AMC Mining Consultants (Canada) Ltd.
BC0767129

200 Granville Street, Suite 202
Vancouver BC V6C 1S4
Canada

T +1 604 669 0044
E vancouver@amcconsultants.com
W amcconsultants.com

Technical Report

Berenguela Mineral Resource Estimate NI 43-101

Aftermath Silver Ltd.

Province of Lampa, Department of Puno, Peru

In accordance with the requirements of National Instrument 43-101 "Standards of Disclosure for Mineral Projects" of the Canadian Securities Administrators

Qualified Persons:
D Nussipakynova, P.Geo. (BC & ON)
W Rogers, P.Eng. (BC)
D Kappes, PE (NV)

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1 Summary

1.1 General and terms of reference

This Technical Report (Report) on the Berenguela Property (Property) has been prepared by AMC Mining Consultants (Canada) Ltd. (AMC) of Vancouver, Canada on behalf of Aftermath Silver Ltd. (Aftermath or the Issuer), of Vancouver, Canada. AMC had previously prepared a Technical Report on the Property for the Issuer titled "Berenguela Silver-Copper-Manganese Property Update, Province of Lampa, Department of Puno, Peru". This earlier report was authored by J.M. Shannon P.Geo., M.A. Batelochi MAusIMM (CP), and G.S. Lane FAusIMM, with an effective date of 18 February 2021 (2021 AMC Technical Report).

This Report has been produced in accordance with the Standards of Disclosure for Mineral Projects as contained in National Instrument 43-101 (NI 43-101) and accompanying policies and documents. NI 43-101 utilizes the definitions and categories of Mineral Resources and Mineral Reserves as set out in the Canadian Institute of Mining, Metallurgy and Petroleum Definition Standards for Mineral Resources and Mineral Reserves 2014 (CIM 2014). The Report has been prepared for lodgment on the Canadian Securities Administrators' System for Electronic Document Analysis and Retrieval (SEDAR). The Issuer, Aftermath, is a Canadian junior exploration company focused on silver and is listed as AAG.V on Tier 2 of the TSX.V exchange, and as AAGFF on the OTCQB.

1.2 Property description, location, and ownership

The Property within which the Berenguela project (Berenguela or the Project) is located, is in the Province of Lampa in the Republic of Peru. The Province of Lampa is in the Department of Puno. The approximate coordinates for the centre of the Property are 8,268,274 mN and 331,860 mE (WGS 84 zone 19), or at latitude 15°39'30" S and longitude 70°34'06" W. It lies between 4,150 and 4,280 m above sea level (masl) in the Western Cordillera of southern Peru in a geographical terrain known as the Altiplano (high plateau). Relief is moderate with relatively poorly drained pampas and limited vegetation.

Berenguela is located six kilometres north-east of the town of Santa Lucía, on the boundary between the communities of Cayachira to the east and Andamarca to the west. Santa Lucía has national grid power, hospital, police station, elementary and high schools, technical institute, and a freight train station. Arequipa (population 1 million) and Juliaca (population 276,000) are well serviced with professional services and labour supporting the mining industry.

On 30 September 2020, Aftermath signed a definitive agreement with SSR Mining Inc. (SSRM) to purchase 100% of the Berenguela silver-copper project through the purchase of 100% of SSRM's shares in the Peruvian holding company Sociedad Minera Berenguela S.A. (SOMINBESA).

On 21 October 2021, SSRM entered into an assignment agreement with EMX Royalty Corporation (EMX) pursuant to which SSRM assigned to EMX all of its right title and interest to the deferred consideration obligations owing by Aftermath to SSRM. On 8 December 2022, Aftermath, EMX, and SSRM signed an agreement to amend the Acquisition Agreement to reflect the revised payment schedule to EMX This extended the date by which Aftermath must complete a Preliminary Feasibility Study (PFS) and file the related technical reports before 23 November 2025.

The Property consists of 17 mining concessions held by SOMINBESA and four claims made by Aftermath Silver Peru S.A.C. (Aftermath Peru), which are pending as recorded by The Institute of Geology, Mining and Metallurgy (INGEMMET). The SOMINBESA's concessions have an area of 7,357 hectares (ha) and Aftermath's claims have an area of 2,800 ha. The concessions have a 30-year expiry date meaning that they do not expire until between 2039 and 2053 depending on when granted.

The climate is variable. The winter months of May, June, July, and August are frigid with intense frosts. During the spring months of September, October, and November the weather is cold and temperate. The weather is rainy, tinged with snowfall and hailstorms during the months of December, January, February, and March and sometime into April. Both exploration and any future mining activities can be conducted year-round, and weather imposes no restrictions on operations.

The mining concessions are sufficiently large enough, at over 7,595.2 ha, to accommodate a processing plant, tails management facility, and other infrastructure required to operate a mine. Land would need to be procured for such activities, but currently for exploration purposes land access agreements have been reached with local landowners. Appropriate water sources will be evaluated during studies including access to existing surface water sources.

1.3 History

Berenguela has a long history of mineral exploration and production. Through the first half of the 20th century, Lampa Mining Company Limited (Lampa Mining) was the main player and directly shipped or operated a plant until cessation of operations in 1965. During the period from 1913 until the cessation of operations, records show that approximately 500,000 tons was mined, and 3.24 million ounces of silver and 3,946 tons of copper produced.

After some options agreements with the American Smelting & Refining Co. (ASARCO), Cerro de Pasco, and Charter Consolidated Limited (Charter), Lampa Mining lost ownership of the Property in 1972 and it reverted to the state. Ownership passed to Minero Perú S.A. (Minero Perú), a state-owned company. In 1995 a policy of privatization was adopted by the Peruvian ministry responsible for Minero Perú, with the result that the Property was offered for sale. Kappes, Cassiday & Associates (KCA) purchased the Property in 1995 by competitive bid and formed a private Peruvian company, SOMINBESA to manage the project. Following acquisition of the Property, KCA conducted a surface bulk-sampling program between 1995 and 1997, collecting two bulk samples for hydrometallurgical testwork.

In March of 2004, Silver Standard Resources Inc. (Silver Standard), now named SSRM, entered into an option agreement with SOMINBESA to purchase 100% of the silver resources contained in the Berenguela Project. Between 2004 and 2005 Silver Standard completed the required exploration commitments, by undertaking 222 reverse circulation (RC) drill and a Mineral Resource estimate reported under NI 43-101.

In January 2006 Silver Standard signed a share purchase agreement to acquire 100% of SOMINBESA for aggregate payments of US$2 million (M) in cash and US$8M in shares of Silver Standard, with KCA retaining a 2% net smelter return (NSR) on copper production, capped at US$3M.

Silver Standard completed drill programs in 2010 and 2015, and in February 2017 announced it had entered into a definitive agreement to sell 100% of SOMINBESA to Valor Resources Limited (Valor), an Australian listed company. Between 2017 and 2018, Valor completed geochemical surveys, an RC drilling program of 67 holes, and completed a JORC (2012) Mineral Resource estimate and a scoping study.

In January 2019 Valor signed a joint venture option agreement with Kennecott Exploration Company, and on their behalf had Rio Tinto Mining and Exploration (Rio Tinto) complete four diamond drillholes (DD) for 1,427 metres (m), collect 707 geochemical samples, and relog 15 historical drillholes. In January 2020 Rio Tinto elected to not continue with the option agreement.

In March 2020, Valor was unable to meet required cash payments and ownership of SOMINBESA transferred back to SSRM.

There have been numerous historical estimates, but the Qualified Person (QP) has not done sufficient work to classify the historical estimates as current Mineral Resources and the Issuer is not treating the historical estimates as current Mineral Resources.

1.4 Geology and mineralization

The Property is located near Santa Lucía in the Department of Puno in the Western Cordillera of the Andean Mountain range in southern Peru. The regional geology of Puno is dominated by deformed Paleozoic and Mesozoic sedimentary strata overlain by volcanic and sedimentary rocks of Cenozoic to Quaternary age. The Berenguela mineralization lies within the Mesozoic sequence.

During the Jurassic and Cretaceous Periods, extension and subsidence east of the early Andean volcanic arc led to the development of a back-arc basin known as the Western Peru Back Arc Basin (WPBAB) with associated clastic and carbonate rocks along the length of the Western Cordillera Within the WPBAB, the mid-Cretaceous Ayabacas Formation (AYA) was formed as a result of the submarine collapse of a Cretaceous carbonate platform (Odonne et al., 2010). The Ayabacas Formation hosts the Berenguela mineralization and consists of a strongly deformed, highly chaotic, and slumped resedimented unit which can be described as a megabreccia or olistostrome (Sempere et al., 2000) which occurs over a 60,000 square kilometres (km^2) area and has thicknesses up to 500 m.

The Cusco-Lagunillas-Laraqueri-Abaroa structural corridor (CECLLA corridor) is a large dextral wrench system 40-80 kilometres (km) in width and is one of the main structural components in South Peru. Berenguela is situated in the north-east (NE) flank of the system which hosts a variety of tectonic, magmatic, and sedimentary features. The CECLLA was active from at least the late Jurassic and normal faulting is currently active forming hemi-grabens such as Lake Lagunillas.

The central core of the Property, and the location of known mineralization, is dominated by carbonates of the Ayabacas Formation. These comprise folded, thickly bedded, light grey and dolomitized limestones juxtaposed in blocks ranging from 10 to >200 m in size, often with an intra-block matrix of refluidized clastic rocks and sedimentary breccias interpreted to originate from the Murco Formation. The underlying Huambo is 5 to 20 m thick, in conformable or brecciated contact with the Ayabacas, and did not re-fluidize to the same degree as the upper units of the Murco Formation. The Huambo-Murco contact is usually faulted or brecciated and interpreted to be the primary slumping (detachment) plane in the area.

The gravitational slumping, subsequent compressive tectonism and ultimately wrench / extensional faulting created the structural architecture for the emplacement of the Berenguela mineralization.

The core area of mineralization forms a prominent whaleback 1,400 m in length striking approximately east-west. All significant mineralization consists of massive, patchy, and fracture-controlled manganese replacement with associated silver, copper, and zinc hosted within the folded Ayabacas Formation. Mineralization is prominent in fold axes where axial plane joints and bounding faults have aided the ingress of fluids.

Alteration and mineralization are commonly exposed at surface and in old workings and are dominated by manganese mostly in the form of psilomelane and pyrolusite manganese oxides replacing carbonates to varying degrees. Within the mineralized zones, least altered material consists of fresh to moderately weathered or altered carbonates. Exposed sedimentary breccias are common on surface juxtaposed with the carbonates and are usually unmineralized. Weathering of the mineralization is often accompanied by the formation of copper oxides (malachite and azurite). Although present throughout the core area in small quantities, the abundance of oxidized copper minerals is much more prevalent on the eastern margins of the deposit in conjunction with a prominent zone of late chalcedonic alteration.

There have been several contrasting genetic models advanced for the Berenguela Ag-Cu-Mn deposit. Based on the latest information including the 2021-22 core logging program, the deposit model favoured by Aftermath is that Berenguela is a base-metal and silver bearing, lithology-controlled, carbonate replacement deposit (CRD) emplaced above a regional detachment surface of mid-Cretaceous age. The principal host is the olistostrome of the mid-Cretacous Ayabacas Formation. Host replacement is most prevalent in dolomitic limestone rafts and clasts.

1.5 Exploration

In the early stage of operatorship of Berenguela by Aftermath, a primary task was to ensure that there was a good topographic control for current and future activities on the Property. In addition, some remote sensing work and a hyperspectral program on newly drilled core was completed to identify and characterize alteration assemblages. In addition, geological mapping was carried out by Aftermath geologists building on the work by previous operators.

Other work carried out by Aftermath has focused on the Berenguela deposit and has consisted of enhancing the database and improving the interpretation of the geology. Hence a focus has been on centralizing all core, samples, and pulps in a new secure storage facility in Arequipa, validating certain aspects of the data, and drilling diamond core holes in strategic areas, included twinning some RC holes drilled in earlier programs.

1.6 Drilling

Since 2004 a total of 386 diamond drillholes (DD) and reverse circulation (RC) holes totaling approximately 42,641 m in length have been drilled on the Property. These consist of 95 DD and 291 RC holes. Of these 63 DD holes for 6,168 m were completed by Aftermath between December 2021 and to May 2022.

Drilling was completed using a triple-tube core barrel and drill sizes of HQ size (63.5 millimetres (mm)) and PQ size (85.0 mm). Totals of 2,412.55 m of HQ size and 3,755.60 m of PQ size were completed.

The program had three main areas of focus:

- Twinning (and replacing) RC holes from 2004-05 that were considered to have poor recovery. Verifying (and replacing) some 2017 RC drilling. Mostly PQ drilling.
- Obtaining metallurgical samples in various geological domains to supply samples for future metallurgical testwork. Metallurgical drilling was combined with the twinning program where appropriate. PQ drilling.
- Exploration (extension) drilling – focusing in the eastern limits of the known mineralization. Predominantly HQ drilling.

Core recovery was 91.3% discounting mining voids that were intercepted and logged. The generally consistent cohesiveness of the drilled formations, use of the triple tube technique, and large core diameters employed to create favourable conditions for core recovery.

While many of the holes are vertical, drilling was carried out from platforms and angle holes are also drilled to give coverage.

Upon receipt at the Limon Verde facility nearby and, after checking and preparation, a "Quicklog" geology review was followed by recovery and rock quality designation (RQD) measurements and core photography. After geological logging and samples selection the core was sawn. Samples were generally 1 m in length in mineralization and 1.5 m in length in areas not considered mineralized, and were also sampled within geological contacts.

A total of 506 samples collected from various types of mineralized and barren zones were selected for bulk density measurements. These measurements were carried out at the ALS Laboratories in Lima using the waxed immersion method.

As mineralization is relatively flat lying and at surface, and the drilling was vertical or at a steep angle from a common drill pad, the intersections were mainly at an angle close to true thickness.

Twinning of DD holes with selected old RC holes was carried out as part of the 2021-22 drilling program. This was completed in to verify the 2004-05 RC drilling where issues of poor recovery and smearing of metal grades had been identified. In addition, six 2017 RC drillholes were twinned as a validation program. In order to ensure better recovery in expected difficult areas, and also to obtain metallurgical samples, the twin program used PQ diameter where deemed appropriate. Data from the DD holes has replaced the old RC information in the drillhole database used for resource estimation.

1.7 Sampling and data verification

Historical RC drill samples were collected and split at the drill site by the drill crews and the drillholes were sampled from collar to total depth. RC chips were retained for lithological logging.

Drill core was collected from the rig and logged in various coresheds. All core drilled since 2004 is now retained in a secure centralized core facility in Arequipa.

Samples were dispatched to ALS Chemex, SGS Laboratories, or ALS Lima for the various programs all of which are accredited, and analytical methods used were appropriate.

Quality control / quality assurance (QA/QC) protocols were employed throughout all programs, though insertion rates varied by program. In 2022, Aftermath ran various reassay campaigns on old pulps and rejects. These reassays, in addition to twinning old holes and the deletion of redundant data from the database, have enhanced the validity of the database.

Aftermath had new certified reference material (CRM) made up to match the expected grade as well as that around the cut-off, specifically for manganese, where there was a gap before. Insertion-rates by Aftermath were satisfactory for CRMs and blanks and control charts were used to monitor performance.

The Aftermath program was comprehensive and included CRMs covering the appropriate grade ranges, blanks for assessing laboratory hygiene and field duplicates to monitor analytical precision. The results of the QA/QC program indicate good laboratory performance. The CRMs exhibited relatively low failure rates, with the predominance of these failures showing an underestimation of grade.

There is an issue with the underestimation of Mn for the primary laboratory. This was evident in the results of the CRMs and comparisons with the umpire laboratory. The issue seems to improve with increasing Mn grade. The BER-RENO CRM (18% Mn) did not record any warnings or failures. The change in overlimit threshold from 10 to 8.5% Mn during program A for CRM BER-21-3 showed the failure rate drop by almost two thirds and the low bias improve. The QP does not consider this to be a material issue to the Mineral Resource estimate.

The re-assay programs confirmed the validity of the previously collected assays and generally assuaged any concerns that were highlighted during the review of the QA/QC from these programs.

The QP recommends that the current level of QA/QC sample submission and monitoring continues. The QP also recommends that coarse reject and pulp duplicates are submitted for future drilling programs.

The QP considers that the sample preparation, security, and analytical procedures are adequate, and the assay database is robust and appropriate for use in the Mineral Resource estimate.

The QP made a site visit to the Property in July 2022, when both the secure Arequipa warehouse was visited, and a site inspection was carried out. The visit included viewing some core as well as drill collar locations. Verification of the drill collar locations and assays showed no errors. Data and the core and samples are centrally and securely stored and the QP considers the database fit-for-purpose.

1.8 Metallurgical testwork

The metals of economic interest in the Berenguela orebody are manganese, silver, and copper, with zinc as a minor co-product. Substantial basic metallurgical work has been completed principally by KCA who acquired the Property in 1995 and conducted a bulk sampling program at 25 locations that comprised 214 separate samples. This sample was processed at KCA laboratories during 1995 to 1999 and later used for KCA testwork in 2010 to 2011 on behalf of Silver Standard. Multiple routes for processing the ores have been studied, as discussed in the 2021 AMC Technical Report. and four process flowsheets were derived from the previous work. These are summarized as Flowsheet1 to 4 below. The two most recent process studies include options to recover Manganese in various forms including manganese sulphate ($MnSO_4$), Electrolytic Manganese Metal (EMM), Electrolytic Manganese Dioxide (EMD), or Chemical Manganese Dioxide (CMD).

Flowsheet 1: limited or no Mn recovery.

- Pelletized ore - segregation roast 750°C - flotation - ship conc.

Flowsheet 2: limited Mn or no recovery.

- Roast - calcine - controlled potential sulphidation (CPS) flotation of ore - ship conc.

Flowsheet 3: Favourable technically and environmentally (no roast) recovers Ag, Cu, and Mn.

- Ore - pre-leach - reductive leach - Cu EW, impurity removal, Zn ppt, Mn recovery (Mn or MnO_2 EW or $MnSO_4$); Ag cyanide leach.

Flowsheet 4: Favourable technically and environmentally (no roast) recovers Ag, Cu, and Mn.

- Ore - high intensity magnetic separation (HIMS) - reductive acid leach - Cu EW, impurity removal, Zn ppt, Mn recovery (Mn or MnO_2 EW or $MnSO_4$); Ag cyanide leach.

An evaluation of the various flowsheets is summarized below:

- **Flowsheet 1** - The Segregation / Roasting process, also called the Torco process, is a process in which salt (sodium chloride) and coal are mixed with the ore which is then roasted. The metal chlorides volatilize and then condense on the coal particles, which are then recovered by flotation. The process is difficult to control and has had only limited commercial application. At least until 1990, there was a very small commercial market for the manganese so recovering it was not considered. In today’s environment the Torco process should not be considered.

- **Flowsheet 2** – This involves CPS (controlled potential sulphidation) flotation of sulphidized materials following Torco segregation roast. This route appears to be very costly and produces low grade copper and silver concentrates with no recovery of the manganese. It should not be studied further.
- **Flowsheets 3 and 4** – These processes are very similar. Flowsheet 3 includes a pre-leach chemical treatment process (Mg removal) to minimize issues associated with downstream viscosity, and Flowsheet 4 incorporates a front-end physical beneficiation process (HIMS) to reduce gangue content and subsequent high reagent consumption. The HIMS tests to date are either inconclusive having been carried out on material that does not warrant upgrading or were largely unsuccessful on lower grade samples. Ore sorting should be pursued in preference to wet high intensity magnetic separation (WHIMS) or HIMS methods at this stage.
- **Ore sorting** - Preliminary tests carried out on ore sorting by Valor used sample material that was extremely high in Mn (>16% Mn head grade) and would not be deemed as necessary for sorting in the operational phase. The upgrading results were understandably moderate. Medium-grade mineralized material with Mn grades in the range of 5% to 8% is the primary focus of upgrading by ore sorting method and will form a key component of upcoming testwork.

The above work and conclusions have resulted in the selection of a process route consisting of:

1. Open pit mining followed by crushing and ball-milling.
2. Up-grading of low-grade ores using ore-sorting techniques at the crushing stage, to remove discrete fragments of limestone-dolomite waste.
3. Pre-leaching with sulphuric acid to remove magnesium.
4. Solution / solids separation, with discard of the solution (or possible recycling after Mg removal).
5. Primary reduction leaching of the solids with sulphurous / sulphuric acids.
6. Solution / solids separation.
7. Standard cyanide leaching of the solids, with Merrill-Crowe silver recovery.
8. Discharge of the slurry to a standard tailings pond with reclaim of the solution for recycle to the cyanide leach.
9. Further processing of the solution from step six to recover the copper, iron, zinc, and manganese, as follows:
   a. Direct electrowinning or solvent extraction / electrowinning of the copper.
   b. Removal of iron by neutralization and air sparging, followed by thickening / filtration to remove the iron precipitate for discard.
   c. Precipitation of the zinc as zinc sulphide using sodium hydrosulphide, followed by thickening / filtration to recover the zinc sulphide as a marketable product.
   d. Recovery of manganese in a variety of forms depending on markets:
      - Manganese metal by electrolysis (EMM).
      - Manganese sulphate by crystallization, filtration, drying.
      - Chemical grade manganese dioxide powder by electrolysis (CMD).
      - Electrolytic manganese dioxide by more sophisticated electrolysis (EMD).
10. Recycle of the step 9 (d) solution to the step (3) leach.

1.9 Mineral Resources

The Mineral Resource estimate is based on a geological model which consisted of data from 386 drillholes including data collected by Aftermath and some from previous drilling. Lithological wireframes were constructed by Rockridge Partnership & Associates (RockRidge) using LeapFrog© software and were used to constrain the interpolation. The five domains were reviewed by the independent QP and were accepted for estimation purposes after minor modification.

RockRidge completed an ordinary kriging (OK) estimate for the four metals with economic significance: silver, manganese, copper, and zinc. Calcium and magnesium, as well as bulk density, were estimated using inverse distance squared. Prior to estimation, drillhole data were composited to an average length of 1.0 m. Capping was evaluated for all variables within each domain and carried out where required. No estimation was carried out outside of the domains. For all domains the parent block size was 10 mE x 10 mN x 5 mRL with sub-blocking employed. Sub-blocking resulted in minimum cell dimensions of 2.5 mE x 2.5 mN x 0.05 mRL.

Bulk density was based on 509 measurements and was estimated into the block model. The values in the model averaged 2.30 tonnes per cubic metre (t/m^3) for mineralized material and 2.25 t/m^3 for waste.

Mineral Resource classification was completed by the QP using an assessment of geological and mineralization continuity, data quality, and data density. Estimation passes were used as an initial guide for classification. Wireframes were then generated manually to build coherent volumes for the different classes. The block model was classified as Measured, Indicated, and Inferred Mineral Resources as appropriate.

The Mineral Resource estimate used conceptual open pit mining constraints for reporting purposes and is presented in Table 1.1. Mineral Resources are stated at a cut-off grade of 80 grams per tonne (g/t) silver equivalent (AgEq) which equates to a 3.55% manganese equivalent cut-off grade. The relative value in the Mineral Resource by metal is as follows, Ag=26%, Mn=44%, Cu=26%, Zn=4% using metal prices for Agri-MnSO4 which generally trades at a considerable discount to battery grade manganese sulphate. The model is depleted for historical mining activities.

The assumptions for the open pit optimization exercise to constrain the Mineral Resource and confirm reasonable prospects for eventual economic extraction are shown in Table 1.1.

Table 1.1 Assumptions for pit optimization

Activity	Items	Unit	Value
Mining	Mining (all types)	$/t material	2.25
	Pit slopes	degrees	45
Processing	Processing - Cost	$/t ROM	41.0
	Processing rate	Mtpa	2.5
	Process Recoveries - Ag	%	81.0
	Process Recoveries - Cu	%	81.0
	Process Recoveries - Zn	%	76.0
	Process Recoveries - Mn	%	81.0
Metal Prices	Ag	$/oz	22.50
	Cu	$/lb	4.00
	$MnSO_4$ (Agri-$MnSO_4$)	$/t	530
	Zn	$/lb	1.45
Other costs	Admin and Support (G&A)	$/t ROM	4.0
	Land Freight	$/t Product	30.0
	Port Charges	$/t Product	20.0
	Marketing	% of Revenue	0.50%
	Royalty – Silver Standard	% of Revenue	1.00%
	Royalty – VDM Partners	% of Cu revenue	2.00%
Other	Conversion	Mn:$MnSO_4$ %	32

Notes:
- Sustaining capital cost has not been included.
- Measured, Indicated, and Inferred Mineral Resources included.

Source: AMC, 2023.

The Mineral Resource for the Berenguela deposit has been estimated by Ms Dinara Nussipakynova, P.Geo. Principal Geologist of AMC, who takes responsibility for the estimate.

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Table 1.2 Mineral Resource as of 31 January 2023

Resource Classification	Tonnage Mt	Grade				Contained metal			
		Ag (g/t)	Mn (%)	Cu (%)	Zn (%)	Ag (Moz)	Mn (Mt)	Cu (Mlb)	Zn (Mlb)
Measured	6.152	101	8.89	0.85	0.30	20.0	0.55	115.3	41.2
Indicated	34.024	74	5.60	0.63	0.34	81.2	1.90	473.7	258.1
Measured and Indicated	**40.176**	**78**	**6.10**	**0.67**	**0.34**	**101.2**	**2.45**	**589.0**	**299.3**
Inferred	22.287	54	3.57	0.42	0.25	38.8	0.80	204.3	122.8

Notes:
- CIM Definition Standards (2014) were used for reporting the Mineral Resources.
- The effective date of the estimate is 31 January 2023.
- The Qualified Person is Dinara Nussipakynova, P.Geo., of AMC.
- Mineral Resources are constrained by an optimized pit shell using the assumptions in Table 1.1.
- No dilution or mining recovery applied.
- AgEq formula is AgEq = Ag+ Cu%*121.905+Mn%*22.809+Zn%*41.463 based on the parameters in Table 1.1.
- Cut-off grade is 80 g/t AgEq.
- Bulk density used was estimated and variable. but averaged 2.30 t/m^3 for mineralized material and 2.25 t/m^3 for waste.
- Drilling results up to 13 October 2022.
- Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
- The numbers may not compute exactly due to rounding.
- Mineral Resources are depleted for historic mined out material.
- The relative value in the Mineral Resource by metal is as follows, Ag=26% Cu=26%, Mn=44%, Zn=4%.

Source: AMC, 2023.

The QP is not aware of any known significant factors or risks that might affect access or title, or the right or ability to perform work on the Property, including permitting and environmental liabilities to which the project is subject. However, it is recognized that there is social unrest in Peru currently, although the situation is improving.

There are no Mineral Reserves on the Property.

1.10 Conclusions and recommendations

Aftermath has completed a comprehensive exploration program incorporating the recommendations made in the 2021 AMC Technical Report. This has included drilling for validation of the previous work including twinning holes and verification of data through a comprehensive re-assay and improvement of QA/QC protocols for new and re-assay samples. The drillholes and samples have also been centralized in a secure storage area in Arequipa.

It is recommended that the Project move forward to a Preliminary Economic Assessment (PEA).

The following recommendations are made.

1.10.1 Geology and drilling

No major resource drilling or modelling is envisaged other that the modelling of geometallurgical domains in the current model. However, the following recommendations are made.

- Carry out infill drilling in specific areas to upgrade both Indicated to Measured and Inferred to Indicated.
- Drill eastern extensions of the known mineralization especially in areas of good outcrop and old workings.
- Include additional bulk density measurements in next estimate.
- Drill to the south-east of the deposit where more drilling is required to understand the dimensions and significance of this potential extension.
- Investigate the area 200 - 500 m south of the deposit where there are indications from the Worldview-3 (WV3) imagery of further anomalies of psilomelane in fold noses of the Ayabacas Formation.
- Advance knowledge of the eastern margins of the mineralization by geophysics and potentially scout drilling to test for potential porphyry-style occurrences.

1.10.2 QA/QC and database

- Ensure that CRMs are monitored in real time on a batch-by-batch basis, and that remedial action is taken immediately as issues are identified and remedial action documented. This should include a table of fails.
- Investigate sourcing a coarse blank with lower concentrations of Mn and Zn.
- Incorporate the use of coarse reject and pulp duplicate samples into the QA/QC program.
- As the re-assay program has confirmed the validity of the original assays, the QP recommends that for the next Mineral Resource update to revert to the original assays. Newer assays should only replace older assays when there has been systematic re-assaying of the original dataset.

1.10.3 Metallurgy

- Explore geometallurgical classification domains that are linked to the target flowsheet.
- Develop ore characterization composites based on domain classification from pre-existing material.
- Confirm characteristics of composites are in line with domain classification or adjust accordingly.

- Develop a geometallurgical model to link the resource database variability to metallurgical performance variability.
- Conduct sufficient variability test work to validate the geometallurgical model.
- Establish typical ore hardness parameters for major ore classes / types.
- Conduct Inductively Coupled Plasma (ICP) head assay suite and extensive mineralogy including Quantitative Evaluation of Minerals by Scanning (QEMSCAN), x-ray diffraction (XRD), SEM, microscopic examination of mineral and gangue.
- Consider silica and carbonate rejection via ore sorting.
- Validate rejection of carbonates, silica, and metal recovery to establish feed for downstream testing.
- Evaluate flowsheet options and conduct associated trade-off studies to determine the most effective processing route.
- Engage in a marketing study.

This work is estimated to cost US$700,000.

1.10.4 Preliminary Economic Assessment

Complete the additional elements of a PEA when the metallurgical work is advanced. In addition to the above these will involve the following:

- Mine engineering work - pit design, schedules, equipment selection, and costing.
- Process design – design of process plant, tailings, and associated infrastructure.
- Infrastructure engineering – roads, power, water, and all support buildings and infrastructure.
- Environmental studies and permitting.
- Overall costing and economics.
- Trade-off studies as required.
- Reporting.

These costs are incorporated into Table 1.3.

1.10.5 Program costs

An estimate to progress the project to a PEA level of study is estimated at approximately $3.7M, and a rough breakdown is shown in Table 1.3.

Table 1.3 Cost summary

Item	**Cost (US$)**
Drilling	1,250,000
Assays	150,000
Follow up metallurgical testing	700,000
Geophysics - magnetic survey	120,000
Geometallurgical modelling, including block model	150,000
Mine engineering including costing	250,000
Process design including costing	250,000
Infrastructural engineering incl costing	100,000
Environmental studies and permitting	250,000
Completion of PEA reporting	150,000
Subtotal	**3,370,000**
Contingency – 10%	337,000
Grand total	**3,707,000**

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Abbreviations & acronyms

Abbreviations & Acronyms	Description
#	Number
$ or US$	US dollar
%	Percentage
°	Degree
°C	Degrees Celsius
µm	Micrometre
1D	One-dimensional
2D	Two-dimensional
3D	Three-dimensional
A	Amps
A/m^2	Amps per meter squared
AA	Atomic absorption
AAS	Atomic absorption spectroscopy
Aftermath; Issuer	Aftermath Silver Ltd.
Aftermath Peru	Aftermath Silver Peru S.A.C.
Ag	Silver
AgEq	Silver equivalent
ALOS	Advanced Land Observing Satellite (a Japanese Earth-imaging satellite)
ALS	ALS Cemex Peru
AMC	AMC Mining Consultants (Canada) Ltd.
AMSL	Above mean sea level
ASARCO	The American Smelting & Refining Co.
ASX	Australian Stock Exchange
Au	Gold
AYA	Ayabacas Formation
$BaSO_4$	Barite
BC	British Columbia
Berenguela; Project	Berenguela Project
BWi	Bond ball mill work index
C$	Canadian dollars
$CaCO_3$	Calcite
$CaMg(CO_3)_2$	Dolomite
CCD	Counter current decantation
CDN	CDN Resource Laboratories Ltd
Charter	Charter Consolidated Limited
CIRA	Certificado de Inexistencia de Restos Arqueológicos / Certificate of Non-Existence of Archaeological Remains
cm	Centimetre
CMD	Chemical Manganese Dioxide
Concesión Minera	Mining concessions
CPS	Controlled potential sulphidation
CRD	Carbonate replacement deposit
CRM	Certified reference material
Cu	Copper
CuEq	Copper equivalent

Abbreviations & Acronyms	Description
$CuFeS_2$	Sulphides chalcopyrite
Cu_2S	Chalcocite
DD	Diamond drillhole
DEM	Digital elevation model
Dentons	Dentons Gallo Barrios Pickmann SCRL
DGAAM	Directorate of Environmental Affairs of MINEM
DGPS	Differential global positioning system
DIA	Declaración de Impacto Ambiental / Environmental Impact Declaration
DTM	Digital Terrain Model
E	East
EIAd	Estudio de Impacto Ambiental Detallado / Detailed Environmental Impact Study
EIAsd	Estudio de Impacto Ambiental Semi-Detallado / Environmental Impact Study Semi-detailed
EMD	Electrolytic Manganese Dioxide
EMM	Electrolytic Manganese Metal
EMX	EMX Royalty Corporation
ESE	East-south-east
EW	East-west; Electrowinning
Fathom	Fathom Geophysics
Fe	Iron
Fe_2O_3	Iron(III) oxide or ferric oxide
FreoMet	Fremantle Metallurgy
FTA	Ficha Técnica Ambiental / Environmental Technical Report
g	Gram
g/cm^3	Grams per cubic centimetre
g/L	Gram per litre
g/t	Grams per tonne
General Mining Law	Uniform Code of the General Mining Law
Go	Goethite
GPS	Global positioning system
H_2O	Water
H_2O_2	Hydrogen peroxide
H_2SO_4	Sulphuric acid
ha	Hectare
HIMS	High intensity magnetic separation
hr	Hours
Ht	Hematite
HUA	Huancane Formation
ICP	Inductively Coupled Plasma
ID^2	Inverse distance squared
ID^3	Inverse distance cubed
IGN	National Geographic Institute of Peru
INGEMMET	The Institute of Geology, Mining and Metallurgy
IP	Induced Polarization
IRMS	Induced Roll Magnetic Separation
ISO	International Organization for Standardization
ITS	Informe Tecnico Sustentatorio

Abbreviations & Acronyms	Description
JORC Code	2012 Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
JRT	JR Topografia y Geodesia E.I.R.L.
$KAlSi_3O_8$	Microcline
KCA	Kappes, Cassiday & Associates
kg	Kilogram
kg/m^2	Kilogram per square metre
kg/t	Kilogram per tonne
km	Kilometre
km^2	Square kilometre
km^3	Cubic kilometre
kt	Thousand tonnes
kWh	Kilowatt-hour
kWh/kg	Kilowatt-hour per kilogram
lab	Laboratory
Lampa Mining	Lampa Mining Company Limited
lb	Pound
LDL	Lower detection limit
LOI	Letter of Intent
LSS	Liquid solid separation
M	Million
m	Metre
m^2	Square metre
m^3	Cubic metre
Ma	Million years / mega annum
mA/cm^2	Milliampere per square centimetre
MAi	Abrasion index
masl	Metre above sea level
Maxar	Maxar Technologies
Mg	Magnesium
mg/L	Milligram per litre
min	Minute
MINEM	The Ministry of Energy and Mines
Minero Perú	Minero Perú S.A.
mL	millilitre
Mlb	Million pounds
mm	Millimetre
MMR	Modified Mining Royalty
Mn	Manganese
MnEq	Manganese equivalent
MnO	Manganese oxide
MnO_2	Manganese dioxide
$MnSO_4$	Manganese sulphate
Mt	Million tonnes
Mtpa	Million tonnes per annum
N	North

Abbreviations & Acronyms	Description
Na	Sodium
NaCl / HSI	Salt / Hydrochloric acid
NaCN	Sodium cyanide
NE	North-east
$(NH_4)_2S$	Ammonium sulphide
NH_4OH	Ammonium hydroxide
NI 43-101	National Instrument 43-101
NS	North-south
NSR	Net smelter return
NW	North-west
ON	Ontario
OK	Ordinary kriging
OREAS	Ore Research and Exploration P/L
oz	Troy ounce
oz/t	Troy ounces per ton
P_{80}	80% Passing
Pb	Lead
PDL	Practical detection limit
PEA	Preliminary Economic Assessment
Petitorio Minero	Mining claim in application phase
PFS	Preliminary Feasibility Study
pH	pH is a measure of hydrogen ion concentration; a measure of the acidity or alkalinity of a solution
PMA	Plan de Monitoreo Arqueológico / Archaeological Monitoring Plan
ppm	Parts per million
PQ	Diamond Drill core size: hole = 122.6 mm, core = 85 mm
PRA	Process Research Associates
Property	Berenguela Property
QA/QC	Quality Assurance / Quality Control
QEMSCAN	Quantitative Evaluation of Minerals by Scanning
QP	Qualified Person as defined by NI 43-101
RC	Reverse circulation
Report	Technical Report
Rio Tinto	Rio Tinto Mining and Exploration
RockRidge	Rockridge Partnership & Associates
ROM	Run-of-Mine
RoUA	Rights of Use Agreement
RPD	Relative paired difference
RQD	Rock quality designation
S	South
S/	Sol
$S_2O_6^{2-}$	Dithionate ions
SAR	Saracocha Formation
SCM	Spectral Correlation Map
SD	Standard deviation
SE	South-east

Abbreviations & Acronyms	Description
SEDAR	System for Electronic Document Analysis and Retrieval
SEM	Scanning Electron microscopy
SENAMHI	The Peruvian National Meteorology and Hydrology Service
SiO_2	Quartz
Silver Standard	Silver Standard Resources Inc.
SMB	Special Mining Burden
SMBS	Sodium metabisulfite
SMT	Special Mining Tax
SO_2	Sulfur dioxide
SOMINBESA	Sociedad Minera Berenguela S.A.
$SrCO_3$	Strontianite carbonate
SSRM	SSR Mining Inc.
SW	South-west
SWIR	Short-wave infrared
SX	Solvent Extraction
t	Tonne
t/m^3	Tonne per cubic metre
tpd	Tonnes per day
UIT	Tax Unit
UKN	Upper detection limit
US	United States
UTM	Universal Transverse Mercator
Valor	Valor Resources Limited
VNIR	Visible and near-infrared
VOL	Intrusive rocks
W	West
WGS 84	WGS-84 datum
WHIMS	Wet high intensity magnetic separation
WNW	West-north-west
WPBAB	Western Peru Back Arc Basin
wt	Wet tonne
WV3	Worldview-3
XPS	XPS Consulting & Testwork Services
XRD	X-ray diffraction
Zn	Zinc
ZnS	Zinc sulphide

2 Introduction

2.1 General and terms of reference

This Technical Report (Report) on the Berenguela Property (Property) has been prepared by AMC Mining Consultants (Canada) Ltd. (AMC) of Vancouver, Canada on behalf of Aftermath Silver Ltd. (Aftermath or the Issuer), of Vancouver, Canada. AMC had previously prepared a Technical Report on the Property for the Issuer titled "Berenguela Silver-Copper-Manganese Property Update, Province of Lampa, Department of Puno, Peru". This earlier report was authored by J.M. Shannon P.Geo., M.A. Batelochi MAusIMM (CP), and G.S. Lane FAusIMM, with an effective date of 18 February 2021 (2021 AMC Technical Report).

