shown in Figure 15-3) will require the following activities:

- Foundation clearing and grubbing
- Removal of a minimum of 0.6 m of the foundation, this includes topsoil and colluvial layers.
- A 0.3 m thick compacted clay layer with a minimum permeability of 1x10-9 m/s.
- A 0.3 m thick sand leak detection layer with 0.1 m diameter perforated corrugated geotubes wrapped in a geotextile.
- A single side textured high density polyethylene (HDPE) 1.5 mm geomembrane (textured side up) covered with a 400 g/m^2 protection geotextile.
- A 0.9 m thick soil protection layer.
- Provision of an internal drainage system to prevent a water table within the stack.

Stack 1 will be developed in three phases. Tailings will be placed in layers of maximum thickness of 0.3 m loose, compacted to 95% of the standard Proctor density. The tailings compaction criteria are to ensure dilating behaviour (i.e., not susceptible to liquefaction). To place and compact the tailings during the wet season (six months), it is proposed to use temporary inflatable warehouses. This system has been used previously in Brazil for several engineering works. Tailings will be transported via trucks and the buckets will be covered in wet season to ensure no moisture is gained.

Geological-geotechnical investigations in the area of Stack 1 have been completed and included drilling, augering, Standard Penetration Tests, and percussive and trench surveys (GeoMaster 2016 and 2018). Laboratory testing of foundation soils have also been completed (GeoMaster 2016) and data used in the stability analyses of Stack 1 which has included both static and pseudo static analyses.

Closing of Stack 1 will include placement of a one metre thick clay soil cover layer, a 0.1 m thick organic soil layer, and hydroseeding to allow revegetation of the area at the end of mining.

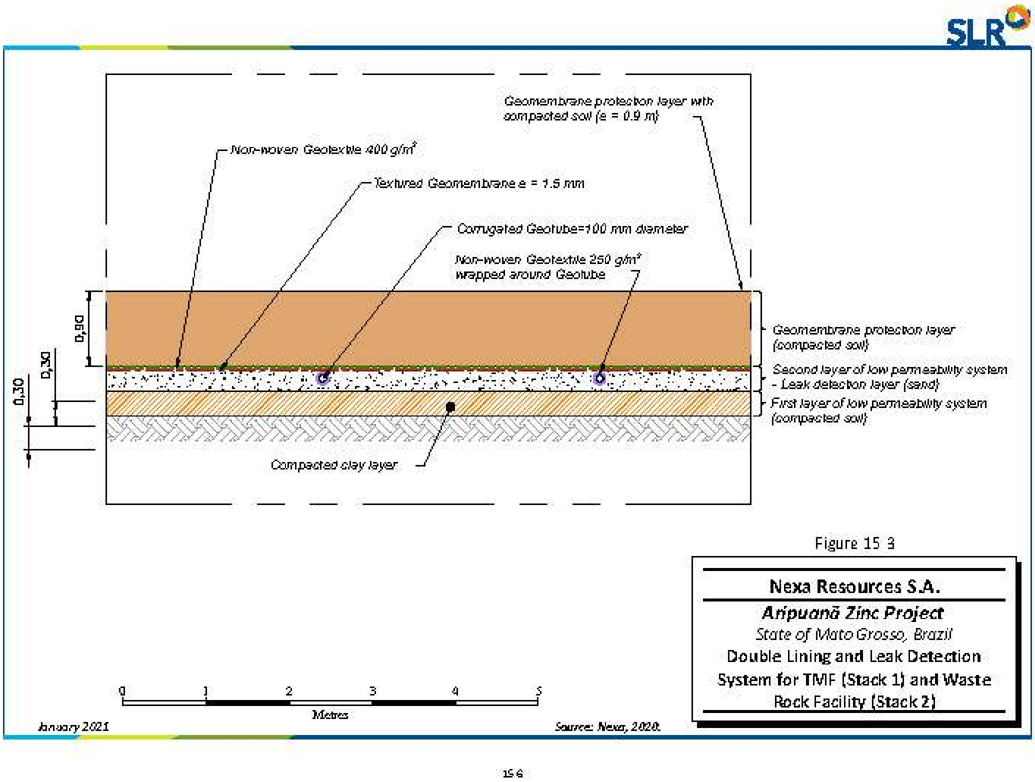


Figure 15-3: Double Lining and Leak Detection System for TMF (Stack 1) and Waste Rock Facility (Stack 2)

15.3.4 Waste Rock Storage Facility Design

Waste rock production that requires surface disposal is approximately 1.32 Mm^3. A dedicated waste rock facility (WRF) at Stack 2 will receive mining waste rock which is classified as Class IIA waste, by NBR 10.004 (ABNT, 2004). However, due to the uncertainties inherent to the tests carried out for the classification of the material, the waste rock was classified as Class I. Class I waste is required to meet the guidelines proposed by NBR 10.157 (ABNT, 1987), which establishes the criteria for the design, construction, and operation of hazardous waste landfills. The waste rock stack design is therefore similar to the TMF and includes:

- A double lining system with leak detection.
- Perimeter surface canals that collect and drain runoff to an effluent management pond (wetland).
- Hydrogeological monitoring and groundwater and surface monitoring wells around Stack 2.
- Closing the facility with a clay soil cover layer and surface drainage system to allow revegetation of the area at the end of mining.

15.4 Water Collection and Treatment

Due to the high flow rates and expected low concentrations of dissolved metals, water collection and treatment will be carried out using engineered wetlands. Separate facilities will be developed for process water recovered from the plant and for runoff from stockpiles (ore, waste, and dry stacked tailings) and access roads.

The wetlands will treat and discharge water in a controlled manner. The engineered wetlands consist of a solids sedimentation pond, with aerobic and anaerobic passive systems for organic/metals removal and pH adjustment (Figure 15-4).

Figure 15-4: Engineered Wetlands Concept

Figure 15-5 shows a general arrangement of the Aripuanã Wetlands, with the TMF in the foreground, the WRF on the right, and the processing plant area in the background.

Figure 15-5: Aripuanã Wetland Water Treatment

15.5 Power Supply

Electrical power will be provided by SE Juina (National Energy System) through private installations of UHE Dardanelos, where the connection to the Nexa bay will be at 230kV. A 20km long transmission line will connect the Dardanelos substation to the Project's main substation at the mine site. Nexa obtained authorization for the connection from the Ministry of Mines and Energy, and in 2019 obtained the access permit provided by Operador Nacional do Sistema Elétrico (ONS), and subsequently obtained authorization to connect to the national grid from the Agência Nacional de Energia Elétrica (ANEEL). Nexa is in the process of signing the Transmission System Connection Agreement (Contrato de Conexão ao Sistema de Transmissão, or CCT) with Empresa Brasileira de Transmissão de Energia S.A. (EBTE), which is responsible for SE Juina..

15.6 Water Supply

The Project water balance requires a top-up of fresh water supply of approximately 150 m^3/h.

Nexa has undertaken a water supply engineering study based on the construction of a water dam and creation of a freshwater lake in a valley adjacent to the Project site (see Figure 15-1).

Nexa has obtained authorization from the regional authority to construct the dam and to draw up to 378 m^3/h of fresh water from the dam to supply the Project.

15.7 Site Access

The Project is located 25 km from the city of Aripuanã (population 17,000) and can be accessed by 935 km of paved roads from Cuiaba, the capital city of the state of Mato Grosso. The city of Aripuanã has an airport with a paved runway, which supports small aircraft. Aripuanã is connected to the national highway system by dirt roads of average quality. Vegetation to the sides of the access roads is dense but has been cleared in nearby areas which are mainly used for agriculture.

16.0 MARKET STUDIES

16.1 Markets

The principal commodities that will be produced at the Aripuanã Project – zinc, lead, copper, silver, and gold – are freely traded at prices and terms that are widely known so that prospects for sale of any production are virtually assured. Zinc and copper represent 69% of Aripuanã's gross revenue, while lead, silver, and gold contribute 31% of the revenue. Approximately 54% of Aripuanã zinc concentrate will be processed at Nexa's Três Marias and Juiz de Fora zinc refineries in Brazil based on the current LOM plan, although this may change based on the availability of concentrates on the open market in the future. The remainder will be sold on the open market. Lead and copper concentrates will also be sold on the open market. Sales contracts for the concentrates from the Project have not been negotiated yet, however, SLR has reviewed the concentrate terms provided by Nexa (based on its other polymetallic operations in South America) and found them to be consistent with current industry norms.

Market information for this section comes from the industry scenario analysis prepared by Nexa's Market Intelligence team in July 2020 based on information sourced from different banks and independent financial institutions, economy and politics research groups, and metals consultants.

Nexa's Market Intelligence team notes that the industry has progressed from volatile markets in 2019 due to US/China trade wars, Brexit, and developing economies slowing down, to more uncertainty in 2020 due to the COVID-19 pandemic, a plunging global economy, the oil crisis, and the US elections. All these factors have affected the market fundamentals.

The SLR QP has reviewed the market studies and analyses and the results support the assumptions in the Technical Report Summary.

16.1.1 Zinc

16.1.1.1 Demand

The major market drivers for zinc demand are construction and infrastructure, transportation and vehicles production, industrial machinery production, batteries, and renewable energy. All these industries have been affected by the COVID-19 pandemic which has caused the global economy to slow down. As a result, zinc metal demand has also decreased in 2020 by approximately 6% compared to 2019.

Nexa's Market Intelligence team examined several scenarios for demand recovery and future growth and settled on a base case that forecasts pre-COVID-19 levels of demand in the second half of 2022, with a demand compound annual growth rate (CAGR) of approximately 1.3% from 2023 to 2025.

16.1.1.2 Supply

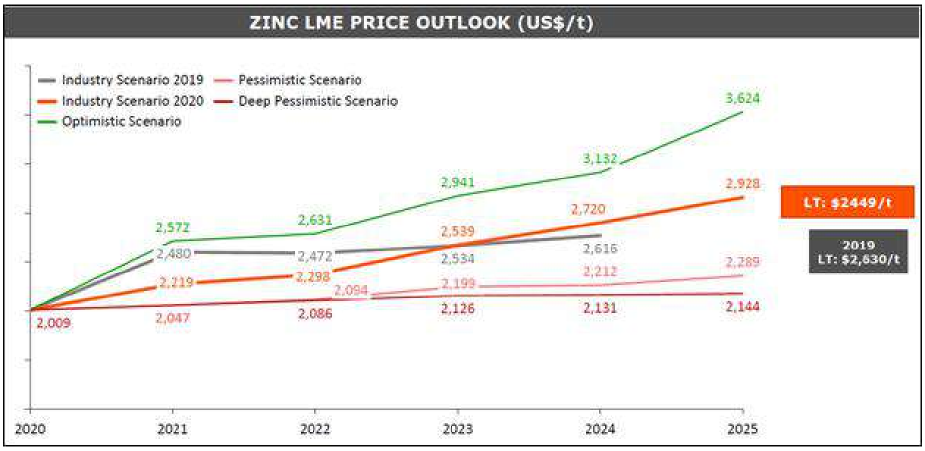
Nexa's Market Intelligence team's supply forecast analysis was based on the following industry information: zinc mine start-up and closure, mine production guidance, disruption allowance evaluation, project pipeline, and cost evaluation. Nexa's analysis results are summarized as follows:

- Project Pipeline: The analysis considered greenfield and brownfield projects forecast to begin production between 2021 and 2025.
- Zinc concentrate production evolution - Global: Zinc mines have been affected by the COVID-19 pandemic, with companies reducing investments and closing operations. This scenario, associated with the fact that there are few zinc projects in the pipeline, is expected to result in limited zinc supply in the long term.
- China concentrate evolution: Although Chinese concentrate supply is projected to increase through the 2021 to 2025 cycle, China showed marginal increments in production in 2020, which led the country to import a significant amount of zinc raw material. The growth perspective significantly depends on the ability of China's small mines to survive amid volatile market conditions and strong environmental scrutiny by the Chinese government.

- Zinc Global Market Balance: Based on the above considerations, Nexa has forecast a surplus in the market in 2020 and 2021, with a more robust demand growth to be observed from 2022 onwards. From 2024 onwards, the global demand will exceed zinc supply, resulting in a market deficit.

16.1.1.3 Zinc Price Outlook

Zinc prices depend mainly on variations in supply, demand, and the perceived supply/demand balance. The most commonly referenced currency for zinc transactions is US dollars. Nexa's Market Intelligence team forecasts stressed zinc prices in 2021 and 2022, with a potential price increase to greater than $2,700/t, starting in 2024 to 2025. Figure 16-1shows the results of Nexa's analysis.



Nexa, 2020a

Figure 16-1: Zinc Price Outlook (2020 to 2025)

16.1.2 Copper

16.1.2.1 Demand

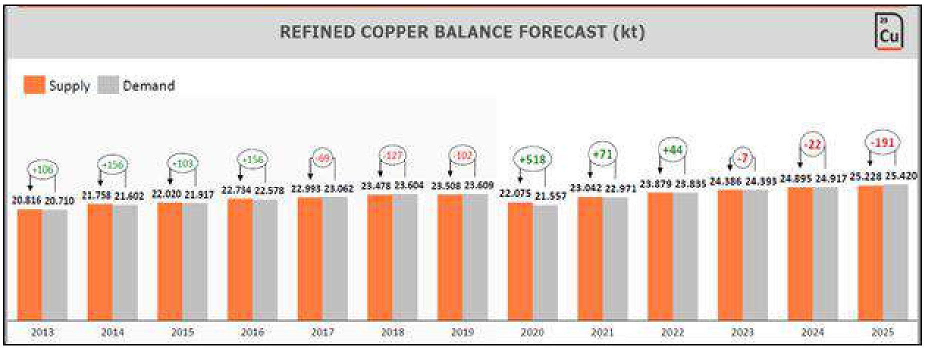
The major market drivers for copper demand are power generation and transmission, construction, factory equipment, and the electronics industry. The COVID-19 pandemic affected copper demand in 2020, which increased 1.3% in 2020 compared to 2019, according to independent estimates. In Nexa's view, the crisis related to the COVID-19 pandemic may also impact demand in the years ahead. However, positive contribution of global trends such as electric vehicles, renewable energy, and urbanization, may contribute to copper demand in the long term.

16.1.2.2 Supply

Nexa's Market Intelligence team's supply forecast analysis was based on the following industry information: copper mine start-up and closure, mine production guidance, project pipeline, and cost evaluation for 2020 onwards. Nexa's forecast analysis results are summarized as follows:

- Project Pipeline: There are few projects in the pipeline, mainly because there are fewer opportunities in mining-friendly jurisdictions.

- Copper concentrate (sulphide) production evolution: Nexa considers that the majority of the production will come from sulphide mines. Nexa forecasts a concentrate production CAGR increase of 4.2% between 2020 and 2025. The increase in supply results from the ramp-up of brownfield projects.
- Copper SXEW (oxide) production evolution: Nexa forecasts a downward trend for SXEW production. Based on Nexa's analysis, the concentrate production CAGR will decrease by 2.7% between 2020 and 2025, as a result of mine closures and reductions in production.
- Refined Copper Market Balance: the copper market has been in deficit for the last three years, leading to lower stocks. Despite this, prices were lower from mid-2018 to mid-2020 mainly due to the trade war between the USA and China, and the COVID-19 pandemic outbreak in 2020. Based on the above production assumptions, Nexa forecast a copper market balance in 2020, with the market driving to a deficit from 2023 onwards, when the global copper demand will surpass the copper supply (Figure 16-2).

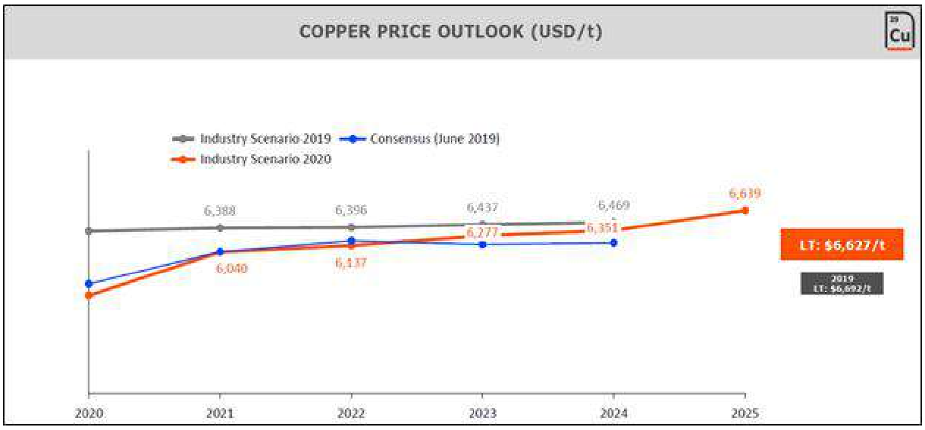


Nexa, 2020a

Figure 16-2: Refined Copper Market Balance (2020 to 2025)

16.1.2.3 Copper Price Outlook

The main factors that drive copper prices are variations in supply, demand, and the perceived supply/demand balance. Nexa forecasts stressed copper prices between 2021 and 2024, with a potential price increase to higher than $6,500/t from 2024 onwards, and a long term price of $6,627/t. Figure 16-3 show the results of Nexa's analysis.



Nexa, 2020a

Figure 16-3: Copper Price Outlook (2020 to 2025)

16.1.3 Lead, Silver, and Gold

Lead , silver, and gold in conjunction represent 31% of Aripuanã's gross revenue. Given their impact on the Aripuanã revenue mix, Nexa has based its lead and silver price forecast solely on consensus prices and correlation analysis published by metal market analysts and financial institutions.

16.1.3.1 Lead Price Outlook

Lead represents 19% of Aripuanã's gross revenue. Nexa's lead prices were chosen considering a spread applied on the zinc prices curve. These spreads are commonly used and monitored by the market, based on a strong correlation between the two metals. For the cycle 2021 to 2025 a growing spread between US$ 350/t Pb to US$ 700/t Pb was considered. Nexa forecasts increasing lead prices between 2021 and 2025 (between US$ 1,869/t Pb and US$ 2,247/t Pb), and a lower long term price of US$ 1,910/t Pb. Figure 16-4 presents the results of Nexa's lead analysis.