This Report has been produced in accordance with the Standards of Disclosure for Mineral Projects as contained in National Instrument 43-101 (NI 43-101) and accompanying policies and documents. NI 43-101 utilizes the definitions and categories of Mineral Resources and Mineral Reserves as set out in the Canadian Institute of Mining, Metallurgy and Petroleum Definition Standards for Mineral Resources and Mineral Reserves 2014 (CIM 2014). The Report has been prepared for lodgment on the Canadian Securities Administrators' System for Electronic Document Analysis and Retrieval (SEDAR).

2.2 The Issuer

The Issuer, Aftermath, is a Canadian junior exploration company focused on silver and is listed as AAG.V on Tier 2 of the TSX.V exchange, and as AAGFF on the OTCQB.

2.3 Qualification of authors

The names and details of persons who prepared, or who have assisted the Qualified Persons (QPs), in the preparation of this Technical Report are listed in Table 2.1. The QPs meet the requirements of independence as defined in NI 43-101, Part 1.

Table 2.1 Persons who prepared or contributed to this Technical Report

Qualified Persons responsible for the preparation of this Technical Report						
Qualified Person	**Position**	**Employer**	**Independent of Aftermath**	**Date of last site visit**	**Professional designation**	**Sections of report**
Ms D Nussipakynova	Principal Geologist	AMC Mining Consultants (Canada) Ltd.	Yes	26 July 2022	P.Geo. (ON & BC)	2 - 12, 14 (except 14.9.1), 15 - 24, and parts of 1, 25, 26, and 27.
Mr W Rogers	Principal Mining Engineer	AMC Mining Consultants (Canada) Ltd.	Yes	No visit	P.Eng. (BC)	14.9.1, part 1
Mr D Kappes	President	Kappes Cassiday & Associates	Yes	2003	PE (NV)	13 and parts of 1, 25, 26, and 27.
Other experts who have assisted the Qualified Persons						
Expert	**Position**	**Employer**	**Independent of Aftermath**	**Visited site**	**Professional designation**	**Sections of report**
Mr M Parker	Chief Operating Officer	Aftermath Silver Ltd.	No	Yes	FAusIMM	All
Ms K Zunica	Senior Geologist	AMC Consultants (UK) Ltd.	Yes	No	None	11
Mr JM Shannon	General Manager / Principal Geologist	AMC Mining Consultants (Canada) Ltd.	Yes	No visit	P.Geo. (BC & ON)	Peer reviewer

AMC acknowledges the numerous contributions from Aftermath in the preparation of this report and is particularly appreciative of the prompt and willing assistance of Mr Michael Parker.

Ms Dinara Nussipakynova visited the Arequipa office and warehouse on 23 July and the site inspection was carried out on 26 July 2022, accompanied by Mr Michael Parker of Aftermath on both occasions. All aspects of the project were examined, specifically drill core, drilling and core processing procedures, drill core and sample storage, Quality Assurance / Quality Control (QA/QC) procedures, on site and database management.

2.4 Sources of information

Certain information in this report was compiled from previous reports as follows:

- "Technical Report on the Berenguela Property, South Central Peru", prepared for Silver Standard Resources Inc. (Silver Standard), authored by James A. McCrea P.Geo., and with a signing date of 26 October 2005 (2005 McCrea Technical Report).
- "Technical Report and Updated Resource Estimate on the Berenguela Project, Department of Puno, Peru", reporting Mineral Resources compliant with JORC 2012. This report was for Valor Resources Limited (Valor), dated 8 February 2018 (2018 Valor JORC Report) and authored by M.A. Batelochi MAusIMM (CP).
- Technical Report titled "Berenguela Silver-Copper-Manganese Property Update, Province of Lampa, Department of Puno, Peru". This report was authored by J.M. Shannon P.Geo., M.A. Batelochi MAusIMM (CP), and G.S. Lane FAusIMM, with an effective date of 18 February 2021.

The document was compiled from some text and reports supplied by Michael Parker and information supplied by Aftermath.

2.5 Other

The core of the Property is held by a Peruvian holding company Sociedad Minera Berenguela S.A. (SOMINBESA). Aftermath will be 100% owners of SOMINBESA once purchase terms are fulfilled. The operating company for the Issuer in Peru is Aftermath Silver Peru S.A.C. (Aftermath Peru.)

This report includes the tabulation of numerical data which involves a degree of rounding for the purpose of resource estimation. The QPs do not consider any rounding of the numerical data to be material to the project.

Any costs or currencies are shown in US dollars (US$ or $) unless stated otherwise. Quantities are stated in metric (SI) units. Commodity weights of measure are in grams (g) or percent (%) unless otherwise stated.

Aftermath was provided with a draft of the Report to review for factual accuracy.

The effective date of the report is 30 March 2023.

3 Reliance on other experts

The QP has relied, in respect of legal aspects, upon the work of the Expert listed below. To the extent permitted under NI 43-101, the QP disclaims responsibility for the relevant section of the Technical Report.

The following disclosure is made in respect to this Expert:

- Dentons Gallo Barrios Pickmann SCRL (Dentons) General Cordova No 313, Miraflores, Lima, 18, Peru.

Report, opinion, or statement relied upon:

- "Due Diligence of Sociedad Minera Berenguela S.A." dated 28 September 2020 in regard to the legal status of the mining concessions, surface rights and environmental issues.
- Letter to AMC Consultants dated 29 March 2023 stating Dentons "have reviewed, up to the date of this letter, the information related to our legal due diligence dated September 28th, 2020, and to the best of our knowledge, there are no outstanding legal issues that may affect directly or indirectly the Peruvian mining project Berenguela".

Extent of reliance:

- Full reliance

Portion of Technical Report to which disclaimer applies:

- Section 4.3, 4.4, and 4.5

There are no other reports, opinions, or statements of legal or other experts on which the QP has relied.

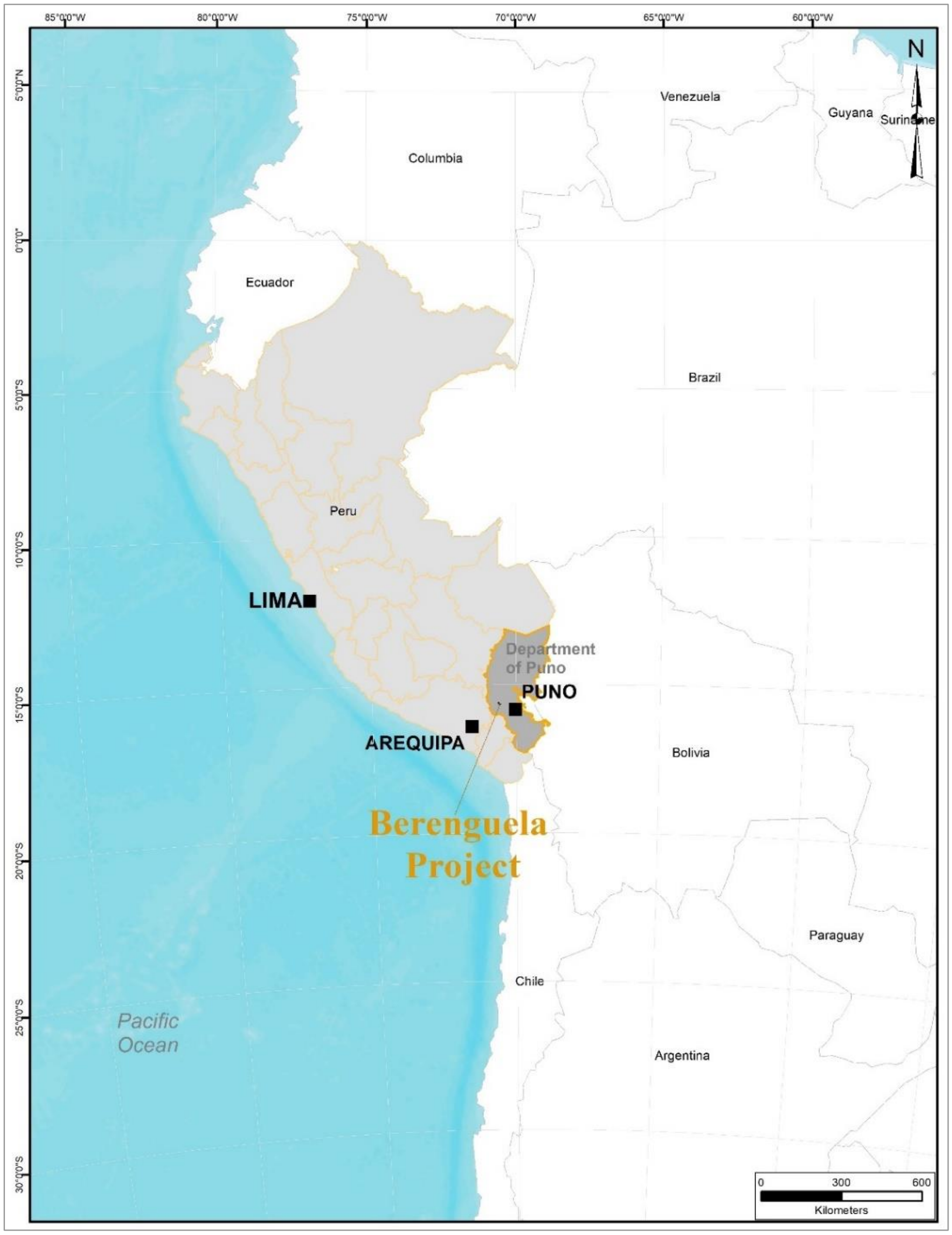
4 Property description and location

4.1 Property location

The Property within which the Berenguela project (Berenguela or the Project) is located, is in the province of Lampa in the Republic of Peru. The Province of Lampa is located in the Department of Puno. The approximate coordinates for the centre of the Property are 8,268,274 mN and 331,860 mE (WGS 84 zone 19), and at a latitude 15°39’30” south (S) and longitude 70°34’06” west (W), as shown in Figure 4.1 and Figure 4.2.

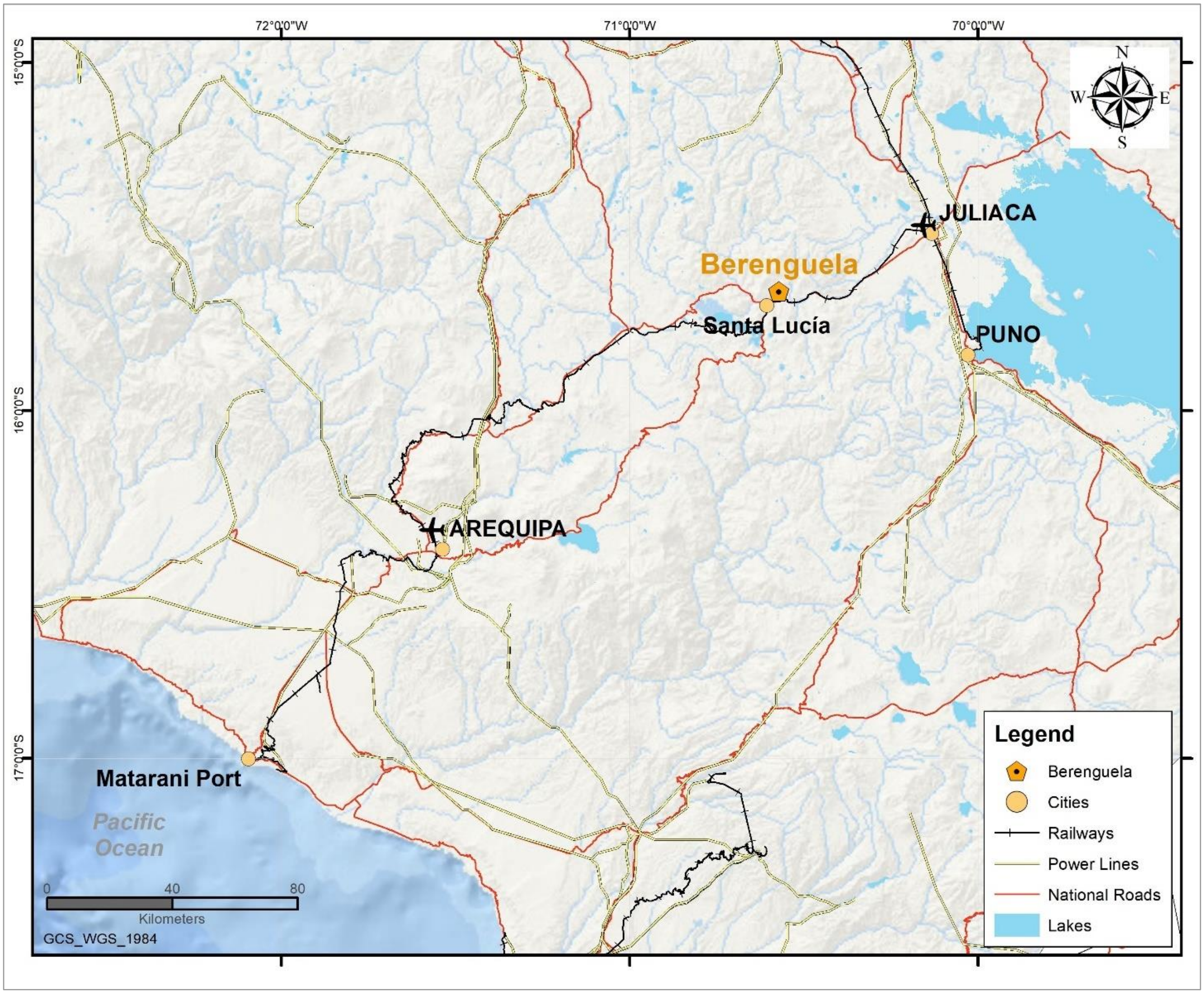
Berenguela is located six kilometres north-east (NE) of the town of Santa Lucía, on the boundary between the communities of Cayachira to the east and Andamarca to the west.

Figure 4.1 Republic of Peru showing Property location



Source: Aftermath, 2021.

Figure 4.2 Berenguela Property location map



Source: Aftermath, 2021.

4.2 Peruvian regulatory framework overview

In Peru, the government retains ownership of all subsurface land and Mineral Resources. The ownership of extracted Mineral Resources, however, is vested on the titleholders of mining concessions. Under Peruvian law, there is a differentiation between the surface land property ownership and that of natural resources.

The right to explore, extract, process, and / or produce minerals in Peru is granted by the Peruvian government in the form of mining, processing, and transport concessions. The rights and obligations of holders of concessions are currently set forth in the Uniform Code of the General Mining Law (General Mining Law), which was approved by Supreme Decree N° 14-92-EM, on 4 June 1992.

This law clearly defines the terms and conditions under which those mining activities are allowed in Peru. This includes the way in which mining rights can be obtained and maintained, how they can be lost and the obligations of their holders. The law also makes provision for contracts permitting options over mineral rights, assignments, and mortgages.

The rights granted by a mining concession can be transferred by their holders with no restrictions or requirements, other than to register the transaction with the Public Mining Register. The Mining Law defines the rules for the transfer of a mining concession and regulates other so-called mining contracts, such as option contracts, concession assignment agreements, mortgages, joint venture agreements, among others. The holder of a mining concession is entitled to the same protection available to holders of private property rights under the Peruvian constitution, the civil code, and other applicable laws. Concession can be owned by local or foreign individuals, or legal entities.

There are four different types of concession:

- Mining concession (allows exploration and mining activities). Concessions are termed mining claims (Petitorio Minero) when in the application phase, and mining concessions (Concesión Minera) after grant. No exploration or mining activities can be conducted on a mining claim. The same mining concession is valid for exploration and for exploitation operations; hence there is no procedure needed to convert title from exploration to mining.
- Production or beneficiation concession, allowing processing, refining, and concentrating activities.
- General labour concession, for ancillary services to mining concession titleholders.
- Mining transport concession.

The Ministry of Energy and Mines (MINEM) is the authority that regulates mining activities. MINEM is responsible for granting mining concessions through a specialized body called The Institute of Geology, Mining and Metallurgy (INGEMMET). The division of responsibilities between MINEM and INGEMMET is as follows:

MINEM:

- Granting of processing, general and transportation concessions.
- Many of the permits for large (>5,000 tonnes per day (tpd)) and medium (350 to 5,000 tpd) scale mining, including the authorization to start exploration and exploitation activities.

INGEMMET is responsible for:

- Processing and issuing of geologic information.
- Granting of mining concessions.
- The administration of the mining cadastre.
- The collection of license fees and penalty payments.

Mining concessions are granted on a "first come, first served" basis, with provision for an auction if simultaneous claims are made. Mining concessions can be granted separately for metallic and non-metallic minerals. Concessions are granted in areas that can go from 100 hectares (ha) to 1,000 ha per concession, according to a defined Universal Transverse Mercator (UTM) co-ordinate system. There is no limit as to the number of concessions that can be held by a single mining company.

Under Peru's current legal and regulatory regime, mining concessions have an indefinite term provided that the concession owner:

- Pays the annual concession taxes or validity fees, called "Derecho de Vigencia", currently $3/ha for large and medium scale metallic mines, payable on 30 June of each year. Failure to pay the Derecho de Vigencia for two consecutive years will result in the concession lapsing automatically.

Mining concessions oblige their holders to invest in the exploration and exploitation (production) of Minerals Resources. Therefore, mining holders are obliged to obtain an annual production (Minimum Annual Production), no later than by the expiration of the 10th year. In case holders of mining concessions do not obtain the Minimum Annual Production in the 10th year, the production penalty payments described below commence, starting in the 11th year. The Minimum Annual Production is calculated through the following formula: 1 Tax Unit (UIT) per year per hectare. For 2021, the amount of one UIT was approximately $1,157.

In the event that the Minimum Annual Production is not reached by the 10th year counted from the date the title of mining concession was granted to the holder, a production penalty is imposed per year and per hectare on a step scale, as defined by Legislative Decree N° 1320 which became effective on 1 January 2019, of:

- As of the 11th year, 2% of the Minimum Annual Production.
- As of the 15th year, 5% of the Minimum Annual Production.
- As of the 20th year, 10% of the Minimum Annual Production.

In case holders of mining concessions fail to pay the production penalty by two consecutive years, the mining concession will expire automatically.

Alternatively, no production penalty is payable if a “Minimum Annual Investment” is made of at least ten times the amount of the production penalty.

Holders of mining concessions which were granted before December 2008 were obliged to pay the penalty from 2019 if the titleholder did not reach either the Minimum Annual Production or make the Minimum Annual Investment in 2018.

Holders of mining concessions must reach the Minimum Annual Production target within 30 years after the concession was granted; failure to do so will cause the mining concession to lapse automatically.

4.3 Required and existing permits and authorizations

According to Peruvian regulations, to perform or undertake exploration activities, a titleholder must obtain all the permits, license, and authorizations required by law. The main permits and authorizations include surface rights, water rights, environmental, and archaeological considerations, as described in the following sections.

4.3.1 Surface rights

Holders of mining concessions must negotiate access and easement agreements with surface landholders. In the case of surface lands owned by communities, it is necessary to obtain approval of a qualified majority of the community. The Project is located in surface lands currently held by private owners.

For the Project, Aftermath Peru has executed fourteen Rights of Use Agreements (RoUA), with the current surface landowners, covering 2,027.11 ha in total.

According to the terms and conditions agreed in the RoUA, the parties agreed that the validity term of the RoUA will be for a fixed three-year term starting on 1 January 2023, and will expire on 31 December 2025, with the exception of the RoUA subscribed with Mr Alberto Cayetano Rosas Perez, which will expire on 1 January 2026.

The annual costs of the RoUA are the following:

- For the year 2023, Aftermath Peru must pay the total amount of Sol (S/)53,133.60 (US$13,982.52 approximately).
- For the year 2024, Aftermath Peru must pay the total amount of S/57,588.80 (US$15,154.95 approximately).
- For the year 2025, Aftermath Peru must pay the total amount of S/62,231.21 (US$16,376.63 approximately).

According to the terms and conditions agreed on four of the RoUA regarding the surface lands denominated "Parcela 11 – Predio Berenguela"; "Predio Chincu Chupa"; "Parcela A6 – Predio Masojlaccaya"; and, "Parcela C8 – Predio Huanumocco", Aftermath Peru must pay S/2,500.00 (US$657.89) per drill pad and in case it is required to use pre-existing drill pads, the payment will be S/1,000.00 (US$263.16) per drill pad.

The current RoUA covers the Berenguela deposit and surrounding area. However, they do not cover all the mining concession areas. If exploration is planned outside of the current land access agreements further agreement with those landowners will be needed.

Lastly, Aftermath Peru subscribed a lease agreement with the Association of Agricultural Producers of Cayachira (hereinafter, the "Lease Agreement"), by which the latter leased in favor of Aftermath Peru a land covering a total area of 3,278.50 square metres (m^2), for the purpose to be used as an area for administrative offices, sample and tool storage areas, logging, sample cutting, parking lots, etc. The term of the Lease Agreement is for a fixed term of three years, starting on January 2023.

The annual cost of the Lease Agreement is S/13,000.00 (US$3,421 approximately).

Peru has adopted the Indigenous and Tribal Peoples Convention to protect the rights of indigenous and tribal people, as stated in article 2 of Law N° 29785: "Indigenous or native people have the right to be consulted in advance on legislative or administrative measures that directly affect their collective rights, their physical existence, cultural identity, quality of life, or development". This procedure is mandatory to develop investment projects in Perú. MINEM has, through an official Letter N° 343-2018-MEM-DGM/DGES dated 29 October 2018, indicated that the area covered in the Berenguela Environmental Impact Study Semi-detailed (EIAsd) (see Section 4.3.3) is not located in a protected community.

4.3.2 Water rights

Water rights are governed by Law 29338, the Law on Water Resources, and are administered by the National Water Authority which is part of the Ministry of Agriculture.

Water rights can be issued at three levels:

1. License: this is the right granted to use the water to a certain aim and in a determined place and will be valid until the activity for which it was granted ceases.
2. Permission: this is the right granted in surplus water periods, by which the use of water is eventual and temporal.
3. Authorization: this is a right granted for a period of two years – extended for an additional year – for the execution of studies, construction, and land wash (i.e., mining projects). None of these are unlimited nor indefinite.

To maintain valid water rights, their beneficiary must fulfil certain duties, the main ones being:

- Payment of retribution, water tariff and any other economic obligation.
- Allocating the use of water according to the water right requested.

According to the hydrological law, the water rights cannot be transferred nor mortgaged. In the case of a change of title holder of a mining concession or the owner of the surface land who is also the beneficiary of a water right, the new title holder or owner can obtain the corresponding water right.

Regarding the Project, by means of Resolution N° 0037-2022-ANA-AAA.TIT dated 20 January 2022, Aftermath Peru can use water from the Cabanillas River up to a total volume of 25,680 cubic metres (m^3) through a Water Authorization issued by the Local Water Authority of Juliaca. This authorization was valid until January 2023. As this authorization may be extended for a period not to exceed two years, this will have to be renewed prior to Aftermath's next drilling program.

Aftermath Peru implemented a flow control and measurement structure at the water source and reported monthly water use to the Juliaca Local Water Authority.

4.3.3 Environmental permits and considerations

The environmental regulations for mineral exploration activities were defined by the Supreme Decree No. 020-2008-EM of 2008. New regulations for exploration were defined in 2017 by Supreme Decree No. 042-2017-EM. The Ministry of the Environment is the environmental authority, although the administrative authority is the Directorate of Environmental Affairs (DGAAM) of MINEM.

The environmental certification is classified based on the level of disturbance or the number of drilling platforms:

- An Environmental Technical Report (Ficha Técnica Ambiental or FTA) is a study for approval of exploration activities with no significant environmental impacts and less than 20 drill platforms.
- Category I: Environmental Impact Declaration (Declaración de Impacto Ambiental or DIA) must be prepared for exploration activities, defined as a maximum of 40 drill platforms or surface disturbance of up to 10 ha.
- Category II: Environmental Impact Study (Estudio de Impacto Ambiental Semi-Detallado or EIAsd) is required for exploration programs, between 40-700 drilling platforms or a surface disturbance of greater than 10 ha. The last programs at Berenguela operated under this level of assessment.
- Category III: a full detailed Environmental Impact Study (Estudio de Impacto Ambiental Detallado or EIAd) must be presented for projects that could generate highly negative environmental impacts. The preparation and authorization of such a study can take as long as two years.

The following environmental permits for drilling are currently in force at Berenguela:

- EIAsd, approved through Resolution N° 181-2018-MEM-DGAAM dated 3 October 2018 for 37 drill platforms and 142 drillholes, sumps and new access tracks.
- First Simple Modification of the 2018 Berenguela EIAsd - Primer Informe Tecnico Sustentatorio (ITS), approved through Resolution N° 069-2019-MEM-DGAAM dated 15 May 2019. This amendment included an additional seven drill platforms and new access tracks, with a six month extension.

However, the following communications were submitted before the competent authority (hereinafter, the "Communications"):

- On 1 June 2021 the REPROGRAMMING OF MINING ACTIVITIES OF BERENGUELA PROJECT for a period of twelve (12) months was filed according to Supreme Degree N° 007-2021-EM.
- On 27 October 2021 the EXTENSION OF WORKING SCHEDULE - BERENGUELA MINING EXPLORATION PROJECT was submitted for six months in application of Article 39° of the Environmental Protection Regulations for Mining Exploration Activities, approved by Supreme Decree No. 042-2017-EM.

Therefore, according to the Communications above, sent to the competent authority, the validity term of the EIAsd the ITS and its Working Schedule has been extended until 20 May 2023.

However, on 14 December 2022, Aftermath Peru submitted before the MINEM a modification to the EIAsd with capacity to construct 140 additional drill platforms in the same area as the existing permit. The duration of the modification would be for an additional 48 months including all closure and post-closure plans and requirements. It is estimated that the modification of the EIAsd would be approved during the month of May 2023.

All drill platforms related to the existing environmental permit have been remediated including reprofiling and revegetation.

4.3.4 Existing environmental liabilities

In accordance with Peruvian Law 28271, generators of environmental liabilities are responsible for remediation activities. Therefore, if historical environmental liabilities are defined, responsibility for these lies with the original generator; the current concession owner is not responsible for either the consequences of such liabilities or the activities of remediation.

MINEM has 27 historical environmental liabilities listed on the Inventory of Mining Environmental Liabilities over the Berenguela Mining Concessions. These include historical surface pits / mines, mine dumps, cleared areas, and the historic Tulva processing plant site.

In addition, according to the environmental base line contained in the Berenguela EIAsd, SOMINBESA, reported to the environmental authority, the presence of 184 additional environmental liabilities is attributed to the result of historical mining activities.

Due to the historical nature of these mining liabilities remediation had been assumed by the Peruvian Government through to Activos Mineros S.A.C., a state-owned company responsible for the remediation of mining environmental liabilities on behalf of the State.

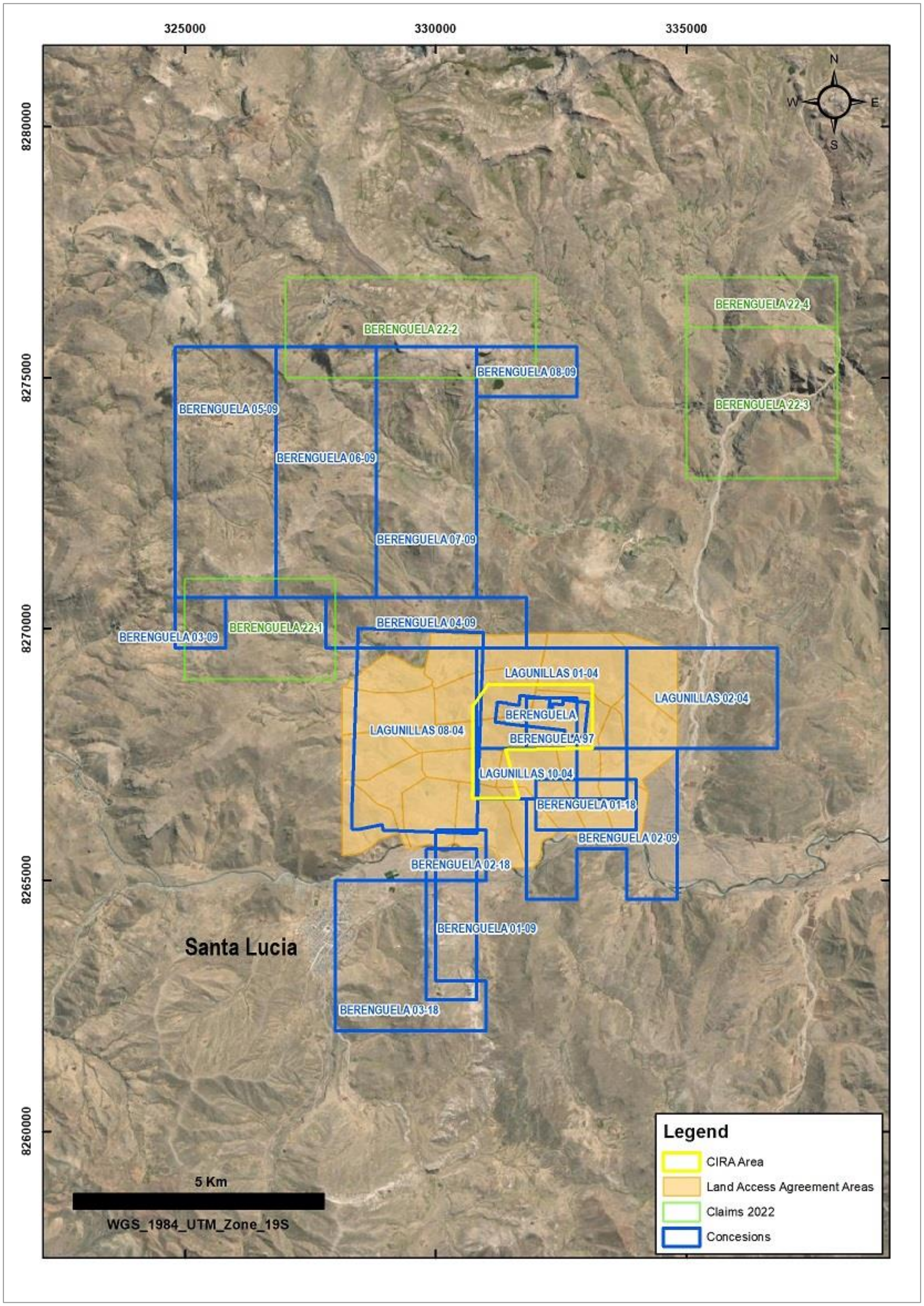
4.3.5 Archaeological considerations

A certificate of non-existence of archaeological remains (Certificado de Inexistencia de Restos Arqueológicos or CIRA) issued by the Ministry of Culture certifies that no archaeology will be disturbed. However, any earth movement still requires direct supervision of an onsite archaeologist as described in an Archaeological Monitoring Plan (Plan de Monitoreo Arqueológico or PMA) which describes the effective manner to respond to an archaeological find.

The CIRA for the Berenguela Project was approved in CIRA N° 110-2015 dated 11 June 2015 over an area of 380.14 ha. Figure 4.3 shows this area as it relates to the mining concessions and mining claims. Also shown are the surface landowner boundaries where land access agreements have been reached.

Previous drill platform construction has been conducted with PMA approval. Future programs will require new PMAs.

Figure 4.3 CIRA area with landowner boundaries and access agreements



Source: Aftermath, 2023.

4.4 Taxes and encumbrances

Peruvian corporations are subject to corporate income taxes at a rate of 29.5%. Mining companies are subject to specific mining taxes and royalties; the Modified Mining Royalty (MMR), Special Mining Tax (SMT), and Special Mining Burden (SMB).

4.4.1 Modified Mining Royalty (MMR)

MMR applies on companies' operating income, rather than sales. The MMR is payable on a quarterly basis with marginal rates ranging from 1% to 12%. An "operating income" to "mining operating revenue" measure (operating profit margin) is calculated each quarter and depending on operating margin the royalty rate increases as the operating margin increases.

Companies must always pay at least the minimum royalty rate of 1% of sales, regardless of their profitability. The amount actually paid for mining royalties shall be considered as an expense for purposes of calculating the income tax.

4.4.2 Special Mining Tax (SMT)

The SMT is a tax applied to mining income. The marginal rate, depending on the margins, ranges from 2-8.4% levied on their quarterly net operating profits from the sale of metallic Mineral Resources. The amount actually paid for SMT shall be considered as an expense for purposes of calculating the income tax in the fiscal year in which it was paid.

4.4.3 Special Mining Burden (SMB)

For large mining companies, with tax stability agreements in place prior to 1 October 2011, a 4% to 13.12% tax is imposed on operating income. The amount actually paid for SMB shall be considered as an expense for income tax purposes in the fiscal year in which it is paid. This does not currently apply to Aftermath.

4.4.4 Employee participation

Employees are entitled to participate in the profits of all the mining companies developing income-generating activities. As a result, mining companies are obliged to distribute 8% of their annual taxable income before taxes on behalf of all their employees, with a maximum limit equivalent to 18 monthly salaries per employee.

A mandatory contribution paid to the Peruvian Mining Retirement Fund based on pre-tax profits, after deduction for the royalty tax and SMT is assessed at a rate of 0.5%.

4.5 Berenguela Property land tenure and ownership

4.5.1 Ownership

On 27 July 2020, Aftermath entered into a binding Letter of Intent (the LOI) with SSR Mining Inc. (SSRM) to purchase 100% of the Berenguela silver-copper project through the purchase of 100% of SSRM's shares in the Peruvian holding company SOMINBESA. The definitive agreement was signed on 30 September 2020 and amended on 23 November 2020.

The amended terms of the acquisition include certain staged payments, the completion of a Preliminary Feasibility Study (PFS) and filing on SEDAR of a NI 43-101 Technical Report summarizing the PFS, and the granting of a sliding scale net smelter return (NSR) royalty to SSRM, as discussed in Section 4.5.4.

On 21 October 2021, SSRM entered into an assignment agreement with EMX Royalty Corporation (EMX) pursuant to which SSRM assigned to EMX all of its right title and interest to the deferred consideration obligations owing by Aftermath to SSRM pursuant to Section 3.2 of the amended definitive Acquisition Agreement.

On 2 December 2022, EMX and Aftermath agreed to defer the $2.5M payment due from Aftermath in November 2022 for a period of 12 months such that this payment is now due in November 2023. In consideration for these deferrals, Aftermath agreed to pay EMX an additional $400,000 and granted EMX a right of first refusal on any royalties that the company may elect to sell.

On 8 December 2022, Aftermath, EMX, and SSRM signed an amending agreement to amend the Acquisition Agreement to reflect the revised payment schedule to EMX and to extend the date by which Aftermath must complete a PFS and file the related technical report in respect of the Berenguela Concessions, on the terms and subject to the conditions set forth in this Amending Agreement. Aftermath must now complete a PFS on or before 23 November 2025.

The progress against the acquisition payments and work commitments is summarized in Table 4.1.

Table 4.1 Aftermath Berenguela acquisition payment terms and progress

Date	Payments and work commitments (US$, unless noted)	Status
27 Jul 2020	$1,000,000 cash	Paid to SSRM
23 Nov 2020	$725,000 cash	Paid to SSRM
	C$3,358,902.50 in Aftermath Shares	Issued to SSRM
23 Nov 2021	$2,250,000 cash (to EMX)	Paid to EMX
23 Nov 2022	$400,000 cash (to EMX)	Paid to EMX
23 Nov 2023	$2,500,000 cash (to EMX)	
23 Nov 2024	$3,000,000 cash (to EMX)	
23 Nov 2025	Completion of a PFS	
23 Nov 2026	$3,250,000 cash (to EMX)	

4.5.2 Land tenure

The Property consists of 17 mining concessions held by SOMINBESA and four claims made by Aftermath Peru, as recorded by INGEMMET.

SOMINBESA's concessions have an area of 7,357 ha and Aftermath's claims have an area of 2,800 ha as listed in Table 4.2. The footnotes of Table 4.2 list the pre-existing and current third-party concessions, termed Priority Concessions, which have affected the area of the SOMINBESA concessions. Note that all of the Aftermath claims will also be subject to a reduction due to overlapping concessions at the time of granting its title, although Berenguela 22-2 only overlaps with SOMINBESA's existing concessions.

The mining concessions and mining claims of the Property including those pending, are shown on the map in Figure 4.4. Current and pre-existing concessions termed Priority Concessions are shown in Figure 4.4 and the impact of these overlapping claims is shown in Figure 5.1 as a total outline. They are also referred to in the notes to Table 4.2.

Table 4.2 List of mining concessions and mining claims

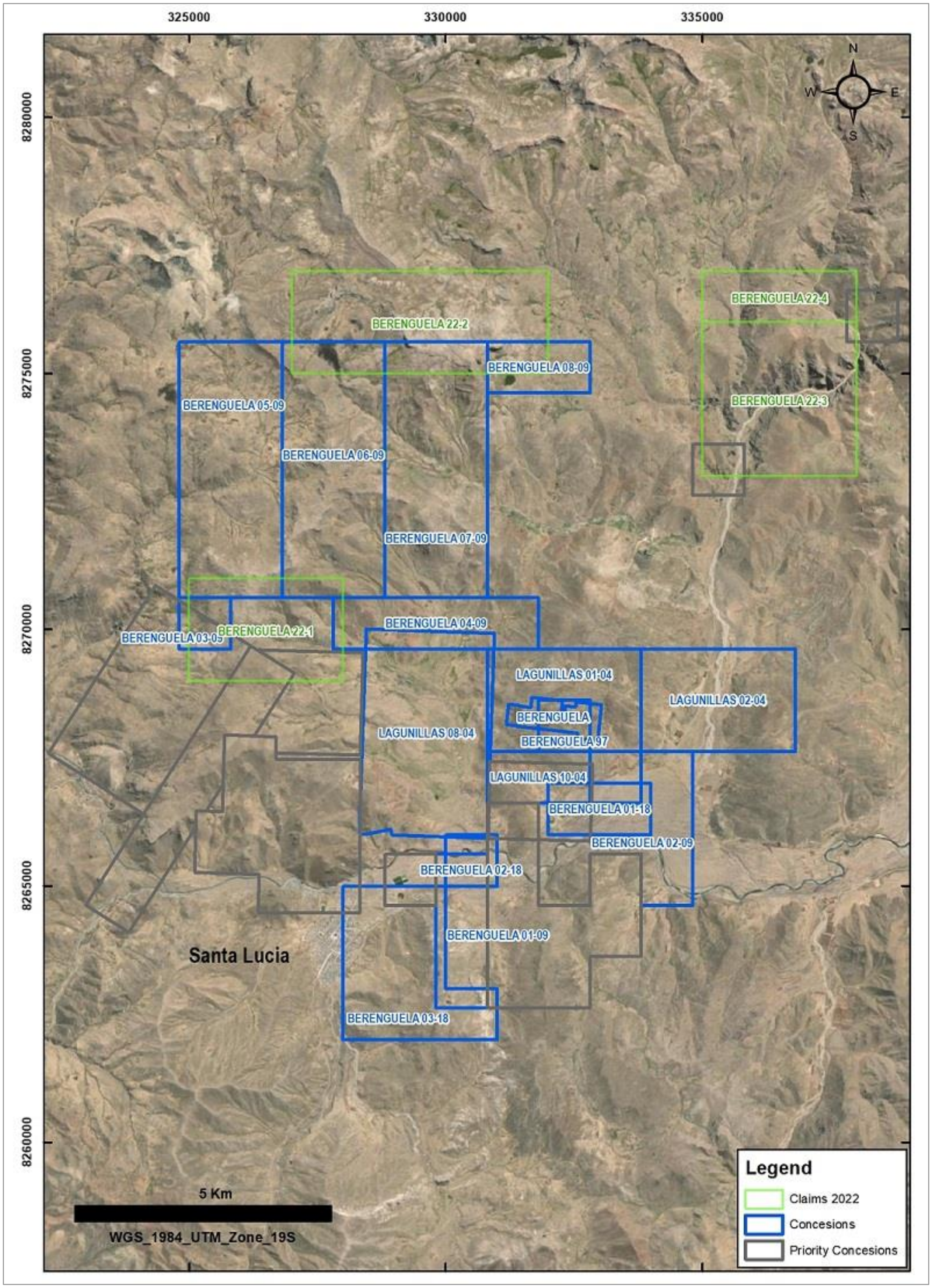
Name	Holder	National code number	Grant date	Expiry date	Area (ha)
BERENGUELA	SOMINBESA	13000001Y03	30 July 1992	1 Jan 2039	100.0005
BERENGUELA 97	SOMINBESA	010128997	27 Mar 1998	1 Jan 2039	41.3308
BERENGUELA 01-09	SOMINBESA	010111609	10 Feb 2010	1 Jan 2041	300.0000
BERENGUELA 02-09[1]	SOMINBESA	010111509	13 Sept 2010	1 Jan 2041	526.0620
BERENGUELA 03-09[2]	SOMINBESA	010134109	20 Jan 2010	1 Jan 2041	36.3580
BERENGUELA 04-09	SOMINBESA	010134209	30 Dec 2009	1 Jan 2040	313.0870
BERENGUELA 05-09	SOMINBESA	010134409	16 Sept 2009	1 Jan 2040	1,000.0000
BERENGUELA 06-09	SOMINBESA	010134509	26 Oct 2009	1 Jan 2040	1,000.0000
BERENGUELA 07-09	SOMINBESA	010134009	30 Nov 2009	1 Jan 2040	1,000.0000
BERENGUELA 08-09	SOMINBESA	010134309	30 Nov 2009	1 Jan 2040	200.0000
LAGUNILLAS 01-04	SOMINBESA	010135004	19 Nov 2004	1 Jan 2039	440.0680
LAGUNILLAS 02-04	SOMINBESA	010135104	4 Aug 2004	1 Jan 2039	600.0000
LAGUNILLAS 08-04	SOMINBESA	010151204	26 Aug 2004	1 Jan 2039	995.6453
LAGUNILLAS 10-04[1]	SOMINBESA	010271004	19 Nov 2004	1 Jan 2039	41.9927
BERENGUELA 01-18[1]	SOMINBESA	010081918	7 Mar 2019	1 Jan 2050	36.5112
BERENGUELA 02-18[3]	SOMINBESA	010090418	7 Mar 2019	1 Jan 2050	26.2603
BERENGUELA 03-18[4]	SOMINBESA	010094618	8 Aug 2022	1 Jan 2053	563.3890
BERENGUELA 22-1	Aftermath	010155322	Pending	Claim	600.0000
BERENGUELA 22-2	Aftermath	010176122	Pending	Claim	1,000.0000
BERENGUELA 22-3	Aftermath	010176222	Pending	Claim	900.0000
BERENGUELA 22-4	Aftermath	010176322	Pending	Claim	300.0000
			Total		**10,020.7048**

Notes: Claims that are pending have not been granted and have no expiry date.
[1] Overlaps a pre-existing and current concession known as Santa Lucía 14.
[2] Overlaps a pre-existing and current concession known as Lucia Josefina 1.
[3] Overlaps a pre-existing and current concession known as Don Jose I 2009.
[4] Overlaps a pre-existing and current concessions known as Acumulacion Magnetita, Fili XVII & Don Jose I 2009.

There is a further note from Dentons on the Berenguela and Berenguela 97 mining concessions as follows:

"According to the dispositions established in Supreme Decree N° 011-2017-EM, the mining concessions "Berenguela", identified with code N° 13000001Y03 and "Berenguela 97", identified with code N° 010128997 (hereinafter, the "Mining Concessions"), will expire automatically on the thirtieth year without production counted from the year 2009, however, said Mining Concessions were transferred to private parties through and investment promotion process. In that sense, according to the dispositions established in Supreme Decree N° 054-2008-EM, the expiration date for the Mining Concessions are governed through the terms and conditions agreed in their respective investment agreements subscribed with the Peruvian State. To the date of this report, the Ministry of Energy and Mines is pending to issue an opinion on the expiration regime to be applied to the Mining Concessions".

Figure 4.4 Plan of Berenguela mining concessions and mining claims



Source: Aftermath, 2023.

4.5.3 Land holding costs

According to the information provided by INGEMMET:

The annual concession taxes and / or validity fees paid for the mining concessions "Berenguela", "Berenguela 97" and "Lagunillas 01-04" for the year 2022 were $1,744.19. With the exception of these three aforementioned concessions, a further total payment of $20,327.75 should be made before 30 June 2023 to maintain the validity of the concessions in Table 4.2.

The annual concession taxes and / or validity fees paid during the application process for the mining claims "Berenguela 22-1", "Berenguela 22-2", "Berenguela 22-3," and "Berenguela 22-4", for the year 2022 were $8,400.00. The concession Berenguela 03-18 was granted during late 2022 and will start attracting concession taxes in 2023, payable in 2024.

The production penalty payments as applied to mining concessions over 10 years old in 2022 is a total of S/567,882.74, or approximately US$150,600. For Lagunillas 01-04 S/38,725, or approximately US$10,300, was paid in June 2022 by Aftermath Peru. A remaining payment of approximately $140,300 should be made before 30 June 2023 to maintain the validity of the concessions in Table 4.2.

It should be noted that all of the Berenguela mineralization known to date is completely covered by concessions Berenguela, Berenguela 97, and Lagunillas 01-04 that have no pending fees due by 30 June 2023 as all are paid.

The annual cost of the RoUA (see Section 4.3.1) for 2023 is S S/53,133.60 (US$13,982.52 approximately).

The annual cost of the Lease Agreement (see Section 4.3.1) is S/13,000.00 (US$3,421.05 approximately).

SOMINBESA also pays nominal rent for the Limon Verde core farm and the Lima sample storage warehouse.

Based on information provided by Aftermath's Peruvian counsel, Dentons Gallo Barrios Pickmann SCRL, all the mining concessions and mining claims listed in Table 4.2 are in good standing.

4.5.4 Royalties

As part of the Aftermath acquisition agreement, SSRM retains a sliding-scale NSR royalty on all mineral production from the Berenguela project for the life of mine, commencing from the declaration of commercial production. This royalty agreement will in effect replace a 1% NSR that originated from the transaction between SSRM and Valor. The sliding scale is based on the following:

- 1% NSR, on all mineral production when the silver market price is up to and including $25 per ounce.
- 1.25% NSR on all mineral production when the silver market price is over $25 per ounce and when the copper market price is above $2 per pound.

Originating from the 2006 sale by Kappes, Cassiday & Associates (KCA) (VDM Partners) to Silver Standard, a 2% NSR Royalty capped at $3 million (M) was applicable on all copper produced from the Property.

Set out in the Public Deed of the Transfer Agreement dated 6 November 2006 is a 2.5% NSR Royalty on any minerals extracted and processed from each of the Lagunillas 01-04, Lagunillas 02-04, Lagunillas 08-04 and Lagunillas 10-04 mining concessions for the benefit of Minera Silex del Peru S.R.L. (in Liquidation).

Royalties to the State are described in Section 4.4.1.

4.5.5 Other significant factors

The QP is not aware of any other significant factors and risks which may affect access, title, or the right or ability to perform work on the Property.

5 Accessibility, climate, local resources, infrastructure, and physiography

5.1 Accessibility

Access to the Property can be made all year round from Juliaca driving south-west (SW) on highway 34A for about 65 kilometres (km) via Santa Lucía. This trip takes between 45 minutes to one hour. Alternatively, the Property can be reached from Arequipa on highway 34A for about 120 km to Santa Lucía, a trip of about four hours.

Daily commercial airline services are available between Juliaca and Lima. Flights are approximately 45 to 60 minutes in duration. Figure 4.2 shows the relationship of these locations to the Property.

From Santa Lucía a dirt road heads north across the Rio Cabanillas, past the Límon Verde camp and then leaving the Rio Cabanillas valley turning north up the Andamarca valley. After traveling about 2 km up the valley a turn-off to the east is taken. This dirt road crosses the valley and is followed for about four km, crosses the Rio Andamarca, and continues up the hill to the western side of the Berenguela deposit, as shown in Figure 5.1.

5.2 Topography and physiography

The Property lies between 4,150 and 4,280 m above sea level (masl) in the Western Cordillera of southern Peru in a geographical terrain known as the Altiplano (high plateau). The main topographical and cultural features are shown in Figure 5.1., and a general view of project area is shown in Figure 5.2. Relief is moderate with relatively poorly drained pampas and limited vegetation.

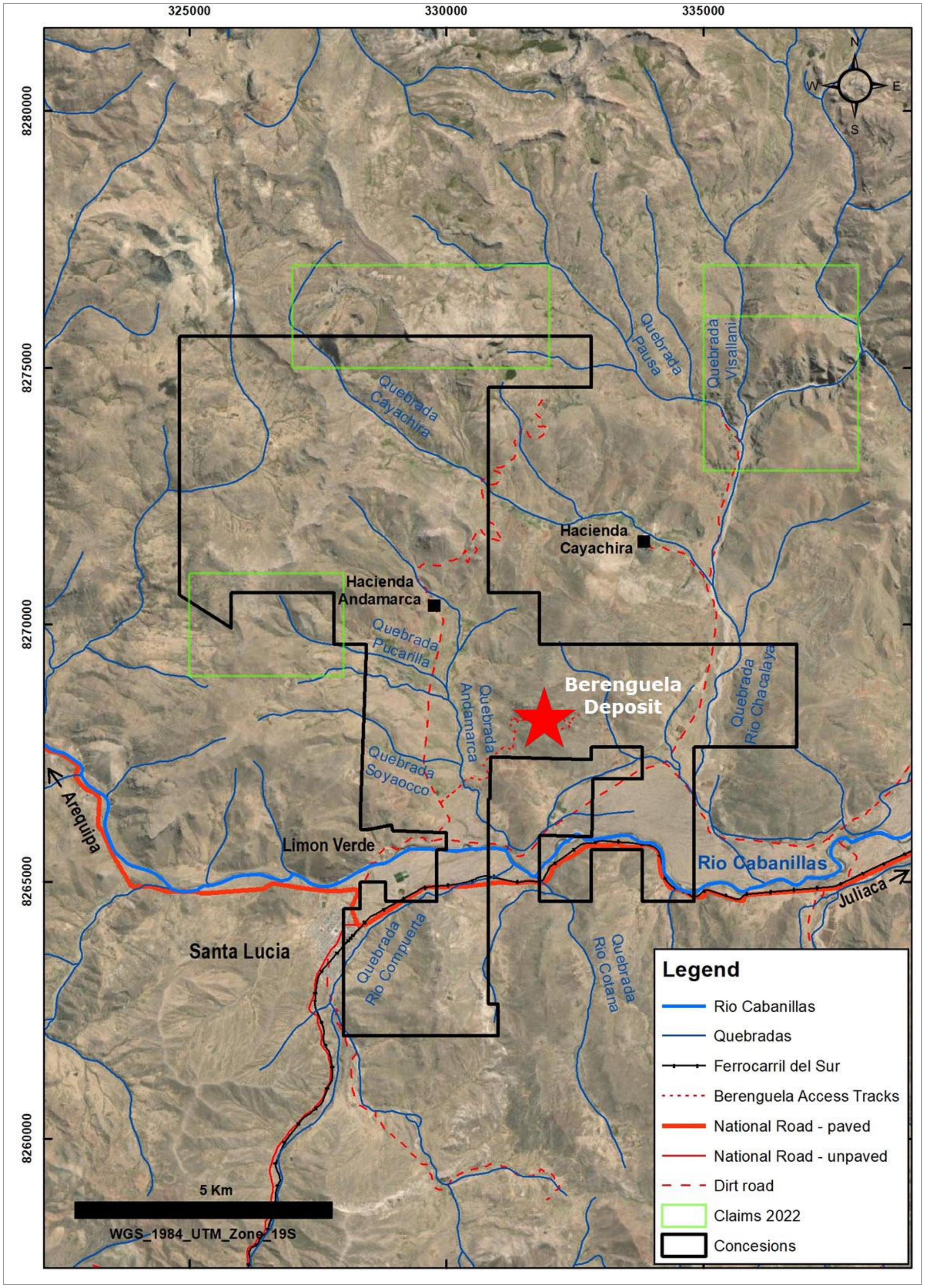
The Berenguela deposit area lies on a ridge between two drainages, Quebrada Andamarca and Rio Chacacaya. Both drain to the south and into the Rio Cabanillas. The Rio Cabanillas has a wide flat alluvial plain which extends up the Rio Chacacaya valley to the NE; an area called the Pampa Jacopampa. There is one other unnamed quebrada, (drainage) that drains the hills to the east of the deposit area and meets the Rio Cabanillas to the SE of the deposit. The Rio Cabanillas has its origins approximately 4.0 km west of Santa Lucía where the Rio Verde and Rio Cerrillos meet. The Rio Cabanillas itself travels 66 km to the east, until it joins the Lampa River, along with other rivers in the area feeding into Lake Titicaca.

The slopes of the hills are typically covered with sparse Ichu grasses and scrub. The steeper slopes generally have much less vegetation and are mostly covered by talus and rock debris.

The surface areas inside and outside the project are owned by traditional Peruvian people who are organized into associations to promote the local economic activity represented by the breeding of camelids (vicuñas, alpacas). The camelids feed on natural pastures and "puna" straw through extensive grazing, supplemented with harvest residues (chala), and fresh herbs.

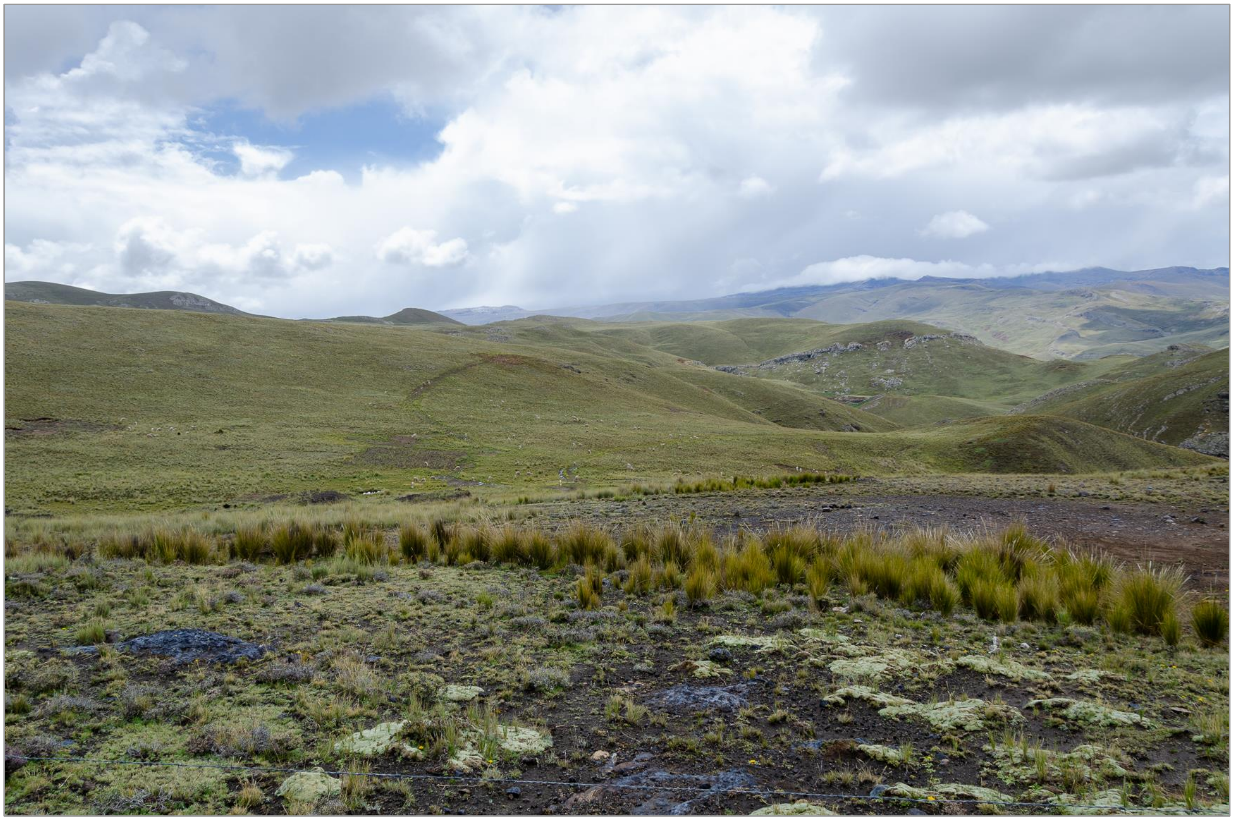
The highest point in the project area is to the north of the Berenguela deposit, Cero Paco at 4,425 masl.

Figure 5.1 Map of the Property



Source: Aftermath, 2021.

Figure 5.2 General view of Berenguela Project area, looking NE



Source: Hector Canales, April 2022.

5.3 Climate

5.3.1 Introduction

The National Meteorology and Hydrography Service (SENAMHI) has implemented weather stations in the area and the most representative and closest station corresponds to Santa Lucía, which records variables such as precipitation, temperature, relative humidity, and winds.

The climate is variable. The winter months of May, June, July, and August are frigid with intense frosts. During the spring months of September, October, and November the weather is cold and temperate. The weather is rainy, tinged with snowfall and hailstorms, during the months of December, January, February, and March and sometimes into April.

5.3.2 Temperature

Based on records from the Santa Lucía meteorological station (existing for a period of 17 years), the multi-annual average monthly temperature range from 3 degrees Celsius (°C) in June to 9.2°C in December and February. Details are shown in Table 5.1.

Table 5.1 Average monthly temperature - Santa Lucía Station (2001-2022)

T (°C)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Mean	9.1	9.2	8.8	7.2	4.9	3.5	3.0	4.0	5.7	7.6	8.6	9.2	6.7
Maximum	11.8	11.4	11.1	9.6	7.8	6.1	6.6	7.5	8.5	10.8	11.7	11.3	9.5
Minimum	6.7	7.2	6.2	4.0	1.5	1.1	-0.6	0.8	1.4	4.3	6.1	6.7	3.8

Source: SENAMHI, adapted by Group GyA SAC.

Note there are gaps in the record and the author of the ESIA application, and Grupo GyA SAC. have filled in incomplete or empty data through a widely accepted statistical process. This applies to all the meteorological data.

5.3.3 Precipitation

Based on existing information from SENAMHI, the multiannual average of precipitation at the Santa Lucía meteorological station is presented in Table 5.2. Annual precipitation is of the order of 763.5 millimetres (mm)/year. The highest rainfall is recorded between the months of December and March, representing a total of 600.6 mm, equivalent to 78.7%; the rest is distributed in the other months of the year, with little rain from May to August.

Table 5.2 Total monthly precipitation - Santa Lucía Station (1970-2022)

Ppt. (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Set	Oct	Nov	Dec	Avg.
Mean	193.0	156.0	125.3	42.9	6.1	3.8	4.7	9.0	13.7	26.6	56.1	126.3	763.5

Source : SENAMHI, adapted by Group GyA SAC.

The wind speed was evaluated based on the record of the Santa Lucía meteorological station for the period 2001-2013. The average annual wind speed is of the order of 3.0 m/s, with not much variation during the year; this being the difference between a minimum of 2.7 m/s in April and a maximum of 3.3 m/s in July.

Both exploration and any future mining activities can be conducted year-round, and weather imposes no restrictions on operations.

5.4 Local resources and infrastructure

The Santa Lucía district has a population of about 7,500 of which about 5,300 live in the town of Santa Lucía. Santa Lucía has national grid power, hospital, police station, elementary and high schools, technical institute, and a freight train station. Arequipa (population 1 million) and Juliaca (population 276,000) are well serviced with professional services and labour supporting the mining industry.

The Berenguela core processing facility is located in an area 1 km north of Santa Lucía and 5 km from the Project. It is located in an old mining camp area called Limon Verde. This secure facility includes two warehouses used as core shacks, office, logging and cutting area (see Figure 5.3).

The standard gauge rail line, the Ferrocarril del Sur, starts at the city of Puno, passes through Juliaca, Santa Lucía and Arequipa on its way to the Matarani Port on the Pacific coast. PeruRail own and operate the freight line. Amongst other commodities, the rail line is used to transport copper concentrate from the Cerro Verde copper mine, 32 km south-west of Arequipa. Matarani Port is one of three major ports in Peru, with warehousing and loading facilities for bulk commodities, mineral concentrates, and containers.

The mining concessions are sufficiently large enough, at over 7,595.2 ha, to accommodate a processing plant, tails management facility, and other infrastructure required to operate a mine.

Currently for exploration purposes land access agreements have been reached with local landowners. The outline of the area covered by agreements and the individual landowner boundaries are shown in Figure 4.3.

Appropriate water sources will be evaluated during studies including access to existing surface water sources.

Figure 5.3 General view of the Limon Verde core logging and processing compound

Note: Looking South-east.
Source: Hector Canales, April 2022.

6 History

6.1 Ownership

Berenguela has a long history of mineral exploration and production. This summary of the mining history of Berenguela is compiled from all available documented exploration and development activities. The QP does not consider it to be inclusive since not all exploration and development activities have been documented and additional historical documents may yet be located.

A summary of ownership and options is shown in Table 6.1 and is elaborated on in Section 6.2 which discusses the documented exploration and development work carried out over time.

Table 6.1 Ownership summary

Years	Company	Milestone
1903	Grundy	Grundy family carried out selective mining in area
1906	Lampa Mining Company Limited	Acquired Berenguela from Grundy
1965	Lampa Mining Company Limited	Ceased operations
1965-66	ASARCO	Executed a purchase option, which was terminated in September 1966
1966-68	Cerro de Pasco Corporation	Took an option to purchase which was terminated in November 1968
1968-70	Charter Consolidated Limited	Option to purchase
1970	Lampa Mining Company Limited	Lost ownership of the Property, and it reverted to the state
1972	Minero Perú S.A.	Ownership passed to Minero Perú, a state-owned company
1995	Kappes, Cassiday & Associates	Purchased through competitive bid and SOMINBESA formed
2004	Silver Standard	Option Agreement with SOMINBESA
2006	Silver Standard	Met option criteria and KCA transferred its shares of SOMINBESA
2017	Valor	Signed an agreement to purchase SOMINBESA
2017-18	Valor	Carried out drilling programs, then sought JV partner
2019	Rio Tinto	Carried out exploration as part of JV option
2020	Valor	Unable to meet cash payments so property reverted to Silver Standard
2020	Aftermath	Agreement to purchase

6.2 Exploration and development

6.2.1 Introduction

The following is a summary of the documented exploration and development history of Berenguela, as carried out by various owners and optionees.

Selective mining was carried out at Berenguela since 1903. While no documents are available, the Property appears to have been owned privately by the Grundy family, who had other significant land holdings in the region. Lampa Mining Company Limited (Lampa Mining) owned the Property from 1906 to 1965. Lampa Mining's activities are detailed below.

6.2.2 Lampa Mining activities

In 1906, the company Lampa Mining of Liverpool, England was floated to develop six mines in the Lampa district, around Santa Lucía. Berenguela was acquired in 1913, from the Grundy family, along with other properties in the region for equity in Lampa Mining. Selected pockets of high-grade silver ores were direct shipped until being exhausted during World War II. This discussion has been abbreviated from a document called Lampa Mining Company circa 1957.

The operations struggled from 1930 through 1934, at which time a plant was built at Berenguela to precipitate silver and copper and produce manganese sulphate. When sulphur prices increased, which was required for the process, and with uncertain market conditions for manganese sulphate the process was abandoned.

Production records from Lampa Mining are not available prior to 1935. During the period 1935 to July 1941 Lampa Mining processed a total of 27,349 tons at 164.9 ounces per ton (oz/t) silver and 2.4% copper (McCutchan, 1941).

An oil fired reverberatory furnace was built at Berenguela around 1941 - 42 to process material below direct shipping grades. This was at a site located on the western side of the deposit, at a location called Tulva, shown in Figure 6.1. The plant proved effective and a larger scale reverberatory furnace was commissioned about 1946. Once constructed, the earlier furnaces were demolished and a second reverberatory furnace was built in its place. In March 1956, a third reverberatory furnace was commissioned.

Figure 6.1 Lampa Mining's Tulva processing site, looking NE

Source: Aftermath, Dec. 2020.

In the 1954 Lampa Mining investigated segregation roasting, which included the operation of a pilot plant, built in England, which was shipped and erected adjacent to the reverberatory smelter furnaces.

6.2.3 Lampa Mining optionees

The American Smelting & Refining Co. (ASARCO) executed a purchase option on Berenguela in August 1965. ASARCO undertook the first studies on Berenguela for which documents are available. Work included topographical surveys, drilling 52 holes on a 50 metre (m) grid for 3,241 m, and obtaining a 300 t bulk sample from the underground workings. The option was terminated in September 1966 (Salazar, 1967).

The American owned Cerro de Pasco Corporation, operators of the La Oroya copper smelter east of Lima, took out a purchase option on Berenguela from Lampa Mining between 4 November 1966 to 4 November 1968. Activities included estimating reserves and metallurgical testwork at the La Oroya smelter.

Charter Consolidated Limited (Charter) took out a purchase option in December 1968. By February 1970 Charter had completed 56 diamond drillholes (DD) for a total length of 3,386 m, and 5,108 m of underground channel sampling (1.5 m lengths) for metallurgical testwork and a feasibility study was completed (Kalcov and Waddle, 1970).