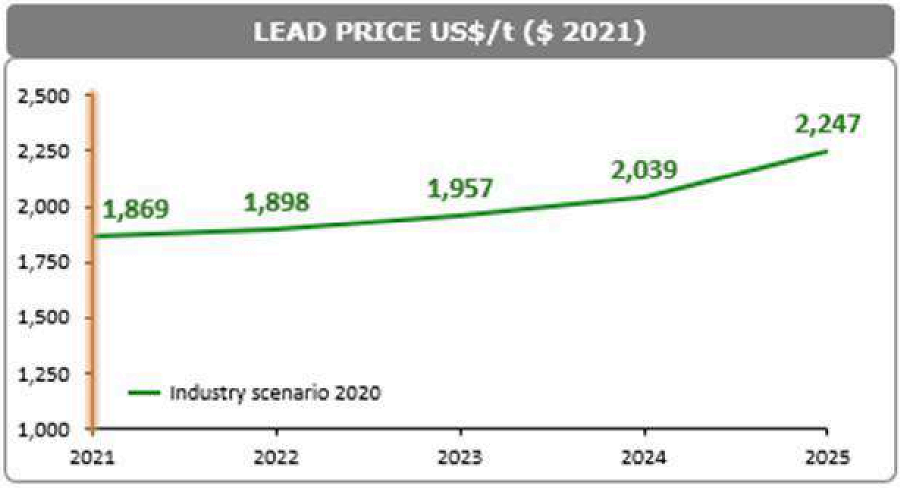


Figure 16-4: Lead Price Outlook (2020-2025)

16.1.3.2 Silver and Gold Price Outlook

Silver and gold represent 9% and 6% of Aripuanã's gross revenue, respectively. Nexa's silver and gold prices were chosen based on the median of consensus prices published by banks and institutions on a monthly basis.

Nexa forecasts a declining silver price between 2021 and 2025 (between US$ 17.30/oz Ag and US$ 16.40/oz Ag), with a potential long term price increase to US$ 16.87/oz Ag after year 2025. For gold, Nexa forecasts declining prices between 2021 and 2025 (between US$ 1,901/oz Au and US$ 1,466/oz Au), with a potential long term price increase to US$ 1,500/oz Au after year 2025. The silver and gold forecast curves in Figure 16-5 and Figure 16-6, respectively, present the median silver and gold prices considering 23 different institutional sources.

Figure 16-5: Silver Price Outlook (2020-2025)

Figure 16-6: Gold Price Outlook (2020-2025)

16.2 Contracts

No contracts for operations have been negotiated yet.

17.0 ENVIRONMENTAL STUDIES, PERMITTING, AND PLANS, NEGOTIATIONS, OR AGREEMENTS WITH LOCAL INDIVIDUALS OR GROUPS

17.1 Environmental Setting

The surface components of the Aripuanã Project are located approximately 25 km northwest of the municipality of Aripuanã, in the northwestern corner of the Mato Grosso State, Brazil, approximately 1,200 km northwest from Brasília, the federal capital.

Nexa commenced construction of the Project in July 2019 and has progressed with the development of surface infrastructure, with the completion of the surface ramp to underground workings completed in 2019. This allowed for the construction of the ventilation raise, continued development of the exploration drift in the mineralized zone, and the commissioning of the plan to supply provisional power, as reported in the 2019 Nexa annual report. Nexa has further indicated in email communication that underground paste fill is in progress, construction of administrative buildings has started, and progress has been made on the ore processing plant construction. In addition, completion of the water supply dam development is planned for 2020.

Key aspects of the environmental setting include (GeoMinAs 2017, RPA 2017 and SETE 2018):

- **Topography:** The Project area is located within an area called Depressão Amazonica Meridional (RADAM Brasil 1982) and the Depressão Norte do Mato Grosso (Seplan 1999). This depression includes the drainage network of the Aripuanã River and Tenente Marques River. The area is hilly with elevations from 129 MASL to 361 MASL and a general northwest-southeast direction.
- **Climate:** According to the Köppen-Geiger climate classification, the climate in Aripuanã is AM – a Monsoon tropical, megathermal with temperatures in the coolest months above 18°C, with no winter season. Annual precipitation is above 2,000 mm, concentrated in the warmer months, and averages below 600 mm in the driest months.

  In the Aripuanã River basin regimen follows the precipitation pattern, with the wet season spanning from November until May. Low flows start in June and end in October. The minimum flows are observed in September and October.
- **Air quality:** Baseline dust monitoring results were below the national standards. Potential sensitive receptors who could be impacted by Project activities were not specifically identified in the Environmental Impact Assessment (EIA) baseline discussion, although the Project's direct and indirect areas of influence were mapped.
- **Geology and potential for acid generation:** The polymetallic deposit of Aripuanã lies in the south-central part of the Amazonian Cráton. The lithological units are represented by the rocks of the Roosevelt Group, the Serra da Providência Granites, in addition to the Caiabís Group.

  Laboratory tests have been conducted at several stages of the Project development to determine if there is potential for the mine to generate acid leachate. These tests included static and kinetic testing on ore samples, waste rock or sterile rock samples and tailings. The results show that some waste rock lithologies have the potential to generate acidity due to the oxidation of sulphides and the low presence of neutralizing components. The tailings samples showed a low to zero acidification potential. The paste fill material will not generate acid and is expected to act as a neutralizing material.

  Leachate testing showed that the main components above regulatory values (Regulation 357/05, Class II, for materials classified as solid waste according to the Brazilian standard NBR 10004) were aluminum, lead, copper, iron, manganese, and zinc. Solubilized metals were determined to be of natural origin and, like copper and lead, associated with local mineralization, and consistent with the background values of water quality. In tailings, lead was also a component in metal solubilization.
- **Surface water:** The Project area has two creeks, Arrainha Creek and Maranhão Creek, both of which are tributaries of Guaribal Creek, which is a tributary of the Aripuanã River, which drains part of the extreme northwest of the state of Mato Grosso and belongs to the Amazon River basin.

Regarding the surface water quality, due to the geological conditions in the region, metals which presented concentrations above the detection limit are: aluminum, dissolved iron, manganese, barium, and zinc. These are part of the rock composition in the area and do not indicate contamination or pollution.

The 2017 EIA reported August and April 2008 and December 2011 monitoring data. The monitoring data reported in the 2017 EIA was classified according to a Water Quality Index in accordance with the methodology of the National Sanitation Foundation of the United States. The water quality ranged from average in the wetter months to good in the drier months. This was assigned to high volume precipitation events in the wet season causing sediment loading.

In August 2008, the parameters which did not meet the limits established by the Ministry of Environment (CONAMA) Resolution No. 357/05 for Class II water bodies were: phosphorus (all sampling locations, except one), dissolved iron (two locations) and manganese (one location). In April 2008, the parameters were: turbidity (one location), dissolved oxygen (one location), phosphorus (all), dissolved iron (all), dissolved aluminum (two locations), manganese (five locations) and Escherichia coli (three locations). In December 2011, the parameters were: Biological Oxygen Demand (one location), total phosphorus (four locations), dissolved iron (one location), manganese (two locations), and E. coli.

Third-party water users were not specifically identified in the EIA baseline discussion, although the Project's direct and indirect areas of influence were mapped.

- **Groundwater:** The Project area is underlain by poor aquifer zones and non-aquifer zones (geology offers very low conditions of storability and transmissivity of groundwater). The 2017 EIA did not include information on the depth of groundwater nor any hydrocensus exercises to identify third-party groundwater users. One spring was monitored as part of the surface water quality study. Water quality in this spring showed E. coli levels above national standards but the EIA noted that the spring is used by wildlife. All other water quality parameters were reported to be within the applicable national standards (CONAMA Resolution 396/2008). As previously mentioned, third-party water users were not specifically identified in the EIA baseline discussion, although the Project's direct and indirect areas of influence were mapped.
- **Biodiversity:** The Project is located in the Amazon Biome, within the South-Amazonian Ecotone Corridor. In terms of habitat, the planned infrastructure will be located mainly in rainforest with palm trees. Other habitats to be impacted to a lesser degree include rainforest with Justaconta, secondary forest previously impacted by anthropogenic activities, planted pasture, degraded pastureland and areas degraded by artisanal mining activities.

Infrastructure will be placed within 76 ha of Permanent Preservation Areas protected by federal law (No. 12,651/2012). This Permanent Preservation Area is a protected area, which may not necessarily have native vegetation, with the environmental function of preserving water resources, landscape, geological stability and biodiversity, soils and ensure the well-being of human populations. A specific resolution does, however, allow development in exceptional cases for low environmental impact activities in the Permanent Preservation Area.

The floristic surveys showed the occurrence of eight species falling into some category of vulnerability to extinction, four of which were vulnerable, two threatened and two considered deficient in data. These include Euterpe edulis (jussara palm tree), Cordia goeldiana (Freijo tree), Hymenaea courbaril (a common hardwood tree), Aniba rosaeodora (pau-rosa tree in the Magnolia family), Bertholletia excelsa (Brazilian nut tree), Virola bicuhyba (known as the epená, patricá, or cumala tree), Manilkara cavalcantei and Manilkara elata (no common names provided). It was also noted that the Brazilian nut tree species and rubber tree are protected by local law.

The Amazon biome is an important area of endemism for fauna, with a wide variety of food resources and diversity of habitats available in the study area. Fauna surveys identified four bird species that fall into some degree of threat of extinction, they are: Tinamus Tao (Azulone), Harpyja (hawk) and Hypocnemis ochrogyna (ocriceous singer) classified as Vulnerable (VU) at national level and Cherrie's Synallaxis (puruchém) classified as Near Threatened (QA) at the global level (International Union for Conservation of Nature (IUCN), 2017 as cited in GeoMinAs, 2017). Records of some species considered by CITES for the area were also obtained, including the aforementioned Harpya harpyja (hawk) and Ara macao (Red Macaw). The

Project area has a high diversity of mammal species. Fourteen species are endemic (specific) to the Amazon biome, such as Mazama nemorivaga (deer- fuboca), Dasyprocta fuliginosa (black agoutis), and the eight primates, Alouatta puruensis (guariba), Ateles chamek (spider monkey), Aotus infulatus (night monkey), Lagothrix cane (pot-bellied monkey), Sapajus apella (capuchin monkey), Chiropotes albinasus (cuxiú), Cebus unicolor (cairara) and Mico intermedius (sagui-do-rio-Aripuanã). Eight species fall into some national or IUCN category: pot-bellied monkey, spider monkey, cuxiú, Priodontes maximus (tatu-canastra), Tapirus terrestris (tapir), Puma concolor (jaguar), Tayassu pecari (pecari), Otter longicaudis (otter). When considering herpetofauna, the yellow tortoise Chelonoidis denticulatus is a species classified as Vulnerable by the IUCN.

Further afield, there are two conservation areas in the municipality located 100 km to 200 km to the north from the Project: Estação Ecológica Rio Flor do Prado, with an area of 9 ha, and Reserva Extrativista Guariba Roosevelt, with an area of approximately 165 ha.

- **Land use:** The Project area is located on the left banks of Rio Guaribal Creek and right banks of the Roosevelt River. Nexa informed SLR through email communication that the area consists of pastures, managed or unmanaged forests, regenerating forests, and degraded pastures.
- **Noise:** Baseline noise monitoring results were below the national standards. Potential sensitive receptors who could be impacted by Project activities were not specifically identified in the EIA baseline discussion, although the Project's direct and indirect areas of influence were mapped.

17.2 Corporate Policy and Commitments

Nexa does not have an Environmental Policy for the Project. According to Nexa's website and the 2019 Nexa annual report, the Company identifies and manages the main risks from both an operational and a strategic point of view, reducing and mitigating impacts to maintain business sustainability. The Company has an integrated management system that establishes the guidelines that govern the conduct of the businesses, with a focus on quality management of environmental, health and workplace safety and social responsibility issues. In addition, the Company follows applicable environmental laws and regulations pertaining to its business in each country where it operates (Nexa, 2019).

Nexa has stated the following environmental goals in its 2020 annual report:

- 75% of recirculation and lower specific use of water.
- Reduce the specific emission of greenhouse gases by 5 %.
- Decrease the disposal of tailings in dams and reduction by 50 % in the specific generation of mining and smelting waste.
- Ensure that 100 % of the units have a pre-prepared future-use alternative study and an updated decommissioning plan, in line with the sector's benchmark standards.

17.3 Environmental Studies

17.3.1 Project Environmental Impact Assessment and Approval

The environmental licensing process for the Project started in 2008 following the Terms of Reference (ToR) (Ofício nº 20084/CM/SUIMIS/2008) issued by Mato Grosso environmental agency (SEMA/MT). For strategic reasons, the process was put on hold and the field activities performed in 2008 were consolidated into a document in the format of a "Diagnosis of an EIA – Environmental Impact Assessment of the Project" (EIA). In 2012, a new ToR was requested (Ofício nº 85522/CM/SUIMIS/2012), and many of the studies performed as a result were consolidated into a comprehensive EIA. The EIA was completed in 2012, however, it was not filed with the authorities due to low commodity prices at that time. In 2014, with zinc prices increasing, the EIA was filed. Taking into account further exploration on the property, increased production levels were presented in 2015 with productions increasing from 1.2 Mtpa to 1.8 Mtpa. The Mato Grosso environmental agency performed many inspections and the Public Hearing was held on August 26, 2015. During 2015 and 2016, the permitting process was analyzed by the agency, however, due to changes in the engineering process, the analyses were put on hold until all changes were performed. There were also updates in the biotic media campaigns and the inclusion of the noise and vibration studies. The Project EIA was finalized in 2017 by Geologica Mineração e Assessoria Ltda (GeoMinAs). This is the most recent EIA and the environmental review has been based mainly on this EIA.

17.3.2 Identification of Project-Specific Environmental Baseline Conditions, Risks, and Impacts

Key baseline information is summarized in the Environmental Setting section at the beginning of this section. Comprehensive baseline studies were conducted by specialists in their field as part of the 2017 EIA, which included desktop data collection and review and fieldwork sampling. Sampling results were compared to national standards as relevant, for example air quality results were compared to the national dust concentration standards. The EIA described the methods of data and sample collection, data analysis and references used.

Project impacts were identified in the 2017 EIA by analyzing the planned Project activities and tasks, taking into account location and the environmental setting, for the Project stages, i.e., planning, implementation, operation, and deactivation. Each potential impact was evaluated considering nature (positive or negative), reversibility, incidence (direct versus indirect impacts), spatial scale, magnitude, and duration. Cumulative impacts were considered. Table 17-1 lists the identified environmental impacts and associated management measures or plans to mitigate the impact. Social impacts are discussed separately in the Social or Community Requirements section.

Table 17-1: Environmental Impacts and Management Measures (GeoMinAs, 2017)
Nexa Resources S.A. – Aripuanã Zinc Project

Impact Identified	Management Measures/Programs
Air quality impact due to particulate material generation and combustion gases	• Program of Control and Monitoring of Atmospheric Emissions. • Monitoring Program of Air Quality and Meteorology
Noise generation	• Preventive maintenance of vehicles, machinery, and equipment. • Noise Control and Monitoring Program.
Vibration generated by blasting activities	• Vibration Control and Monitoring Program
Soil structure and erosion processes	• Recovery Plan for Degraded Areas • Control and Monitoring of Erosive Processes.
Silting of water bodies	• Surface and Groundwater Management Program • Recovery Plan for Degraded Areas • Control and Monitoring of Erosive Processes.
Impacts on the Arrainha and Maranhão Creeks due to the construction of the dam, the waste pile and recovered water pond	• Erosive Process Control and Monitoring Program • Surface and Groundwater Management Program.

Changes in the terrain and landscape	• Degraded Areas Recovery Plan • Decommissioning Program of Site Structures.
Changes in the surface water and soil quality	• Solid Waste Management Program • Liquid Effluent Management Program Erosive Process Control and Monitoring Program • Surface and Groundwater Management Program • Degraded Areas Recovery Plan • Decommissioning Program of Site Structures • Mining Mine Closure Plan.
Changes in the aquifer recharge rate Interference in springs flow Changes in groundwater flow	• Groundwater and Surface Water Dynamics Monitoring Program.
Changes in groundwater quality	• Surface and Groundwater Management Program • Liquid Effluent Management Program.
Reduction of the open forest cover, with losses of flora and threatened flora Direct disturbance of 75.85 ha of Permanent Preservation Areas, designated protected areas (due to the establishment of the dam and drainage systems). Reduction in the connectivity between native vegetation Loses in vegetation cover in areas already impacted by human activities (pastures with some remnants of original vegetation)	• Flora Rescue Program • Degraded Areas Recovery Plan • Program of Monitoring of Plant species and Wildlife Rescue • Environmental Education Program. • Compensatory measures: forest replacement in the Permanent Preservation Areas to be implemented under the Forest Connectivity Program, in addition to the Environmental Compensation Program.
Fauna displacement due to machines, vehicles and people movement and noise generation. Risk to fauna due to vehicles and hunting activities Losses of fauna specimens due to loss of vegetation Loss in mammals due to habitat loss, including endangered species	• Terrestrial Fauna Monitoring Program • Program of Monitoring of Plant species and Wildlife Rescue • Environmental Education Program.

Changes in the fish populations due to changes in the surface water flow	• Erosive Process Control and Monitoring Program • Surface and Groundwater Management Program • Ichthyofauna Monitoring Subprogram.
Changes in the freshwater biota due water bodies silting	• Erosive Process Control and Monitoring Program • Surface and Groundwater Management Program • Degraded Areas Recovery Plan • Herpetofauna Monitoring Subprogram • Ichthyofauna Monitoring Subprogram • Hydrobiological Communities Monitoring Subprogram
Changes in vectors such as insect populations	• Fauna Monitoring Program - Subprogram of Monitoring Entomofauna (Vectors) • Health Support and Epidemiological Surveillance Program. • Malaria Control Action Plan.
Change in hydrobiological communities resulting from water quality changes due to backfill activities underground and effluent generation in the sterile deposit, waste, and minerals (Acidic drainage)	• Water and Effluent Management Plan • Surface and Groundwater Management Program • Monitoring of Hydrobiological Communities Monitoring Subprogram

Nexa commissioned a Forest Management Plan which was completed in June 2018. This management plan was developed following the guidelines set out in the relevant legislation of the state of Mato Grosso and was required to allow the Project to proceed.

Nexa also commissioned an Environmental Control Plan which was compiled by Solucoes E Tecnologia Ambiental (SETE) in July 2018. This plan provides a detailed account of:

- The Project description
- The management plans as mentioned in Table 17-1, originating from the 2017 EIA
- Decommissioning plan
- Emergency response plan
- Monitoring plans

This plan provides detail in terms of aims and objectives, timing and responsibilities including any needed training and institutions to be involved. The objective of this plan was to meet regulatory requirements through submission to SEMA to obtain the Project Installation Licence. In the SLR QP’s opinion the proposed environmental management plans are adequate to address issues related to environmental compliance.

The 2017 EIA concludes that the most significant Project impacts are those that will directly and indirectly affect, synergistically and cumulatively, vegetation cover and soils in the Permanent Preservation Areas and water resources, as well as changes in fauna communities, both terrestrial and aquatic, highlighting the relevance of local biodiversity, with species of flora and fauna of the Amazon biome, including endangered species (GeoMinAs, 2017). Key mitigation measures with regard to the Permanent Preservation Areas will be the implementation of a compensation plan and programs aimed at connectivity of habitat.