Due to a failure to fulfil the schedule of operations set forth in the then Peruvian General Mining Law, Lampa Mining forfeited the project on 30 September 1970. Ownership reverted to the State and on 19 January 1972 ownership passed to the government owned Minero Perú S.A. (Minero Perú).

6.2.4 Privatization and recent owner-operators exploration activities

In 1995, a policy of privatization was adopted by the Peruvian ministry responsible for Minero Perú, with the result that the Property was offered for sale by the state company. KCA purchased the Property in 1995 by competitive bid and formed a private Peruvian company, SOMINBESA to manage the project. Following the acquisition, KCA conducted a surface bulk-sampling program between 1995 and 1997, collecting two bulk samples for hydrometallurgical testwork.

In March of 2004, Silver Standard, now SSRM, entered into an option agreement with SOMINBESA to purchase 100% of the silver resources contained in the Berenguela Project. Silver Standard agreed to pay $200,000 and issue 17,500 common shares of Silver Standard. In addition, Silver Standard was required to carry out an exploration program estimated to cost a minimum of $500,000 to expand the property Mineral Resource, complete a resource estimate in accordance with NI 43-101 and initiate prefeasibility work.

Between 2004 and 2005 Silver Standard completed the exploration commitments, by undertaking a 222-hole reverse circulation (RC) drill program to define the deposit and producing a Mineral Resource estimate reported under NI 43-101.

Geological mapping programs were carried out by Silver Standard during the 2004 and 2005 drilling programs. Mapping began at 1:2,000 scale and was upgraded to a more detailed 1:1,000 outcrop map.

Between September and October 2004, Silver Standard completed 11 shallow shafts with plan dimensions of 1.3 m x 1.8 m. Nine shafts were mined to a depth of 10 m and two to a depth of ≈5 m, for a total of 100.7 m, in order to validate the reverse circulation (RC) drilling results and acquire sample for metallurgical testwork. The shafts were sunk by local mining contractors.

The shafts were located at existing drill platforms, in proximity to a vertical RC hole. A comparison of the silver and manganese assays for the shaft samples and the closest vertical RC hole showing that the absolute values are variable, particularly in the top 5 m.

This is discussed in detail in Section 9 and 10 of the 2021 AMC Technical Report and summarized below.

In January 2006 Silver Standard signed a share purchase agreement to acquire 100% of SOMINBESA for aggregate payments of $2M in cash and $8M in shares of Silver Standard, with KCA retaining a 2% NSR royalty on copper production, capped at $3M.

Silver Standard completed an exploration drill program in 2010 and a resource development focused drill program in 2015. Between these dates the following exploration work was also carried out:

- Silver Standard hired Arce Geofisicos to carry out the following geophysical surveys in 2009:
  - Ground microgravity on 50 m spacing, on six lines for a total of 22.7 km.
  - Total field magnetometer on 10 m spacing, along seven lines, a total of 23.75 km.
  - Induced polarization (IP) (self-potential, chargeability, and resistivity) with readings every 50 m, using pole-pole array electrode configuration, readings every 50 m and 100 m on seven profiles, five NS and two EW, spacings of 50, 100, 150, 200, 150, 300, and 350 m. The two-dimensional (2D), 50 m depth slice is shown in Figure 9.4.
  - Induced polarization (self-potential, chargeability, and resistivity) with readings every 100 m, using pole-pole array electrode configuration, readings every 50 m and 100 m on five NS profiles, spacings of 100, 200, 300, 400, 500, 600, and 700 m.
- Silver Standard commissioned the following geophysical surveys in 2010:
  - Arce Geofisicos to carry out a ground magnetic survey.
  - Zonge Ingenieria Y Geofisica, carried out a Magneto-Telluric survey on four lines. Modelling included one-dimensional (1D) and 2D pseudo sections and 1D and 2D resistivity depth slices at depths of 100, 200, 300, 500, 750, 1,000, and 1,500 m.
- A re-mapping program was carried out before the 2010 drilling campaign, and the mapping was updated again in 2015.

In February 2017 Silver Standard announced that it had entered into a definitive agreement to sell 100% of SOMINBESA to Valor, an Australian listed company, for aggregate consideration of $12M in deferred cash, a 9.9% equity interest in Valor and the requirement for Valor to raise $8M for project expenditures.

Between 2017 and 2018 Valor completed an RC drilling program of 67 holes, two JORC (2012) resource estimates, geochemical surveys, and a scoping study. The 2018 estimate, incorporating all that drilling, was reported in the 2018 Valor JORC Report and is discussed in Section 6.3.

In January 2019 Valor signed a joint venture option agreement with Kennecott Exploration Company, later assigned to Rio Tinto Mining and Exploration (Rio Tinto), for $700,000 in cash payment and $2M in exploration, after which Rio Tinto could elect to form a 50:50 joint venture with Valor by paying an additional $3M to Valor. Rio Tinto could further elect to sole fund $5M on the Project over three years to earn an additional 25%. In 2019 Rio Tinto completed four DD for 1,427 m, collected 707 geochemical samples and relogged 15 historical drillholes. In January 2020 Rio Tinto elected not to continue with the option agreement.

In 2019 Arce Geofisicos carried out a ground magnetic survey for Rio Tinto.

In March 2020 Valor was unable to meet required cash payments and SSRM commenced transfer of the ownership of SOMINBESA back to SSRM.

On 1 October 2020 Aftermath announced it had signed an acquisition agreement with SSRM to purchase 100% of the Berenguela silver-copper project through the purchase of 100% of the shares in SOMINBESA. Final closing of the Transaction is expected to take place on or before 24 November 2026. Details of this deal are discussed in Section 4.5.1.

6.2.5 Drilling by historical owners / operators

Between September 1965 and 7 July 1966, ASARCO completed 52 DD on a regularized 50 m grid. A total of 3,241.6 m was completed. Details of this program are provided in a final project report ASARCO provided to Lampa Mining upon the termination of the option agreement (Salazar, 1967). This report includes hand-written logs and transcribed assay results, although in the available scan of the data it is often difficult to read.

During 1968 and 1970, Charter conducted 56 vertical holes on the 50 m grid established by ASARCO. Holes were collared using a rotary tricone and completed in with diamond drilling. A total of 3,386 m was drilled. This program is briefly described in the 1969 Historical Mineral Resource report by Strathern (1969), however, no original drill data referred to in the report is available.

The holes drilled by ASARCO and Charter do not form part of the current project database and have not been used in the historical resource estimates since 1970 because no raw data is available.

Drilling carried out since 2004 is discussed in Section 10, as is part of the database used for estimation.

6.3 Historical Mineral Resources

There have been several unpublished and published Mineral Resource estimates on the Berenguela Property. The dates of the historical estimates are listed below in Table 6.2.

The first recorded estimate was made by ASARCO in 1966 (Kalcov and Waddle, 1970).

Table 6.2 Historical estimates by year

Date	Company	Reference
1966	ASARCO	Kalcov and Waddle 1970
1969	Charter	Strathern 1969
1980	Minero Perú	
2005	Silver Standard	2005 McCrea Technical Report
2018	Valor	2018 Valor JORC Report

The results of the most recent historical estimates by Silver Standard reported according to CIM Definition Standards 2000 and by Valor, who reported according to JORC 2012 are discussed below.

In October 2005, James A. McCrea, P.Geo., prepared a Mineral Resource estimate for Silver Standard using inverse distance squared to inform 5 x 5 x 5 m blocks, which is reported in the 2005 McCrea Technical Report. This is summarized in Table 6.3.

Table 6.3 Historical McCrea resource estimate summary – October 2005

Classification	Mt	Ag (g/t)	Cu (%)	Mn (%)	Ag (millions of ounces)
Indicated	15.6	132.0	0.92	8.8	66.1
Inferred	6.0	111.7	0.74	6.5	21.6

Notes:
- Effective date not stated but submitted date of Technical Report is 26 October 2005.
- Estimated using inverse distance squared interpolation method using a maximum of 16 composites.
- Silver grades were capped at 2,000 parts per million (ppm), copper grades were capped at 4.5% and manganese grades were capped at 35%. Capping applied prior to compositing.
- Classification was based on distance 0 to 25 m for Indicated and 25 to 60 m for Inferred. Blocks outside these ranges are not reported.
- Reported using a 50 g/t silver cut-off.

The information above is presented as provided in the report cited. The QP has not done sufficient work to classify the historical estimates as current Mineral Resources and the Issuer is not treating the historical estimate as current Mineral Resources.

Valor updated the Berenguela Mineral Resource in January 2018 when the 2017 drilling was available. This was reported in the 2018 Valor JORC Report dated 8 February 2018. The 2018 estimate used ordinary kriging (OK) to inform 5 x 5 x 5 m blocks to estimate separate grade shell domains.

The results are summarized in Table 6.4.

Table 6.4 Historical 2018 Valor resource estimate summary

Classification	Mt	Ag (g/t)	Cu (%)	Mn (%)	Zn (%)	Pb (%)
Measured	7.71	103.79	0.989	8.676	0.335	0.048
Indicated	28.23	80.45	0.734	5.161	0.296	0.066
Measured and Indicated	**35.93**	**85.46**	**0.788**	**5.915**	**0.304**	**0.062**
Inferred	**9.97**	**87.90**	**0.670**	**2.145**	**0.203**	**0.095**

Notes:

- For full details see Valor news release, dated 30 January 2018, to the Australian Stock Exchange (ASX), which summarizes the results presented in report titled "Technical Report and Updated Resource Estimate on the Berenguela Project, Department of Puno – Peru, JORC – 2012 Compliance" 8 February 2018, report to Valor by Mr Marcelo Batelochi, independent consultant, MAusIMM Competent Person.
- Prepared to comply with the 2012 Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC code).
- Grades are estimated by the OK interpolation method using capped composite samples.
- Bulk density has been estimated by Nearest Neighbour method and the average value is 2.82 g/cm^3.
- The historical Mineral Resource uses a copper equivalent cut-off of 0.5%, copper equivalent (CuEq) based on the formula CuEq (%) = Cu (%) + ((Ag (g/t)/10,000) in ounces x Ag price x silver recovery)/(Cu price x Cu recovery) + (Zn% x Zn price x Zn recovery)/(Cu price x Cu recovery). Assuming: Ag price $16.795/oz and Zn $3,150/t and recoveries of Ag 50%, Cu 85%, and Zn 80%. Mn grades are not considered for CuEq calculations.
- Numbers may not add / multiply due to rounding.

The information above is presented as provided in the report cited. The QP has not done sufficient work to classify the historical estimate as current Mineral Resources and the Issuer is not treating the historical estimate as current Mineral Resources.

6.4 Production

There has been intermittent historical production predominantly by Lampa Mining.

Production between June 1944 and July 1956 was 189,126 tons at 2.09% Cu and 17.15 oz/t silver (Ag) (Lampa Mining, circa 1957). In 1965, Lampa Mining ceased operations at Berenguela after mining a total of approximately 500,000 tons from approximately 17,700 m of underground workings and small open pits, producing 3.24 million ounces of silver and 3,946 tons of copper. These figures have been replicated from the 2018 Valor JORC Report.

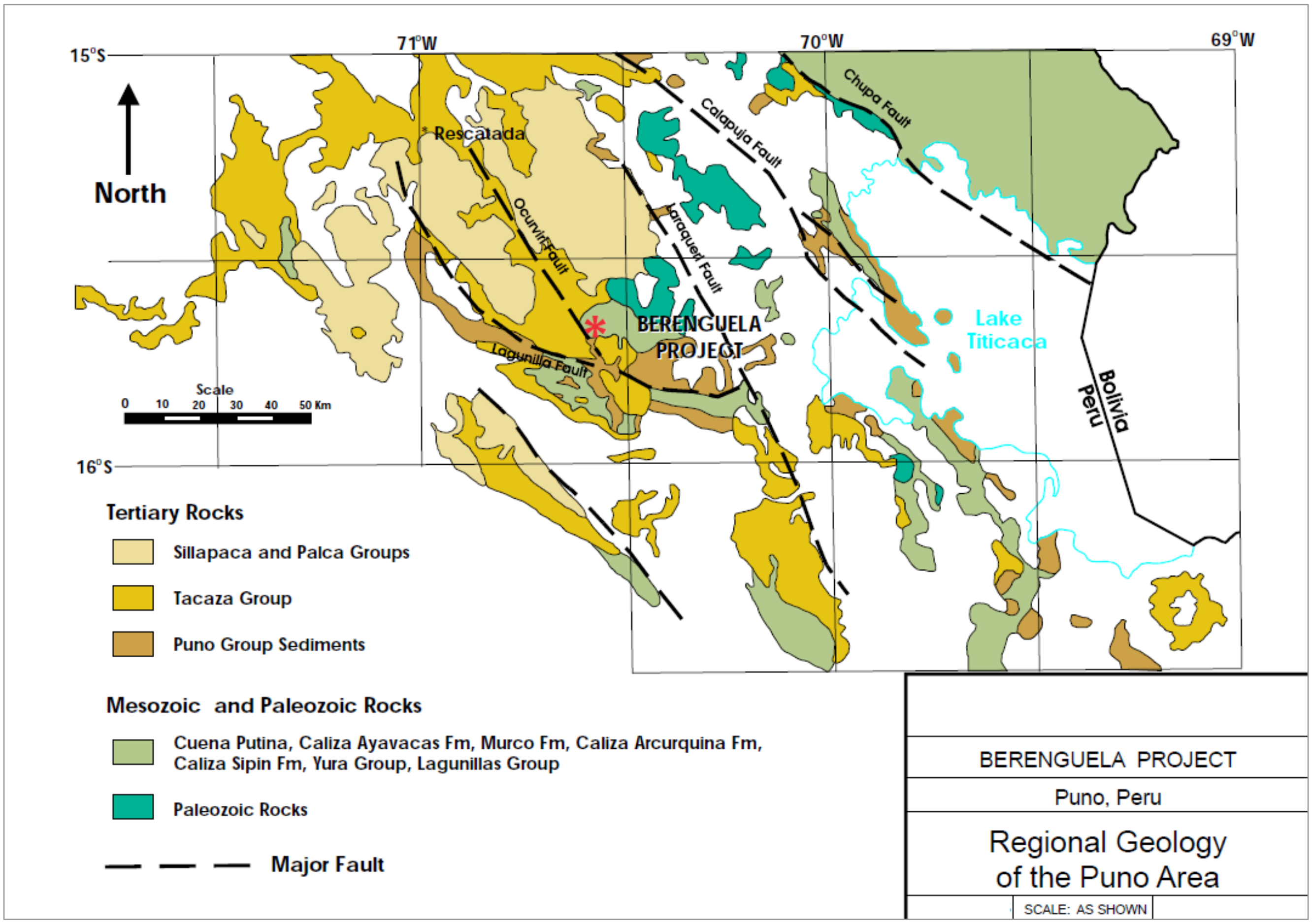
7 Geological setting and mineralization

7.1 Regional

7.1.1 Southern Peru overview

The Property is located near Santa Lucía in the Department of Puno in the Western Cordillera of the Andean Mountain range in southern Peru. The regional geology of Puno is dominated by deformed Paleozoic and Mesozoic sedimentary strata overlain by volcanic and sedimentary rocks of Cenozoic to Quaternary age (Figure 7.1). The Berenguela mineralization lies within the Mesozoic sequence.

Figure 7.1 Regional geology of the Puno area with principal units and structures



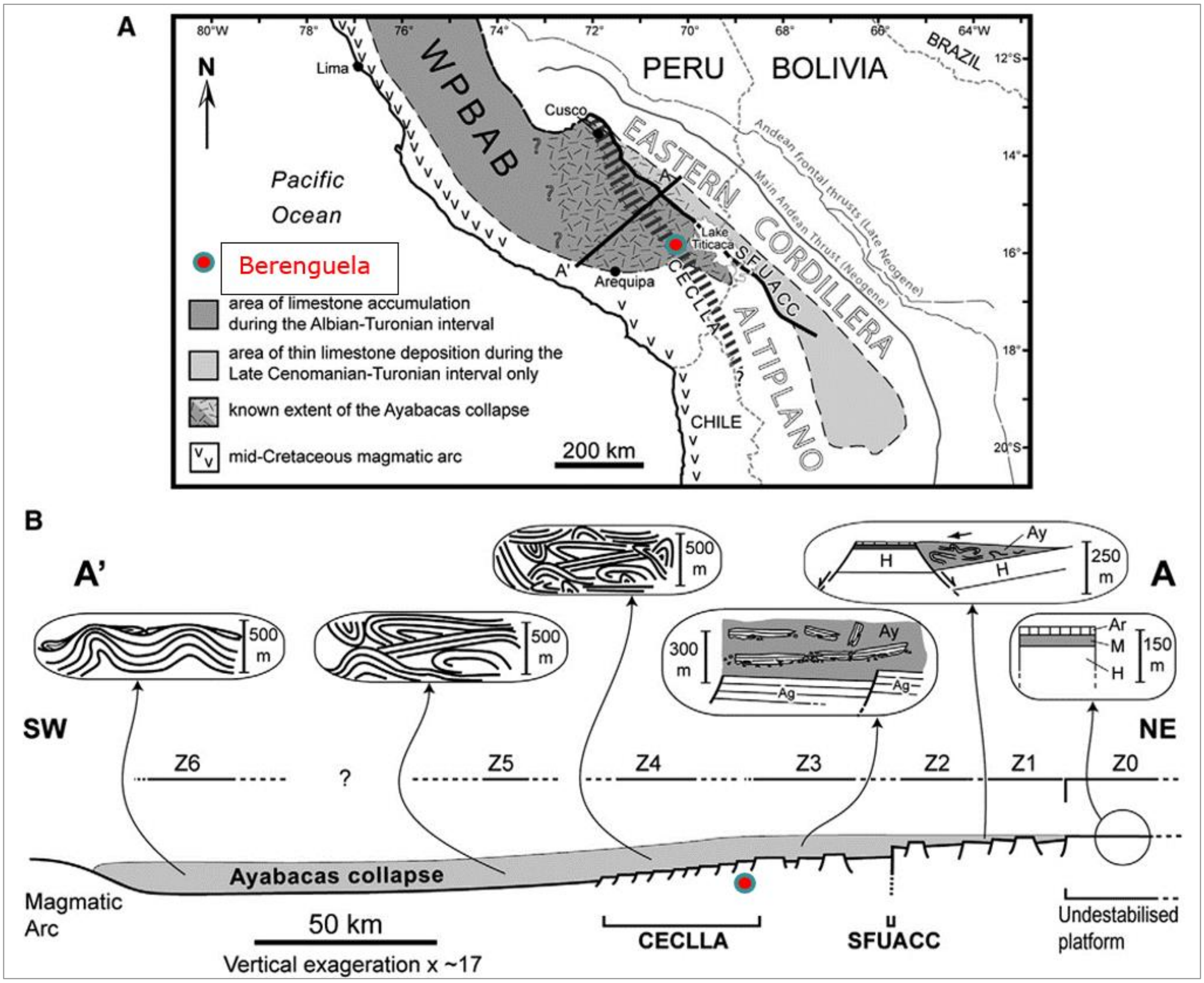
Source: Silver Standard 2005, published in the 2005 McCrea Technical Report.

7.1.2 Regional tectonic framework

During the Jurassic and Cretaceous Periods, extension and subsidence east of the early Andean volcanic arc led to the development of a back-arc basin known as the Western Peru Back Arc Basin (WPBAB) with associated clastic and carbonate rocks along the length of the Western Cordillera (see Figure 7.2).

Within the WPBAB, the mid-Cretaceous Ayabacas Formation (AYA) was formed as a result of the submarine collapse of a Cretaceous carbonate platform (Odonne et al., 2010). The Ayabacas Formation is the host of the Berenguela mineralization and consists of a remarkably deformed, highly chaotic, and slumped resedimented unit which can be described as a megabreccia or olistostrome (Sempere et al., 2000). It occurs over a 60,000 square kilometres (km^2) area and has thicknesses up to 500 m, see Figure 7.2. Its volume is estimated to be >10,000 cubic kilometres (km^3) making it one of the largest ancient submarine mass-wasting bodies known.

Figure 7.2 Southern Peru with elements relevant for Albian to Turonian times



Notes:
A) Both shaded areas belong to the WPBAB, in which mostly limestones accumulated during this time interval. The Ayabacas collapse (irregular dashes) developed in the north-western and south-western parts of the main basin (Callot et al., 2008).
B) Distribution of deformational styles across a section of the Ayabacas body and its substratum. Each insert zooms in on an area and includes its own scale bar.

- H = Huancané Formation (substratum of the collapse)
- Ag = Angostura Formation (substratum of the collapse)
- M = Murco Formation
- Ar = Arcurquina Formation
- Ay = Ayabacas Formation

Source: Adapted from Callot et al., 2008, AFTER Odonne, et al., 2010.

The collapse occurred in a SW direction, down the basin slope. Six zones have been described based on the deformational facies, and a seventh north-eastern stable area (Zone 0). Zones 1 to 3 show increasing fragmentation from SW to NE. Berenguela is located in the Cabanillas area of Zone 3.

The degree of lithification of siliclastic materials in the lower part of the slumped succession was low at the time of collapse, whereas the overlying limestone sequence had undergone some cementation shortly after deposition (Odonne et al., 2010). The Ayabacas mainly consists of mm- to km-size fragments of regularly stratified and folded limestones, almost entirely reworked from the underlying Arcurquina Formation, and enclosed in a largely red siltstone "matrix." Orientations of fold axes are generally scattered around a northwest-southeast (NW-SE) axis. The Ayabacas collapse occurred at approximately 90-89 Ma (Callot et al., 2008) and marks a profound and permanent change in the south Peru basin from marine to continental conditions. An outcrop photograph of the Ayabacas folded limestone blocks is shown in the property geology section (Section 7.3).

7.2 Local geology

7.2.1 CECLLA structural corridor

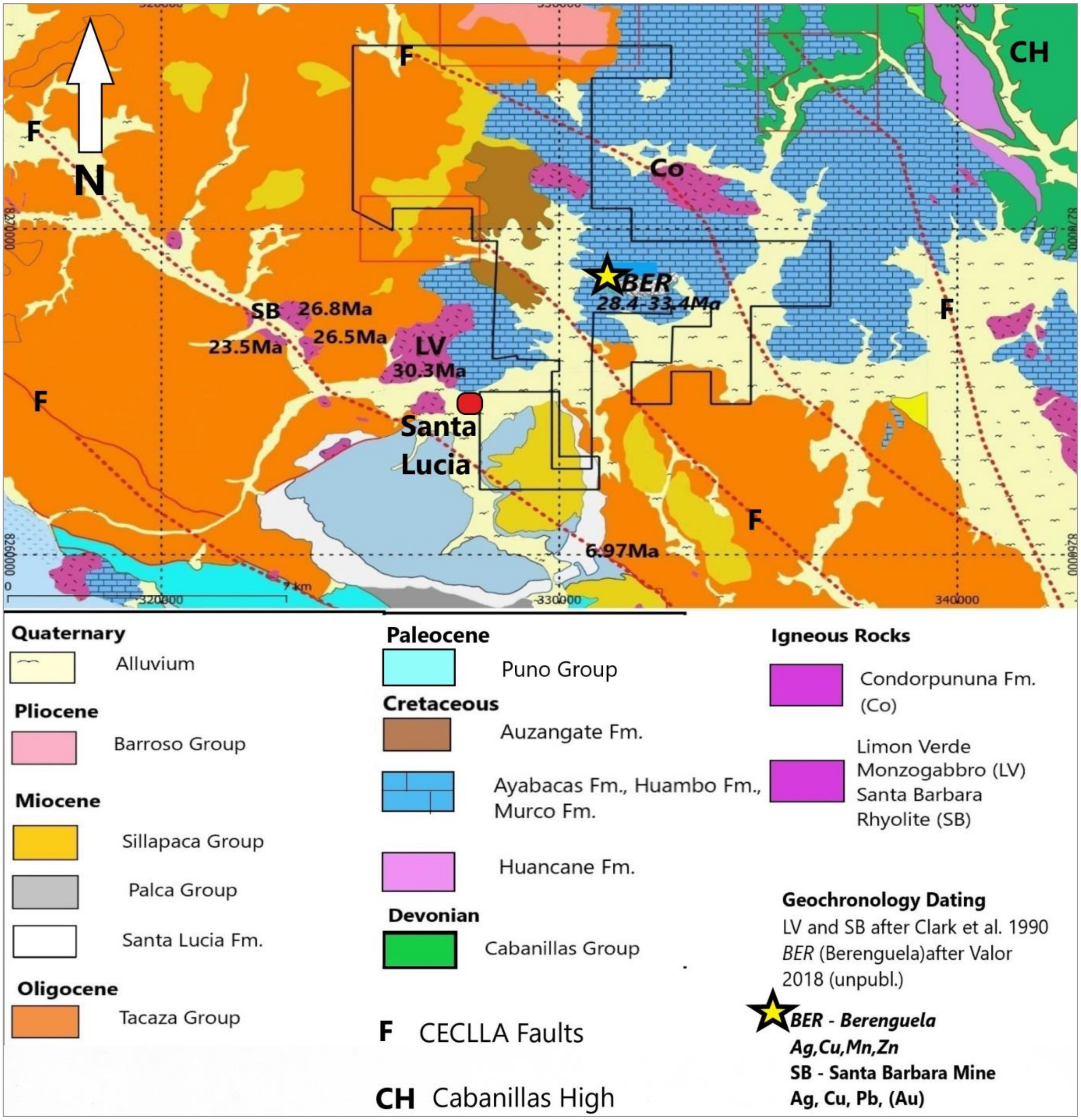
The Cusco-Lagunillas-Laraqueri-Abaroa structural corridor (CECLLA corridor) is a large dextral wrench system 40-80 km in width and is one of the main structural components in South Peru (Sempere et al., 2002). It strikes N150E and is unusually 20 degrees oblique to the regional Andean trend. Berenguela is situated in the NE flank of the system which hosts a variety of tectonic, magmatic, and sedimentary features. The CECLLA was active from at least the late Jurassic and normal faulting is currently active forming hemi-grabens such as Lake Lagunillas.

The CECLLA forms the major zone of emplacement of the Tacaza Group igneous rocks – alkaline basic volcanics dated 30-24 Ma and basic to felsic intrusions of which some are interpreted to be linked to the Berenguela mineralization. The geometric and geochemical characteristics of the magmatic corridor show that it functioned as a lithospheric-scale wrench fault permitting mantle melts to access the surface rather than as a conduit for subduction-generated magmas.

7.2.2 Stratigraphy

As discussed above the Property is in the CECLLA regional fault zone. Faulting and basinal facies changes lead to stratigraphic variations, particularly in the Lower Cretaceous, such that Berenguela geology strongly aligns with Lower Cretaceous stratigraphy from the region SW of the CECLLA zone termed the Manazo area. The local geology is shown in Figure 7.3 along with the location of the deposit and outline of the Property.

Figure 7.3 Geology of the Santa Lucía District



Source: Aftermath after INGEMMET, 2023.

The stratigraphy described below is adapted from Jaillard (1992). The principal stratigraphic units exposed in the region as shown in Figure 7.3 are:

Cabanillas Group (Siluro-Devonian) are the oldest recognized sediments of the region exposed in the Cabanillas High formed by CECLLA structures to the NE of Berenguela. The basement of the Berenguela area is inferred to be the Cabanillas Group.

Lagunillas Group (Jurassic) Dark grey limestone intercalated with black pelite and calcareous arenites deposited in a back arc basin (Figure 7.2). Uplifted in fault-bound blocks and eroded prior to onlap of the Cretaceous sequence. This outcrops east of Figure 7.3.

Huancané Formation (Lower Cretaceous NE of CECLLA): Deeper water coarse reddish arenites with lenses of conglomerate and thin layers of lutite, up to 600 m thick and overlain by the Ayabacas. Contemporaneous with the Cretaceous sediments south-west of the CECLLA.

Hualhuani, Murco, and Huambo Formations (Lower Cretaceous SW of CECLLA including the Berenguela area) Fluvio-deltaic sediments comprised of massive arenites with red siltstones (Hualhuani)), reddish-brown mudstones, siltstones, and sandstones (Murco), brick-red shale interbedded with red sandstone and gypsum (Huambo). The combined thickness of these units is up to 500 m.

Ayabacas Formation (Middle-Late Cretaceous): Composed of massive limestones and lutitic limestones, up to 300 m thick, host of the Berenguela mineralization. Folded, olistostrome with limestone blocks derived from contemporaneous Arcurquina Formation. (see Section 7.2). Unconformably overlain by the Puno and Tacaza Groups.

Auzangate Formation Late Cretaceous): Composed of mudstones and siltstones as isolated remnants west of Berenguela. Post-slumping formation covering the Ayabacas Formation with limited aerial extent.

Puno Group (Paleocene to Oligocene): Extensive deposits of arenites and conglomerates, intercalated with thin tuff layers, derived from uplift and erosion of the Cabanillas and Lagunillas Groups. Variable thickness from 100 to 3,600 m. Puno Group continental clastics are well exposed in a NW trending, 10 to 12 km-wide hemi-graben active CECLLA structure which now is marked by a topographic depression containing Lake Lagunillas.

Tacaza Group (Oligocene): Composed of andesite lavas, tuffs, and volcanic agglomerates, with basalts at lower levels. Thickness is variable and ranges from 800 to 3,600 m. Shallow water and subaerial eruption of the Tacaza Group is dated at 30-22 Ma (Jaillard, 1992). Volcanism was likely associated with rising mantle melts within the CECLLA wrench faults (Sempere et al., 2002). Numerous mafic to intermediate, calc-alkaline (medium- to high-K) intrusive stocks, including the Limón Verde monzogabbro dated at 30.3 Ma (see Figure 7.3), and dikes and sills of high-K andesite were also emplaced during this period. These middle Tertiary Tacaza Group volcanics and intrusives are considered co-magmatic by Clark et al. (1990).

Santa Lucía Formation (Lower Miocene). Composed of rhyolitic ingnimbrites associated with coarse polymictic clastics. Regionally incorporated into the Palca Group (below) but separately delineated in a caldera-like structure 5km south of Santa Lucía town.

Palca Group (Lower Miocene) Felsic pyroclastic volcanism and eruption of the rhyolitic ignimbrites of the Churuma and the Santa Lucía Formations (Ingemmet, 2003). The main vents were probably in the NW of the Santa Lucía district. About 5 km north-west of Santa Lucía there is a circular body, 2 km in diameter, of polylithic breccias and weakly stratified felsic tuffs which have been interpreted to be a volcanic vent complex dated at 26.5 Ma. Referred to as the Santa Barbara Complex by Clark et al. (1990), it is the location of the second most significant mineral occurrence in the district after Berenguela. This is at the Santa Barbara Mine.

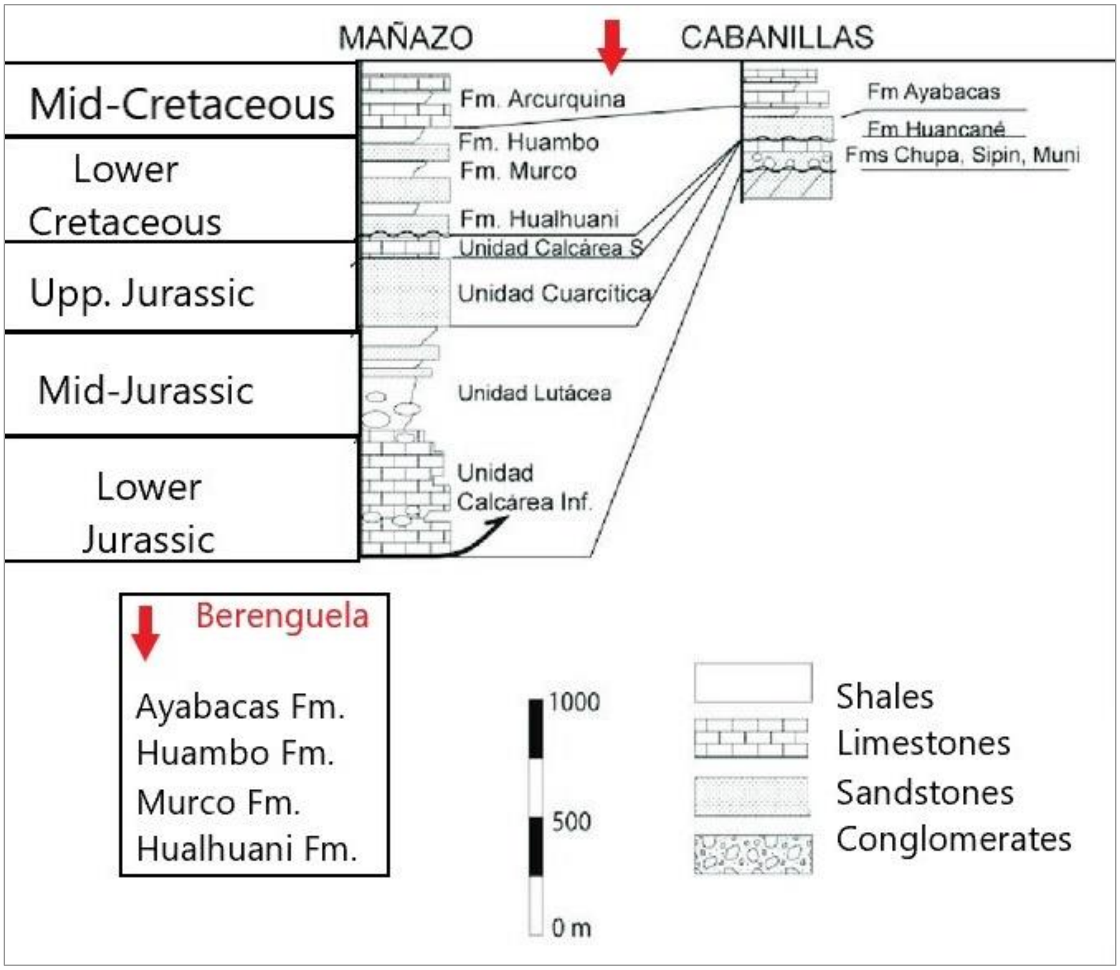
Sillapaca Group (Upper Miocene): Composed of andesite lavas with basaltic flows, tuffs, and volcanic agglomerates with thickness to 3,000 m. Dated from 16.2-14.7 Ma (Batelochi, 2018).

Barroso Group (Pliocene): Composed of dark grey andesitic lavas with abundant plagioclase crystals. Outcropping in the Cordillera north of Berenguela.

Intrusives (Cenozoic): Consist of andesite, dacite, and diorite stocks intruding Huancané and Ayabacas Formations and the volcanics of the Tacaza Group. Examples include the Condorpununa Formation. 5 km NE of Berenguela, and a small dacitic dome of apparently similar composition and age 5 km NW of Berenguela.

The Jurassic and Cretaceous stratigraphy of the region showing lateral variations due to basin dimensions and structures (after Carlotto, 2009) is shown in Figure 7.4. The transitional position of Berenguela is interpreted by Aftermath.

Figure 7.4 Jurassic and Cretaceous stratigraphy of the region

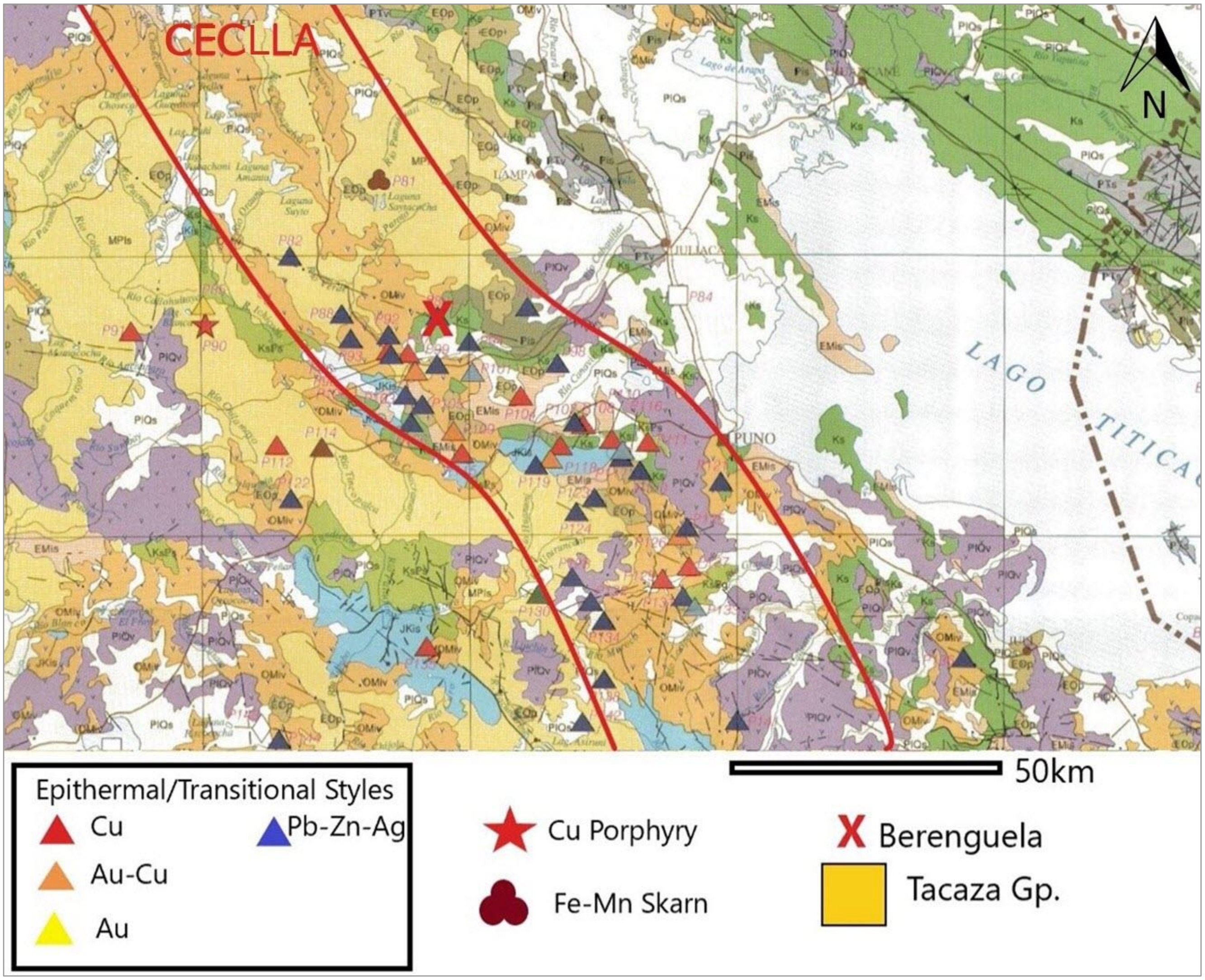


Source: Carlotto, 2009 with insertion of Berenguela location and stratigraphic column by Aftermath.

7.2.3 Metallogenesis

The majority of the metallic occurrences in the Puno region west of Lake Titicaca are vein or stratiform ("mantos") occurring along the CECLLA structural corridor and hosted by either the Tacaza Group volcanics or the underlying Mesozoic sedimentary strata as shown in Figure 7.5. In the Santa Lucía area these include copper and silver veins and mantos, with sporadic gold and iron oxide.

Figure 7.5 Metallogenic map of the region west of Lake Titicaca



Source: Adapted from Multinational Geological Publication No.2, 2001- Metallogenic Map of Border Regions Between Argentina, Bolivia, Chile, and Peru.

Most of the base and precious metal mineralization in the region is hydrothermal and usually epithermal. Mineralization shows a close association with Late Oligocene Tacaza Group calc-alkaline sub-volcanic intrusions. The Berenguela mineral occurrence is considered to represent the strongest expression of metal-rich hydrothermal activity in the Santa Lucía area.

7.3 Property geology

7.3.1 Geology and stratigraphy

Seven main geological Formations / Groups occur on the Property. These were discussed in detail in Section 7.2.2 and are shown schematically in Figure 7.6. A summary of the rock types associated with these Formations / Groups as they occur on the Property are shown below in Table 7.1.

Table 7.1 Berenguela Property stratigraphy

Group / Formation	Description (as occurs on the Property)
Santa Lucía Formation	Conglomerates with rounded clasts of predominantly dacite with minor quartzites and porphyritic intrusives*
Tacaza Group	Intercalated andesite lavas, tuffs, and agglomerates
Auzangate Formation	Mudstones and siltstones**
Ayabacas Formation	Carbonates (host to mineralization)
Huambo Formation	brick-red shale interbedded with red sandstone and gypsum
Murco Formation	Mainly reddish-brown mudstones, siltstones, and sandstones
Hualhuani Formation	Massive arenites with red siltstones

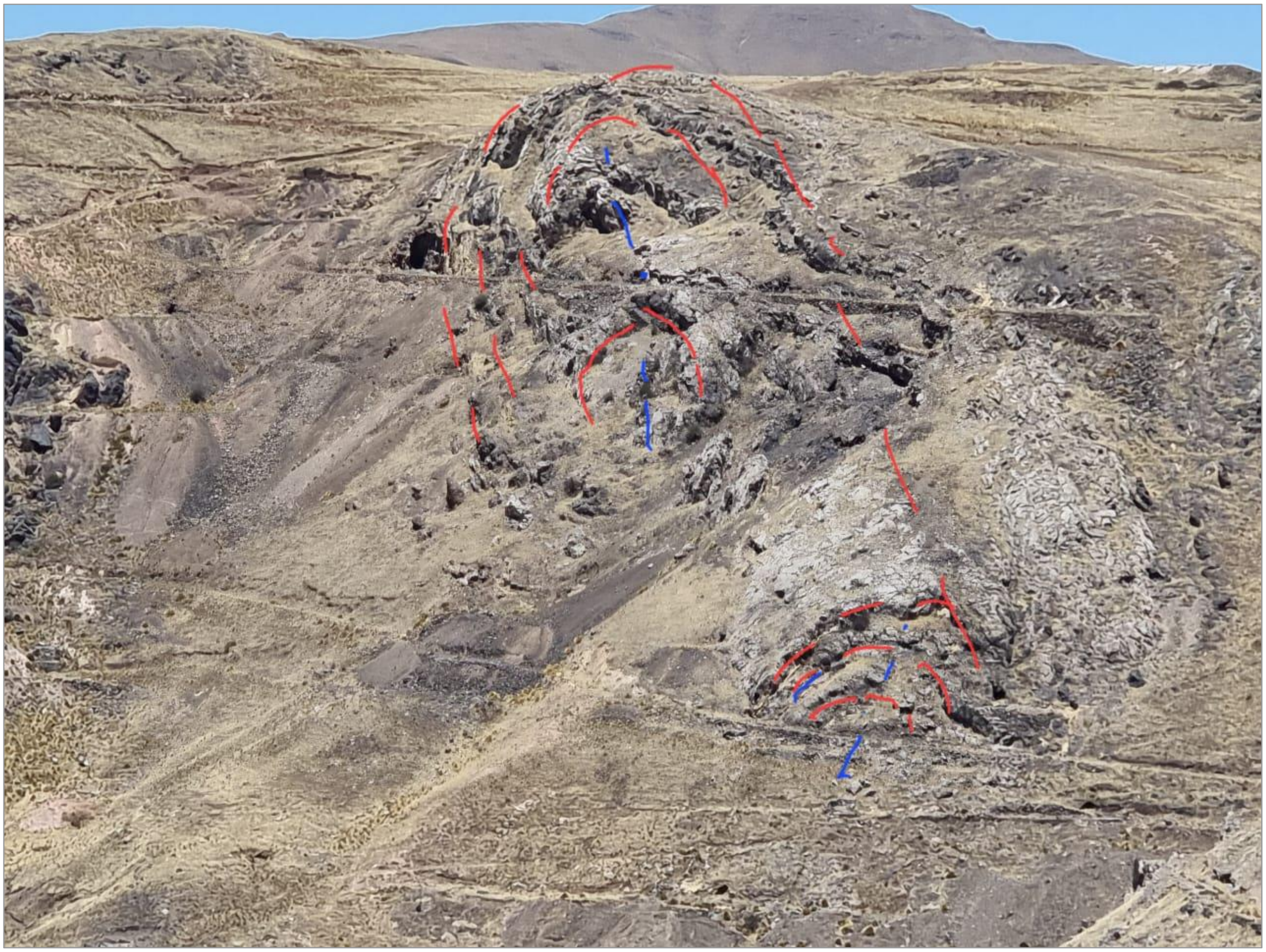
Notes:
*Occurs in centre of the Property
**Occurs west of the main area and in the north of the Property and is not shown in Figure 7.4.
Source: Portugal, 1974; Jaillard, 1992, Carlotto, 2009.

A Cenozoic dacitic dome occurs 5 km NW of Berenguela where it is seen to intrude the Ayabacas Formation.

The central core of the Property, and the location of known mineralization, is dominated by carbonates of the Ayabacas Formation. These comprise folded, thickly bedded, light grey and dolomitized limestones juxtaposed in blocks ranging from 10 to >200 m in size, often with an intra-block matrix of refluidized clastic rocks and sedimentary breccias interpreted to originate from the Murco Formation. The underlying Huambo is 5 to 20 m thick, in conformable or brecciated contact with the Ayabacas, and did not re-fluidize to the same degree as the upper units of the Murco Formation. The Huambo-Murco contact is usually faulted or brecciated and interpreted to be the primary slumping (detachment) plane in the area. The Murco Formation displays various breccias, mostly sedimentary but some with tectonic appearance. The original Murco unit appears to be a mixture of shales, siltstones, and arenites. In this locality, the unit is characterized by its considerable thickness (up to 200 m drill-width in some deep holes, i.e., drillhole 19BERE0003 of 2019), its bleached appearance, and abundance of secondary gypsum that forms cement in the matrix and late veins.

Figure 7.6 shows the WNW-ESE trending Ayabacas folded limestone blocks located at north-eastern end of Berenguela project.

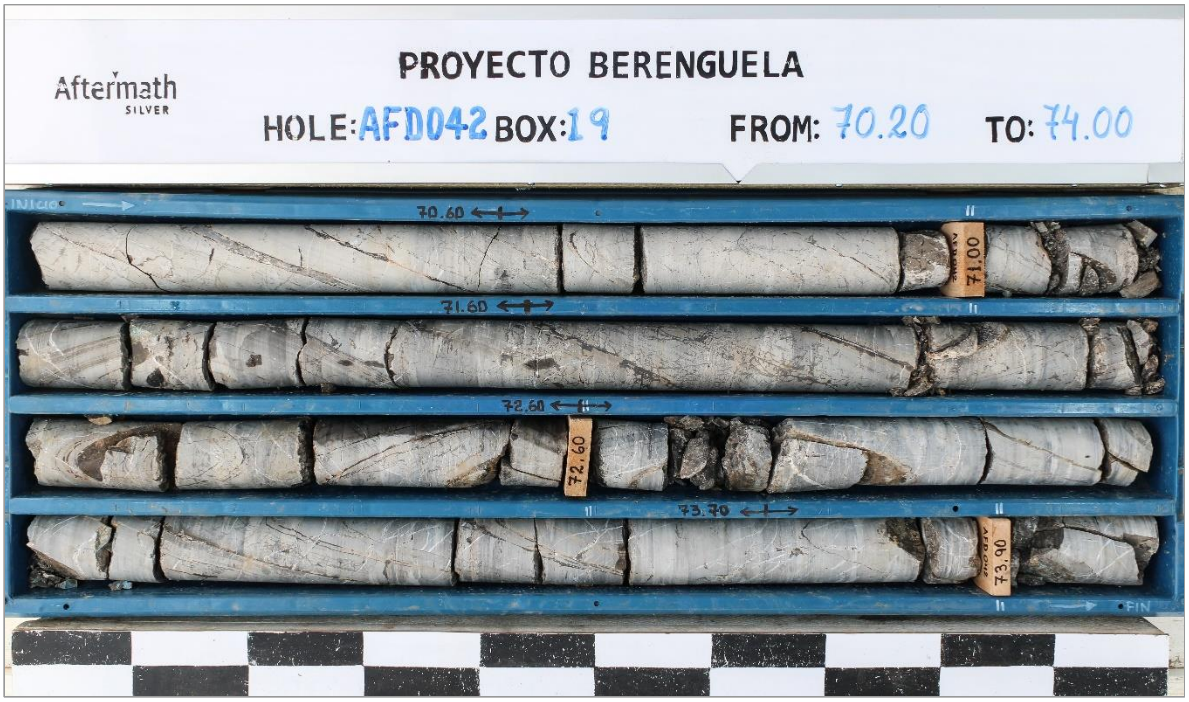
Figure 7.6 Ayabacas folded limestone blocks



Notes: The fold scale is 100 m+ from left to right of picture. Note separate lower folded block.
Source: Photo taken by Saturnino Vera, Aftermath, 2023.

Figure 7.7 to Figure 7.11 show core photographs illustrating the features described in the previous text. These core boxes are one meter long and so the scale is in 10 centimeter (cm) increments.

Figure 7.7 Ayabacas Formation



Note: Part of large, folded limestone sequence.
Source: Aftermath, 2022.

Figure 7.8 Ayabacas Formation - sedimentary breccia with unsorted, angular limestone clasts

Note: Sedimentary breccia with unsorted, angular limestone clasts incorporated into a matrix largely composed of carbonate fragments and siliceous grains. Matrix supported – fluidized Murco. Breccia origin characteristic of slumping event with injected sediments freeing and incorporating limestone fragments into the matrix. Black rectangle represents the close-up photo of the core shown in Figure 7.9.
Source: Aftermath, 2022.

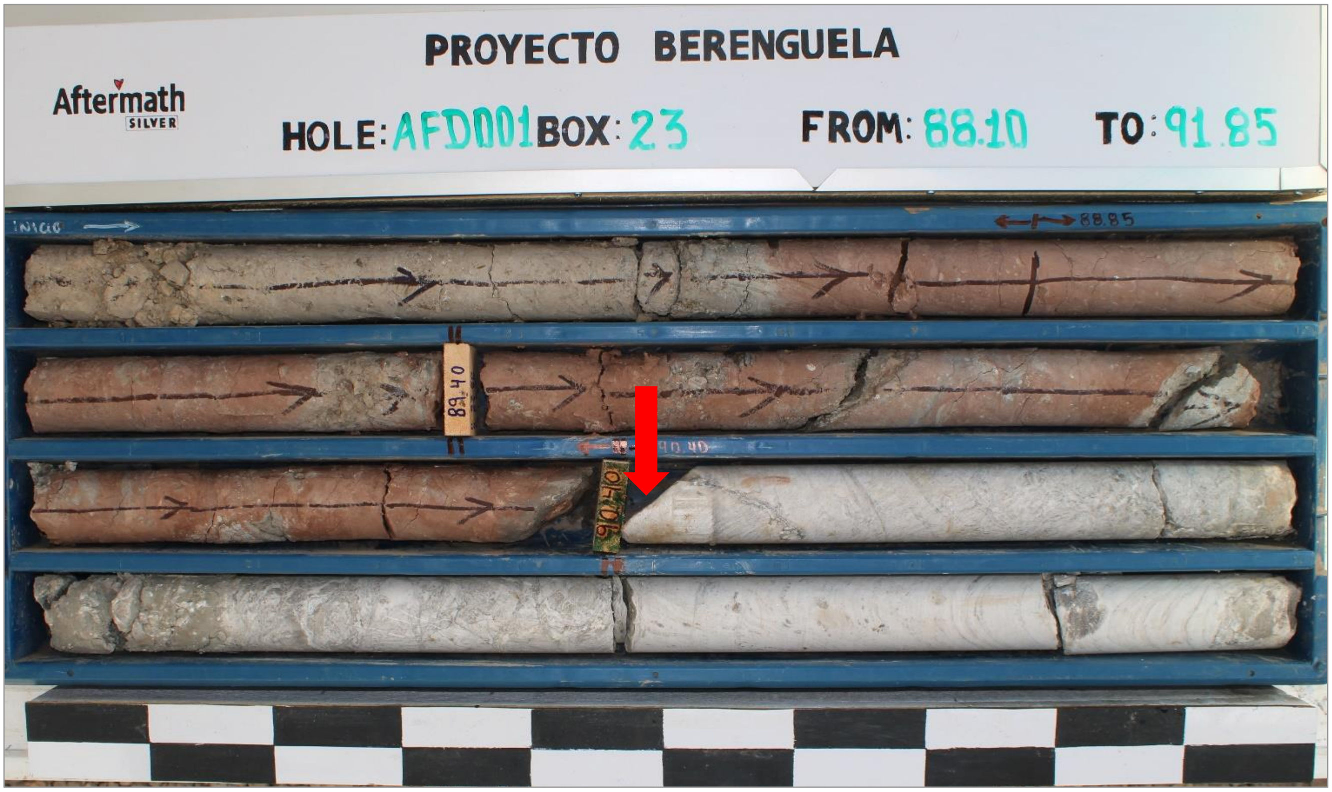
Figure 7.9 Ayabacas Formation – fragmented limestone in slump breccia

Note: Close-up of Figure 7.8. See Figure 7.8 for scale.
Source: Aftermath, 2022.

Figure 7.10 Ayabacas-Huambo contact

Note: Red arrow denotes contact.
Source: Aftermath, 2022.

Figure 7.11 Huambo-Murco contact



Notes: Red arrow indicates contact. Huambo is brecciated in this example. Note the bleached appearance of the Murco with abundant secondary gypsum.
Source: Aftermath, 2022.

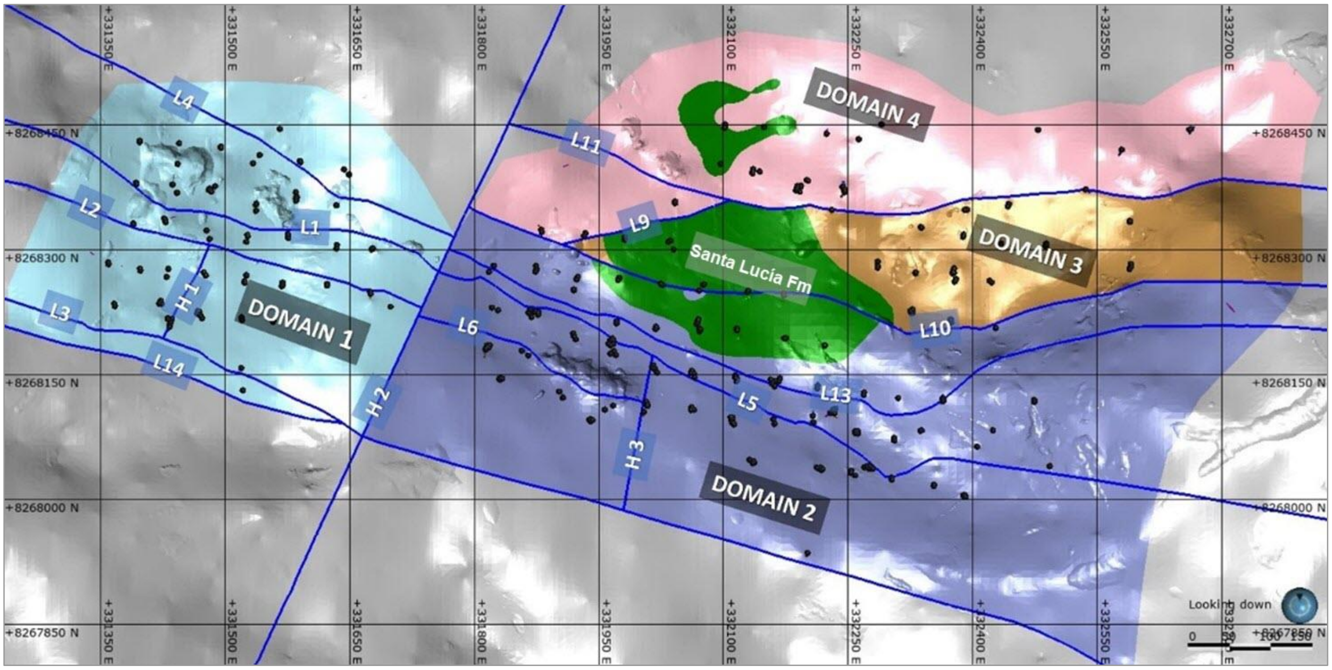
7.3.2 Structural geology

The central core of the Property where the mineralization is localized is shown in Figure 7.12 and has the following structural characteristics:

- **Phase 1:** Folding and brecciation of the Ayabacas and Huambo formations by a late-Cretaceous submarine slumping event above the Murco Formation. This is observed as the substratum of the Ayabacas collapse event in this area and is likely related to normal faulting associated with the extensional pre-collapse conditions (CECLLA).
- **Phase 2:** Late Cretaceous compressive tectonics (Andean orogeny) leading to disruption and deformation of the Murco substratum and overlying Ayabacas / Huambo in the project area.
- **Phase 3:** (CECLLA) Faulting contributing to the emplacement and subsequent offsetting of mineralization particularly along the long E-W axis of the mineralization. Late high-angle faults offset mineralization across the main axis.

Longitudinal faults prefixed L and high-angle faults prefixed H, observed from mapping and drilling, are shown in Figure 7.12 on a plan of the core area.

Figure 7.12 Plan of area of the deposit showing faults observed from mapping and drilling



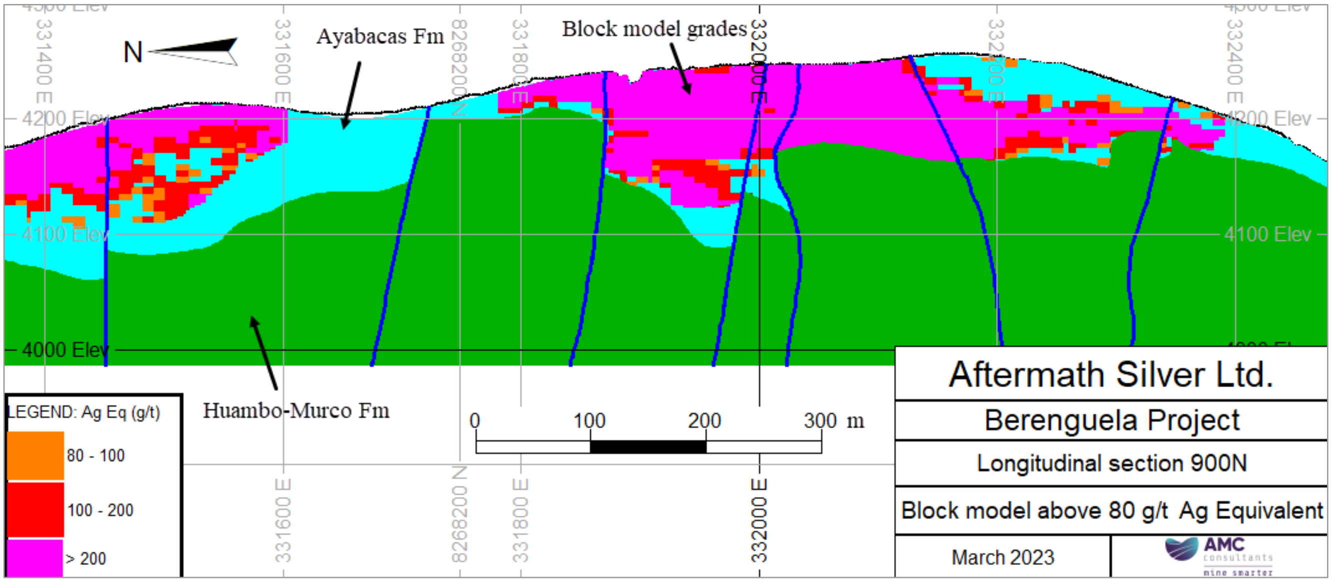
Note: Domains are further discussed in detail in Section 14.3.3.
Source: Aftermath, 2023.

7.3.3 Mineralization

7.3.3.1 Expression and dimension of mineralization

The core area of mineralization forms a prominent whaleback 1,400 m in length striking approximately east-west. The north-south extent of the exposed mineralization is generally 400 m. Figure 7.13 shows the variability in thickness of the mineralization in a long section. This is on section line 900N which is through the core of the deposit. The location of the section line is shown in Figure 14.2.

Figure 7.13 Long section showing mineralization thickness



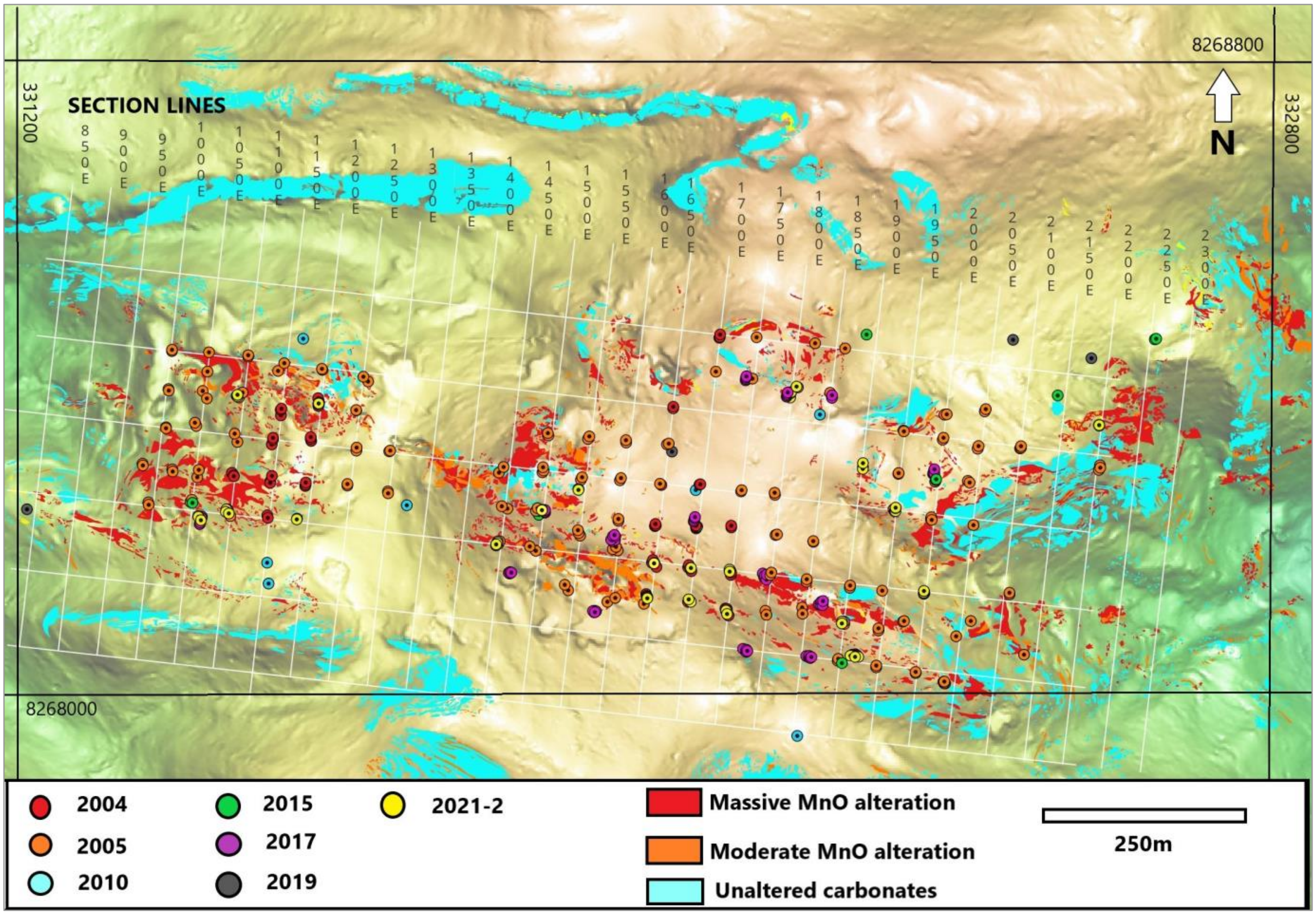
All significant mineralization consists of massive, patchy, and fracture-controlled manganese oxide (MnO) replacement with associated silver, copper, and zinc hosted within the folded Ayabacas Formation. Mineralization is prominent in fold axes where axial plane joints and bounding faults have aided the ingress of fluids. Mineralized structures generally strike parallel to the main trend of mineralization (azimuth 105 degrees) but many examples of smaller scale cross-cutting mineralized joints and structures are also present. Large blocks of completely altered folded carbonates occur between structures - some up to several tens of metres in extent. Many old workings exist on the exposed mineralization including small open pits, trenches, shallow "glory holes", and various adit entrances and shafts. Small waste and ore dumps are common, especially in the west of the area where the foundations of the old Lampa Mining sorting plant can still be observed.

Alteration and mineralization are commonly exposed at surface and in old workings and are dominated by manganese (Mn) mostly in the form of psilomelane and pyrolusite manganese oxides (referred to as MnO in this report), replacing carbonates from 60-100% MnO (massive replacement), 30-60% MnO (moderate replacement), to <30% MnO (weak replacement / veins). Within the mineralized zones, non-altered material consists of fresh to moderately weathered or altered carbonates. Exposed sedimentary breccias are common on surface juxtaposed with the carbonates and are usually not mineralized.

Weathering of the mineralization is often accompanied by the formation of copper oxides (malachite and azurite). Although present throughout the core area in small quantities, the abundance of CuOx is much more prevalent on the eastern margins of the deposit in conjunction with a prominent zone of late chalcedonic alteration. This late silicification cuts and englobes MnO alteration both in the east and west of the core area and commonly has a jasperoidal appearance where accompanied by Fe oxides.

The surface geology of the core area showing exposed MnO alteration and drillholes per campaign overlain on an IKONOS image digital elevation model (DEM) is shown in Figure 7.14. Note IKONOS refers to the commercial Earth observation satellite which collects high resolution data.

Figure 7.14 Alteration outcrop map of core area and drillholes



Source Aftermath, 2023.

7.3.3.2 Structural setting of mineralization

The gravitational slumping, subsequent compressive tectonism and ultimately wrench / extensional faulting prepared the structural architecture for the emplacement of the Berenguela mineralization. Blocks of fractured and folded Ayabacas carbonates were arranged in synforms and antiforms above a raised footwall of relatively plastic, but still folded and faulted, siltstones, arenites and evaporites of the Huambo / Murco formations. Mineralization was localized in the core of folded Ayabacas Formation blocks adjacent to bounding faults which provided a pathway for mineralizing fluids. As observed in the field and drilling, intensely folded areas contain many joints, fractures, and faults along or parallel to fold axial planes which prepared the passage for later mineralizing fluids and placed the fluids in contact with the host limestones. High-angle joints, or minor faults, were also exploited by the mineralizing event to a lesser degree.

Zones mapped with prominent folding in the core area coincide with stronger mineralization. A zone of folding 75 to 100 m wide which passes along the entire length of the mineralization has a correlative relationship with higher Mn grades. In the west of the Property, parallel folds south of this main zone also have higher Mn values. Higher-angle fold orientations in the eastern part of the Property display a positive Mn relationship as well. In general, the amplitudes of the folds bordering the mineralized area are greater than those within the area by a factor of 2 to 4 suggesting a shortening or re-arranging of Ayabacas blocks within the main mineralized area.

7.3.3.3 Alteration zones

The alteration mineralogy of a deposit is a key indicator of hydrothermal conditions associated with mineralization. While weathering has resulted in a near surface supergene layer, the hypogene sequence appears to be characterized by low temperature hydrothermal facies. This includes silicification with kaolinite and illite. Structures with low temperature silica (chalcedony and opaline quartz) are sometimes found with manganese oxide and oxide copper (malachite-azurite) mineralization. Skarns, which would have resulted from high temperature hydrothermal activity, and are not present on the Property.

7.3.4 Mineralization hosts and textures

MnO replacement is most prevalent in massive dolomitic limestone host units and occurs to a lesser degree in siltstone or sandstone units of the Ayabacas Formation. The second most prevalent host to mineralization is the siltstone unit, then the sandstone until and lastly the sedimentary breccia. These four styles of mineralization are discussed below as well as the copper-rich mineralization that occurs in the intrusive breccia.

Table 7.2 lists the distribution of mineralization by host rock.

Table 7.2 Distribution of mineralization host observed in 2021-22 core drilling

Rock type code	Rock type	Percentage of total intersections	Observations
SLS	Limestone	77.0%	Dominant mineralization host
SSI	Siltstone	11.8%	Less mineralized (grades) than limestone
SST	Sandstone	5.1%	Similar to siltstone unit
BXS	Sedimentary Breccia	4.3%	Mineralized where probable pathways for mineralization
BXO	Unclassified Breccia	0.6%	Minor unit unidentifiable by logging
BXI	Intrusive Breccia	0.4%	Brecciated dioritic intrusives (east) – elevated Cu
RCO	Cover	0.4%	Cover rocks
IOO	Cover (volcanic)	0.2%	Cover rocks (volcanic)
AOO	Unclassified Alteration	0.1%	Extremely altered rock
SOO	Unclassified Sediment	0.1%	Sediment unidentifiable by logging

Notes: Intersections are based on an approximate cut-off of 0.5% total equivalent copper.