17.3.3 Monitoring Plans

The 2017 EIA provides some detail on monitoring plans. The 2018 Environmental Control Plan provides detail on the monitoring programs. This plan provides a list of specialists responsible for implementing the plan such as a biologist, agronomist, geologist and community and environmental educator. The monitoring plan covers:

- Air quality and meteorology
- Noise
- Vibration
- Geotechnical monitoring
- Water quality and effluent
- Erosion
- Groundwater and surface water (including linkages between surface and groundwater)
- Terrestrial flora
- Terrestrial fauna (birds, insects, amphibians and reptiles, mammals, bats)
- Aquatic biota (hydrobiological communities i.e. phytoplankton, zooplankton; and fish, including monitoring of trace metals in fish tissues)

In SLR's opinion, the monitoring plans are comprehensive and include goals of the monitoring, legal requirements, methods used for sample or data collection and data analysis, scheduling, technical team, areas, and indicators to be monitored and references. Each monitoring program also describes links to other management and monitoring plans and programs.

17.4 Emergency Preparedness and Response

A detailed risk assessment was conducted for the Project and included in the 2017 EIA. Ninety-one scenarios were identified which could result in accidents or events for which recommendations were made to mitigate or mitigate the risk. The environmental scenarios identified included spills or oil and grease and emission of combustion gases and inhalable particulates. These were assessed as having a low risk. The most significant health and safety risks identified were a potential failure of the water dam, fire or explosions in utility and reagent storage areas, general occurrence of accidents, and underground mine collapse or incidents.

The 2017 EIA included a Risk Management Program and the Emergency Response Plan. The Risk Management Plan aims to prevent the occurrence of accidents and, if they occur, minimize the impacts that may jeopardize the physical integrity of employees and/or the company's assets, as well as the safety of employees and the environment as a whole. The Emergency Response Plan defines the responsibilities, guidelines, and information aimed at the adoption of structured technical and administrative procedures, in order to provide the necessary conditions for the triggering of quick and efficient actions to be adopted when a risk scenario materializes, aiming to minimize possible damage to people, the environment, and property.

17.5 Mine Waste Management

17.5.1.1 Tailings and Waste Rock Management

Approximately 6.3 Mm^3 of tailings will be produced and will require surface disposal over a period of 13 years with the remaining tailings applied as cemented paste backfill. In addition, approximately 1.3 Mm^3 of waste rock will also be disposed of at surface. The tailings are prone to acid drainage and are classified as Class I according to the Brazilian waste classification standard NBR ABNT 10.004/2004. The waste rock is classified as Class IIA waste, however, due to the uncertainties inherent to the tests, a classification of Class I has also been adopted. Class I waste disposal must meet the guidelines proposed by NBR 10.157 (ABNT, 1987), which establishes the criteria for the design, construction, and operation of hazardous waste landfills. A double lined storage facility with a leak detection system is therefore required for both the tailings and waste rock disposal.

The provisional design of a dedicated TMF has been completed. The tailings will be filtered to a relatively low moisture content for transport by truck and placed and compacted in thin lifts, similar to typical earth embankment construction. The tailings compaction criteria are to ensure dilating behaviour (i.e., not susceptible to liquefaction). The TMF is located to the west of the plant on local high ground with no upstream catchment. There is no surface tailings pond required with the use of filtered tailings. Surface runoff will be collected by a perimeter concrete channel and directed to two effluent storage ponds. Implementation of inflatable warehouses is proposed for use in the wet season to allow for the placement and compaction in dry conditions. Groundwater and surface water monitoring is required for the operating and closure phases of the Project. At closure, the TMF and WRF will be capped with a clay layer and vegetated. Runoff from the TMF will be directed to a wetland treatment system.

The following recommendations are proposed for the next phase of the design:

- Classify the TMF in terms of the Global Tailings Standard or the Canadian Dam Association. The classification may require more conservative design criteria in terms of flood management and seismic loading.
- Consider the stability assessment of the individual components of the double lined system and the interface between the components in the stability analyses. In particular, the interface between the smooth side of the geomembrane and the sand leakage detection layer.
- Complete a deformation analysis to determine if the long-term strain of the high density polyethylene geomembrane is within acceptable limits.
- Implement measures to control dust generation from the slopes of the TMF and internal access roads and ramps during the dry season.
- Implement requirements to allow the progressive rehabilitation of the slopes.
- Implement deposition planning for the wet season and the associated logistical requirements for the use and management of the inflatable warehouses.
- Investigate the extent of the colluvial layer within the foundation of the TMF to provide a more accurate estimate of the volume of material that must be removed.
- Complete an initial assessment of the stability of the capping clay layer on the intermediate bench slopes to determine if slope flattening is required for closure.
- Determine a source of clay with suitable quality for use as a lining and capping material.
- Complete a formal risk assessment.

17.6 Water Management

Preliminary characterization studies of acid rock drainage included collection of samples and laboratory static and kinetic testing of waste rock and tailings. The results of the tests indicate low acid generating potential. The paste fill material will not generate acid and is expected to act as a neutralizing material (GeoMinAs, 2017).

The water management strategy for the Project includes the implementation of the following main water management facilities:

- Freshwater supply dam
- Water recovery pond
- Wetlands

The freshwater dam (Figure 18-1) will be the source of make-up water for ore processing. The dam will be equipped with an emergency spillway to prevent dam overtopping. The water dam reservoir was designed to meet a demand for 150 m^3/hr for the processing of ore in the industrial processing plant of the Project.

The water recovery pond located south of the processing plant area collects the underground mine dewatering and the surface water runoff collected in the processing plant area, the administration area, and the ore stockpile. Water from all these Project components is conveyed first to a wetland, and from the wetland to the water recovery pond.

The TMF and WRF are designed with a double lining system with leak detection that will minimize infiltration of water to the groundwater environment. The water management system has been conceptualized and designed to ensure that the surface drainage water and infiltration to the TMF and WRF will be directed to engineered wetlands (Figure 18-4) for passive treatment prior to discharging the water to the receiving environment. Two wetlands are proposed for the TMF and one wetland for the WRF. Surface runoff from the TMF and WRF is directed to a network of interception and conveyance channels that convey the flows to the wetlands. Rainfall that infiltrates the TMF and WRF footprints gets collected through an internal drain system to prevent accumulation inside the facilities and formation of saturated areas. The internal drains convey the flows to the wetlands.

The NBR 10.157 guidelines developed by the Brazilian Association of Technical Norms for hazardous waste were considered for design and environmental monitoring of the TMF and WRF. These guidelines recommend the installation of monitoring wells in sufficient number to monitor the water surrounding the structure.

Surface water and groundwater quality monitoring will be implemented for receiving water bodies to identify potential water contamination and implement corrective actions if needed. Compliance with water quality standards will be carried out according to CONAMA Resolution No. 357/2005 for surface water and CONAMA Resolution No. 396/2008 for groundwater. Environmental water quality compliance for the receiving environment will be tracked during the stages of construction, operation, and closure of the Project. The program proposed quarterly sampling at eleven surface water quality sampling locations, and six groundwater quality sampling locations. Quarterly and annual reports will be prepared documenting the results of the monitoring campaigns. The quarterly frequency and the suite of water quality parameters sampled will be reviewed after the initial year of monitoring (GeoMinAs, 2017).

Monitoring will allow the identification of possible deviations or lack of performance of the proposed treatment systems for operation and the implementation of adaptive management in order to correct potential issues identified and maintain environmental water quality compliance.

According to the Project Description in the EIA (GeoMinAs, 2017), there are no natural sources of water used for collection of water for human consumption in the surroundings of the Project area.

17.7 Project Permitting

Nexa maintains a list of permits for the Project along with any relevant expiry dates which was provided to SLR. These include installation and operating licences. Examples include installation of electricity distribution infrastructure and the mineral beneficiation plant, implementing a malaria control plan and roadworks. Nexa reports regularly to the environmental regulatory agency (SEMA) on compliance with conditions of Installation Licence No. 69614/2018 for the Project.

Nexa indicated that required permits are in place. The permitting list can be used to track the Projects legal obligations.

17.8 Social or Community Requirements

This section is guided by the S-K 1300 content requirements as well as the following IFC PS:

- **PS1: Social and Environmental Assessment and Management Systems** requires that companies identify, assess, and mitigate the social impacts and risks they generate throughout the lifecycle of their projects and operations. From a social perspective, the requirement includes: a comprehensive social assessment; identification of critical social impacts and risks; community consultation and engagement; information disclosure; mitigation plans to address impacts and risks; and development of an organizational structure with qualified staff and budgets to manage the overall social management system.
- **PS2: Labor and Working Conditions** incorporates the International Labor Organization conventions that seek to protect basic worker rights and promote effective worker/management relations.

- **PS4: Community Health and Safety** declares the project's duty to avoid or minimize risks and impacts to community health and safety and addresses priorities and measures to avoid and mitigate project related impacts and risks that might generate community exposure to risks of accidents and diseases.
- **PS5: Land Acquisition & Involuntary Resettlement** considers the need for land acquisition or involuntary resettlement of any individual, family, or group; including the potential for economic displacement.
- **PS7: Indigenous Peoples** considers the presence of Indigenous groups, communities or lands in the area that may be directly or indirectly affected by projects or operations.
- **PS8: Cultural Heritage.** This standard is based on the Convention on the Protection of the World Cultural and Natural Heritage. The objectives are to preserve and protect irreplaceable cultural heritage during a project's operations, whether or not it is legally protected or previously disturbed and promote the equitable sharing of benefits from the use of cultural heritage in business activities.

17.8.1 Social Setting

The developing mining Project is located approximately 20 km northwest from Aripuanã in the municipality of Aripuanã. This municipality was founded in 1943 and has a total area of approximately 25,048,965 km² with a population of 18,656 people and a population density of 0.74 inhabitants per square kilometre, according to the 2010 Census (Comtexto Consultoria, 2018). The Brazilian Institute of Geography and Statistics (IBGE) website currently indicates that the population is approximately 22,714 people. The population is distributed in a greater proportion in the urban areas (62.6%). Within the municipal territory lies the Aripuanã and Arara Indigenous Lands of Rio Branco. The municipality includes the urban district of Conselvan, and four rural areas. The municipality is away from the main economical centres of the state (i.e., Cuiaba, Sinop, and Lucas do Rio Verde). Until 1995, there were gold and diamond artisanal mining activities in the area (RPA, 2017). Nexa has progressed with the development of infrastructure at the developing mine, with the completion of the surface ramp to underground workings completed in 2019.

Illegal mining or artisanal mining activities were detected by Nexa in October 2018 close to some of the mining rights and in the surrounding areas of the Project. According to a legal opinion dated July 17, 2020 provided by Nexa, the Company reported these activities promptly to the relevant authorities. In 2019 one of these artisanal mining activities persisted in the areas surrounding the Project and Nexa again reported it to the relevant authorities. In October 2019, a joint operation was carried out between state agencies to curb such illegal mining activities. Arrests, searches, and seizures were carried out and the artisanal miners were temporarily removed, with the destruction of part of the equipment used for illegal mining. However, once the police authorities left the area, illegal mining activities resumed again. In January 2020, Nexa was invited by the ANM's Conflict Resolution Advisory to participate in a meeting with representatives of the artisanal miners organized in a cooperative.

As a result of these negotiations an agreement with the artisanal miners cooperative was signed under the coordination of the ANM and establishes a consent from Nexa to the cooperative for them to use an area of 517 ha assigned by Nexa for artisanal mining activities, and be granted a specific permit called "Permissão de Lavra Garimpeira – PLG", for a period of two and a half years, which may be renewed for an equal period. The cooperative assumed the commitment to withdraw from all other areas where there were illegal mining activities surrounding the Project and to carry out their activity only in the assigned area upon the PLG and the applicable environmental permit. The agreement also establishes that all environmental damages arising from the artisanal mining activity in the assigned area will be the cooperative's responsibility, and Nexa is exempt from any environmental liabilities arising from their activities. The agreement was signed with the participation of the Mato Grosso's State Mining Company (Companhia Matogrossense de Mineração, METAMAT), as a representative of the State of Mato Grosso. The 517 ha area is a polygonal between the mining rights registered in ANM under numbers 867.381/1991, 866.565/1992, 866.051/2015 and 866.386/2003. The PLG granted to the artisanal miners is registered in the ANM under the number 866.390/2020. The assigned area has no interference with the mining concession area related to the Project, which is located in another mining right owned by Nexa. At the end of the PLG term, the area must be returned to Nexa. The agreement and PLG granted are exclusively for gold exploitation, no other mineral substance can be exploited by the cooperative.

The validity of this agreement is currently being discussed in a public civil action filed by the Federal Prosecutor. Nexa is taking all legal measures to ensure no impacts on Project implementation due to illegal mining activities.

17.8.2 Social and Environmental Assessment and Management Systems

17.8.2.1 Corporate Guidelines and Standards

At a corporate level, Nexa has adopted the guidelines of the International Integrated Reporting Council (IIRC) and the standards for the Global Reporting Index (GRI). The IIRC guidelines promote a cohesive and integrated approach to reporting on organizational activities. The GRI standards provide best practices for public reporting on economic, environmental, and social impacts in order to help Nexa and its shareholders and stakeholders understand their corporate contribution to sustainable development. These standards were reported on in the most recent Nexa Resources Annual Report (Nexa, 2020). With respect to social issues, the Annual Report for 2019 provided details of corporate activities aligning with the following GRI Standards:

- Employment
- Occupational Health and Safety
- Non-discrimination
- Training and education
- Diversity and equal opportunities
- Freedom of association and collective bargaining
- Child labor
- Forced or compulsory labor
- Human rights assessment
- Local communities
- Social assessment of suppliers
- Socio-economic compliance

Nexa's 2019 Annual Report also includes reporting on corporate progress towards several sustainable development goals. With respect to social environment issues, these include:

- Gender equality
- Decent work and economic growth
- Good health and well-being
- Peace, justice, and strong institutions
- Quality education
- Reduced Inequalities
- Sustainable cities and communities
- Responsible consumption and production

Nexa has a corporate compliance policy (PC-RCC-CCI-005-EN) meant to guide Nexa representatives and third parties. The compliance policy includes the following policies and procedures:

- Code of Conduct
- Anti-Corruption Policy
- Money Laundering and Financing Terrorism Prevention Policy
- Antitrust/Competition Policy
- Insider Trading Policy
- Disclosure Policy
- Compliance Program Manual
- Money Laundering and Financing Terrorism Prevention Manual

- Gifts and Hospitality Procedure
- Relationships with Government Representatives Procedure
- Travel and Entertainment Procedure
- Integrity Due Diligence Procedure
- Conflict of Interests Procedure

17.8.2.2 Identification of Project-Specific Social Baseline Conditions, Risks, and Impacts

The most recent EIA for the Project is the 2017 EIA compiled by GeoMinAs. This EIA includes a social baseline description, assessment of socio-economic impacts, and management plans detailing measures to prevent, minimize, or mitigate the identified socio-economic impacts. These components are generally consistent with social impact assessment practices.

The socio-economic baseline description includes:

- The social areas of influence
- The social, economic, and cultural characteristics of the population of the areas of influence of the project including:
    - Information on the Indigenous Peoples within the area of influence
    - Information on historical, cultural, and archeological resources
- Socio-economic variables that might be affected by the project
- Potential indicators to assess impacts of the project
- Identification of the main socio-economic and environmental issues of relevance to the population
- The foundation for a social impact management plan to mitigate potential negative impacts and maximize potential positive benefits

The baseline characterization was developed using a variety of methods including both primary and secondary data collection. Primary data collection included field investigations such as surveys and interviews, which were conducted prior to the EIA. Secondary data collection included reviews of available data from the Brazilian Institute of Geography and Statistics, as well as other government departments.

The analysis of the Areas of Indirect and Direct Influence was based on the Technical "Socioeconomic Diagnosis of Aripuanã, Mato Grosso, August 2016", developed by the consulting firm Diagonal for the Project.

The potential socio-economic impacts were assessed for the various stages of the Project and included an assessment of potential negative and positive impacts of the mine on the social environment. The social impacts assessed in the 2017 EIA are summarized in Table 17-2.

Table 17-2: Socio-Economic Impacts and Management Measures (GeoMinAs, 2017)
Nexa Resources S.A. – Aripuanã Zinc Project

Impact Identified	Management Measures/Programs
Potential increase in prostitution indexes, violence and drugs consumption and social cultural conflicts due to outside workers arrival in Aripuanã Municipality	• Labor Training and Qualification Program • Health Support and Epidemiological Surveillance Program • Social Communications Program • Environmental Education Program • Program for Monitoring Socioeconomic Indicators • Migrant Support Program.
Increase in the demand for housing and basic services	• Program of Actions with the Community and the Local Government • Health Support and Epidemiological Surveillance Program • Migrant Support Program.
Potential positive impacts such as employment and wage generation, new business opportunities generation, increase in tax collection.	• Labor Training and Qualification Program • Development Program for Entrepreneurs and Local Rural Producers.
Potential increase in endemic diseases due to the arrival of immigrants	• Health Support and Epidemiological Surveillance Program • Environmental Education Program • Program for Monitoring Socioeconomic Indicators • Entomofauna Monitoring Subprogram - Vectors.
An increase in traffic impacts with associated safety risks	• Road Signaling and Standardization Program • Social Communications Program • Migrant Support Program.
Negative impacts at the end of the life of the project such as a decrease in employment opportunities, decrease in tax collection.	None identified.
Community expectations and worries regarding potential environmental and social impacts	• Social Communication Program.

17.8.2.3 Management of Identified Social Risks and Impacts

In 2019, Nexa created a General Social Management Department, which is responsible for evaluating all social programs developed in Brazil and Peru, delving more broadly into these activities within the sustainability pillar.

The Project has developed and utilizes a number of social management programs and tools aimed at managing identified risks and impacts. These include:

- Identification of social and economic risks
- Integrated Socio-economic Plan
- Indigenous Population management plan
- Stakeholder tracking and stakeholder issues and concerns matrix
- Tracking social initiative implementation

The Project's Integrated Socio-economic Plan is aligned with the Company sustainable development goals (January 2019). Key objectives of this plan include:

- Development of local suppliers and entrepreneurs.
- Personal development of local workforce.
- Implementing strategies to promote the hiring and strengthening the employability of women and people with disabilities.

- Strengthening of the health care system through strategies such as raising funds, upgrading existing basic health units to meet the standards of the Ministry of Health etc.
- Assisting with improving solid waste management in urban and rural areas through strategies such as the establishment of partnerships to support public management in training for project development and fundraising aimed at the regularization of landfill and the implementation of an incinerator for the proper disposal of hospital and health waste, etc.
- Supporting projects for the proper management of sewage.
- Providing health, safety, and environmental education for different audiences (community, school, etc.).
- Assisting with management of an influx of people to the area through actions such as managing employment expectations, mapping potentially vulnerable locations in advance for conflicts, holding workshops with children, adolescents and young people on conflict mediation and nonviolent communication etc.
- Assisting with managing access routes used by Nexa for the flow of traffic and standardization of the movement of light and heavy vehicles.
- Ensuring better teaching conditions for the population of Aripuanã, through the training of human resources and improvement of teaching equipment and methods.
- Reducing and preventing the occurrence of human rights violations with respect to children, adolescents, women, the elderly, and people with disabilities.

This plan includes a description of each action, along with strategies, objectives, relevant stakeholders and expected results, including indicators. There is, however, no mention of revising or updating this plan based on the monitoring data collected or any other relevant feedback. In the SLR QP's opinion the social management programs and tools for Aripuanã are adequate to address potential issues related to local communities and Indigenous Peoples.

Since the EIA (2017), Nexa has continued to monitor socio-economic indicators. This monitoring program is focused on the potential impacts for the various phases of the Project. Specific information was not provided on the methods used to collect this monitoring data, however, Nexa has reported some key results of this monitoring:

- **Schooling**: an increased demand for school enrollment and an increase in the average class size at all stages of education (except high school).
- **Health care:** increased outpatient care, a reduction in hospitalizations, an increase in the number of physicians, increased care of women victims of intrafamily violence, relative increase of adolescent women (up to 19 years) in hospitalizations for pregnancy and childbirth.
- **Crime:** an increase in crime, notably an increase in the homicide rate.
- **Basic services:** an extension of the water supply and sanitation networks, increase in household waste collected.
- **Income levels:** an increase in the assets of formal workers, increase in the average salary of workers.
- **Municipal income and taxes:** projected increase in municipal GDP, projected increase in the number of formal establishments and increase in tax revenues.

17.8.2.4 Stakeholder Engagement and Participation

Stakeholder engagement was conducted during and prior to the preparation of the EIA. Most recently, in 2019, Nexa contracted a specialized service for the management and execution of environmental programs related to "Economic Development and Social Participation" in compliance with the Environmental Control Plan commitments to develop:

- A program for the development of entrepreneurs and local suppliers, including rural producers.
- A socio-economic indicator monitoring program.
- An environmental education program.
- A program to strengthen municipal health management.

Nexa is also developing a Workforce Qualification Program among others that involve external stakeholders. The programs conducted with the community and local government are related to Nexa's four strategic areas: Economic Development, Public Management and Social Participation, Childhood and Youth, and Socio-Environmental.

The specialized service was additionally tasked with actions defined in the strategic planning of the area and social projects, such as the development of a social agenda through a community participation group. This included participatory workshops and one-on-one interviews.

Nexa informed SLR that the social team maintains documentation related to the meetings held with stakeholders. No specific information was reviewed by SLR on stakeholder engagement planning going forward at the time of writing this Technical Report Summary.

17.8.2.5 Community Issues and Concerns System

In order to better understand community-specific issues and address concerns that arise at Aripuanã, Nexa implements a complaint register guided by Nexa's Order and Complaint Procedure, which details roles, responsibilities, and commitments to gather and respond to complaints from the public in a fair and equitable way. All communications and complaints are recorded, investigated, evaluated, and resolved according to the Order and Complaint Procedure. The process is meant to provide Nexa with a better understanding of the local population and related issues. Nexa also maintains a compliance matrix, which is a database of relevant stakeholders and a matrix/listing of interactions with each stakeholder.

Nexa provided a matrix of recent stakeholder issues and concerns. The majority of issues focused on requests for assistance in dealing with the COVID-19 pandemic and the Project responded as follows:

- Donations of personal protective equipment to the civil defense and health organizations, such as police and health departments and a hospital in the local area.
- The Project loaned a truck used for disinfecting the city centre.
- Donations of rapid test kits and thermometers.
- Donations of 1,680 basic food baskets for vulnerable and Indigenous communities.
- Donations of uniforms to volunteer organizations carrying out prevention actions for COVID-19.

17.8.3 Labour and Working Conditions

17.8.3.1 Collective Bargaining and Freedom of Association

Corporately, Nexa reports that 100% of its workers in Brazil are covered by collective bargaining units. Nexa also reports corporately on the freedom of association and collective bargaining. At Aripuanã, Nexa employees are covered by a collective bargaining agreement for 2019/2021 (registration number MT000081/2020).

17.8.3.2 Working Conditions

According to the 2020 shift rotation schedule provided by Nexa, workers involved in the current development activities are on shift for six days, then off for one day for one week, then six days on shift followed by three days off the following week. This provides staff with sufficient opportunity to rest in between scheduled work activities. Once operational, the mine plans to operate 360 days per year with three 8-hour shifts per day for a total of 18 operating hours per day (RPA, 2017).

Employees have access to a number of benefits including life insurance, health and dental plans, private pensions, paid vacations and holidays, financial bonuses, living allowance, paid vacation flights for five years, and assistance for moving or buying real estate. These benefits vary according to the position of the employee.

Services to the Project property are provided by the town of Aripuanã, which includes accommodation, restaurants, and other retail services (RPA, 2017).

17.8.3.3 Local Hiring, Disability, and Diversity Considerations

Corporately, some of the Sustainable Development Targets Nexa has identified include (but are not limited to):

- By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.
- Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular migrant women, and persons in precarious employment.

The 2019 Nexa annual report indicates that at the Project, the Company followed the strategic plan for hiring employees, seeking, and qualifying local labor, with short and medium-term courses, offered in partnership with Senai/MT. Nexa reported that there were 515 vacancies in 2019 and that 54% of these jobs were filled by women. Nexa intends to fill the staff contingent with 65% of local employees, primarily students graduated from the Senai-MT Professional Qualification Program, with the remaining 35% from other parts of the country, filling positions that require specific technical knowledge (Nexa, 2019). Nexa provided a planned employment graph for the various phases of the Project from construction, commissioning, ramp-up of operations, and then stabilized operations. This graph confirms plans to employ mostly local people, averaging at approximately 65% local employees.

The annual report further indicates that Nexa is working on identifying local infrastructure needs, such as building homes, expanding hospitals, improving, or building schools, in order to attract employees hired from outside the region and contribute to local development.

A key objective of Integrated Socio-economic Plan is to implement strategies to promote the hiring and strengthening the employability of women and people with disabilities.

As described under the PS1 section above, Nexa reports corporate activities aligned with the GRI Standards regarding non-discrimination, diversity, and equal opportunities.

17.8.3.4 Health and Safety

Nexa has adopted occupational health and safety (OHS) policies to ensure the protection and promotion of the safety, human health, and welfare of employees. Nexa implements 12 “Golden Rules”, to ensure the safety of company and outsourced employees. These are based on critical risk standards and other safety management tools Nexa has implemented, such as the use of seat belts, restrictions on the use of cell phones and a ban on working under the influence of alcohol or drugs. Failure to comply with any rule may lead to a warning, suspension, or even termination. The identification of non-compliance with a rule goes through a structured process, with evidence gathering, evaluation and, if deemed applicable, a penalty (Nexa, 2019).

Nexa has a Health and Safety Master Plan which is used to identify occupational risks and apply early diagnosis protocol for occupational diseases. This is part of the shared management model for Occupational Hygiene and Health, a program that aims to mitigate risks, share knowledge and responsibilities with preventive methods and practices with all employees. The program is managed by the Corporate Quality of Life Committee, composed of representatives of Health and Safety, Head of Department and Corporate Communication, as well as representatives of the units, defined by each local committee. The corporate committee defines the guidelines and actions that must be implemented in all units while the local Quality of Life Committees are responsible for implementing corporate and local actions pursuant to the demands of each unit (Nexa, 2019).

Corporately, Nexa reports on its health and safety performance and safety is a prioritized topic on the agenda in weekly Board of Executive Officers meetings and in the scheduled meetings of managers with their teams. Safety is also part of the Board of Directors’ meetings, with quarterly assessment of the indicators and planning for the following quarter (Nexa, 2019). For 2020, Nexa’s Sustainability Master Plan foresees health and safety initiatives for the transformation of culture and behavior, to improve company infrastructure for routine activities and for the management of the area. These are divided into Crucially Important Goals, for which 18 projects will be developed over the next five years (Nexa, 2019). According to the 2019 annual report, Nexa maintains Daily Safety Dialogues to assist employees in their perception of the risks in their workplace environment, as well as managerial inspections in operational areas, along with other safety management tools. The risks of the activities are surveyed, and control measures are implemented. These may include engineering (such as the need to install physical barriers), procedures (written standards, work rules that guarantee safety) or be related to personal or collective protection equipment. For outsourced employees, the survey is conducted in conjunction with the leadership and the outsourced company's safety team (Nexa, 2019).

Site-specific information for occupational health and safety plans were unavailable for review at the time of writing this Technical Report Summary. The annual report indicates that the total recorded injuries 2017 was 200, 174 in 2018 and 161 in 2019. There were seven fatalities in 2017, none in 2018 and one in 2019 (Nexa, 2019). Nexa established an internal indicator in 2017 called the "Nexa Internal Rate" to measure safety effectiveness (Nexa, 2019). In the case of fatalities, sanctions are applied to the executives (Nexa, 2019). Nexa provided data on health and safety incidents at Aripuanã in a presentation dated July 2020. There were nine recorded near-misses, no fatalities, six personal injuries and nine incidents where assets were damaged reported for 2020 until the end of July.

In 2019, Nexa implemented a health and well-being challenge to encourage behavioral change and the practice of physical activities, called "Go Nexa". Some 1,900 people enrolled in the program. At the end of the year, during the awards event, the three winning teams were recognized for their efforts. Nexa's overall health index rose by 14% in three months, from 6.4 to 7.4 (Nexa, 2019). In 2019 Nexa also continued the Live Better Program that had been established in 2017, which 100% of Nexa's units, with corporate actions and initiatives from each unit, according to the local situation and the risks related to the lifestyles of employees and their families. In 2019, 88% of Nexa units implemented actions related to health and well-being in local communities (Nexa, 2019).

At a Project level, construction activities had not yet been affected by the COVID-19 pandemic at the time the 2019 annual report was published. Nexa reported that additional safety measures and procedures were being discussed with contractors to mitigate any potential impact of the global COVID-19 outbreak, including a revision to the construction schedule.

17.8.3.5 Human Rights Compliance and Monitoring

Nexa is signatory to the Global Compact United Nations Initiative since 2017, which aims to mobilize the business community around the world to adopt ten principles that represent fundamental values of human rights, labor relations, the environment, and the fight against corruption. Corporately, Nexa has stated its commitment to internationally recognized human rights and prohibits any violation of human rights in its operations and suppliers. Suppliers are asked to provide information regarding both social responsibility and human rights preservation. The 2019 annual report states a target of maintaining the evaluation cycles of suppliers in Brazil and Peru and inclusion of new categories in the supplier monitoring process (Nexa, 2019). Nexa reported that in 2019, there were no complaints of non-compliance with any requirements related to human rights impacts, across its operations. Furthermore, Nexa is also seeking to review all outside suppliers for their conformity with human rights ethics. As of 2019, approximately half of its suppliers had been reviewed, with no known records of any human rights violations.

17.8.3.6 Grievance System

There are procedures in place for employees and contractors to report grievances and ethical violations, including directly to management, via telephone and online. At the time of writing this Technical Report Summary, there were no specific reports on the number of grievances or ethical violations relevant to Aripuanã.

The 2019 annual report states that Nexa did not register any strikes that lasted for more than seven days during the year, which the Company believes demonstrates their ability to establish an open dialogue with employees and labor unions (Nexa, 2019).

17.8.4 Community Health and Safety

17.8.4.1 Corporate Commitments and Progress

Corporately, Nexa has made several commitments to improve community health and safety, as well as the overall well-being of community members. The Nexa 2019 annual report indicates that during 2019, the Company made progress with regard to community health and safety as described below (Nexa, 2019):

- **Health support and epidemiological surveillance** – through training for the management of health services; expansion of health coverage in the Conselvan district; budgets and partnerships under negotiation for the renovation and acquisition of equipment in the Basic Health Units and emergency rooms; accreditation and training of local medical teams; improvement in specialized care; preparation of the epidemiological surveillance plan; and donation of vehicles for use by the teams (one panel truck, one pickup, eight motorcycles, six bicycles, and two boats). The Company made a voluntary transfer of R$1,149 million to municipality through a cooperation agreement. The amount is intended for the maintenance of four doctors and the purchase of supplies, such as medicines and items for hospital use.
- **Strengthening the health and prevention system** – Nexa is involved in the diagnosis of the current situation and monitoring of long-term improvements, strengthening of public health policies and the search for shared solutions, in addition to improving primary care quality.
- **Housing** – Nexa is building 200 new houses for employees hired outside Aripuanã, as an item in the worker benefits package offered. The construction of new residences aims to mitigate local real estate speculation.
- **Migrants, vulnerable communities, and public management** –the Company continued to implement a program to strengthen the network for the protection of the rights of children and adolescents and to train community agents to act in the prevention of violations of the rights of youths and women. The Company reports that it promoted a project in Conselvan, one of the districts with the greatest social vulnerability, to disseminate restorative practices in education, in which the Company certified 32 education professionals (72% of the program's target audience). The Company also inaugurated two Migrants Support Centers which will offer guidance and assistance to migrants, in addition to serving as a channel for dialogue with the social assistance network and other public policies in the municipality.
- **Entrepreneurship and local suppliers** – The Company now requires that suppliers for social projects must commit to conduct their activities in accordance with the Nexa social responsibility requirements. These include guarantees about human rights, support for local development, promotion of safety and a healthy workplace, compliance with the Social Golden Rules and the 15 Community Relationship Protocol rules. In 2019, the second edition of the Opportunities Meeting was held in Cuiabá (the state capital city located approximately 938 km from the Project), which brought together 70 entrepreneurs, public managers, consultants, self-employed professionals, and commercial representatives to learn about the project, the future demands for goods and services and our supplier management policy. Nexa initiated the Local Entrepreneurs and Suppliers Development Program, designed to support the sustainable and integrated growth of existing production activities and new businesses.
- **Indigenous Peoples** – The Company aims to develop local production chains, expand the opportunities for coexistence and participation of the Indigenous community and safeguard their territories and culture, avoiding the emptying of villages and loss of identity.

17.8.4.2 Project Level Commitments and Social Initiatives

At the Project level, the EIA identified several positive and negative impacts on the community as described in the PS1 section above. The Project has developed an Integrated Socio-economic Plan and an Indigenous Population management plan. These two plans are aimed at managing and mitigating the social risks and impacts identified in the EIA.

Key objectives of Integrated Socio-economic Plan which are aimed at managing potential community health impacts include:

- Strengthening of the health care system.
- Assisting with improving solid waste management in urban and rural areas.
- Supporting projects for the proper management of sewage.
- Providing health, safety, and environmental education for different audiences (community, school, etc.).
- Assisting with management of an influx of people to the area.

- Assisting with managing the access routes used by Nexa for the flow of traffic and manage the movement of light and heavy vehicles.
- Contributing towards better teaching conditions for the population of Aripuanã.
- Reducing and preventing the occurrence of human rights violations with respect to children, adolescents, women, the elderly, and people with disabilities.

The proponent has provided a lengthy list of social initiatives implemented for the Project during 2019 and 2020. These focus on the following areas:

- Community awareness training on prevention of sexually transmitted disease, teenage pregnancy, women's health.
- Upgrades to the emergency room of the municipal hospital.
- Training of teachers.
- Promotion of leisure, culture and sport activities aimed at the care of children, adolescents, and young people.
- Implementation of two Migrant Care Centers (CAM) and Database. This includes monitoring the influx of migrants.
- Supporting the economic development of the municipality of Aripuanã, with the creation of incentives for the expansion, diversification, and training of local productive activities.
- Installation and maintenance of information and warning signs on roads.
- Promotion and expansion of the culture of road safety throughout the municipality of Aripuanã.
- Identification and empowering of the main community and project leaders, in topics related to citizenship, human rights, social participation, among others.
- Promotion of a campaign on sexual rights violations.
- Contributing to improved performance of the municipality of Aripuanã regarding safety of the community, through training in public security and the developing an integrated action plan that community safety with relevant stakeholders.
- Preparation of training courses in planning and management for public servants.
- Response to sponsorship requests, donations, and related demands.
- Integration workshops, dissemination of information in newspapers and magazines and in programs or spots on radios of local and regional scope.

Specific initiatives or programs directed at Indigenous Communities and are discussed below.

17.8.5 Land Acquisition and Involuntary Resettlement

No resettlement will be required to implement the Project.

17.8.6 Indigenous Peoples

17.8.6.1 General Context

According to the 2019 annual report, Nexa operations are not located on Indigenous or immediately adjacent lands. This developing Project is also not located on Indigenous lands, but it is located adjacent to such lands as described below. The annual report also states that Nexa aims to develop local production chains, expand the opportunities for coexistence and participation of the Indigenous community, and safeguard their territories and culture, avoiding the emptying of villages and loss of identity (Nexa, 2019).

The 2017 EIA described two Indigenous villages located approximately 10 km to 12 km from the Project: Arara do Rio Branco with an area of approximately 114,842 ha and Povo Cinta Larga with an area or approximately 750,649 ha. The total population was stated as being 512, 74 of whom live in areas outside of the villages.

17.8.6.2 Engagement with Indigenous Communities

Consultation with Indigenous Peoples regarding Project impacts and mitigation were undertaken under the tutelage and consent of National Historical and Artistic Heritage Institute (IPHAN) with National Indian Foundation (FUNAI) during the preparation of the 2017 EIA.

In 2018, Nexa commissioned a study on the Indigenous Component of the Indigenous Lands Aripuanã and Arara do Rio Branco, within the framework of the Environmental Licensing Process of the Aripuanã Mining Project (Comtexto, September 2018). The study methods were developed based on a ToR issued by FUNAI and through consultation with the Indigenous Communities of Arara and Cinta Larga. Indigenous researchers were trained and conducted surveys in the villages of the Aripuanã and Arara Indigenous Lands of Rio Branco. A series of participatory workshops were also held to gather information, for example Ethno-mapping workshops. The study findings were shared through workshops with Indigenous Communities before the report was finalized.

As previously mentioned, Nexa implements a complaint register guided by Nexa's Order and Complaint Procedure. When asked if there were any complaints, issues or concerns raised specifically by Indigenous Peoples or Communities, Nexa responded that at the time of writing this report, there were no records of such complaints.

No specific information was available on recent engagement in 2019 or 2020 with Indigenous Communities at the time of writing this report, however, Nexa has indicated that progress has been made with regard to agreements with Indigenous Peoples and the mitigation of environmental impacts on these communities.

17.8.6.3 Impact Avoidance and Minimization

The Project made efforts to reduce potential environmental and social impacts. Various adjustments were made to the Project such as the use of underground mining methods as opposed to open pit mining which was initially considered and using some of the tailings for backfill underground instead of depositing all of the tailings on surface. The overall footprint was optimized and efforts were made to place infrastructure in areas already affected by anthropogenic activities.