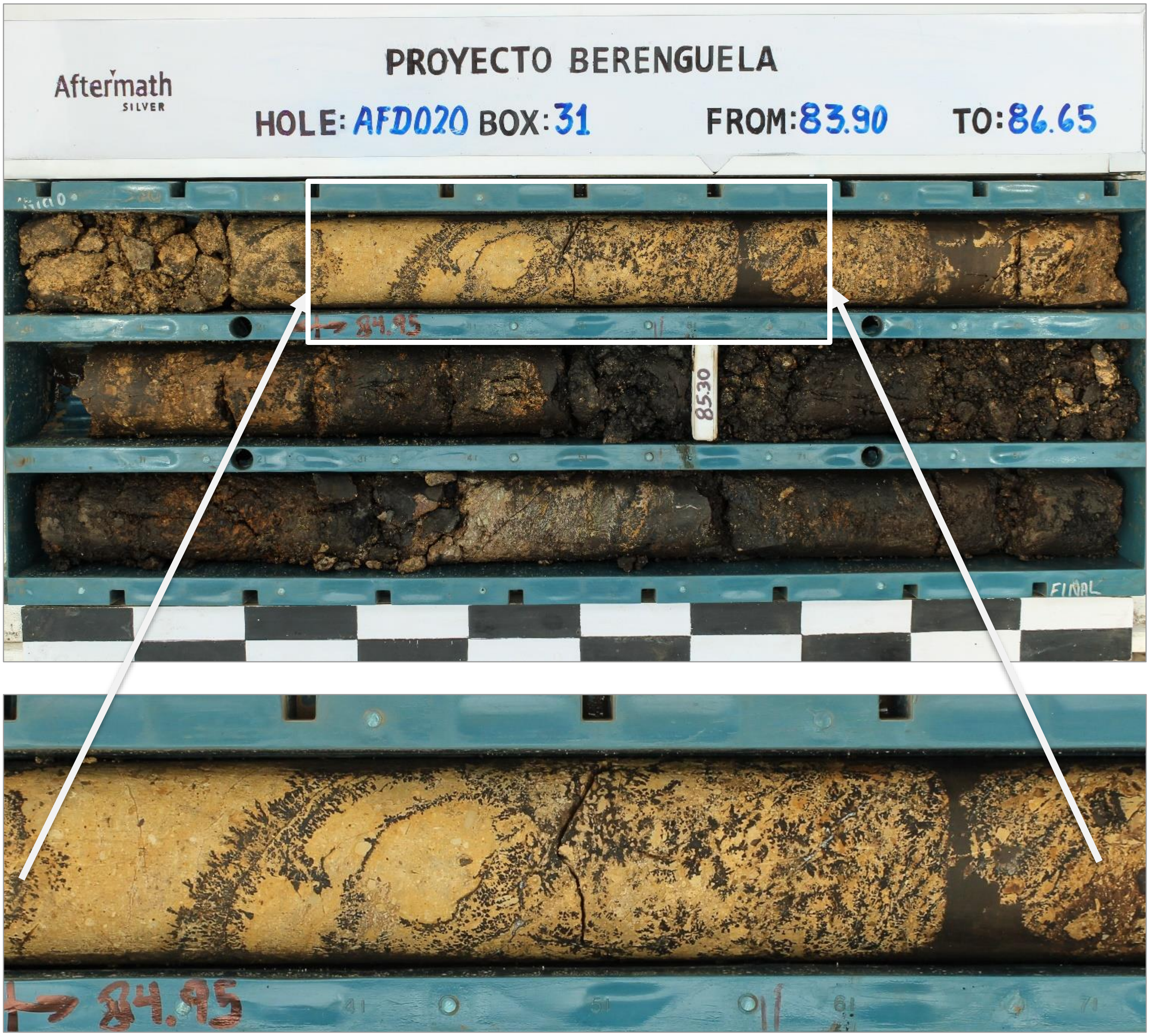
7.3.4.1 Limestone-hosted mineralization

The dominant mineralized unit is the dolomitic limestone of the Ayabacas Formation. Mineralization in this host rock makes up 77% of the total number of intersections. This is where the carbonate has been progressively replaced by MnO with associated Ag, Cu, and Zn. This metal association is common throughout the core of the Property, although variations in metal ratios occur (see Section 7.4). As Mn grade increases through alteration and mineralization of the dolomitic limestone, there is usually a corresponding decrease in Ca and Mg content of the host as the replacement of carbonates occurs. This relationship is observed on the Property-wide scale as well as in core.

MnO replacement takes place via various processes seen in the field and during core logging and these are illustrated below in Figure 7.15, Figure 7.16, and Figure 7.17.

- Replacement takes place by the migration of MnO into dolomitic limestone from fractures and joints. Some such associations are shown in Figure 7.15. As the replacement becomes more dominant, or the frequency of joints is higher, the dolomitic limestone can be transformed into a massive black MnO aggregation with relic limestone "clasts".

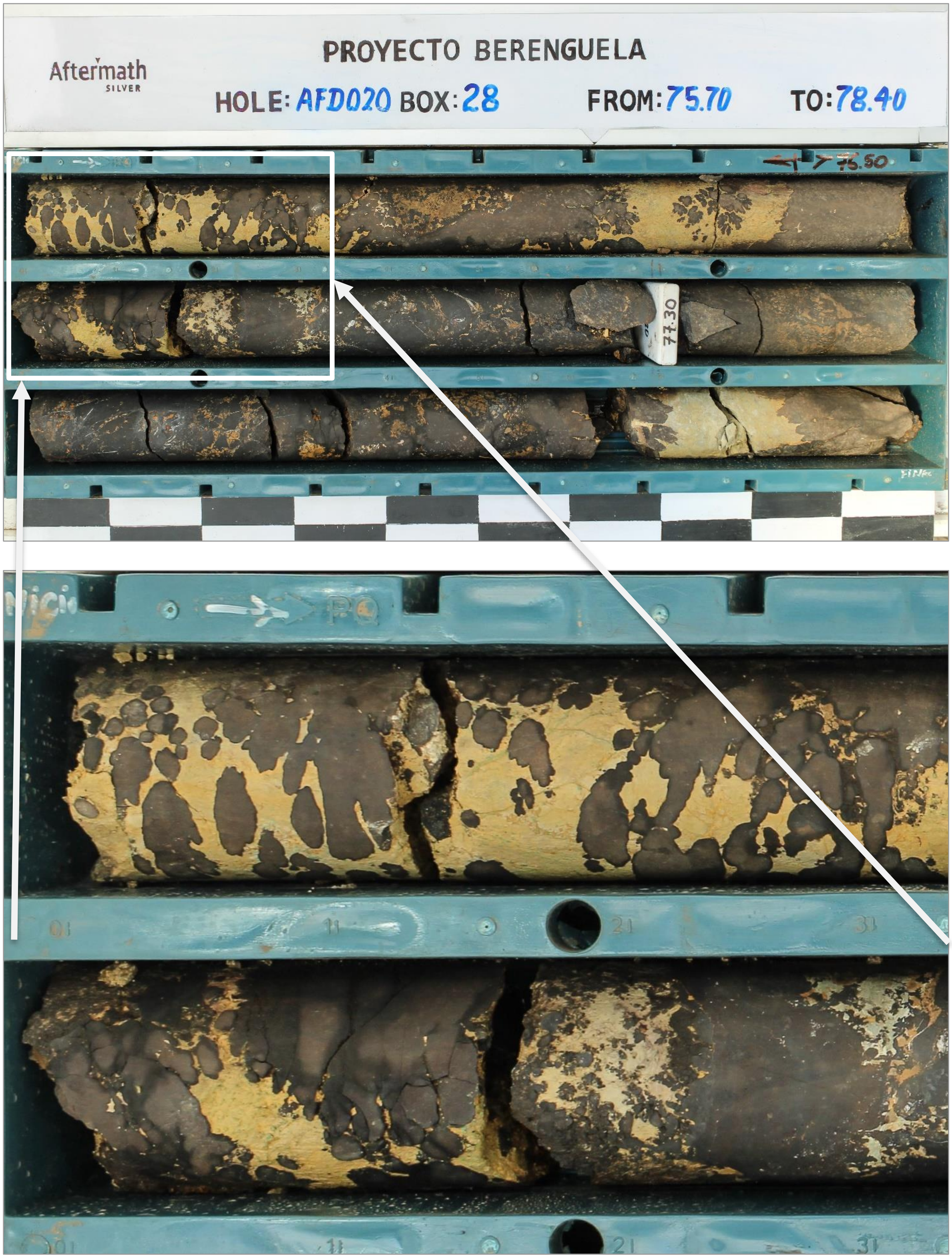
Figure 7.15 Replacement through fractures and joints



Notes: Replacement of dolomitic limestone by fracture / joint controlled ingress of mineralizing fluids (zoom part of image on right). Note altered massive MnO replacement in the bottom right of the core-box (and in the "vein" in the zoom image). Metal grades increase with Mn grades which show an inverse relationship to Ca+Mg as the carbonate host is replaced by the MnO alteration.
Source: Aftermath, 2023.

- "Chemical" replacement of dolomitic limestone by MnO with no apparent joints or fracturing associated as pathways, although macro fractures or faults sourcing MnO are usually present within a few metres. This texture is characterized by initial oval or circular accumulations of MnO in the dolomitic limestone – sometimes referred to as a "leopard spot texture" (see Figure 7.16). The MnO growths coalesce forming the more predominant component until the limestone is transformed into a massive MnO body with very few relic textural features preserved.

Figure 7.16 Chemical replacement textures



Notes: "Chemical replacement" textures – MnO replacing dolomitic limestone in segregated accumulations ("leopard spot texture") coalescing to a more massive replacement texture. In the second row of the zoom image, individual coalesced accumulations can still be discerned.
Source: Aftermath, 2023.

Both processes described above appear capable of producing the most altered dolomitic limestone, which is a pitch-black, crumbly, massive rock with no relic textures and an earthy appearance frequently accompanied by ferruginous clays. The grades in this alteration can include Mn grades >20% and sometimes as high as 30%.

Figure 7.17 Complete replacement of dolomitic limestone

Notes: High-grade mineralization. Complete replacement of dolomitic limestone by MnO alteration with high-grade Mn, Ag, Cu, and Zn. One relic of dolomitic limestone host conserved in bottom right. Note characteristic ferruginous clays.
Source: Aftermath, 2023.

7.3.4.2 Siltstone and sandstone hosted mineralization

The silty portions of the Ayabacas Formation, logged as dolomitic siltstones and sandstones, are the second and third most common mineralized units with 12% and 5% of the mineralized intersections recorded respectively. Due to lesser reactivity as a host, grades are considerably lower than in the dolomitic limestone host except for Cu. Cu, although lower, maintains an elevated grade in the siltstones. In several zones, the siltstones return assays with elevated Ca+Mg values indicating a carbonate-rich matrix and / or grains, but do not appear to be as susceptible to mineralizing fluids as the more massive dolomitic limestone. This suggests that the reactivity to hydrothermal fluids is governed not only by chemical composition of the host, but also by the textural differences that dictate how chemical reactions can take place.

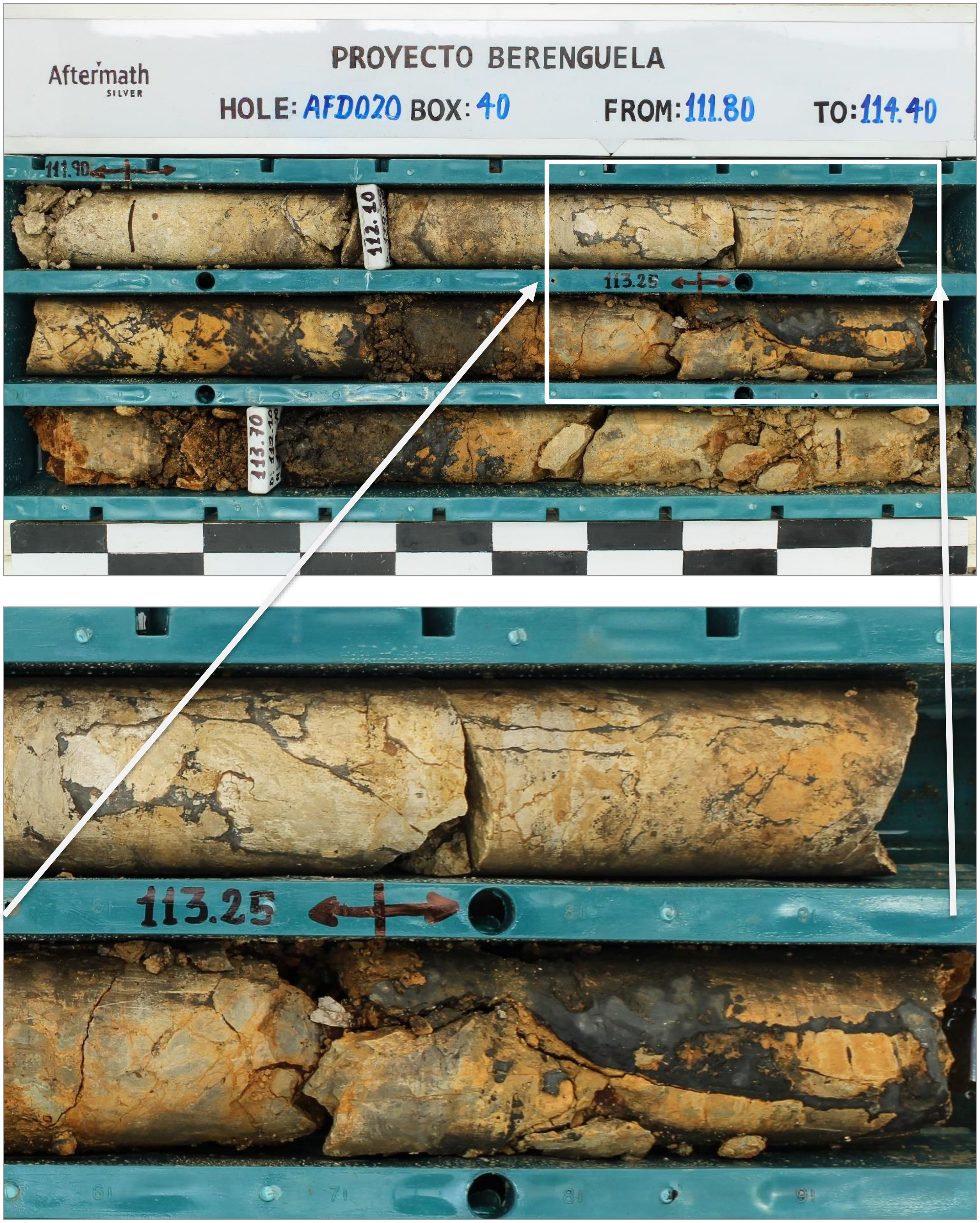
Figure 7.18 Mineralized siltstone

Notes: Mineralized siltstone shows less pervasive alteration than the altered limestone. Note disintegration of the core in the central row indicating probable alteration of a carbonate matrix.
Source: Aftermath, 2023.

7.3.4.3 Sedimentary breccia hosted mineralization

Mineralized sedimentary breccias are a minor component of the mineralization, (4%). Some sedimentary breccias are traversed by zones of Mn-Ag-Cu-Zn mineralization in a structural setting, where various examples of mineralizing fluids "consuming" or altering limestone clast rims can be observed. This indicates the existence of the sedimentary breccias as an original texture prior to the mineralizing event (Figure 7.19). Such mineralized structures can be interpreted as feeder faults of the mineralizing event feeding the alteration and deposition zones of more massive limestone hosts.

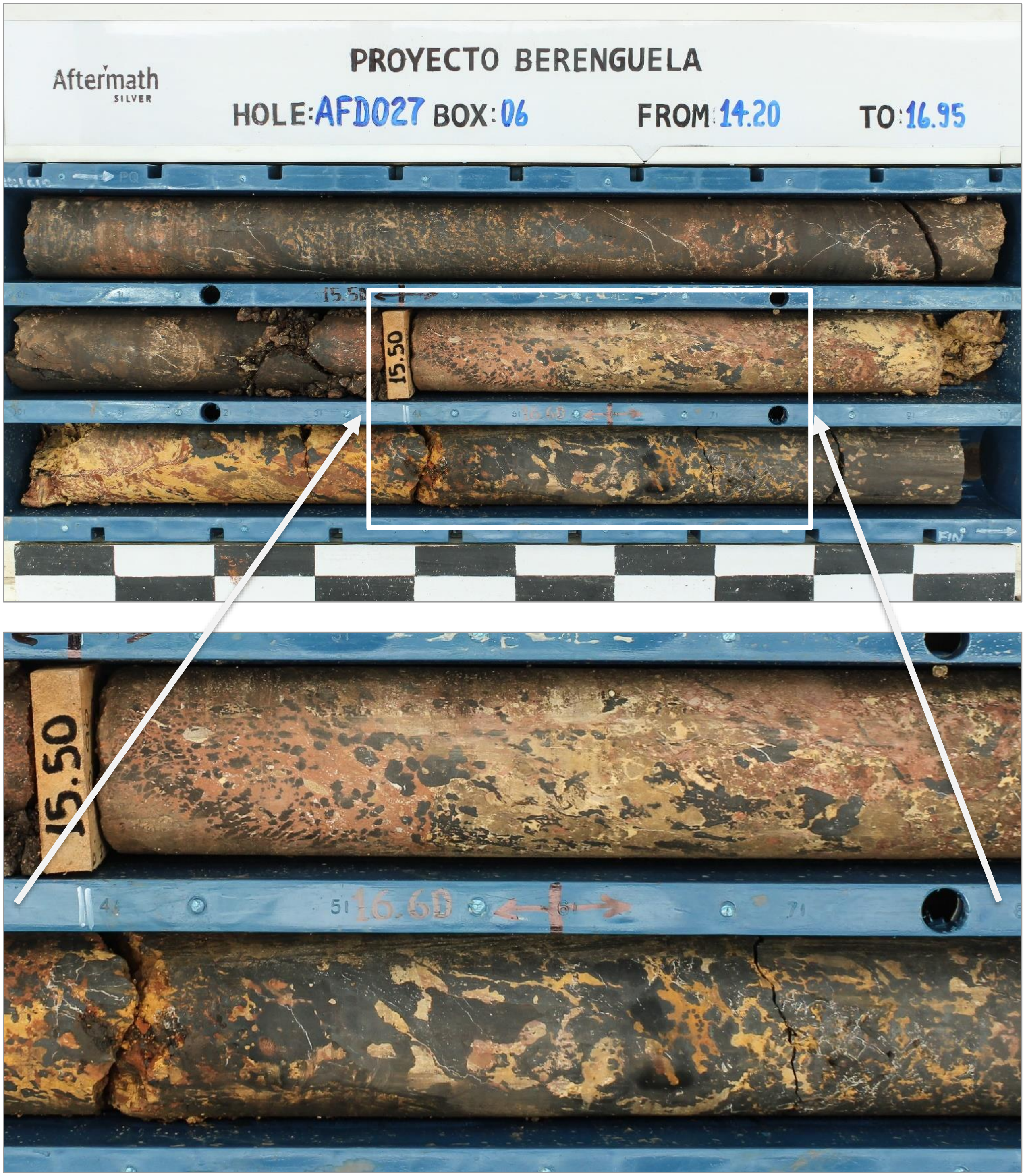
Figure 7.19 Sedimentary breccia mineralization



Notes: Mineralized structure traversing sedimentary breccia zone. Contacts (not shown) grade sharply into unmineralized breccias. Insert shows mineralizing fluids altering or "consuming" limestone clasts in a process analogous to the main mineralizing event in massive limestone host rock. White veins are calcite, and some fill is ferruginous (brown).
Source: Aftermath, 2023.

Where some sedimentary breccias do appear to be mineralized, they are usually adjacent to highly mineralized dolomitic limestone and form a halo to this enrichment. In a similar way to siltstones, the breccias do not appear to be as susceptible to mineralized fluids as the more massive dolomitic limestones. Mineralized sedimentary breccia showing sporadic replacement of clasts and matrix is shown Figure 7.20.

Figure 7.20 Mineralized sedimentary breccia

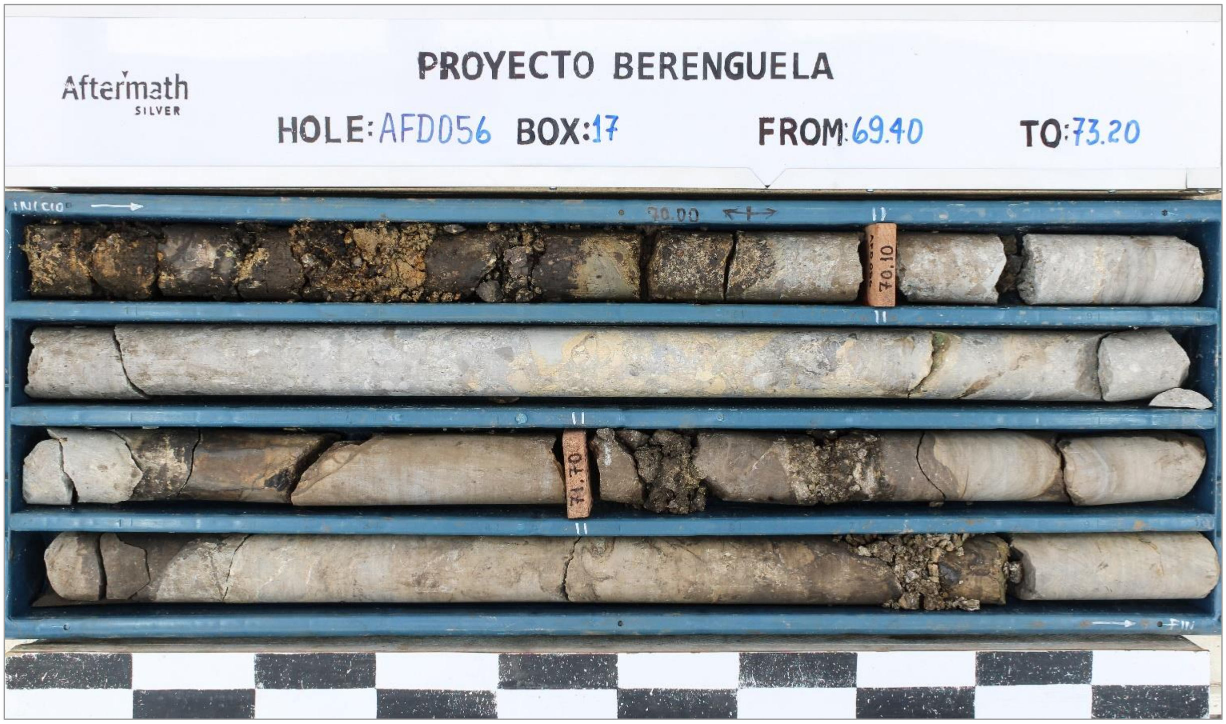


Source: Aftermath, 2023.

7.3.4.4 Intrusive breccia hosts

In the east of the Berenguela project, several holes (AFD-056, AFD-058, BED-006) have intrusive brecciated dioritic dykes up to 5 m in width. The dykes are steeply dipping and in some cases are comingled with altered, mineralized limestones (Figure 7.21). Other contacts are sharp, some displaying slight thermal metamorphism suggesting various phases of dyke emplacement into pre-altered rocks. However overall, the dykes appear contemporaneous with the Berenguela mineralization event. The dykes can locally contain secondary biotite, pyrite, and covellite. Other dykes locally have significant copper content (commonly >1% Cu) and lower Ag, Mn, and Zn than typical Berenguela mineralization. Despite the minor contribution to date, the significance of this style of mineralization is important as an exploration vector for potential associated porphyry-style mineral occurrences.

Figure 7.21 Intrusive diorite breccia in contact with brecciated limestone



Notes: Secondary biotite, silicification. Eastern area alteration zone. This core box is associated with high Cu assays.
Source: Aftermath, 2023.

7.4 Metal zoning

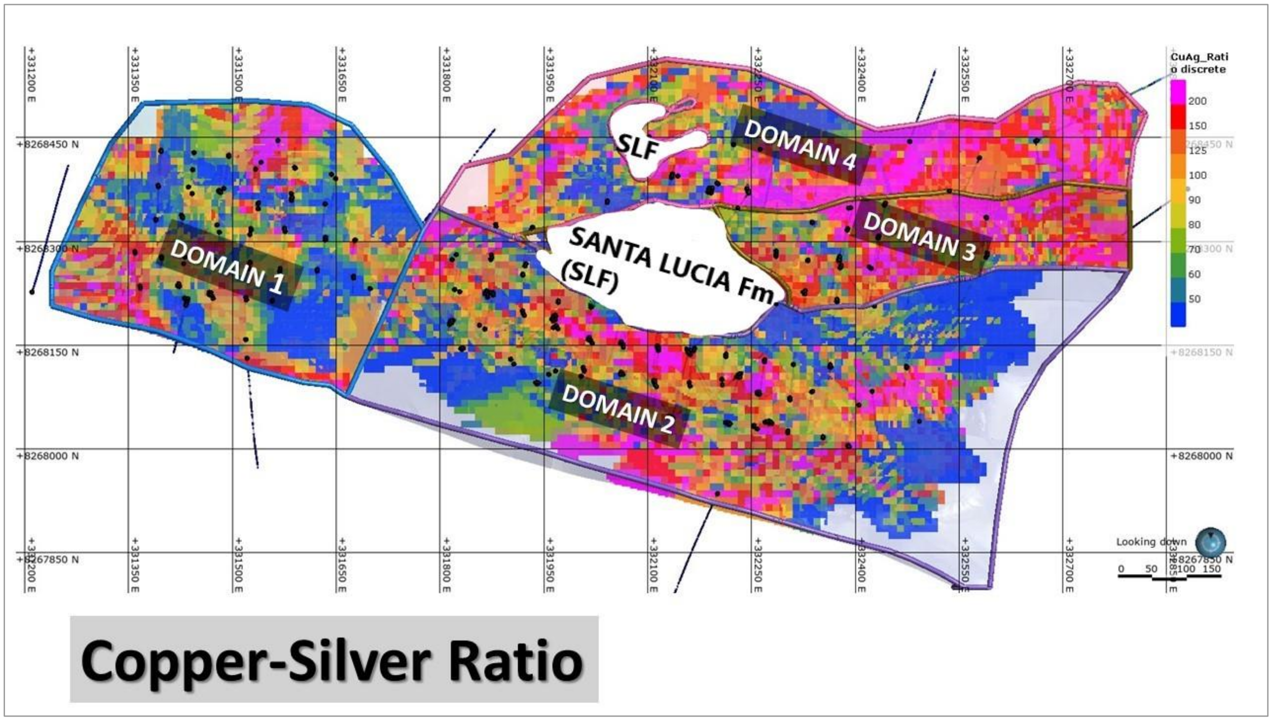
The processes of alteration and mineralization have resulted in distinct metal zoning at the Property and deposit scale.

Dolomitization of the Ayabacas Limestone Formation has occurred throughout the Property. As mentioned previously, higher Mn content correlates well with lower Ca+Mg content at a property-wide scale. This effect is due to the MnO alteration replacing host carbonates / dolomites.

Zonation is also observed for the other metals at the deposit scale. Comparison of block model grades of Cu, Ag, and Zn has allowed the relative distribution of the metals to be observed.

In Figure 7.22, Cu is divided by Ag and shows the prevalence of Cu in the east of Domains 3 and 4, and the south of Domain 2.

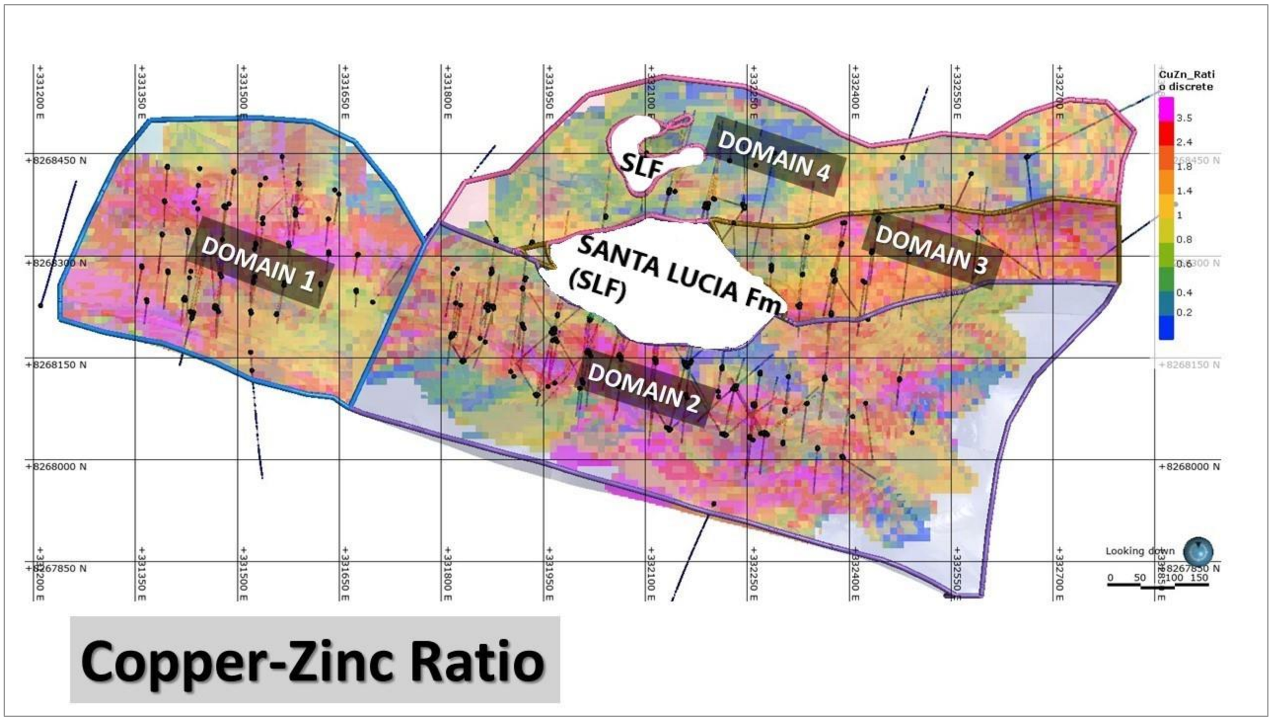
Figure 7.22 Cu / Ag derived from block model results



Source: RockRidge, 2023.

In Figure 7.23, Cu is divided by Zn and shows the prevalence of Cu in Domains 1, 2, and 3. Zn is at parity or exceeds Cu in Domain 4.

Figure 7.23 Cu / Zn derived from block model grades



Source: RockRidge, 2023.

The metal zoning confirms the style of the predominant alteration (MnO replacing carbonates), the degree of dolomitization of the limestones, and the prevalence of Cu mineralization in the east and south of the Property. Combined with other data such as the clay alteration suites and the presence of mineralized intrusives, the eastern part of the Property appears to be the higher temperature zone and can be postulated as the direction from which the mineralizing fluids were introduced. This has important implications for exploration – particularly for a porphyry system that may have driven the mineralization event at Berenguela.

8 Deposit types

There have been several contrasting genetic models advanced for the Berenguela Ag-Cu-Mn deposit. These are discussed along with the preferred carbonate replacement deposit (CRD) model currently proposed.

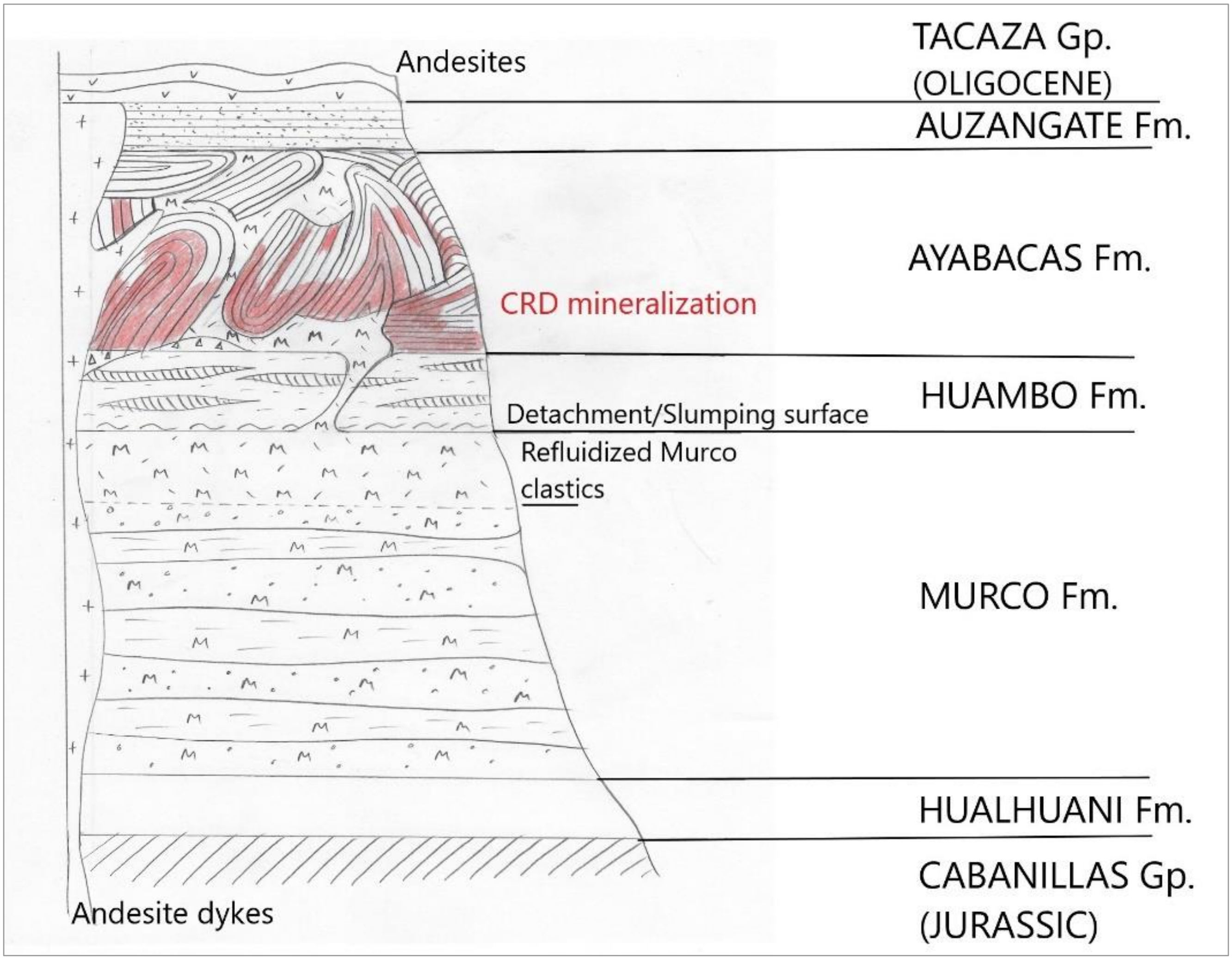
Candiottia and Castilla (1983) proposed that Berenguela is an exogenous infiltration deposit. The authors identified what they thought were conglomerates hosting mineralized clasts from the hypogene Limón Verde Ag and Cu deposit located to the west and that these rocks were gradually leached by meteoric processes. This resulted in Ag- and Cu-rich fluids percolating through faults and fractures into the underlying manganiferous limestones. It has since been shown that what was thought to be conglomerates are pebble dykes / pipes.

An alternate model was proposed by Clark et al. (1990), in which mineralization resulted from fracture-controlled metasomatism of carbonate rocks, suggesting a direct relation to a subvolcanic intrusion. This interpretation is based on the presence of pebble breccia dykes / pipes in the mineralized zones at Berenguela and several of these bodies display marginal, fracture-controlled manganese replacement of the limestone and these fractures also carry copper and silver mineralization. These dykes are interpreted by Clark et al (1986) as phreatic breccias. Similar breccias are associated with the epithermal silver deposits in this district. The final evidence of epithermal character at Berenguela is silicification associated with the manganese oxides (Candiotti & Castilla, 1983). Silicification is present as microscopic chalcedonic quartz grains.

Based on the latest information including the 2021-22 core logging program, the deposit model favoured by Aftermath is that Berenguela is a base-metal and silver bearing, lithology-controlled, CRD emplaced above a regional detachment surface of mid-Cretaceous age. The principal host is the olistostrome of the mid-Cretacous Ayabacas Formation. Host replacement is most prevalent in dolomitic limestone rafts and clasts. Deep drilling conducted in 2019 located rare, mineralized structures which are considered as peripheral to the main mineralization predominantly found above the detachment surface which is shown in Figure 8.1. Mineralization is localized in intense zones of folding related to parallel structures that acted as conduits for hydrothermal fluids. Field evidence strongly suggests that the hydrothermal fluids originated to the east of the mineralized zone. The presence of altered dioritic breccia dykes with elevated copper content (often greater than 1%), metal zonation favouring elevated copper ratios in the east and south, and the indications of hotter, more acidic, alteration conditions, all support a relatively proximal eastern source of alteration and mineralization. An unexposed felsic intrusion related to lithospheric-scale wrench faults, potentially with associated porphyry-style Cu, is postulated as a driver of the mineralizing system. Brines present in the rocks may have assisted metal transport by mixing with cooling ascending hydrothermal fluids with decreasing acidity. The absence of skarn or high temperature hydrothermal alteration mineral assemblages suggests the mineralization is a low temperature, near neutral mineralizing event. Manganese is present in the form of oxides with little to no associated carbonates suggesting oxidizing conditions during deposition. Hence Berenguela represents an unusual type of hypogene Mn-oxide mineralization.

A schematic section of the setting of the mineralization at Berenguela is presented in Figure 8.1 and shows the main stratigraphic units. A full discussion of the stratigraphy and unit thicknesses are found in Section 7.

Figure 8.1 Schematic section of the Berenguela mineralization



Note: Schematic and not to scale.
Source: Aftermath, 2023.

9 Exploration

9.1 Introduction

The work described in this section relates to ensuring that there was a good topographic control for current and future activities on the Property. In addition , some remote sensing work and a hyperspectral program on newly drilled core was completed to identify and characterize alteration assemblages. In addition, geological mapping was carried out by Aftermath geologists and is described in Section 9.2.1.

Other work carried out by Aftermath has focused on the Berenguela deposit and has consisted of enhancing the database and improving the interpretation of the geology. Hence a focus has been on centralizing all the core, samples, and pulps in a new secure storage facility in Arequipa, validating certain aspects of the data, and drilling diamond core holes in strategic areas, which included twinning some RC holes drilled in earlier programs. These activities are discussed elsewhere.

The work by previous operators has been summarized in Section 6 and detailed discussion can be found in the 2021 AMC Technical Report in Section 9.

9.2 Work carried out by Aftermath

9.2.1 Mapping

Silver Standard previously produced an excellent quality 1:1000 outcrop map of the mineralized area (Smith, 2006). Aftermath used its extensive drone photography and survey capacity as described in Section 9.2.2, along with modern GIS software to successfully georeference the 2006 data to a high degree of accuracy. Infill mapping at 1:1000 scale was carried out by Aftermath in the core of the mineralized area to validate and complement the existing data over an area of roughly 3 km^2.

Additionally, using ternary diagrams from remote sensing described in Section 9.2.3, and high-quality satellite imagery as a guide, regional mapping at a 1:2500 scale was carried out on roughly 25 km^2 of concessions bordering the main mineralized area. This has been particularly useful to understand the characteristics and scale of folding in the Ayabacas Formation and identify local structures.

9.2.2 Topography

In October and November 2021 Aftermath engaged the services of JR Topografia y Geodesia E.I.R.L. (JRT), a registered survey company from Arequipa, to establish survey control at Berenguela in the WGS84/19S datum – the official system now adopted by the mining authorities of Peru.

Using differential global positioning system (DGPS) methods and calibrations, JRT established three “Category C” geodesic beacons on the Berenguela Property that were subsequently assessed and approved by the National Geographic Institute of Peru (IGN) see Figure 9.1.

Figure 9.1 Establishment of beacons on the Berenguela Property November 2021

Source: Aftermath, 2023.

After survey control points were established, JRT, in conjunction with Aftermath staff undertook the survey of all historic borehole beacons on the Property as well as picking up access roads and assisting in the Aftermath drill program layout.

In December 2021, JRT undertook a drone photogrammetry survey of a 3.11 km^2 area encompassing the core of the infrastructure of the Property, (e.g., drillhole sites, open pits and trenches, old buildings, etc.) The survey drone had an average elevation of 206 m, collected 1,482 images with an average resolution of 5.98 cm/pixel, and included 66 control points. Accuracy was calculated to be within a range of 15 cm although vertical errors over control points were usually as low as 15 mm. The drone photogrammetry covers all resources mentioned in this report.

JRT continuously assisted in surveys up to the completion of the Aftermath drill program in May 2022 with final pick-ups of hole sites. Additionally, to aid with the positioning of underground workings from plans, specific adit entrances and infrastructure were identified by Aftermath on the ground and surveyed by JRT.

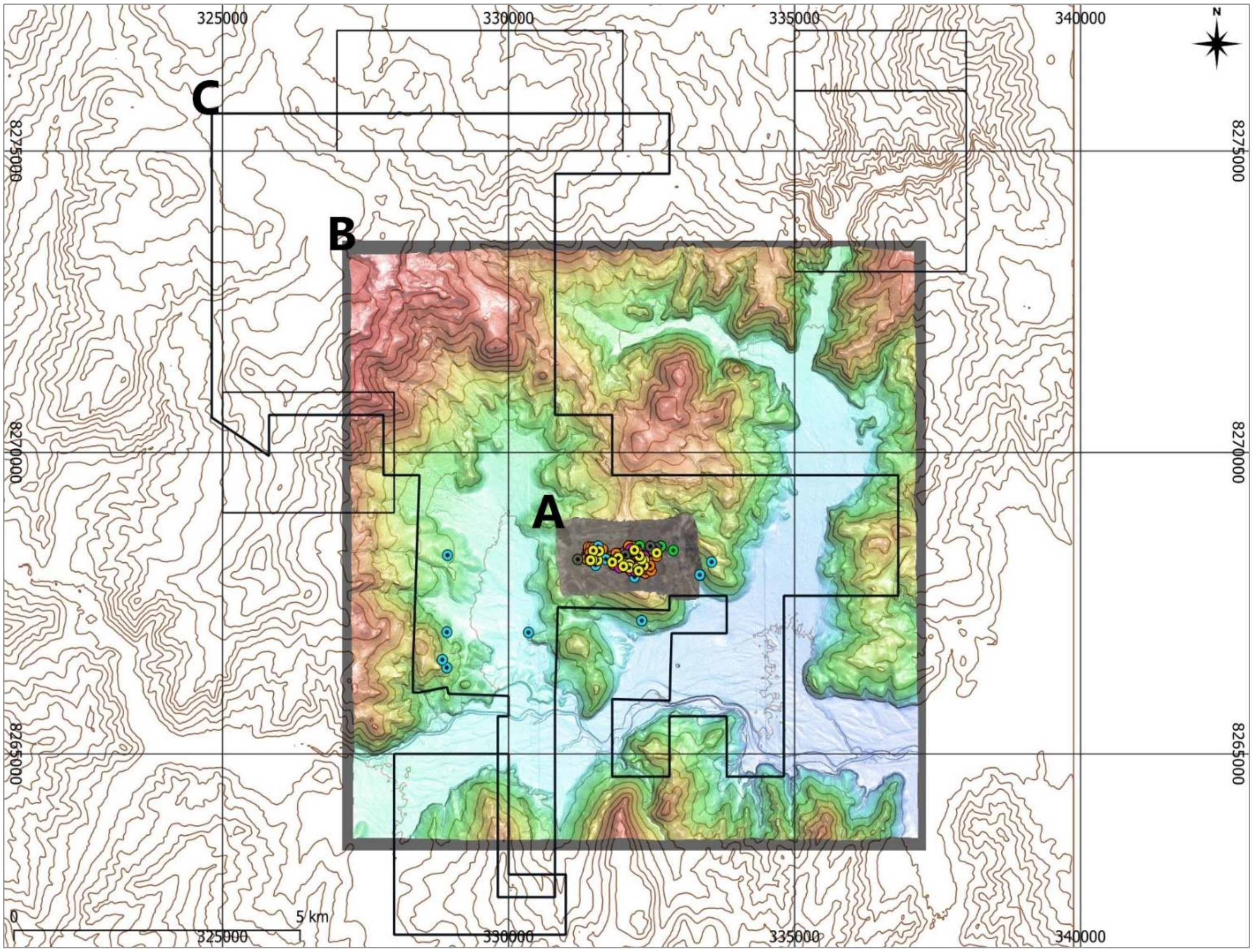
Aftermath obtained a 10 x 10 km IKONOS satellite image which had been acquired in 2004. Fathom Geophysics (Fathom) converted the projection from PSAD56 to WGS84/19S and supplied DEMs and contour files at 2, 10, and 50 m intervals. The IKONOS image covers roughly 70% of the mineral property concessions and claims.

Fathom then created topographic data for the Property concessions and claims by extracting contours from 30 m Advanced Land Observing Satellite (ALOS) DEM public domain sources and supplied contour files at 2, 10, and 50 m intervals as shown in Figure 9.2, area B. Note ALOS refers to the Advanced Land Observing Satellite (ALOS-1) which was a Japanese Earth-imaging satellite.

Random checks between the three datasets where they overlap shows an excellent correlation in areas of flatter topography (<1 m vertical difference, and similar contours). Larger errors (5-10 m in vertical elevation) occur in highly steep topography which reflects the resolution of the source data. Order of accuracy in the dataset is:

- Drone photogrammetry central 3.11 km^2 of property – most accurate
- IKONOS imagery and derived data 70% of concessions and claims – secondary accuracy
- Public domain imagery and derived data rest of concessions and claims – least accurate.

Figure 9.2 Areas of various topographic surveys in relation to the Property



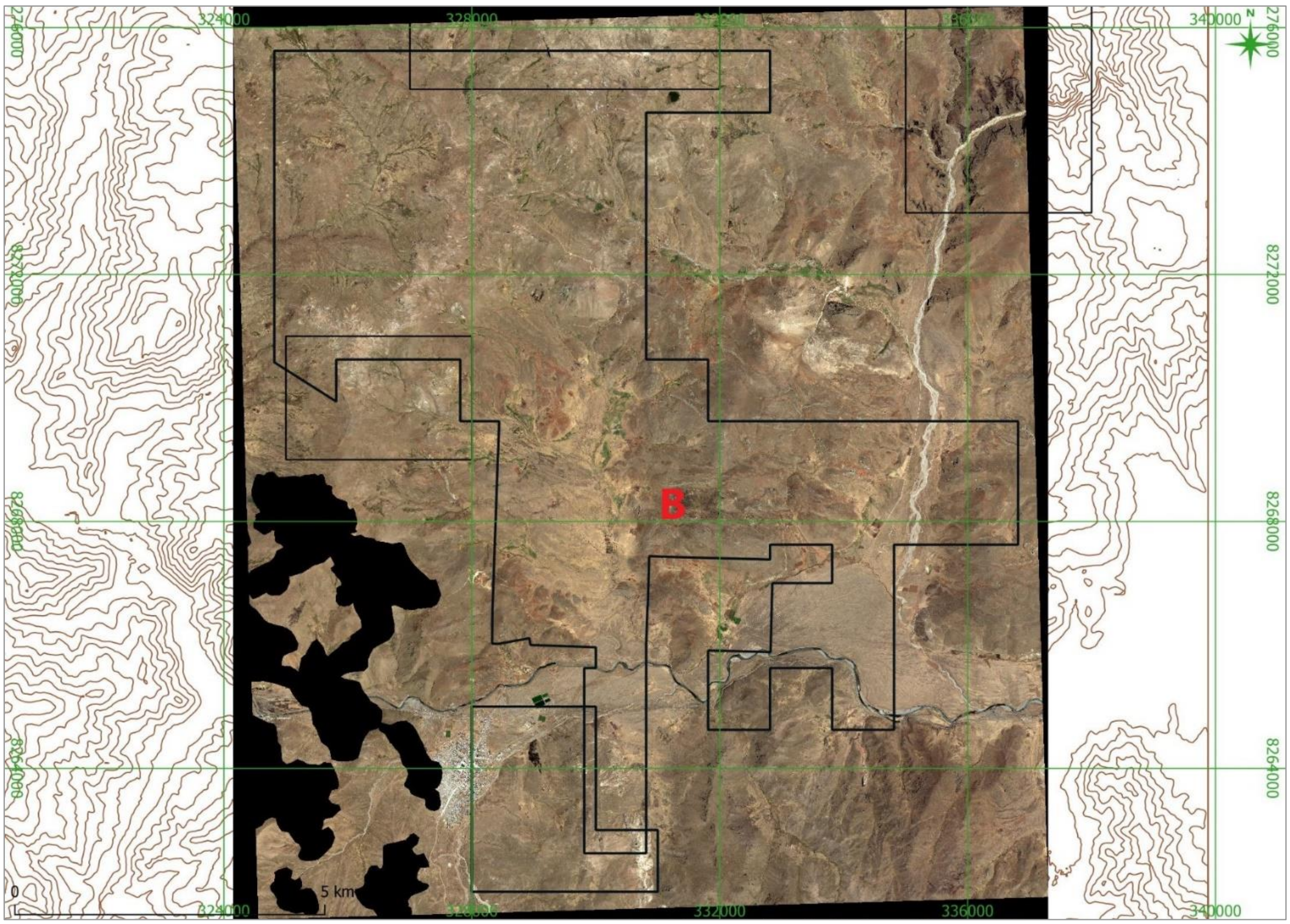
Notes: Different surveys denoted by A, B, and C as follows:
A. Drone photogrammetry over main mineralization, note drillhole collars shown.
B. IKONOS satellite image with DEM.
C. Public domain data (50 m contours shown).
Concession boundaries shown as a black outline.
Source: Aftermath, 2023.

9.2.3 Remote sensing

In 2021, Aftermath commissioned Fathom to obtain and use Worldview-3 (WV3) data to highlight lithologies and possible alteration zones at Berenguela. The imaged area is shown in Figure 9.3.

The data were collected on three separate passes on 9 November 2021 by Maxar Technologies' (Maxar) WV3 satellite. Visible and near-infrared (VNIR) and short-wave infrared (SWIR) data were collected. Maxar's superspectral dataset was used, which includes atmospherically corrected reflectance data for all bands with the SWIR data upsampled to 1 m resolution to match that of the VNIR data. The data were also orthorectified by Maxar. Small areas of cloud cover in the south-west of the image were excluded from processing.

Figure 9.3 Area of Worldview-3 satellite data acquisition



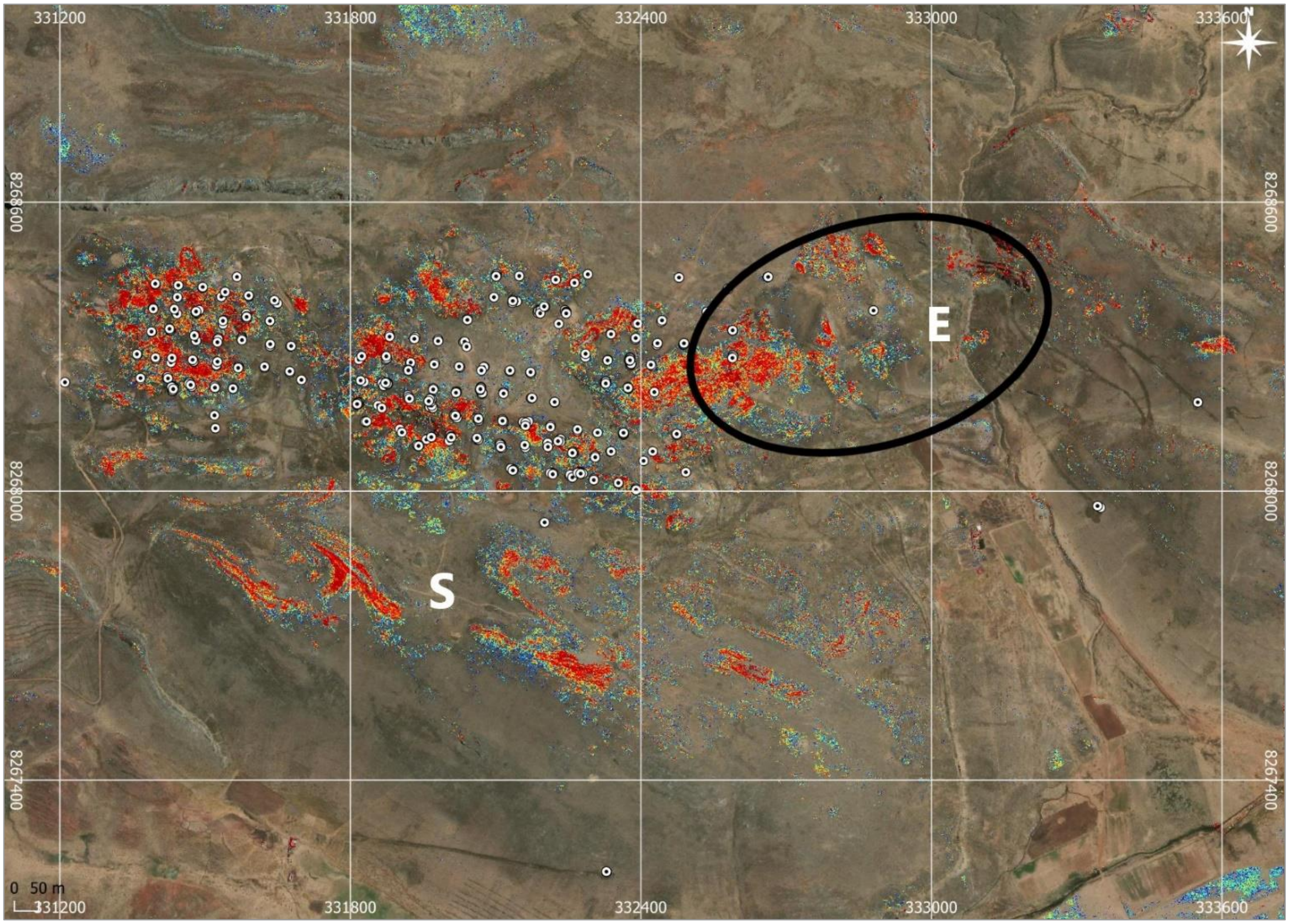
Notes:
- Worldview-3 data area (true colour photo), November 2021.
- Berenguela location marked with a capital B, within the concessions shown as black outlines.
- Dark portion in south-west caused by cloud cover.

Source: Worldview-3 data, supplied by Aftermath, 2023.

Several processing techniques were carried out on the data by Fathom. Mineral Indexes were analyzed in addition to Spectral Correlation Maps (SCMs). Indexes are band ratios that can be used to highlight areas with the potential to host different mineral phases. SCMs look at the correlation between a spectrum at a pixel in the data and a reference spectrum. The areas that are most likely to have very high contents of a mineral are where the SCMs and indexes have coincident highs. To achieve this, Fathom's mineral mapping locates coincident highs by thresholding the index and the appropriate SCMs at the same percentile and then attributing grid cells with the index and SCM values. Various mineral maps were produced at a range of percentiles, with lower percentiles being less discriminating and more likely to have false positives.

A representation of the 80th percentile psilomelane index mineral map is shown in Figure 9.4. The map shows an excellent correlation between the exposed or outcropping Berenguela mineralization, rich in MnO, and the psilomelane mineral mapping. It should be noted that mine stockpiles or other accumulations of mineralization are also mapped by this technique.

Figure 9.4 Psilomelane distribution from Mineral Map using WV3 data



Notes:
- Psilomelane 80th percentile mineral map.
- Drillhole collars shown in white, identifying the mineralization drilled.
- Arear of additional psilomelane response shown to east (E) and south (S).

Source: BG_WV3_MinMap_80th_HEq-Psilomelane-Th-Idx supplied by Aftermath, 2023.

The remote sensing data identifies two areas of interest for exploration close to Berenguela:

- Area E is partly composed of areas of in-situ highly altered MnO outcrops and some extensive exploration by trenches and adits. The area is noteworthy for the abundance of secondary copper associated with mineralization and common chalcedonic silicification. An eastern adit is mapped as entering at an elevation 60 m below the outcropping alteration (just to the right of the E marked on the map) and reported the presence of mineralization in channel samples. The area has not been extensively drilled due to steep relief and access difficulties.

- Area S, in contrast to area E, has not been the object of much, if any, mining activities. The satellite data outlines psilomelane concentrations in the noses of S-shaped folds in the Ayabacas Formation. Whilst some of this area has been subject to geochemistry by previous operators, no drilling appears to have taken place.

Other datasets from the remote sensing show excellent mapping of units, particularly the Ayabacas, and the presence of alteration in the Tacaza Group rocks to the N and NW of Berenguela, and in Mesozoic rocks to the NE. The claims applied for by Aftermath in 2022 were based on geological interpretation aided by this remote sensing data.

9.2.4 Hyperspectral program on core

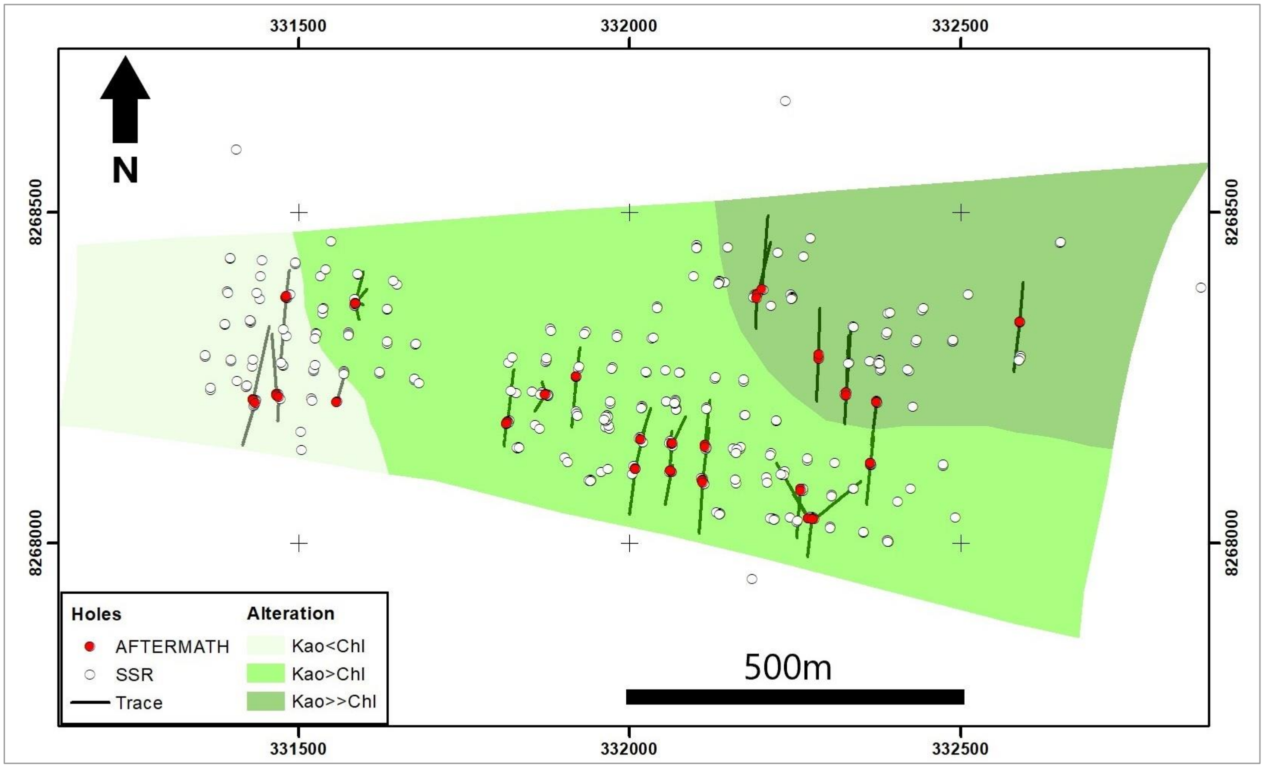
In 2022 Aftermath carried out a program to identify alteration minerals that consisted of collecting hyperspectral data over 6,091 m of core in the 63 holes from Aftermath’s drilling campaign. A Malvern Panalytical ASD TerraSpec® Halo mineral identifier was used and the onboard software identified mineral assemblages. Alteration identified at Berenguela was typically epithermal argillic to propylitic.

Due to the great variety of minerals identified, an initial step was to identify minerals in function of their abundance in the project area. Kaolinite, smectite, illite, and to a lesser extent, chlorite, were identified in all analyzed holes and were used to identify the possible migration direction of alteration fluids in the deposit.

The minerals which present the greatest variation in pH are kaolinite and chlorite. Based on these contrasts, Aftermath generated hyperspectral maps which showed the relative proportion of kaolinite versus the other minerals formed in conditions of greater pH. The results, whilst recognized as preliminary and subject to further processing, showed a variation in relative proportion from the northeast to the south-west of the drilled area, as shown in Figure 9.5. According to Corbett and Leach (1998), this type of alteration assemblage would form at low temperature with an increase in pH from kaolinite to chlorite bearing areas.

The zonation of alteration displays a similar pattern to metal zoning at the Property; the eastern area has relatively more copper mineralization than the west and is associated with a style of alteration more proximal to a presumed, intrusive source.

Figure 9.5 Preliminary hyperspectral data showing alteration



Notes: Alteration zonation of the mineralization from north-east to west is evident.
Source: Aftermath, 2023.

9.3 Exploration potential and recommendations

The eastern margin of known mineralization presents a more obvious exploration target to add resources. Various indicators from core logging (mineralized diorite breccias), metal ratios (predominance of copper), and alteration mapping complement the extensive exploratory mine workings and altered outcrops. At least 60 m of vertical thickness of mineralization can be extrapolated from surface outcrop to mapped underground workings in parts of the area. Very little drilling has been carried out, partly due to the steepness of the terrain.

This area presents the most likely vector to a possible source of the Berenguela hydrothermal alteration system. An unexposed intrusion, emplaced in the extensive lithospheric wrench-fault CECLLA system, is postulated to be driving alteration and mineralization and may have porphyry Cu potential. Existing ground magnetic data will be reprocessed using modern filters and magnetic vector inversion techniques to identify magnetic anomalies. A further 15 km^2 of ground magnetic surveys would be required to complete the eastern area. Follow-up would probably involve IP surveys before scout drilling could commence.

The area to the south-east of the known mineralization also offers scope for identifying more resources in a downfolded limb of the Ayabacas Formation Though this feature has been drilled twice in 2021-22, additional drilling is required to understand the dimensions and significance of this potential extension.

Some 200 - 500 m south of the main mineralization, as revealed by the WV3 imagery, further psilomelane occurrences are present in fold noses of the Ayabacas Formation This zone is parallel to the main zone mineralization and is aerially extensive. The significance of this zone is undetermined and will be extensively checked as a priority in upcoming fieldwork.

10 Drilling

10.1 Introduction

This section describes the drilling conducted on the Property which is used in the estimation discussed in Section 14. Thus it discusses drilling carried out by operators prior to Aftermath, and includes drilling designed for exploration and for resource development purposes. Section 10.3 provides a discussion for each program that includes the purpose, methods, and procedures used in each historical program, as much of this data has been used in the estimation.

Aftermath conducted a diamond drilling program from December 2021 to May 2022 consisting of 63 holes totaling 6,168.15 m.

10.2 Drilling summary

Since 2004 a total of 386 diamond drillholes (DD) and reverse circulation (RC) holes totaling approximately 42,641.4 m in length have been drilled on the Property consisting of 95 DD and 291 RC holes. There was also earlier drilling which is discussed in Section 10.3.1, but as there is no back-up data available it has not been used in the estimation nor included in Table 10.1.

A summary of the drillholes from 2004 to 2022 is shown in Table 10.1.

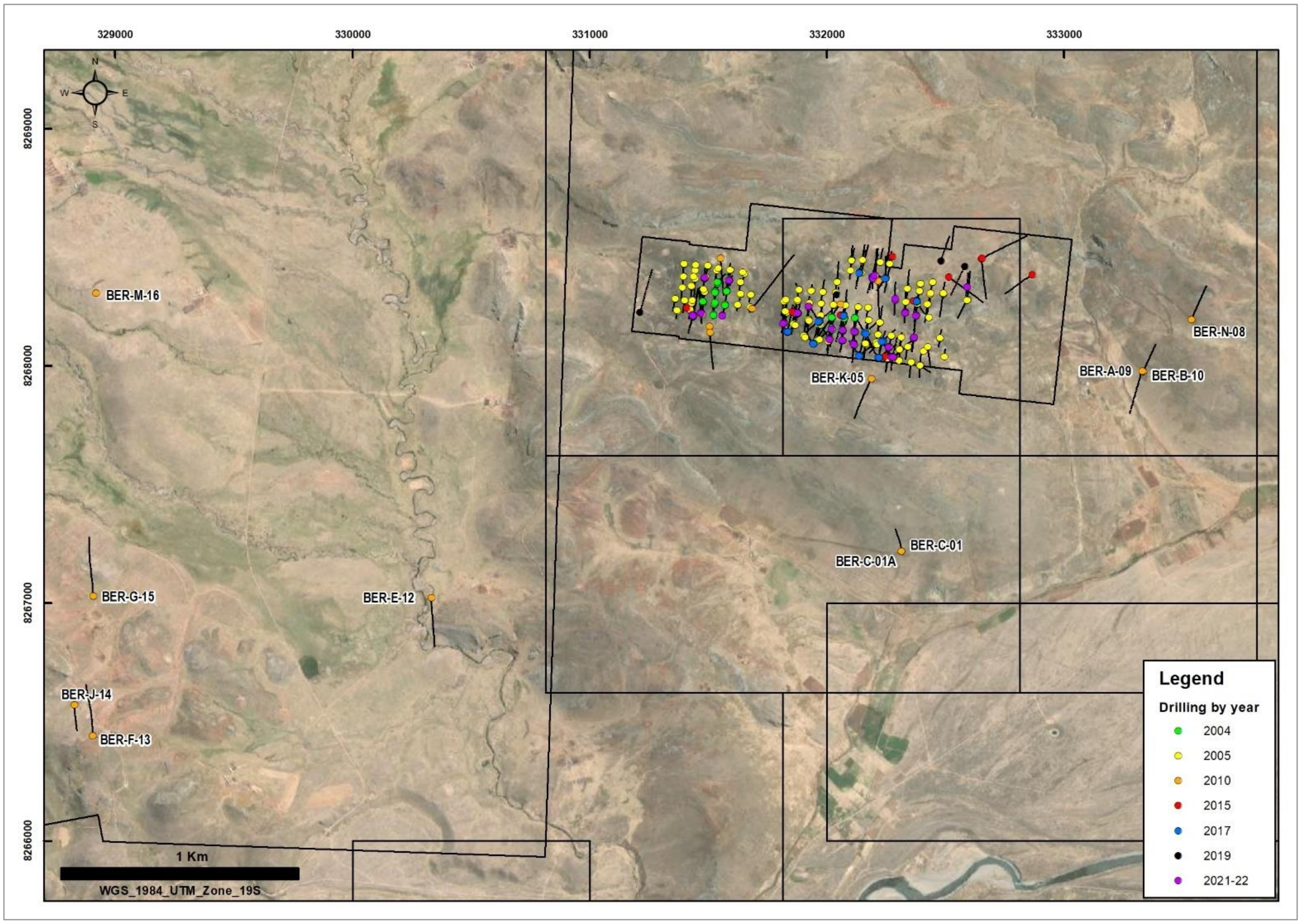
Table 10.1 Berenguela Property drilling summary

Year	Company name	Diamond core holes			Reverse circulation holes			Total meters	% of total metres
		Num.	Length (m)	Number of samples[1]	Num.	Length (m)	Number of samples[1]		
2004	Silver Standard	-	-	-	57	5,393	4,985	5,393	13%
2005	Silver Standard	-	-	-	165	13,766	13,497	13,766	32%
2010	Silver Standard	17	5,546	1,620	-	-	-	5,546	13%
2015	Silver Standard	11	1,876	1,497	-	-	-	1,876	4%
2017	Valor	-	-	-	69	8,465	8,325	8,465	20%
2019	Rio Tinto	4	1,427	705	-	-	-	1,427	3%
2021-22	Aftermath	63	6,168	4,700	-	-	-	6,168	15%
	Total	**95**	**15,017**	**8,522**	**291**	**27,624**	**26,807**	**42,641**	**100%**

Note: [1]Excludes QA/QC samples.