17.8.6.4 Identification and Assessment of Potential Impacts on Indigenous Lands and Communities

As mentioned above, in 2018 Nexa commissioned a study on the Indigenous Component of the Indigenous Lands Aripuanã and Arara do Rio Branco, within the framework of the Environmental Licensing Process of the Aripuanã Mining Project (Comtexto, September 2018). The objective of the study was to assess the environmental and socio-cultural impacts arising from the Project on the communities of the Arara and Cinta Larga Indigenous Peoples who inhabit the Arara Indigenous Lands of Rio Branco and Aripuanã. The resultant report describes:

- Study methodology and activities.
- Environmental characterization of Indigenous Lands and Communities.
- Socio-cultural characterization of Indigenous Lands and Communities.
- Social, political, and economic organization of the Indigenous Communities.
- Characterization of the environmental and social impacts.
- Alternatives assessment.
- Monitoring, control, mitigation, and compensation measures.

The study methods were developed based on a ToR issued by National Indian Foundation (FUNAI) and through consultation with the Indigenous Communities of Arara and Cinta Larga. Desktop research was followed with primary data collection in the field. Indigenous researchers were trained and conducted surveys in the villages of the Aripuanã and Arara Indigenous Lands of Rio Branco. A series of participatory workshops were also held to gather information, for example Ethno-mapping workshops. The study findings were shared through workshops with Indigenous Communities before the report was finalized. The perceptions of the Indigenous Communities on the potential impacts were specifically investigated through personal interviews, questionnaire, Ethno-mapping workshops and collective conversations.

The potential impacts were identified taking into account the location of Indigenous Communities, territories and how these communities use the land for fishing, hunting, harvesting and feedback from Indigenous communities. For example, potential surface water impacts included a change in the availability of quality of water available to Indigenous Communities. The Aripuanã River is very important for the Arara because its banks are areas of traditional use for collection, fishing and harvesting. There was therefore concern among the Arara People regarding these potential impacts. The report described the river systems and concluded that the Project is situated a significant distance upstream of these communities that no surface water impacts should occur upon Ingenious territories, especially when implementing the management measures outlined in the EIA. However, management measures over and above the measures stated in the 2017 EIA were still developed. For example, a "sub-program" was developed for Environmental Monitoring Control, with emphasis on water resources. There is a range of "subprograms" developed to specifically address potential Impacts on Indigenous Communities and their territories as described in Table 17-3. Detailed workplans were developed for each of the subprograms identified.

Impacts on Indigenous Communities, as well as the management plans, are identified in Table 17-3. In the SLR QP's opinion the Indigenous study and management plans for Aripuanã are adequate to address potential issues related to Indigenous Peoples.

Table 17-3: Impacts on Indigenous Communities and Identified Management Measures (Comtexto Consulting, 2018)
Nexa Resources S.A. – Aripuanã Zinc Project

Impact Identified	Management Measures
Change in the availability and quality of surface water resources	• Indigenous Subprogram for Environmental Monitoring and Control, focusing on surface water. • Water Effluent Management Plan • Recovery Degraded Area Recovery Plan.
Vibration generated by blasting activities	• Indigenous Subprogram for Environmental Monitoring and Control • Indigenous Subprogram for Communication • Vibration Control and Monitoring.
Increased pressure on indigenous fauna due to hunting and harvesting.	• Indigenous Subprogram of Environmental Monitoring and Control, focusing on wildlife. • Indigenous Subprogram of Management and Territorial Protection. • Indigenous Subprogram to Support Productive Activities and Indigenous Ethnic development. • Fauna Connectivity Program: Creation of Conservation Units, Environmental Education, Vibration Control and Monitoring Program.
Impacts on the quality of fish in Indigenous Lands due to the potential pollution of surface water.	• Indigenous Subprogram of Environmental Monitoring and Control, including actions for evaluation of heavy metals in fish tissues in the Branco River • Indigenous Subprogram to Support Productive Activities and Indigenous Ethno-development • Indigenous Subprogram of Management and Territorial Protection • Water Effluent Management Plan.

An increase in traffic on local roads generating nuisance and safety risks.	• Indigenous Subprogram for Communication. • Road signaling and standardization for Project vehicles.
Social ills such as an increase in prostitution, drug abuse, unwanted pregnancies, sexually transmitted disease etc.	• Indigenous Subprogram for Communication • Indigenous Subprogram for Complementary Support to Indigenous Schools • Socio-economic indicator monitoring • Provide health support and epidemiological surveillance.
Increased pressure on public services used by Indigenous Communities	• Indigenous Subprogram for Institutional Strengthening • Indigenous Subprogram for Complementary Support to Indigenous Schools • Socio-economic indicator monitoring • Provide health support and epidemiological surveillance.
Generation of expectations in Indigenous families and communities regarding jobs, and concerns regarding environmental impacts. Intensifying pressure on cultural heritage	• Indigenous Subprogram for Communication. • Indigenous Subprogram for Institutional Strengthening • Indigenous Subprogram for Complementary Support to Indigenous Schools • Indigenous Subprogram for the protection of Indigenous Cultural Resources.
Pressure on the organization and socio-political representativeness of Indigenous Peoples Economic "slowdown" of Indigenous families and communities upon mine closure	• Indigenous Subprogram for Institutional Strengthening. • Indigenous Subprogram for Communication • Indigenous Subprogram for the protection of Indigenous Cultural Resources.
Intensification of territorial pressure on Indigenous Lands and their natural resources	• Indigenous Subprogram for Communication • Indigenous Subprogram for Institutional Strengthening • Indigenous Subprogram for Territorial Protection and Management.
Concern regarding the fate of archeological resources in the Project area.	• Program of Management of Archaeological, Historical, Cultural and Ethno-archaeological Heritage. • Indigenous Subprogram for the monitoring of archaeological prospecting.

There are general programs for training and development of entrepreneurs which the 2018 report indicates will apply to Indigenous Communities, however, there does not seem to be preferential hiring, training, and development of Indigenous Peoples specifically.

As previously mentioned, Nexa has provided a lengthy list of social initiatives implemented for the Project during 2019 and 2020. Specific initiatives or programs directed at Indigenous Communities follow on from the 2018 study which identified management actions. This shows progress in implementing the management measures identified. The relevant social initiatives include:

- Supporting productive activities and Indigenous Ethno-development.
- Institutional strengthening program.

- Indigenous cultural protection program.
- Indigenous school education program.
- Indigenous health program.
- Protection of cultural resources.
- Management and territorial protection.
- Indigenous communications program.

When considering the United Nations Declaration of the Rights of Indigenous Peoples, the Project is not expected to infringe on these rights according to the documentation reviewed. It should, however, be noted that SLR does not have information on potential historical claims on the Project area by Indigenous Peoples.

17.8.7 Cultural Heritage

Archaeological studies performed in the direct and indirect area of influence of the Project showed no archaeological remains. This included site surveys in the direct and indirect areas of influence as reported in the 2017 EIA. It was noted that, additional studies would be performed to confirm these findings. In February 2019 Nexa documented the steps taken to obtain the First Installation Licence with respect to archeological, historical, and cultural heritage.

When asked specifically about heritage resources, Nexa responded that all the existing archaeological sites in the Project area have been mapped, demarcated for protection, and registered under guardianship with the responsible national agency (IPHAN). It is noted, however, that there is no record of a Chance Find Procedure developed or implemented on site.

The Project is not expected to make use of cultural resources.

17.9 Mine Closure Requirements

A Conceptual Mine Closure Plan was developed in October 2018. The main objective of the plan is to present proposals and solutions to be implemented before, during and after mine closure in order to avoid, eliminate or minimize long-term environmental liabilities and possible future obligations. The plan was submitted to SEMA for approval both in the EIA phase and in the application for the Implementation Licence. Update plans with greater level of detail will have to be prepared in the future to meet requirements of the Operation Licence and environmental licences. No specific frequency for submission and review of updated plans is defined in the Brazilian legislation. However, Nexa has developed an internal standard for mine closure that defines stages for preparation of the Mine Closure Plan updates (standard PG-SUS-GMA-003-PT).

The current plan provides the minimum requirements for the effective planning of mine closure activities, including the necessary provisioning of resources. The plan identifies three key phases:

- **Pre-closure Phase:** period of two years before the start of decommissioning and execution of works and rehabilitation work, when execution plans should be prepared.
- **Closure Phase:** decommissioning period and execution of works.
- **Post-closure Phase:** period of environmental stabilization, monitoring and verification of physical, biological, and socioeconomic stability, including continuous maintenance activities. For this phase, an initial period of five years after the end of the previous phase is adopted for the structures to be decommissioned, and this period may be prolonged if necessary. It is emphasized that the water dam will have a longer monitoring period, estimated at 10 years after closure.

The plan provides a detailed outline of the legal framework for closure planning within mining law and environmental law. Municipal legislation was also considered.

The plan includes:

- Closure objectives.
- Applicable legal requirements.

- Socio-economic aspects.
- Alternatives considered and the selection of future land use.
- Current environmental and social conditions.
- Identification of environmental and social impacts at closure.
- Conceptual plan for closure.
- Actions and monitoring programs for post closure.
- Closure cost estimate.

Some of these aspects are discussed in more detail below.

17.9.1 Closure Alternatives Considered

Four alternatives of future use of the area were evaluated (SETE, 2018):

- **Alternative A - Integral Protection Conservation Unit:** Most infrastructure will be removed; contaminated soils will be treated where required and the area will be rehabilitated and re-vegetated with native plant species. Minimal infrastructure remaining for use of safety and maintenance personnel for the required post-closure activities. The area will become a Conservation Unit and an agreement will be put in place with a public institution for the management of the Conservation Unit.
- **Alternative B - Sustainable Use Conservation Unit + Technical School for Biodiversity Conservation and Development of Amazonian Communities:** As with alternative A, most infrastructure will be removed; contaminated soils will be treated where required and the area will be rehabilitated and re-vegetated with native plant species and a Conservation Unit established and maintained by a public institution. However, some infrastructure will be retained for the development of a technical school for the local communities. This includes the administrative offices and some electrical infrastructure.
- **Alternative C - Industrial District + Industrial Technical School:** Most infrastructure will be removed and rehabilitated, but some infrastructure will be retained for the development of an industrial technical school and an industrial district. The administrative offices and some electrical infrastructure will remain, part of the processing plant (without crushers and equipment), support sheds and workshops as well as the sewage treatment plant and water supply dam will continue to operate to support these activities.
- **Alternative D - Agro-industrial District + Agricultural Technical:** Similar to alternative C but the infrastructure will be used for developing an agricultural technical school and an agro-industrial district. The administrative offices and some electrical infrastructure will remain, part of the processing plant (without crushers and equipment), support sheds, and workshops as well as the sewage treatment plant and water supply dam will continue to operate to support these activities.

These alternatives are being evaluated by Nexa, however, for the time being, all of the alternatives are being considered and have been costed for in the financial closure costing. The costing is provided later in this section.

17.9.2 Conceptual Plan for Closure

A summary of pre-closure, closure, and post-closure activities for all of the closure alternatives is provided in Table 17-4.

Table 17-4: Summary of Pre-Closure, Closure, and Post-Closure Activities (SETE, 2018)
Nexa Resources S.A. – Aripuanã Zinc Project

Infrastructure/Component	Pre-Closure (Preparation for Decommissioning)	Closure	Post-Closure
Underground mine (planned to stop production in 2044)	• Reassessment of specific environmental impacts resulting from the closure of the underground mine. • Plan for removal of ventilation structures, pumping and recirculation/ treatment of water and electrical system.	• Securing the access openings and the ventilation wells. • Disassembly of surface support structures • Removal of ventilation structures, pumping and recirculation/ treatment of water and electrical system. • Execution of electrical, hydraulic, and mechanical disassembly and pipe networks	• Geochemical monitoring • Hydrogeological monitoring • Solid waste management.
Support facilities on surface e.g. offices, maintenance workshops, fuel station etc.	• Investigate soil contamination in the workshop and fuel station areas. • Plan for disassembly, demolition, and disposal of structures.	• Transport and storage of materials and equipment • Partial demolition of concrete structures • Soil decontamination, if necessary • Topographic regularization of the area i.e. sloping of the area	• Geochemical monitoring • Monitoring of revegetation • Monitoring of air quality • Monitoring of soil erosion • Solid waste management.

Water dam Two alternatives for future uses for water dam were evaluated: Maintenance of the dam for use of the Agro-industrial District Removal and recovery of the reservoir area.	• Study for the rehabilitation and revegetation of the area.	• For alternative 2: • Emptying of the reservoir and removal of retaining structures • Removal of hydraulic system and spillway • Surface sloping and rehabilitation and revegetation of the area with grass species and native tree and shrub.	• Monitoring of revegetation • Monitoring of soil erosion • Solid waste management.
Processing plant	• Investigate soil contamination • Plan for the disassembly, demolition, and disposal of structures, with quantitative survey of structures and equipment for the establishment of reuse and commercialization actions.	• Execution of electrical, hydraulic, and mechanical disassembly and pipe networks • Transportation and storage of materials and equipment • Partial demolition of the concrete structures of the plant • Soil decontamination if necessary.	• Floors, drainage systems and building facilities and some sheds for use in the industrial district should be maintained. • The water treatment plant, the power substation, the solid waste storage shed, and the laboratory should also be maintained for use in the industrial district. • Geochemical monitoring • Monitoring of soil erosion • Solid waste management.
Administrative facilities, consisting of offices, restaurant, medical service and warehouse, sanitary effluent treatment plant. Planned for use after closure by the district.	• None.	• Maintenance of facilities for use of the industrial district.	

Topsoil stockpile	• Evaluate the topsoil conditions for its use in rehabilitation.	• The stored material will be removed for the rehabilitation of other areas • After the removal of the material, the area will be rehabilitated and revegetated with the implantation of grasses and native tree and shrub species	• Monitoring of revegetation
Waste rock dump or pile	• Studies and geotechnical evaluation considering the potential for acid drainage generation. • Surface drainage and sediment containment design for final dump configuration	• Cover with a layer of waterproof compacted clay with a thickness of 0.4 meters. • Implement surface drainage devices • Implement a sediment containment system, if necessary • Implement a passive water treatment system, if necessary • Revegetation.	• Geochemical monitoring • Geotechnical monitoring • Monitoring of revegetation • Monitoring of erosion.
Tailings dam	• Studies and geotechnical evaluation considering the potential for acid drainage generation. • Surface drainage and sediment containment design for final dump configuration	• Cover with a layer of waterproof compacted clay with a thickness of 0.9 meters. • Implement surface drainage devices • Implement a sediment containment system, if necessary • Implement a passive water treatment system, if necessary • Revegetation.	• Geochemical monitoring • Geotechnical monitoring • Monitoring of revegetation • Monitoring of erosion.
Access roads Planned for use after closure by the district.	• Assess the adequacy of surface drainage and sediment containment systems.	• The main access routes should be maintained for the activities of the district • Unused roads must be cleared and rehabilitated.	• Monitoring of revegetation.

Previously mined areas on the banks of the Maranhão stream in the Area of the Aripuanã Project (legacy liability)	• A confirmatory research program will be drawn up on the potential for soil and water contamination. • If contamination of the mined areas is confirmed, a project to rehabilitate the area should be prepared.	• To be determined	• To be determined

17.9.2.1 Actions and Monitoring Programs

The identified management actions and programs are as follows (SETE, 2018):

- Geochemical Monitoring Actions and Programs.
- Geotechnical Monitoring Program.
- Monitoring of Water and Liquid Effluent Quality.
- Program for the Control of Atmospheric Emissions and Environmental Noise (during decommissioning).
- Solid Waste and Hazardous Products Management (during decommissioning).
- Erosive Processes and Silting Process Control Program.
- Degraded Areas Recovery Plan.
- Program of Monitoring of Flora and Fauna in Areas under Rehabilitation.
- Stakeholder engagement program.
- Socio-economics Monitoring Program.
- Local Manpower Qualification Program.
- Involvement Program for Interested Communities (Community Strengthening).
- Stakeholder Engagement Programme including Indigenous Programs.
- Closure Socio-Environmental Performance Monitoring Program.
- Monitoring aspects relevant to the decommissioning of the water supply dam.

17.9.2.2 Closure Cost Estimate

Detailed cost sheets are provided in the Conceptual Closure Report which assumes that the mine will operate from 2020 to 2044 and that some post-closure activities will be carried out by the year 2054. The costs were estimated for the various future land use alternatives evaluated as follows (SETE, 2018):

- Alternative A - Integral Protection Conservation Unit: US$123,793.52.
- Alternative B - Sustainable Use Conservation Unit + Technical School for Biodiversity Conservation and Development of Amazonian Communities: US$109,141.27.
- Alternatives C and D Industrial District + Industrial Technical School / Agro-industrial District + Agricultural Technical: US$102,263.04.

A financial assurance was provided by Nexa consistent with the internal Corporate Policy PC-COP-GCT-022-EN that establishes general guidelines for decommissioning considering the Asset Retirement Obligation (ARO) procedure and Environmental Liabilities. The ARO is an accounting procedure that requires companies to recognize the fair value of future obligations for the dismantling and removal of long-lived assets, in order to ensure their balance sheets are more accurate. From an environmental perspective, they refer to future obligations to restore/recover the environment to ecological conditions that are similar to those existing before the start of the project or activity. In cases where it is impossible to return to the pre-existing conditions, there is an obligation to carry out compensatory measures to be agreed with the relevant entities.

18.0 CAPITAL AND OPERATING COSTS

18.1 Capital Costs

18.1.1 Pre-Production Capital

Pre-production capital costs were estimated by Nexa using a combination of contracts already awarded (the greater part of the commitments), quotations, and factored estimates. A new baseline capital cost estimate was completed in August 2020, with an estimated accuracy of ±5% and a base date of July 2020.

The breakdown of sources for the cost estimate is:

- Project commitments – 75% of direct capital costs.
- Costs provided by Nexa – 17% of direct capital costs.
- Contingency – 3% of direct capital costs.
- Quotes provided by Nexa – 3% of direct capital costs.
- Allowances – 2% of direct capital costs.

Costs were estimated in Brazilian reais, with 96% of the estimate originating in this currency, and 4% of costs originating in US$, a conversion rate of R$5.16 : US$1.00 was used. Upon completion of the capital cost re-baseline in Q3 2020, total capital costs in Brazilian reais were converted to US$ for economic evaluation using exchange rates of R$5.25: US$1.00 in 2020, R$5.05: US$1.00 in 2021, R$4.84: US$1.00 in 2022, R$4.85: US$1.00 in 2023, and R$4.80: US$1.00 onwards.

Pre-production capital costs remaining at the start of 2021 are estimated to total US$234 million. Prior to the end of 2020, Nexa had forecast pre-production capital costs of US$228 million using actual costs incurred in the first half of 2020 and anticipated costs to be incurred during the remainder of 2020; these are summarized in Table 18-1. The main reasons for the difference between the 2020 forecast and the estimate at the start of 2021 are the postponement from 2020 to 2021 of certain infrastructure activities to allow for enhanced detailing without impacting the total Project capital cost, less horizontal development than planned in 2020, and better-than-planned mobilization of the operations team.

Table 18-1: Pre-Production Capital Costs Forecast Prior to the End of 2020
Nexa Resources S.A. – Aripuanã Zinc Project

Area	Category	Units	Initial Costs
Mine	Development	US$ millions	25.2
	Mobile Equipment	US$ millions	4.5
Plant & Infrastructure	Site Prep & Earthworks	US$ millions	53.9
	Civil & Roadwork	US$ millions	14.7
	Steelwork	US$ millions	2.4
	Electrical	US$ millions	12.6
	Instrumentation	US$ millions	8.4
	Mechanical Equipment	US$ millions	14.9
	Piping	US$ millions	8.3
Subtotal Direct Costs		**US$ millions**	**144.9**
Indirect Costs	EPCM	US$ millions	7.2
	Temporary Services	US$ millions	7.3

Area	Category	Units	Initial Costs
	Owner's Team	US$ millions	10.2
	Other	US$ millions	42.6
Subtotal Indirects		**US$ millions**	**67.3**
Contingency		US$ millions	16.0
Total Capital Cost		**US$ millions**	**228.2**

Contingency comprises 7.6% of direct and indirect capital costs, which SLR considers to be reasonable for the current stage of the Project. A total cost of $312 million has been incurred up to the end of 2020.

Upon detailed review of the capital cost estimate and the supporting documents, SLR is of the opinion that the capital cost estimate is representative of the Project scope, the estimate accuracy falls in the range of -5% to +5%, and the estimate can be considered a Class 2 estimate as defined by the Association for the Advancement of Cost Engineering International (AACE).

The capital cost estimate is based on detailed engineering material take-offs, bids from vendors and contractors as received during the study, as well as some historical project data. In addition, parts of the estimate are based on the advanced detailed engineering data, which at the time was 99% complete

18.1.2 Sustaining Capital

Sustaining capital was estimated by Nexa, with the majority of the costs consisting of mine development and mobile equipment. Sustaining capital is summarized in Table 18-2.

Table 18-2: Sustaining Capital Cost Estimate
Nexa Resources S.A. – Aripuanã Zinc Project

Area	Category	Units	Sustaining Costs
Mine	Development	US$ millions	65.8
	Mobile Equipment	US$ millions	56.4
Plant & Infrastructure	Dry Stack Tailings	US$ millions	20.4
	Other	US$ millions	38.9
Total Sustaining Cost		**US$ millions**	**181.5**

Closure costs are estimated at an additional US$19.94 million.

18.1.3 Construction Progress

The Project schedule has been impacted by internal and external factors leading to the estimated capital costs of the Project increasing to US$547 million compared to US$392 million estimated in the feasibility study. Cost increases and schedule delays resulted primarily from, among other factors:

- Delays in detailed engineering and outcomes of detailed engineering resulting in increases in quantities including earthworks and construction materials, investment in mine development, consumables, and spare parts, among others.
- Additional infrastructure services due to issues experienced during earthworks activities.
- Additional scope such as new equipment and infrastructure items in the process plant and in the tailings dry stack piles.
- Increase in third-party services.

- Upgrades at the Dardanelos electrical substation.
- Logistics constraints on the upgrade of the Aripuanã river bridge.
- The COVID-19 pandemic.

Capital costs to the end of 2020 amounted to US$312 million. Nexa forecasts that an additional US$232 million will be incurred in 2021, and US$2 million in 2022, totalling US$547 million. An additional US$201 million of sustaining capital is estimated over the LOM, which includes US$66 million in mine development and US$20 million in mine closure costs. The remaining capital will be provided by Nexa's current cash position, future cash generation, and a long-term loan agreement with BNDES of approximately US$140 million that matures in 2040.

Actions undertaken by Nexa to address capital cost and schedule issues and mitigate further risk include:

- Reorganization of the project management team and added resources.
- Revisions to the scope of key contractors.
- Replacement of the Engineering, Procurement and Construction Management (EPCM) team by an Integrated Owners Team (IOT) to improve communication with all stakeholders and ensure better control of the Project.

Current status:

- The scope definition has been revised and fixed.
- 99% of detailed engineering has been completed.
- All of the long-lead items and critical packages were awarded in 2019/2020 (80% of procurement has been completed).
- 70% of long-lead equipment has been delivered to site (including the SAG mill, vertical mills and ball mill, crushers, flotation columns, flotation cells, and thickeners).
- 100% of construction packages have been awarded and renegotiated, taking into consideration new quantities and scope changes.
- All permits have been obtained and all the environmental programs are in place.

Overall Project physical progress reached 55.37% at the end of December 2020 and is advancing according to the updated plan. The Project schedule and capital costs are subject to the successful execution of the updated project plan. COVID-19 impacts have been incorporated into the updated schedule and the revised capital cost estimate based on current conditions. Potential additional impact on the Project's current schedule and estimated capital costs will continue to be evaluated.

18.2 Operating Costs

Operating costs, averaging US$73 million per year at full production, were estimated for mining, processing, and G&A. Operating cost inputs such as labour rates, consumables, and supplies were based on Nexa operating data. The operating cost estimate is accurate to within +/- 10%. A summary of operating costs is shown in Table 18-3.

Table 18-3: Operating Cost Estimate
Nexa Resources S.A. – Aripuanã Zinc Project

Parameter	Total LOM (US$ millions)	Average Year (US$ millions/yr)	LOM Unit Cost (US$/t)
Mining	361	32.8	15.34
Processing	313	28.5	13.31
G&A	134	12.2	5.69
Total	886	73.5	34.35

19.0 ECONOMIC ANALYSIS

The economic analysis contained in this Technical Report Summary is based on Aripuanã's Mineral Reserves, economic assumptions provided by Nexa, and capital and operating costs as presented in Section 18 of this Technical Report Summary. A summary of the key criteria is provided below.

19.1 Economic Criteria

19.1.1 Revenue

- LOM processing of 23.5 Mt, grading 3.7% Zn, 1.4% Pb, 0.3% Cu, 34 g/t Ag, and 0.3 g/t Au
- Metallurgical recoveries at the LOM average head grades (recoveries vary as a function of head grade) of 89.4% Zn, 83.4% Pb, 67.5% Cu, 70.0% Ag, and 70.0% Au for stratabound material, and 88.8% Cu, 50.0% Ag, and 63.0% Au for stringer material.
- LOM average metal payable of 85% Zn, 95% Pb, 96% Cu, 83% Ag, and 83% Au.
- LOM payable metal of 713,000 t Zn, 251,000t Pb, 41,000 t Cu, 16.654 Moz Ag, and 131,000 oz Au.
- LOM metal prices derived from Nexa's Internal Projection forecasts converging on long-term prices of US$1.11/lb Zn, US$0.87/lb Pb, US$3.01/lb Cu, US$16.87/oz Ag, and US$1,500/oz Au from 2026 onwards.
- All revenues are received in US$.
- Total gross revenue of US$2,654 million.
- Total offsite treatment and refining charges of US$422 million.
- Total transport costs of US$331 million.
- Total royalties of US$113 million.
- Net revenue of US$2,541 million.
- Average net smelter return of US$94/t processed.
- Revenue is recognized at the time of production.

19.1.2 Costs

- Mine life: 11 years.
- LOM production plan as summarized in Table 19-1.
- Pre-production capital remaining totals US$234 million from 2021 onward.
- Pre-production capital incurred by the end of 2020 (since 2018) totals US$312 million.
- Sustaining capital over the LOM totals US$201 million.
- Average operating cost over the mine life is US$34.35/t processed.

19.1.3 Taxation and Royalties

SLR has relied on a Nexa taxation model for calculation of income taxes applicable to the cash flow (Table 19-1).

19.2 Cash Flow Analysis

An after-tax Cash Flow Projection has been generated and a summary of the cash flow is presented in Table 19-1.

The Net Present Value (NPV) at a 9% discount rate is $356 million, and the Internal Rate of Return (IRR) is 31.9%, not considering capital expenditures prior to 2021.

Table 19-1: After-Tax Cash Flow Summary
Nexa Resources S.A. – Aripuanã Zinc Project

Aripuanã Project - FEL3	Cash Flow Summary Inputs	UNITS	TOTAL	Year 0 2018	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028	Year 11 2029	Year 12 2030	Year 13 2031	Year 14 2032	Year 15 2033	Y 2
MINING																				
Underground																				
Operating Days	365	days				30	100	365	365	365	365	365	365	365	365	365	365	365	365	
Tonnes mined per day		tonnes / day	5,241.7		-	1,325	3,478	3,589	5,891	6,050	5,908	5,931	6,073	6,260	6,250	6,062	6,155	5,170	-	
Production		'000 tonnes	23,507	-	-	40	348	1,310	2,150	2,208	2,157	2,165	2,217	2,285	2,281	2,213	2,247	1,887	-	
Zn Grade		%	3.7%	0.0%	0.0%	1.6%	2.9%	3.2%	3.8%	3.9%	3.5%	3.6%	3.6%	4.0%	3.9%	3.3%	3.7%	3.8%	0.0%	(
Pb Grade		%	1.4%	0.0%	0.0%	0.4%	1.1%	1.2%	1.3%	1.4%	1.3%	1.3%	1.3%	1.6%	1.4%	1.3%	1.4%	1.4%	0.0%	(
Cu Grade		%	0.3%	0.0%	0.0%	0.9%	0.5%	0.7%	0.4%	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.2%	0.1%	0.1%	0.0%	(
Ag Grade		oz/t	1.10	-	-	0.49	0.85	1.04	1.04	1.17	1.17	1.11	1.21	1.28	1.01	0.95	1.04	1.11	-	
Au Grade		oz/t	0.010	-	-	0.016	0.014	0.020	0.014	0.009	0.013	0.011	0.010	0.006	0.005	0.011	0.007	0.008	-	
Contained Metal in ROM																				
Zn		000 tonnes	860	-	-	0.6	10.1	42.5	81.5	85.6	75.5	77.1	79.6	91.6	88.2	73.0	82.5	71.9	-	
Pb		000 tonnes	319	-	-	0.2	3.8	15.3	28.8	30.4	28.3	28.5	28.7	36.6	31.3	28.4	32.4	26.3	-	
Cu		000 tonnes	60	-	-	0.4	1.9	9.5	9.7	6.1	7.4	6.2	7.1	2.2	1.6	3.4	2.3	2.0	-	
Ag		kozs	25,887	-	-	19.4	296.4	1,364.1	2,233.5	2,575.9	2,528.8	2,407.4	2,689.8	2,925.9	2,314.3	2,102.1	2,335.1	2,094.1	-	
Au		kozs	236	-	-	0.6	4.8	25.6	30.0	20.4	28.5	24.3	21.3	14.2	10.8	24.7	16.1	14.7	-	
PROCESSING																				
Mill Feed		**'000 tonnes**	**23,507**	**-**	**-**	**-**	**-**	**1,698**	**2,150**	**2,208**	**2,157**	**2,165**	**2,217**	**2,285**	**2,281**	**2,213**	**2,247**	**1,887**	**-**	
Head grade																				
Zn Grade		%	3.7%					3.1%	3.8%	3.9%	3.5%	3.6%	3.6%	4.0%	3.9%	3.3%	3.7%	3.8%	0.0%	(
Pb Grade		%	1.4%					1.1%	1.3%	1.4%	1.3%	1.3%	1.3%	1.6%	1.4%	1.3%	1.4%	1.4%	0.0%	(
Cu Grade		%	0.3%					0.7%	0.4%	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%	0.2%	0.1%	0.1%	0.0%	(
Ag Grade		oz/t	1.10					0.99	1.04	1.17	1.17	1.11	1.21	1.28	1.01	0.95	1.04	1.11	-	
Au Grade		oz/t	0.01					0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	-	
Contained Zn		'000 tonnes	860					53.3	81.5	85.6	75.5	77.1	79.6	91.6	88.2	73.0	82.5	71.9	-	
Contained Pb		'000 tonnes	319					19.3	28.8	30.4	28.3	28.5	28.7	36.6	31.3	28.4	32.4	26.3	-	
Contained Cu		'000 tonnes	60					11.7	9.7	6.1	7.4	6.2	7.1	2.2	1.6	3.4	2.3	2.0	-	
Contained Ag		koz	25,887					1,679.8	2,233.5	2,575.9	2,528.8	2,407.4	2,689.8	2,925.9	2,314.3	2,102.1	2,335.1	2,094.1	-	
Contained Au		koz	236					31.1	30.0	20.4	28.5	24.3	21.3	14.2	10.8	24.7	16.1	14.7	-	
Net Recovery																				
Zn Recovery		%	89.1%					88.4%	89.2%	89.3%	88.9%	89.1%	88.4%	89.3%	89.4%	89.3%	89.2%	89.3%	0.0%	(
Pb Recovery		%	83.0%					82.0%	83.5%	82.5%	83.5%	84.1%	80.7%	84.6%	81.9%	83.2%	83.5%	83.1%	0.0%	(
Cu Recovery		%	71.0%					77.9%	75.7%	70.3%	77.8%	78.0%	75.5%	47.8%	29.3%	62.1%	47.8%	48.5%	0.0%	(
Ag Recovery		%	75.2%					74.0%	75.0%	75.6%	74.7%	74.9%	74.9%	75.9%	75.9%	75.1%	75.6%	75.7%	0.0%	(
Au Recovery		%	67.4%					66.5%	67.5%	68.4%	66.2%	66.6%	67.6%	69.4%	69.4%	66.3%	68.5%	68.0%	0.0%	(
Concentrate Production																				
Zn Concentrate		'000 tonnes	1,380					84.8	131.0	137.6	121.0	123.7	126.8	147.5	142.0	117.5	132.6	115.8	-	
Zn		%	55.50%					55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	55.5%	5
Ag		oz/t	1.09					1.10	0.98	1.10	1.19	1.12	1.22	1.19	0.98	1.04	1.04	1.07	-	
Pb Concentrate		'000 tonnes	461					27.6	41.8	43.6	41.1	41.6	40.3	53.9	44.5	41.1	47.1	38.1	-	
Pb		%	57.50%					57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	57.5%	5
Ag		oz/t	27.3					28.2	25.7	29.1	29.2	27.7	31.9	27.0	25.9	24.7	24.4	27.2	-	
Au		oz/t	0.06					0.11	0.09	0.07	0.06	0.06	0.07	0.05	0.04	0.06	0.05	0.06	-	

Cu Concentrate I		'000 tonnes	72		16.5	10.7	2.7	11.2	9.9	7.7	1.0	0.5	6.8	2.4	2.1	-
Cu		%	30.00%		30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%3(
Ag		oz/t	5.30		3.9	4.0	8.2	5.8	5.1	7.7	6.3	5.7	5.2	7.9	5.6	-
Au		oz/t	0.78		0.59	0.62	1.07	0.86	0.76	0.61	0.75	1.12	1.21	0.91	1.29	-
Cu Concentrate II		'000 tonnes	70		13.9	13.6	11.6	8.1	6.2	10.2	2.5	1.1	0.2	1.2	1.1	-
Cu		%	30.00%		30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%	30.0%3(
Ag		oz/t	72.04		22.26	31.48	43.81	59.44	74.73	50.44	229.54	437.64	1,755.64	368.61	378.43	-
Au		oz/t	1.06		0.56	0.71	0.69	0.81	1.00	0.68	2.56	4.66	25.09	5.06	4.79	-
TOTAL Recovered																
Zn		'000 tonnes	766.0		47.1	72.7	76.4	67.2	68.6	70.4	81.8	78.8	65.2	73.6	64.2	-
Pb		'000 tonnes	264.9		15.8	24.0	25.1	23.6	23.9	23.2	31.0	25.6	23.6	27.1	21.9	-
Cu		'000 tonnes	42.4		9.1	7.3	4.3	5.8	4.8	5.4	1.1	0.5	2.1	1.1	1.0	-
Ag		koz	19,476.8		1,243.5	1,675.3	1,946.3	1,888.0	1,803.3	2,013.5	2,220.4	1,757.3	1,578.9	1,764.8	1,585.4	-
Au		koz	159.1		20.7	20.3	14.0	18.9	16.1	14.4	9.8	7.5	16.4	11.0	10.0	-
Zn equivalent		**kt /year**	1,307		**108.3**	**132.8**	**124.4**	**118.5**	**122.6**	**125.6**	**130.2**	**116.8**	**110.3**	**116.6**	**100.9**	**-**

Aripuanã Project - FEL3	Inputs	UNITS	TOTAL	Year 0 2018	Year 1 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	Year 6 2024	Year 7 2025	Year 8 2026	Year 9 2027	Year 10 2028
REVENUES														
Metal Prices														
Zn price		US$/t	$2,474.52					$ 2,298.00	$2,539.00	$ 2,720.00	$ 2,928.00	$ 2,449.00	$ 2,449.00	$ 2,449.00
Pb price		US$/t	$1,928.56					$ 1,898.00	$1,957.00	$ 2,039.00	$ 2,247.00	$ 1,910.00	$ 1,910.00	$ 1,910.00
Cu price		US$/t	$6,586.11					$ 6,137.00	$6,277.00	$ 6,351.00	$ 6,639.00	$ 6,627.00	$ 6,627.00	$ 6,627.00
Ag price		US$/oz	$ 16.85					$17.11	$ 16.95	$16.40	$16.40	$16.87	$16.87	$16.87
Au price		US$/oz	$1,503.63					$ 1,613.00	$1,553.00	$ 1,466.00	$ 1,466.00	$ 1,500.00	$ 1,500.00	$ 1,500.00
FX Rate		BRL/USD	$ 4.77	$ 3.85	$3.91	$5.25	$5.05	$ 4.84	$4.85	$ 4.80	$ 4.80	$ 4.80	$ 4.80	$ 4.80
Payable Metal														
Zn		'000 tonnes	713					43.8	67.7	71.1	62.5	63.9	65.5	76.2
Pb		'000 tonnes	251					15.0	22.8	23.8	22.4	22.7	22.0	29.4
Cu		'000 tonnes	41					8.8	7.1	4.1	5.6	4.7	5.2	1.0
Ag		kozs	16,654					1,058.5	1,425.6	1,671.0	1,618.8	1,542.0	1,735.3	1,899.6
Au		kozs	131					18.0	17.3	11.5	15.9	13.4	11.9	7.4
Zn Concentrate														
Selling Price		US$/t conc	$1,097.73					$ 971.43	$1,099.02	$ 1,196.20	$ 1,306.01	$ 1,065.12	$ 1,064.97	$ 1,064.20
Concentrate		'000 tonnes	1,380					84.8	131.0	137.6	121.0	123.7	126.8	147.5
Revenues		**US$ '000**	**$ 1,515,113**					**$ 82,386**	**$ 143,933**	**$ 164,611**	**$ 158,067**	**$ 131,721**	**$ 135,042**	**$ 156,939**
Pb Concentrate														
Selling Price		US$/t conc	$1,386.20					$ 1,449.74	$1,408.01	$ 1,456.08	$ 1,563.16	$ 1,363.91	$ 1,444.10	$ 1,335.82
Concentrate		'000 tonnes	461					27.6	41.8	43.6	41.1	41.6	40.3	53.9
Revenues		**US$ '000**	**$ 638,548**					**$ 39,949**	**$58,804**	**$ 63,456**	**$ 64,284**	**$ 56,780**	**$ 58,200**	**$ 72,042**
Cu Concentrate I														
Selling Price		US$/t conc	$2,870.78					$ 2,555.52	$2,612.94	$ 3,231.42	$ 3,007.09	$ 2,874.22	$ 2,720.83	$ 2,883.01
Concentrate		'000 tonnes	72					16.5	10.7	2.7	11.2	9.9	7.7	1.0
Revenues		**US$ '000**	**$ 205,528**					**$ 42,238**	**$28,002**	**$8,625**	**$ 33,742**	**$ 28,404**	**$ 20,893**	**$2,947**
Cu Concentrate II														
Selling Price		US$/t conc	$4,225.31					$ 2,802.54	$3,152.25	$ 3,237.62	$ 3,715.23	$ 4,243.22	$ 3,446.38	$ 8,605.47
Concentrate		'000 tonnes	70					13.9	13.6	11.6	8.1	6.2	10.2	2.5
Revenues		**US$ '000**	**$ 294,757**					**$ 39,090**	**$43,023**	**$ 37,428**	**$ 29,980**	**$ 26,188**	**$ 35,143**	**$ 21,843**
(=) TOTAL Gross Revenues		**US$ '000**	**$ 2,653,946**					**$ 203,663**	**$ 273,762**	**$ 274,119**	**$ 286,072**	**$ 243,093**	**$ 249,277**	**$ 253,771**
Zn Concentrate		*%*	*57%*					*40%*	*53%*	*60%*	*55%*	*54%*	*54%*	*62%*
Pb Concentrate		*%*	*24%*					*20%*	*21%*	*23%*	*22%*	*23%*	*23%*	*28%*
Cu Concentrate		*%*	*19%*					*40%*	*26%*	*17%*	*22%*	*22%*	*22%*	*10%*
(-) Royalties		**US$ '000**	**$ 112,641**					**$8,526**	**$11,278**	**$ 11,303**	**$ 12,081**	**$ 10,197**	**$ 10,442**	**$ 10,859**
Luiz Almeida		US$ '000	$16,913					$2,439	$ 3,122	$2,928	$3,152	$2,065	$2,184	$748
Anglo America		US$ '000	$28,617					$2,276	$ 2,992	$2,981	$3,218	$2,635	$2,705	$2,667
Garimpeiros		US$ '000	$18,331					$ -	$ 111	$355	$393	$1,011	$952	$2,814
CFEM		US$ '000	$48,782					$3,811	$ 5,053	$5,039	$5,318	$4,486	$4,601	$4,630
(=) TOTAL Net Revenues		**US$ '000**	**$ 2,541,305**					**$ 195,137**	**$ 262,484**	**$ 262,816**	**$ 273,991**	**$ 232,895**	**$ 238,836**	**$ 242,912**
NSR		**US$/t ROM**	**$ 94.0**					**$100.8**	**$ 106.8**	**$104.2**	**$112.9**	**$ 93.5**	**$ 93.8**	**$ 91.3**
OPERATING COST														
Mining (Underground)		US$ '000	$ 360,650					$ 35,657	$34,828	$ 34,803	$ 37,374	$ 37,346	$ 36,425	$ 31,932
Processing + Tailings		US$ '000	$ 312,962					$ 22,395	$28,394	$ 29,470	$ 28,704	$ 28,818	$ 29,563	$ 30,512
G&A		US$ '000	$ 133,852					$ 13,220	$13,333	$ 13,548	$ 13,792	$ 13,152	$ 12,612	$ 12,781
Total Operating Cost		**US$ '000**	**$ 807,464**					**$ 71,271**	**$76,555**	**$ 77,820**	**$ 79,871**	**$ 79,317**	**$ 78,600**	**$ 75,226**
Mining (Underground)		US$ /t proc	$ 15.3					$ 21.0	$16.2	$ 15.8	$ 17.3	$ 17.3	$ 16.4	$ 14.0
Processing + Tailings		US$ /t proc	$ 13.3					$ 13.2	$13.2	$ 13.3	$ 13.3	$ 13.3	$ 13.3	$ 13.4

G&A	US$ /t proc	$5.7	$ 7.8	$ 6.2	$ 6.1	$ 6.4	$ 6.1	$ 5.7	$ 5.6
Total Operating Cost	**US$ /t proc**	**$ 34.4**	**$ 42.0**	**$35.6**	**$ 35.2**	**$ 37.0**	**$ 36.6**	**$ 35.5**	**$ 32.9**
Cost/Zn eq.	**US$ /t Zn eq.**	**$ 617.7**	**$657.9**	**$ 576.3**	**$625.6**	**$674.1**	**$646.7**	**$625.7**	**$577.6**
Selling Expenses	**US$ '000**	**$ 331,368**	**$ 24,088**	**$32,901**	**$ 32,671**	**$ 30,486**	**$ 30,409**	**$ 31,003**	**$ 34,195**
Zn Concentrate	US$ '000	$ 221,301	$ 13,526	$20,874	$ 22,087	$ 19,426	$ 19,849	$ 20,353	$ 23,670
Pb Concentrate	US$ '000	$84,251	$5,015	$ 7,596	$7,978	$7,529	$7,621	$7,378	$9,873
Cu Concentrate	US$ '000	$25,816	$5,547	$ 4,432	$2,605	$3,531	$2,939	$3,272	$652
(=) Operating Cash Flow - EBITDA	**US$ '000**	**$ 1,402,473**	**$ 99,777**	**$ 153,027**	**$ 152,326**	**$ 163,634**	**$ 123,169**	**$ 129,232**	**$ 133,491**
EBITDA Margin	*%*	*53%*	*49%*	*56%*	*56%*	*57%*	*51%*	*52%*	*53%*

Aripuanã Project - FEL3	**Cash Flow Summary**			Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Y
	Inputs	**UNITS**	**TOTAL**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	
CAPITAL COST														
Initial Capital Cost														
Mining		US$ '000	$92,264	$ -	$ 29,366	$ 33,234	$ 29,664	$0						
Plant & Infrastructure		US$ '000	$ 280,391	$1,549	$ 53,067	$110,559	$115,210	$6						
Total Direct Cost		**US$ '000**	**$ 372,655**	**$1,549**	**$ 82,433**	**$143,793**	**$144,874**	**$6**						
EPCM / Owners / Indirect Cost		US$ '000	$ 157,818	$542	$ 41,267	$ 48,723	$ 66,154	$1,134						
Subtotal Costs		**US$ '000**	**$ 530,473**	**$2,090**	**$123,700**	**$192,516**	**$211,027**	**$1,140**						
Contingency		US$ '000	$16,040	$ -	$-	$-	$ 16,040	$ -						
(=) TOTAL Initial Capital		**US$ '000**	**$ 546,513**	**$2,090**	**$123,700**	**$192,516**	**$227,067**	**$1,140**						
Operating Capital Cost														
Mine Development		US$ '000	$65,772	$ -	$-	$-	$-	$8,505	$10,653	$ 11,477	$8,229	$ 11,225	$5,373	
Sustaining infrastructure		US$ '000	$ 115,679	$ -	$-	$-	$-	$ 23,793	$13,259	$ 22,742	$3,747	$ 11,676	$ 12,882	
Closure and Other		US$ '000	$19,940	$ -	$-	$-	$-	$ -	$-	$ -	$ -	$ -	$ -	
Operational Working Capital		US$ '000	$ -	$ -	$-	$-	$-	$9,606	$ 3,681	$1	$592	$ (2,199)	$370	
(=) TOTAL Operating Capital Cost		**US$ '000**	**$ 201,391**	**$ -**	**$-**	**$-**	**$-**	**$ 41,903**	**$27,592**	**$ 34,219**	**$ 12,568**	**$ 20,701**	**$ 18,626**	
CASH FLOW			**NPV**											
(+) Revenues		US$ '000	$ 1,593,815	$ -	$-	$-	$-	$ 203,663	$ 273,762	$ 274,119	$ 286,072	$ 243,093	$ 249,277	$
(-) Royalties		US$ '000	$67,301	$ -	$-	$-	$-	$8,526	$11,278	$ 11,303	$ 12,081	$ 10,197	$ 10,442	$
(-) Mining Costs		US$ '000	$ 219,878	$ -	$-	$-	$-	$ 35,657	$34,828	$ 34,803	$ 37,374	$ 37,346	$ 36,425	$
(-) Processing Costs		US$ '000	$ 183,777	$ -	$-	$-	$-	$ 22,395	$28,394	$ 29,470	$ 28,704	$ 28,818	$ 29,563	$
(-) G&A		US$ '000	$81,756	$ -	$-	$-	$-	$ 13,220	$13,333	$ 13,548	$ 13,792	$ 13,152	$ 12,612	$
(-) Selling Expenses		US$ '000	$ 196,385	$ -	$-	$-	$-	$ 24,088	$32,901	$ 32,671	$ 30,486	$ 30,409	$ 31,003	$
(=) EBITDA		**US$ '000**	**$ 830,293**	**$ -**	**$-**	**$-**	**$ (14,586)**	**$ 99,262**	**$ 153,027**	**$ 152,326**	**$ 163,634**	**$ 123,169**	**$ 129,232**	**$**
(-) Initial Capital (net of taxes)		US$ '000	$ 205,602	$ -	$-	$-	$213,670	$1,073	$-	$ -	$ -	$ -	$ -	
(-) Sustaining Capital (net of taxes)		US$ '000	$ 107,813	$ -	$-	$-	$-	$ 28,138	$20,832	$ 29,811	$ 10,433	$ 19,951	$ 15,905	
(-) Closure and Other		US$ '000	$ 7,283	$ -	$-	$-	$-	$ -	$-	$ -	$ -	$ -	$ -	
(+-) Operational Working Capital		US$ '000	$ -6,352	$ -	$-	$-	$-	$ (9,606)	$(3,681)	$ (1)	$ (592)	$2,199	$ (370)	
(=) Pre-Tax Cashflow		**US$ '000**	**$ 503,244**	**$ -**	**$-**	**$-**	**$ (228,256)**	**$ 60,446**	**$ 128,515**	**$ 122,514**	**$ 152,609**	**$ 105,418**	**$ 112,958**	**$**
(-) Income Tax		US$ '000	$79,452	$ -	$-	$-	$-	$4,575	$13,947	$ 13,375	$ 14,893	$8,265	$ 12,225	$
(-) PIS/COFINS		US$ '000	$64,583	$ 77	$ 4,577	$ 7,475	$ 9,532	$7,449	$ 7,023	$8,020	$6,185	$7,161	$6,735	
(-) ICMS		US$ '000	$60,671	$ 46	$ 2,721	$ 4,700	$ 6,491	$7,320	$ 7,437	$7,957	$7,252	$7,698	$7,494	
(+) Tax Recovery		US$ '000	$57,010	$ -	$-	$-	$-	$4,575	$13,947	$ 13,375	$ 14,893	$8,174	$7,053	
(=) After-Tax Cashflow		**US$ '000**	**$ 355,548**	**$ (123)**	**$ (7,298)**	**$ (12,175)**	**$ (244,279)**	**$ 45,676**	**$ 114,055**	**$ 106,538**	**$ 139,172**	**$ 90,467**	**$ 93,557**	**$**
PROJECT ECONOMICS			*period*	*-2.5*	*-1.5*	*-0.5*	*0.5*	*1.5*	*2.5*	*3.5*	*4.5*	*5.5*	*6.5*	
Pre-Tax														

	Pre-tax IRR		%	45.0%											
	Pre-tax NPV at 7.82% discounting	8.00%	US$ '000	$541,689	$ -	$-	$-	$ (219,640)	$ 53,855	$ 106,021	$ 93,584	$ 107,938	$ 69,037	$ 68,495	$
	Pre-tax NPV at 9.00% discounting	9.00%	US$ '000	$503,244	$ -	$-	$-	$ (218,630)	$ 53,116	$ 103,606	$ 90,614	$ 103,552	$ 65,625	$ 64,513	$
	Pre-tax NPV at 10.00% discounting	10.00%	US$ '000	$467,658	$ -	$-	$-	$ (217,634)	$ 52,393	$ 101,268	$ 87,763	$ 99,383	$ 62,410	$ 60,794	$
After-Tax															
	After-tax IRR		%	31.9%											
	Pre-tax NPV at 7.82% discounting	8.00%	US$ '000	$387,499	$ (149)	$ (8,191)	$ (12,653)	$ (235,057)	$ 40,696	$94,092	$ 81,381	$ 98,434	$ 59,246	$ 56,731	$
	Pre-tax NPV at 9.00% discounting	9.00%	US$ '000	$355,548	$ (153)	$ (8,305)	$ (12,711)	$ (233,977)	$ 40,138	$91,949	$ 78,797	$ 94,435	$ 56,318	$ 53,433	$
	Pre-tax NPV at 10.00% discounting	10.00%	US$ '000	$325,933	$ (156)	$ (8,420)	$ (12,769)	$ (232,911)	$ 39,592	$89,874	$ 76,318	$ 90,633	$ 53,559	$ 50,353	$
	Discount factor	9.00%			1.24	1.14	1.04	0.96	0.88	0.81	0.74	0.68	0.62	0.57	
Regular Payback (after start-up)			**years**	**3.0**	-	-	-	-	1.0	1.0	1.0	-	-	-	
1/1/2022	Cumulative After-Tax Cashflow		US$ '000		(123)	(7,422)	(19,597)	(263,876)	(218,199)	(104,144)	2,394	141,566	232,032	325,590	
Discounted Payback (after start-up)			years	**3.3**	-	-	-	-	1.0	1.0	1.0	0.3	-	-	
	Dicounted Casflow		US$ '000		(153)	(8,305)	(12,711)	(233,977)	40,138	91,949	78,797	94,435	56,318	53,433	
	Cumulative discounted Cashflow		US$ '000		(153)	(8,458)	(21,170)	(255,146)	(215,009)	(123,059)	(44,262)	50,173	106,490	159,923	

19.3 Sensitivity Analysis

Project risks can be identified in both economic and non-economic terms. Key economic risks were examined by running cash flow sensitivities:

- Metal price
- Head grade
- Metallurgical recovery
- Operating costs
- Capital costs

IRR sensitivity over the base case has been calculated for a variety of ranges depending on the variable. The sensitivities are shown in Figure 19-1 and Table 19-2.

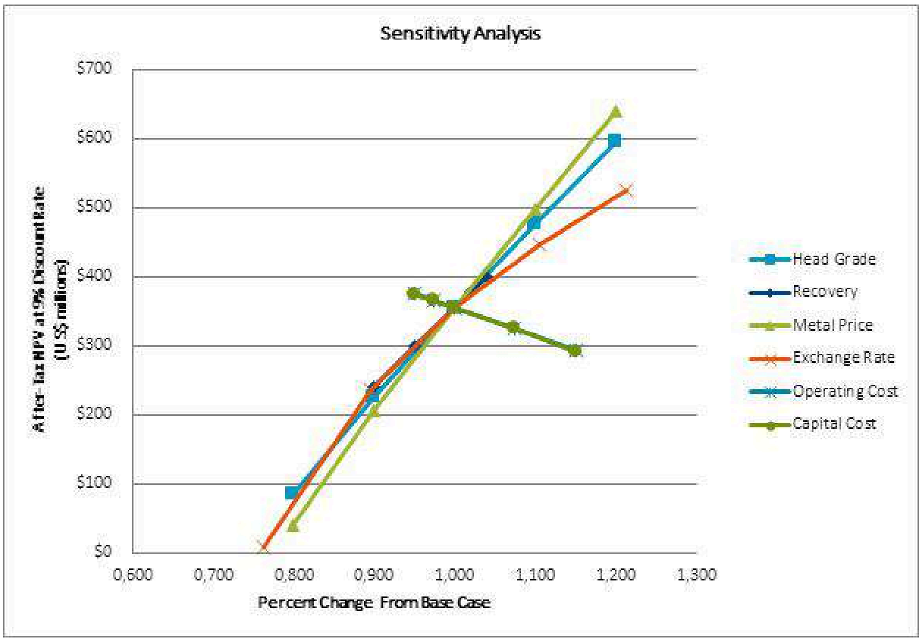


Figure 19-1: Pre-Tax Sensitivity Analysis Example

Table 19-2: Sensitivity Analyses
Nexa Resources S.A. – Aripuanã Zinc Project

Description	Units	Low Case	Mid-Low Case	Base Case	Mid-High Case	High Case
Head Grade (Zn)	% Zn	2.9	3.3	3.7	4	4.4
Overall Recovery (Zn)	%	80.2	84.6	89.1	90.9	92.7
Metal Prices (Zn)	US$/lb Zn	1.01	1.13	1.26	1.38	1.51
Exchange Rate	R$/US$	3.63	4.27	4.77	5.27	5.78
Operating Costs	US$/t	32.63	33.49	34.35	36.93	39.5
Capital Cost	US$ millions	332	341	349	376	402
Adjustment Factor						
Head Grade (ZnEq)	%	80	90	100	110	120
Overall Recovery	%	90	95	100	102	104
Metal Prices (Zn)	%	80	90	100	110	120
Exchange Rate	%	76	90	100	111	121
Operating Costs	%	95	97.5	100	107.5	115
Capital Cost	%	95	97.5	100	107.5	115
Post-Tax NPV @ 9%						
Head Grade (ZnEq)	US$ millions	84	225	356	476	595
Overall Recovery	US$ millions	240	299	356	378	400
Metal Prices (Zn)	US$ millions	39	206	356	498	641
Exchange Rate	US$ millions	8	236	356	447	524
Operating Costs	US$ millions	376	366	356	324	293
Capital Cost	US$ millions	375	365	356	325	291

For head grade, recovery, and metal prices, factors were applied to all metals in the various categories, however, in Table 19-2, values for zinc are shown because it provides the most revenue.

The Project is most sensitive to changes in metal prices, and least sensitive to capital and operating costs.

20.0 ADJACENT PROPERTIES

SLR is not aware of any significant deposits or properties adjacent to the Aripuanã Project.

21.0 OTHER RELEVANT DATA AND INFORMATION

No additional information or explanation is necessary to make this Technical Report Summary understandable and not misleading.

22.0 INTERPRETATION AND CONCLUSIONS

SLR offers the following conclusions for each area:

22.1 Geology and Mineral Resources

- The Aripuanã deposits are located within the central-southern portion of the Amazonian Craton, in which Paleoproterozoic and Mesoproterozoic lithostratigraphic units of the Rio Negro-Juruena province (1.80 Ga to 1.55 Ga) predominate.
- The Aripuanã polymetallic deposits are typical VMS deposits associated with felsic bimodal volcanism. Four main elongate mineralized zones, Arex, Link, Ambrex, and Babaçú, have been defined in the central portion of the Project.
- Two separate material types have been identified – massive sulphide stratabound Zn-Pb mineralization, and Cu-Au bearing stringer mineralization found in the footwall of the stratabound zones.
- The drilling, sampling, sample preparation, analysis, and data verification procedures meet or exceed industry standard, and are appropriate for the estimation of Mineral Resources.
- As prepared by Nexa and adopted by SLR, the Aripuanã Measured and Indicated Mineral Resources, effective as of September 30, 2020, comprise 8.1 Mt at 2.1% Zn, 0.7% Pb, 0.3% Cu, 0.4 g/t Au, and 22 g/t Ag for 169,000 t Zn, 60,000 t Pb, 25,000 t Cu, 98,000 oz Au, and 5.8 Moz Ag. Mineral Resources are reported on a 100% Nexa attributable ownership basis.
- Inferred Mineral Resources comprise 39.5 Mt at 3.3% Zn, 1.2% Pb, 0.3% Cu, 0.6 g/t Au, and 34 g/t Ag for 1.3 Mt Zn, 482,000 t Pb, 131,000 t Cu, 737,000 oz Au, and 43.0 Moz Ag.
- Based on additional drilling completed since 2018, the Babaçú deposit has been incorporated into the Project's Mineral Resource estimate. The deposit remains open and presents exploration potential beyond the current Mineral Resources. Limited exploration has identified additional mineralized bodies including Massaranduba to the south and Arpa to the north.

22.2 Mining and Mineral Reserves

- The deposits support a production rate of 2.2 Mtpa, producing an average of 70,000 tpa zinc (zinc equivalent of 119,000 tpa, after converting other metals based on net revenue).
- Deposit geometry and geomechanical properties are amenable to bulk longhole mining methods, in primary/secondary or longitudinal retreat sequencing, depending on thickness.
- As prepared by Nexa and adopted by SLR, the Aripuanã Proven and Probable Mineral Reserves, effective as of September 30, 2020, comprise 23.5 Mt at grades of 3.7% Zn, 1.4% Pb, 0.25% Cu, 0.31 g/t Au, and 34 g/t Ag, containing 859,800 t Zn, 319,000 t Pb, 59,700 t Cu, 236,100 oz Au, and 25.9 Moz Ag. Mineral Reserves are reported on a 100% Nexa attributable ownership basis.
- Dilution and extraction estimates include:
  - Dilution – planned (captured within stope designs) and additional unplanned dilution applied as factors ranging from 5% to 15%, by mining method.
    - SLR's preference is to apply dilution as a hanging wall/footwall distance, rather than a global percentage (as has been done in estimating Mineral Reserves). The percentage approach applies too much dilution to larger stopes and not enough to smaller stopes.
    - SLR reviewed the impact of this methodology and found that using percentage dilution may introduce small inaccuracies to some individual stope estimates, however, it has little impact on the overall estimate.
  - Extraction – initial selection of resources by stope optimization and design, plus additional factors of 85% to 100% (100% dilution only occurs during development), by mining method.

- The stope shapes are based on optimizer output, with some editing and manual redesign. There will be opportunities to reduce planned dilution and increase extraction after infill drilling and before mining as part of the short-term planning process.
- The Arex, Link, and Ambrex deposits are not directly connected underground, making it difficult to share slow-moving mobile equipment efficiently. Fleet unit numbers are adequate to achieve the proposed mine production with limited sharing.

22.3 Mineral Processing

- The results of the metallurgical test work form the basis for the current engineering design of the sequential talc, copper, lead, and zinc flotation circuit.
- Stringer and stratabound mineralization have been tested separately and in blends of various proportions. Different comminution results and recovery kinetics were observed during bench-scale test work for the different mineralization. The decision was initially made to process the two material types separately on a campaign basis, however, continued test work on blends indicated that acceptable recoveries and concentrate grades can be achieved when processing blended ore.
- Process performance is projected as:
  - Stratabound Zinc – 89.5% recovery to Zn concentrate. Silver recovery to this concentrate will be 10%.
  - Stratabound Lead – Variable recovery in the range of 80% to 90% with a LOM average of 84.5% to Pb concentrate. Gold and silver recoveries to this concentrate will be 20% and 55%, respectively.
  - Stratabound Copper – 67.6% to Cu concentrate. Gold and silver recoveries to this concentrate will be 50% and 20%, respectively.
  - Stringer Copper – Variable recovery in the range of 85% to 95% with a LOM average of 86.9% recovery to Cu concentrate. Gold and silver recoveries to this concentrate will be 63% and 50%, respectively.
  - Regression models have been developed from the test work to relate recovery to head grade for each of the metals and have been used to estimate recovery in the cash flow model for the LOM.
- Test work in late 2019 and early 2020 by SGS GEOSOL on composites representing ore to be processed in the first nine quarters of operation (based on the FEL3 LOM plan) confirmed that acceptable recoveries and concentrate grades could be achieved. While zinc and copper recoveries were within expected ranges, lead recovery was below expectations. However, since many of the LCT using these composites did not reach equilibrium, recoveries and concentrate grades need to be verified.
- Pilot plant test work is being conducted by Nexa at its Vazante Mine using blended (stratabound and stringer) bulk ore samples drawn from the ROM stockpile at Aripuanã. Results from this test work were not available at the time of writing this Technical Report Summary.
- Grinding circuit simulations were conducted to evaluate the capacity of the grinding circuit when processing different ore types. The simulations indicated that throughput would be limited to 216 tph (4,730 tpd) for stringer ore and 289 tph (6,300 tpd) for stratabound ore, with throughput between these two cases for blends of stringer and stratabound ore. SLR estimated that throughput of stringer ore of up 5,000 tpd could be achieved for ore corresponding to the 75^{th} percentile of hardness values determined during test work, rather than the higher hardness values used in the grinding circuit simulations.
- Talc (non-sulphide fines) removal by flotation is sometimes required prior to sequential flotation of Cu, Pb, and Zn. Copper losses to the talc concentrate can be recovered by reverse copper flotation from the talc concentrate, which will be implemented in the processing plant if required.
- Concentrates are expected to be generally clean without penalizable levels of deleterious elements.

22.4 Environment

- No environmental issues were identified from the documentation available for review that could materially impact the ability to extract the Mineral Resources and Mineral Reserves.

- Nexa maintains a list of permits for the Project along with any relevant expiry dates, which was provided to SLR. These include installation and operating licenses. Nexa reports regularly to the Mato Grosso environmental regulatory agency (SEMA) on compliance with conditions of Installation License No. 69614/2018 for the Project.
- Nexa has assessed the environmental impacts of the Project in the 2017 EIA for all Project phases, taking into account the baseline conditions. Management programs and monitoring plans were included in the EIA to mitigate the identified impacts, and further detail on these programs and plans were provided in a stand-alone Environmental Control Plan in 2018. The EIA and subsequent management plans are comprehensive in the detail they provide. Some aspects such as resource use efficiency are yet to be considered by the developing Project. In the SLR QP's opinion the proposed environmental plans are adequate to address issues related to environmental compliance.
- Nexa reports that it has ISO systems in place and has committed to complying with all relevant legal requirements.

22.5 Social

- The 2017 EIA includes a social baseline description, assessment of socio-economic impacts, and management plans detailing measures to prevent, minimize, or mitigate the identified socio-economic impacts. These components are generally consistent with social impact assessment practices. Since the completion of the 2017 EIA, Nexa has continued to monitor socio-economic indicators. This monitoring program is focused on the potential impacts for the various phases of the Project. Nexa implements a complaint register to gather and respond to complaints from the public. In the SLR QP's opinion the social management programs and tools for Aripuanã are adequate to address potential issues related to local communities and Indigenous Peoples.
- Consultations with Indigenous Peoples regarding Project impacts and mitigations were undertaken. A study of the Indigenous communities was carried out to assess the environmental and socio-cultural impacts arising from the Project.
- The agreement signed with the artisanal miners cooperative establishes a consent from Nexa for use of 517 ha for artisanal mining activities for a period of two and a half years, which may be renewed for an equal period. The assigned area has no interference with the mining concession area related to the Aripuanã Project, which is located in another mining right owned by Nexa. The agreement also establishes that all environmental damages arising from the artisanal mining activity in the assigned area will be the cooperative's responsibility, and Nexa is exempt from any environmental liabilities arising from their activities.
- Nexa plans to employ mostly local people averaging approximately 65% local employees. Nexa reports that 54% of job vacancies in 2019 were filled by women.
- Nexa's developing the Project contributes positively to community well-being and development. The Project has provided assistance to the local authorities and communities in responding to the current COVID-19 pandemic. Nexa has established environmental and social management programs, as well as health and safety programs for its employees. Corporate policies, procedures, and practices are implemented in a manner consistent with relevant IFC Performance Standards.

22.6 Construction Progress

- Detailed engineering is 99% complete.
- Physical construction progress has been estimated by Nexa to be 55.37% as of the end of December 2020.
- 70% of long-lead equipment has been delivered to site.
- Pre-commissioning and commissioning are scheduled for the second half of 2021, with ramp-up to full production starting in 2022.
- Delays from the original schedule include:

- ○ Delays in completion of detailed engineering and outcomes of detailed engineering resulting in increases in quantities including earthworks and construction materials, investment in mine development, consumables, and spare parts, among others.
- ○ Additional infrastructure services due to issues experienced during earthworks activities.
- ○ Additional scope such as new equipment and infrastructure items in the process plant and in the tailings dry stack piles.
- ○ Increase in third-party services.
- ○ Upgrades at the Dardanelos power substation.
- ○ Logistics constraints on the upgrade of the Aripuanã river bridge.
- ○ The COVID-19 pandemic.

22.7 Costs and Economics

- Pre-production capital costs remaining from 2021 onward total approximately US$234 million.
- Contingency comprises 7.6% of direct and indirect capital costs.
- Operating costs average US$34.35 per tonne over the LOM, with higher unit costs at the start and end when full production is not achievable.
- Long-term metal prices (from 2026 onwards) are based on Nexa's projections. Nexa's long term price model uses multiple variables including supply (mine and refined), demand, cost drivers, capital cost, and other key elements. The long-term prices derived are in line with the consensus forecasts from banks and independent institutions and are as follows: US$1.11/lb Zn, US$0.87/lb Pb, US$3.01/lb Cu, US$1,500/oz Au, and US$16.87/oz Ag.
- Smelter terms are projected by Nexa based on selling 46% of produced concentrates directly to China and 54% to Nexa's internal smelters and are consistent with industry benchmarks.
- The after-tax NPV at a 9% discount rate is $356 million, and the IRR is 31.9%.
- This NPV and IRR does not include capital expenditures to date. Capital costs up to Q2 2020 amounted to US$201 million. Nexa has forecast expenditures of US$117 million in H2 2020, US$227 million in 2021 and US$1 million in 2022, totalling US$547 million. An additional US$201 million of sustaining capital is estimated during the LOM, which includes US$66 million in mine development and US$20 million in mine closure cost. Considering capital expenditures to date, the Project's after-tax NPV at a 9% discount rate is US$27 million, and the IRR is 9.8%.

23.0 RECOMMENDATIONS

SLR offers the following recommendations for each area:

23.1 Geology and Mineral Resources

1. Infill areas where poorly angled drill holes are driving the geological interpretation.
2. Investigate the use of density weighting during compositing and interpolation.
3. Following up with additional step out drilling at Babaçú to increase the Mineral Resources.
4. Drill the Babaçú NW Exploration Target to convert the exploration target to Mineral Resources.
5. Continue to review minor issues with certain CRMs used in analytical quality assurance procedures.

23.2 Mining and Mineral Reserves

1. Review and optimize stope shapes after infill drilling and before mining as part of the short-term planning process.
2. Implement a rigorous grade control program during operations, to assess the impact of the various material grades and effectiveness of blending on the process recovery.

23.3 Mineral Processing

1. Confirm the recovery and concentrate grade values derived from earlier test work that have been used in project cash flow calculations by completing the ongoing pilot test work at Nexa's Vazante Mine using bulk blended ore samples simulating the processing of stringer and stratabound material together. This test work may also provide opportunities to optimize flotation conditions to maximize recovery and concentrate quality.
2. Using the talc flotation circuit configuration arrived at during test work at SGS GEOSOL in early 2020, confirm talc rejection efficiency and copper losses through pilot test work at Vazante Mine.

23.4 Environment

1. Develop and implement a project-specific environmental policy.
2. Revise the management plans on a regular basis and improve them where relevant based on feedback such as monitoring data or stakeholder comments. An action should therefore be specifically included in the management plans which describes how and when these plans will be revised and updated.
3. Ensure that the environmental monitoring plans are being implemented according to the Environmental Control Plan.
4. Compare monitoring results to relevant international standards, e.g., IFC standards specified in various guideline documents, in addition to local or national applicable standards.
5. Nexa has indicated that all third-party water users were identified, and the monitoring program was developed taking these users into account. Information should be maintained on potential sensitive receptors with respect to impacts such as dust generation, noise and third-party water surface and groundwater users so that these receptors can be monitored as relevant in order to ensure that all potential Project impacts are adequately managed.

The following recommendations associated with tailings disposal are proposed for the next phase of the design:

1. Classify the TMF in terms of the Global Tailings Standard or the Canadian Dam Association. The classification may require more conservative design criteria in terms of flood management and seismic loading.
2. Consider the stability assessment of the individual components of the double lined system and the interface between the components in the stability analyses. In particular, the interface between the smooth side of the geomembrane and the sand leakage detection layer.

3. Complete a deformation analysis to determine if the long-term strain of the high density polyethylene geomembrane is within acceptable limits.
4. Implement measures to control dust generation from the slopes of the TMF and internal access roads and ramps during the dry season.
5. Implement requirements to allow the progressive rehabilitation of the slopes.
6. Implement deposition planning for the wet season and the associated logistical requirements for the use and management of the inflatable warehouses.
7. Investigate the extent of the colluvial layer within the foundation of the TMF to provide a more accurate estimate of the volume of material that must be removed.
8. Carry out an initial assessment of the stability of the capping clay layer on the intermediate bench slopes to determine if slope flattening is required for closure.
9. Determine a source of clay with suitable quality for use as a lining and capping material.
10. Complete a formal risk assessment.

23.5 Social

1. Nexa has conducted extensive stakeholder engagement with communities in the area, including Indigenous Communities. As the Project evolves, Nexa should develop a stakeholder engagement plan going forward and update this plan regularly. A separate plan should be developed for engagement with Indigenous Communities. The Engagement with Indigenous Communities plan should specifically determine if these stakeholders are satisfied with the risks, impacts, and management measures identified for the Project. All stakeholder engagement plans should consider the current COVID-19 pandemic in terms of how interaction with stakeholders can be achieved both effectively and safely for as long as the pandemic is a factor.
2. Revise the social management plans on a regular basis and improve where relevant, based on feedback such as monitoring data or stakeholder comments. An action should therefore be specifically included in the management plans which describes how and when these plans will be revised and updated.
3. Clearly document the socio-economic monitoring program and methods and include benchmarks.
4. Develop and implement site-specific occupational, health, and safety plans.
5. Develop and implement a Chance Find procedure for heritage resources.
6. Maintain clear records on any worker grievances or ethical violations, if not done already.
7. Consider implementing preferential hiring, training, and development of Indigenous Peoples specifically.

23.6 Costs and Economics

1. Continuously monitor costs and exchange rates and lock in costs as soon as possible to eliminate economic uncertainty.

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25.0 RELIANCE ON INFORMATION PROVIDED BY THE REGISTRANT

This Technical Report Summary has been prepared by SLR Consulting Ltd (SLR) for Nexa. The information, conclusions, opinions, and estimates contained herein are based on:

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

For the purpose of this report, SLR has relied on ownership information provided by Nexa. SLR was provided with a legal opinion letter prepared by Nexa's legal department describing the mineral rights, dated July 17, 2020 and a letter by ICP Brazil describing the surface rights, dated April 28, 2020. These opinions have been relied on in Section 3 and the Summary of this report. SLR has not researched property title or mineral rights for the Project as we consider it reasonable to rely on Nexa's legal counsel who is responsible for confirming this information on a regular basis..

Except for the purposes legislated under U.S. federal securities laws and the Canadian provincial securities laws, any use of this Technical Report Summary by any third party is at that party's sole risk.

26.0 DATE AND SIGNATURE PAGE

This report titled "Technical Report Summary on the Aripuanã Zinc Project, State of Mato Grosso, Brazil" with an effective date of September 30, 2020 was prepared and signed by:

SLR Consulting (Canada) Ltd. (**Signed)** ***SLR Consulting (Canada) Ltd*.**

Dated at Toronto, ON
January 15, 2021

SLR Consulting (Canada) Ltd
55 University Avenue, Suite 501,Toronto, ON M5J 2H7

SLR

November 01, 2021

CONSENT OF QUALIFIED PERSON

Re: Form 20-F of Nexa Resources S.A. (the "Company")

SLR Consulting (Canada) Ltd. ("**SLR**"), in connection with the Company's Form 20-F, consents to:

- the public refiling by the Company and use of the amended technical report titled "Technical Report Summary on the Aripuanã Zinc Project, State of Mato Grosso, Brazil" (the "**Technical Report Summary**"), with an effective date of September 30, 2020, and amended date of October 18, 2021, that was prepared in accordance with Subpart 1300 of Regulation S-K promulgated by the U.S. Securities and Exchange Commission, as an exhibit to and referenced in the Company's Form 20-F dated March 22, 2021;
- the use of and references to our name, including our status as an expert or "qualified person" (as defined in Subpart 1300 of Regulation S-K promulgated by the U.S. Securities and Exchange Commission), in connection with the Form 20-F and any such Technical Report Summary; and
- any extracts from or a summary of the Technical Report Summary in the Form 20-F and the use of any information derived, summarized, quoted, or referenced from the Technical Report Summary, or portions thereof, that was prepared by us, that we supervised the preparation of, and/or that was reviewed and approved by us, that is included or incorporated by reference in the Form 20-F.

SLR is responsible for authoring, and this consent pertains to, the Technical Report Summary. SLR certifies that it has read the Form 20-F and that it fairly and accurately represents the information in the Technical Report Summary for which it is responsible.

SLR Consulting (Canada) Ltd.

Per:

(Signed) *Jason J. Cox*

Jason J. Cox, P.Eng
Technical Director – Canada Mining Advisory