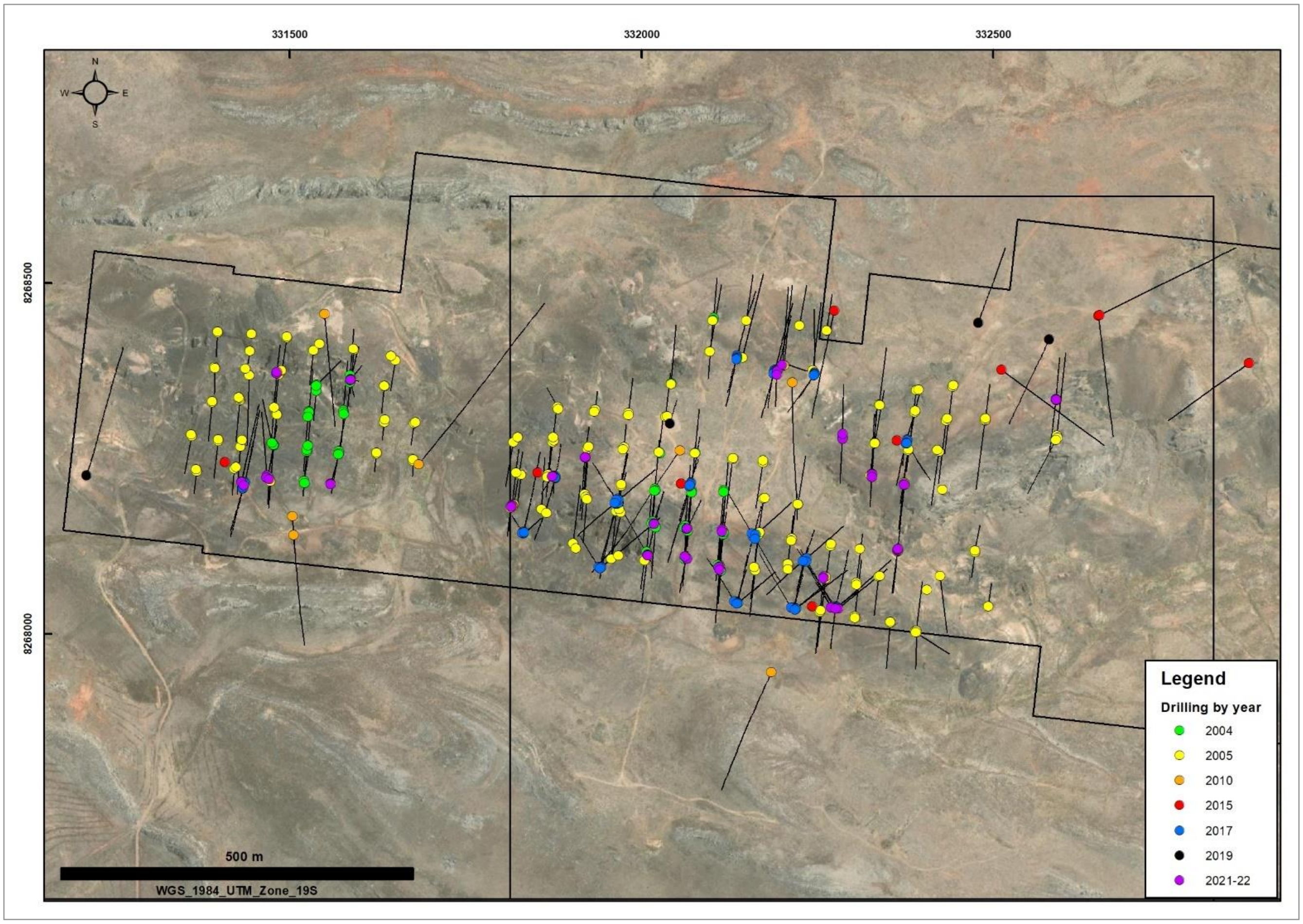
The location of these drillholes is shown by year drilled in Figure 10.1 in relation to the Property and in Figure 10.2 in and around the main area of mineralization, also by year drilled. Note the Aftermath drilling refers to the program and not the year. The program commenced in December 2021 and the majority of the drilling was completed in 2022.

Figure 10.1 Location of drillholes on Property



Source: Aftermath, 2023.

Figure 10.2 Location of drillholes in the deposit



Source: Aftermath, 2023.

10.3 Drilling progress by year and operator

10.3.1 Silver Standard 2004-05

Silver Standard's first drilling program occurred between November and December 2004, pausing for Christmas and New Year, and was completed between March and May 2005. The purpose of the program was to define a Mineral Resource over the mineralization drilled by ASARCO and Charter.

Details of the 2004 – 2005 program including interpreted cross sections are provided in Smith (2006). The period review of the QA/QC for these programs is presented in the 2005 McCrea Technical Report and summarized in Section 11.

The programs were designed on a regular grid of nominally 50 m x 50 m. The 2004 program comprised 57 RC holes and the 2005 program included 165 RC holes. The 2004 and 2005 program included 95 vertical holes with an average depth of 78.0 m and 127 angled holes with an average downhole depth of 92.5 m.

There is no record of any downhole surveying on the angled holes. It is assumed that the recorded bearings are the design grid bearings, as such no magnetic declination has been applied in the database. A fairly complete set of coarse reject samples have been sourced from the Silver Standard warehouse in Lima and are now stored at Aftermath's core shed in Arequipa for reference.

Smith (2006) described the RC drilling conditions varying from good to difficult. often due to clay zones. During the first 57 RC holes clay zones and mining voids frequently reduced RC sample recovery or even lost intervals, with many intervals being flanked by mineralization. The clay blocking the face sampling hammer was alleviated using water injection and additives which was reported to have solved these issues but can also potentially contaminate the samples. It is stated that there was a clear improvement in the reduction of unsampled RC intervals in the 2005 holes.

Prior to the twinning program in 2021-22, described in Section 10.5, a study of the reported weights of the 2004 and the 2005 samples delivered to the assay laboratory was undertaken by Aftermath. The reported weights were taken as a proxy of sample recovery as low recoveries resulted in low sample weights to the laboratory. It was evident that the presence of voids impacted the average recovery both because of the void itself and collection of the samples after the void. Where no voids exist, there was generally good recovery, but where voids were present and recovery was poor, the majority of these holes were replaced with DD holes in 2021-22 when 20 of the 2004-5 RC holes were twinned.

Eleven exploration shafts were mined by Silver Standard adjacent to vertical RC holes. While these were for both bulk sampling and grade validation, the grade comparisons were mixed and quite variable.

10.3.2 Silver Standard 2010

The 2010 Silver Standard program was primarily designed as an exploration program consisting of 17 HQ size (96 mm) diamond core holes, including one redrill. A brief review of the 2010 program is provided by Soler and Burk (2012). The holes were designed to test several geophysical and geochemical targets. All holes intersected mineralization although at lower overall grades than the 2005 Mineral Resource estimate. These holes were the first to test deeper levels at Berenguela, helping to define the stratigraphy below the known carbonate units. Core recovery was not recorded.

Eleven of the holes were drilled outside of the deposit area, to the south and east. Six holes were drilled on the edge of the 2004 / 2005 drilling area exploring below the then known mineralization.

Average drillhole depth for the 2010 program was 326.25 m. Downhole surveys were performed at 50 m and 100 m, then every 100 m thereafter. The survey instrument type was not recorded; however it has been assumed a single shot digital tool was used. A magnetic declination to correct to grid north has been applied in the database.

Period digital photos of the core trays are available for eight of the nine DD. The photos are of good quality.

10.3.3 Silver Standard 2015

Silver Standard's final program on the Property was in 2015 and consisted of 11 diamond core holes: five HQ size and six PQ size, having core sizes of 63.5 mm and 85 mm, respectively. The main purpose of the program was to obtain metallurgical samples and in part replicate or twin vertical RC holes from the 2004 / 2005 program. Four holes were designed to explore on the edge of the known extent of the mineralization.

Seven holes were drilled within the area of known mineralization, including one redrill, and the average depth was 120 m. Another four holes were drilled on the north-east side of the known mineralized area. Mineralization was expanded to an average depth of 260 m.

Angled holes were downhole surveyed using Reflex EZ digital multishot tool, with surveys recorded every 25 m. Magnetic declination correction to grid north has been applied in the database.

Core recovery was recorded for 6 holes (one repeat) and rock quality designation (RQD) was recorded for the entire 10 hole 2015 program. Values are reported in Becerra and Barboza (2016) however at this stage this dataset has not been incorporated into the Aftermath project database due to incompleteness.

The 2015 program also incorporated the collection of bulk density data. Becerra and Barboza (2016) reported that 1,771 core samples were selected for bulk density determinations. The available Silver Standard data however totaled 1,716 samples of which 1,461 have bulk density determinations by the water displacement method, 175 samples measured only by weight and dimensions, 80 with no measurement. Silver Standard sent 58 samples to SGS Lima for independent verification.

High quality digital photos of the core trays are available for all of the 2015 program holes.

10.3.4 Valor 2017 program

Valor completed a total of 69 RC holes with an average depth of 122.68 m. The program lasting 73 days and, was designed to be an infill program and to expand the known mineralization. The intended spacing of the program was nominally 35 m including the previous drilling.

All but three holes, two vertical holes, and one angled hole, were downhole surveyed by true north seeking gyroscope. Surveys were recorded every 5 m downhole. A correction was applied in the database to record grid north.

Sample recovery was not as big an issue as for the 2004-05 RC program. The drilling technique changed and the same contractor used as in 2004-05, thus applying lessons learned. Samples of less than 1.5 kilograms (kg) recovered over one meter were treated as "none recovered", and not used. The average weight received at the laboratory is recorded 2.74 kg which could refer to 75% according to Aftermath. Six holes from the 2017 RC program were twinned by Aftermath in a part of the 2021-22 program which also provided sample for metallurgical testwork.

Good quality digital photos of the RC chip trays are available for 59 of the 69 holes.

10.3.5 Rio Tinto 2019 program

In 2019 Rio Tinto drilled four relatively deep exploration holes, investigating possible feeder zones and different styles of mineralization at depth below the known mineralization.

The holes were surveyed using a multishot tool. The instrument type was not recorded. Magnetic declination correction to grid north has been applied in the database. Average core recovery for the 2019 program was 87.1%. RQD measurements were also collected.

High quality digital photos of the core trays are available.

10.3.6 Aftermath 2021-22 program

From December 2021 to May 2022, Aftermath carried out a diamond drilling program consisting of 63 holes. These centred on the known mineralization and its flanks to the east, north, and south. Drilling was carried out by a single machine from AK Drilling of Lima which worked two shifts throughout the program. Minor delays were encountered due to electrical storms which necessitated the crews taking refuge in safe areas. The program was accomplished with three minor safety incidents and one COVID-19 outbreak resulted in a three-day shutdown.

The program had three main areas of focus:

- Twinning (and replacing) RC holes from 2004-05 that were considered to have poor recovery. Verifying (and replacing) some 2017 RC drilling. Mostly PQ drilling.
- Obtaining metallurgical samples in various geological domains to supply samples for future metallurgical testwork. PQ drilling. Metallurgical drilling was combined with the twinning program where appropriate.
- Exploration (extension) drilling focusing on the eastern limits of the known mineralization. Predominantly HQ drilling.

Drilling was completed using a triple-tube core barrel and drill sizes of HQ size (63.5 mm) and PQ size (85.0 mm). Totals of 2,412.55 m of HQ size and 3,755.60 m of PQ size were completed for the program total of 6,168.15 m.

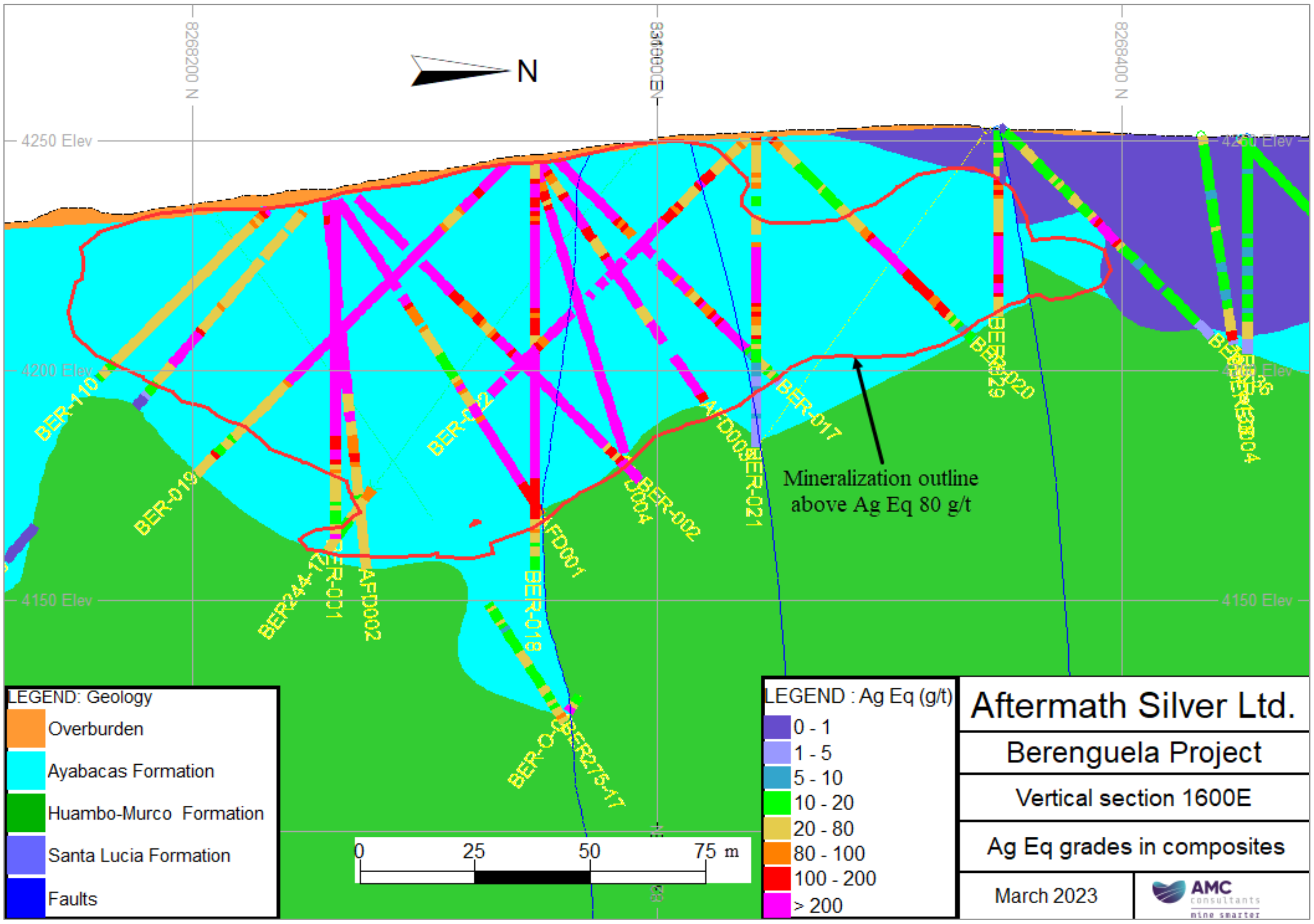
The holes were surveyed every 5 m downhole by a gyroscopic survey instrument and results delivered in true north format.

Core recovery was 91.3% discounting mining voids that were intercepted. The generally consistent cohesiveness of the drilled formations, use of the triple tube technique, and large core diameters employed created favourable conditions for core recovery. A total inventory of 3,044.70 m of mineralized intersections had 141.0 m of mining voids associated with it (4.6% voids). The voids were rarely longer than 3.0 m drill length and were immediately detectable by the drillers due to rod advance and water loss. Recovery past the voids was generally excellent as drill conditions were quickly restabilized by the large-diameter drill-string. The nature and size of the voids confirmed the predominance of underground exploration or development drives with little, if any associated stoping. This is also reflected in all underground plans available.

The section presented in Figure 10.3 is a cross section which shows the drilling as it relates to the shape of the deposit and the grades which are generally fairly consistent and continuous, on a calculate silver equivalent basis. The section has a 10 m clipping causing some holes not to fit the outline of the mineralization in detail and is drawn across the core area of the mineralization and is located on section line 1600E which is through the core of the deposit and can be located on Figure 14.2.

While many of the holes are vertical, drilling was carried out from platforms and angle holes are also drilled to give coverage.

Figure 10.3 Cross section showing drillholes



10.4 Processing the Aftermath core

Core was received in the Limon Verde camp twice per day during drilling. Washing and core marker validations were performed before routine core photography. A “Quicklog” geology review was followed by recovery and RQD measurements. Detailed geological logging was then followed by sample interval selection. Cores were marked and sawn at the dedicated core-saw facility in the Limon Verde camp. Generally samples were 1 m in length in mineralization and 1.5 m in length in areas not considered mineralized. Samples were selected on geological contacts where appropriate. For HQ cores, half of the core was taken for analysis with a quarter core used for duplicate samples where applicable. For PQ cores, a quarter of the core was taken for analysis with a corresponding quarter used for duplicate samples as required.

In total, 4,700 samples were submitted for laboratory analysis (excluding control samples) totaling 5,296 m of drilling or 86% of total metres drilled in the 2021-22 campaign.

A total of 506 samples collected from various types of mineralization and barren zones distributed throughout the mineralized area were selected for bulk density measurements. These measurements were carried out at the ALS Laboratories in Lima using the waxed immersion method.

10.5 Twinned holes 2021-22

Twinning of DD holes with selected old RC holes was carried out as part of the 2021-22 drilling program. This was completed in to verify the 2004-05 RC drilling where issues of poor recovery and smearing of metal grades had been identified. In addition six 2017 RC drillholes were twinned as a validation program. In order to ensure better recovery in expected difficult areas, and also to obtain metallurgical samples, the twin program used PQ diameter where deemed appropriate. A list of twinned holes is shown in Table 10.2.

Table 10.2 Details of twinned holes

RC hole	Year drilled	2021-22 DD hole	Distance apart
BER-191	2004/5	AFD-021	3.5 m to north-east
BER-057	2004/5	AFD-024	2.0 m to west
BER-083	2004/5	AFD-025	4.0 m to north-west
BER-004	2004/5	AFD-026	0.5 m to north
BER-009	2004/5	AFD-027	1.0 m north-west
BER-008	2004/5	AFD-028	0.5 m north-west
BER-011*	2004/6	AFD-028	2.0 m to west
BER-005	2004/5	AFD-029	2.0 m to south
BER-012*	2004/6	AFD-029	3.0 m to south-east
BER-006	2004/5	AFD-030	0.5 m to north
BER-013	2004/5	AFD-031	3.0 m to north-west
BER-165	2004/5	AFD-032	2.5 m west
BER-164	2004/5	AFD-033	3.0 m west
BER-185	2004/5	AFD-034	1.0 m to north-west
BER-183	2004/5	AFD-036	1.0 m to north
BER-184	2004/5	AFD-037	2.5 m to north-west
BER-102	2004/5	AFD-043	3.0 m to west
BER-103	2004/5	AFD-044	2.0 m to north-west
BER-101	2004/5	AFD-045	1.5 m to north
BER-078	2004/5	AFD-046	8.5 m to south-west
BER-077	2004/5	AFD-047	2.5 m to north-west
BER227-17	2017	AFD-052	4.5 m to north-east
BER228-17	2017	AFD-053	4.5 m to east
BER-210	2004/5	AFD-055	2.0 m to east
BER278-17	2017	AFD-060	2.5 m to south-west
BER279-17	2017	AFD-061	4.0 m to west
BER280-17	2017	AFD-062	2.5 m to south-east

Note *Means that BER-011 and BER-012 were redrills of BER-008 and BER-005 respectively.

Data from the DD holes has replaced the old RC information in the drillhole database used for resource estimation.

The 2021-22 DD successfully overcame the technical problems of recovery initiated by encountering mining voids or soft / wet samples in the 2004-05 and, to a much lesser extent, 2017 RC programs. Core recoveries, discounting the identified mining voids, were almost all in the high 90 percent range.

A thorough analysis was carried out by Aftermath of each twinned situation and while all voids did not match exactly, the smearing of grades and precision of the location of the mineralized intersections was greatly improved.

In terms of comparative grades, preliminary observations show that the diamond holes generally, but not always, reported grades on parity or higher than the RC holes. Intervals of mineralization were generally more discrete in the DD program, but generally compared well to the RC. Those RC holes with high calculated recoveries generally had intersections similar to the diamond drilling.

10.6 Aftermath validation of historic collar surveys

10.6.1 Introduction

All historical collars from 2004 onwards were re-surveyed or re-evaluated in 2021-22 to obtain their position in WGS84, UTM zone 19S. Field surveys were carried out by JRT, a registered survey company from Arequipa. JRT established 3 "Category C" beacons on the Berenguela Property which were registered with the Peruvian National Geographic Institute.

The method and outcome of the validation of drillhole collars from various campaigns is discussed in Sections 10.6.2 to 10.6.5.

10.6.2 2004-2005 RC holes

All sites were visited in November 2021 by JRT personnel accompanied by Aftermath personnel. Surveys were carried out using a DGPS (base station and mobile unit). Most of these holes are situated on non-rehabilitated drillpads. Of the 222 RC holes drilled in 2004-05:

- 99 concrete beacons with numbers were observed (45% of total).
- 89 concrete beacons without numbers were observed (40% of total).
- 7 physical holes with no beacon were observed (3% of total).
- 27 holes had no remaining evidence due to rehabilitation during later drilling (7% of total).
- 166 dips and azimuths were discernible from the construction of the beacons (75% of total).

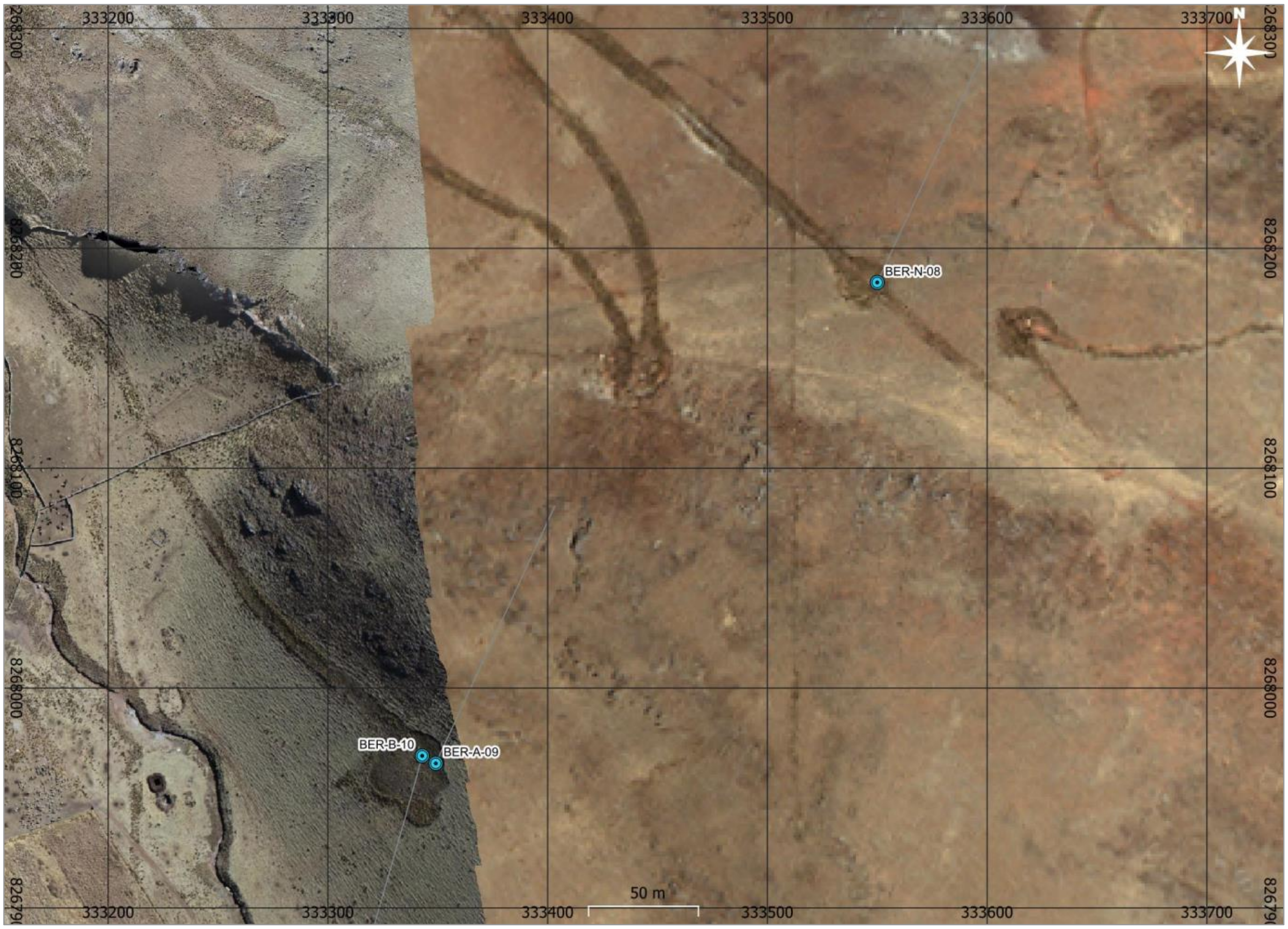
All holes, dips, and azimuths were observed to be in excellent relative correlation with previous survey maps from Silver Standard (albeit on a different datum) allowing drillhole numbers to be assigned with a high degree of confidence for those beacons without full identification. Those holes with no remaining evidence were found to be on old drillpads visible from historical satellite photos and 2022 drone images supplied by the survey contractor. Hole collars not physically surveyed were assigned elevations from the 2021 drone survey DEM models.

10.6.3 2010 and 2015 diamond drillholes

The collar coordinates in PSAD56 indicated as derived from handheld global positioning system (GPS) or DGPS were sourced from previous data records. JRT carried out a standard transformation to convert the collars to WGS84/19S. Utilizing the 2021 drone imagery, the transformed holes were seen to have a high degree of correspondence with vestiges of rehabilitated historical drillpads with the exception of BED-006 and BED-007 which were adjusted 5m west to fit, and BED-010 which was adjusted 10.5 m north-east. These errors are typical of those derived from handheld GPS instruments. No physical traces of the collars such as beacons were found due to rehabilitation of the sites. Seven holes in this group fell outside the drone survey imagery but were checked against the IKONOS image of 2004 and WV3 full colour imagery obtained by the Issuer in 2022. The comparisons showed a high degree of positional certitude. Hole collars were assigned elevations from the 2022 drone survey DEM models within the mineralized area or from the IKONOS DEM for those falling outside this zone.

Figure 10.4 shows examples of transformed 2010 drill collars plotted against drone imagery (left third of image) and satellite imagery (right two-thirds of image) showing positional accuracy with drillpad vestiges. All data shown is in WGS84/19S.

Figure 10.4 2010 drill collars plotted against historical pad locations



Source: Aftermath, 2023.

10.6.4 2017 RC drillholes

The collars of these drillholes were surveyed using DGPS methods in the PSAD56 coordinate system. JRT transformed the holes to WGS84/19S using standard techniques and elevations were derived from the 2021 drone survey DEM. Transformed holes plotted with excellent correlation to vestiges of rehabilitated drillpads with access roads etc. Three holes (BER224-17, BER228-17, and BER234-17) did not have coordinates supplied. Studies of the 2017 technical reports (especially drillpad reports) allowed these holes to be positioned with great deal of certainty. The position of the drillpad containing holes BER288-17, BER289-17, BER290-17, and BER291-17 was unclear due to the utilization of a road as a drillpad rendering positional comparisons unfeasible for this group. No physical vestiges of drilling were found as all beacons had been removed as part of rehabilitation regulations.

10.6.5 2019 Diamond drillholes

This group of four holes had been surveyed in WGS84/19S with DGPS or GPS units and were positioned with a high degree of correlation on vestiges of their rehabilitated drillpads.

10.7 Drilling conclusions

At this time there are no known drilling, sampling, or recovery factors that could impact the accuracy and reliability of the results. Aftermath have carried out several activities which have addressed earlier concerns regarding the location of drillhole collars and sample quality. This included twinning of RC holes with DD where recovery was poor. Drilling large diameter core and the collection of bulk density measurements was also carried out in the 2021-22 program as recommended in the 2021 AMC Technical Report.

A site visit was carried out by Ms Dinara Nussipakynova of AMC in July 2022. Several dozen drillhole beacons or drillpads encompassing all of the drilling from 2004 were visited across the full strike length of the mineralization and verified on plans by beacon number or drillpad location.

The findings of the site inspection are further discussed in Section 12.

11 Sample preparation, analyses, and security

11.1 Introduction

This section describes the sampling methods, analytical techniques, and assay QA/QC protocols employed at the Property between 2004 and October 2022. As mentioned in Section 10, pre-2004 holes were drilled by ASARCO and Charter but, due to poor record keeping, do not form part of the current project database.

The 2004, 2005, 2010, and 2015 programs were managed by Silver Standard. All work was carried out in accordance with the Silver Standard internal procedures. One program was carried out by Valor in 2017. In 2019, Rio Tinto completed four DD holes as part of a due diligence project. No written technical report is available for these drillholes; as such, there is no description of sampling methods and analysis.

QA/QC completed before 2021 is described in detail in prior technical reports. The QP has reviewed this work and, after independent analysis, accepts the results. This section includes a summary of these results.

The main sources of information for this section of the report come from:

- Raw data and assay certificates supplied by Aftermath.
- Notes and explanations accompanying the raw data.
- McCrea (2005a, 2005b), Batelochi (2018), and AMC's 2021 Technical Report.

Aftermath completed a QA/QC program for their core drilling, covering the period 10 March 2021 to 30 May 2022. In addition to this, Aftermath re-assayed a selection of pulps and coarse rejects from the drilling campaigns managed by previous owners of the Property. The re-assaying programs also included the submission of QA/QC samples. The programs are divided as follows in the order they were submitted to the laboratory:

- A: 2021 - 2022 core drilling QA/QC program
- B: Re-assay of 2017 program pulps
- C: Re-assay of 2004/5 program coarse rejects
- D: Re-assay of 2017 program coarse rejects

In addition, the following programs formed part of the overall assaying program in 2022. As results from these programs do not inform the resource database, these are listed here but will not be discussed.

- E: Umpire samples and submission of high Mn CRM – "BER-RENO"
- F: Re-assay of 2004/5 pulps

11.2 Sampling methods

11.2.1 Silver Standard

The following is a summary of the sampling methods undertaken for the 2004–05 Silver Standard program as stated in the 2005 Technical Report.

Silver Standard, during the 2004 and 2005 RC drill programs sampled the drillholes on one-metre intervals. RC drill samples were collected at the drill site by the drill crews.

RC samples were collected at the drill rig as follows:

- Samples were split by the drilling crew.
- Samples were split by a Jones splitter into three samples down to 1/8th size, creating samples ranging from 2 – 10 kg in weight.
- Approximately, every 40th sample had a second field duplicate sample taken.
- RC drillholes were sampled from collar to total depth.
- All samples were bagged and tagged, sent to the warehouse where they were prepared for shipment.
- Prior to shipment, blanks (1:40) and standards (1:20) were inserted into the sample stream.

The QP notes that while the procedure was to insert one blank every 40 samples, the actual insertion rate is much higher, see Table 11.4.

Following is a summary of the sample method from the 2018 JORC Report for the 2010 and 2015 DD campaigns carried out by Silver Standard:

- Sample intervals were generally 1.5 m, ranging from 0.5 – 1.5 m.
- Sample intervals were demarcated by geological characteristics.
- Samples were placed in plastic boxes and tagged and readied for shipment to the preparation laboratory.

A check by the QP showed that in the 2010 campaign, samples had a mean of 1.39 m with a minimum of 0.15 m and a maximum of 9.5 m. The corresponding statistics for 2015 is a mean of 1.22 m with a minimum of 0.5 m and a maximum of 2.2 m.

11.2.2 Valor

The 2017 RC sampling program is summarized from the 2018 Valor JORC Report.

Samples were acquired from the cyclone and placed in two plastic bags for each 1.0 m drilled. Samples were appropriately tagged. The material was quartered using a riffle splitter, to maximize homogeneity.

From the first splitter pass a sample was placed into a bag for chip logging and the remainder was divided into two samples of approximately 2 kg each. One of these samples was stored and the other sent to the laboratory. To create a duplicate sample, the laboratory sample was split.

11.2.3 Aftermath

Cores were marked and sawn at the dedicated core-saw facility in the Limon Verde camp. Generally, samples were 1 m in length in mineralization and 1.5 m in length in areas not considered mineralized. Samples were selected on geological contacts where appropriate. For HQ cores, half of the core was taken for analysis with a quarter core used for duplicate samples. For PQ core, a quarter of the core was taken for analysis with a corresponding quarter used for duplicate samples.

11.3 Sample shipment and security

11.3.1 Silver Standard

For the 2004 and 2005, programs Silver Standard staff would periodically deliver the samples to the ALS Chemex Labs depot in Arequipa and the samples were shipped to Lima, Peru for preparation. The assay pulps were shipped to ALS Chemex Labs in North Vancouver for analysis.

Samples in 2010 and 2015 were shipped to SGS Laboratories in Arequipa by Silver Standard for preparation. The assay pulps were then sent to SGS Laboratories in Callao.

11.3.2 Rio Tinto and Valor

Samples in 2017 were shipped to SGS Laboratories in Arequipa by Valor for preparation. The assay pulps were then sent to SGS Laboratories in Callao. The 2019 samples were prepared and analyzed for Rio Tinto by ALS Lima. Details of shipment and security are not known. Three of the Rio Tinto drillholes were within the model but the grades are low and do not impact the estimate.

11.3.3 Aftermath

As of early 2022, historical samples from 2004 to 2019 were stored principally in Lima in the Silver Standard secure warehouse (mostly RC coarse rejects and sample pulps from all historical assay campaigns). Cores from 2010, 2015, and 2019 were stored at Limon Verde. In general, the storage in Lima was of a disordered nature whilst the cores at Limon Verde were relatively well stacked in a secure indoor environment. During the period of May to September 2022, all historical samples were moved to a dedicated secure warehouse in Arequipa which is also the storage for the 2021-22 samples. The warehouse is in an industrial area of Arequipa, close to the airport.

Samples were shipped to ALS in Arequipa where they were prepared for analysis before being sent to Lima for analysis. Umpire samples were sent to SGS in Arequipa for preparation before being sent to Lima for analysis.

The laboratories used for all programs for sample preparation and analysis are shown in Table 11.1.

11.4 Sample preparation and analysis

11.4.1 Silver Standard

Samples taken by Silver Standard for the 2004–05 program were prepared using a standard sample preparation (PREP-31) to produce a 250-gram pulp.

The analyses performed were four acid "near total" digestion with a 27 element Inductively Coupled Plasma (ICP) analysis (ME-ICP61). Samples over the maximum for silver (200 ppm), copper (100,000 ppm), or manganese (100,000 ppm) were re-analyzed using Atomic Absorption (AA62b) and samples > 1,000 Ag ppm were analyzed using a fire assay procedure with a gravimetric finish (Ag- GRA21).

The samples taken by Silver Standard for the 2010 and 2015 program were prepared and analyzed in the same manner.

11.4.2 Valor

Following is the sample preparation procedure carried out for the 2017 RC program, as summarized in the 2018 Valor JORC Report:

- Reception - Samples were received and checked with the sample form from Berenguela.
- Data Entry – SGS followed an internal procedure to generate the "Presheet" worksheet which was printed and checked against the physical samples.
- Weight - samples were weighed and data were recorded online.
- Drying - at 105°C controlled.
- Primary Crushing - Final product ~¼" (6 mm).
- Secondary Crushing - Final product at -10 # (2 mm) at 90% P_{80}.
- Homogenized – Further homogenized using a riffle splitter.

- Riffle Splitter - Successive reduction size until obtained approximately 250 g and the reject was stored.
- Pulverized - Pulverized 250 g with final product -140 # at 90% P_{80}.
- Sample pulps were assayed by SGS – Callao – Peru. The analysis was carried out by two main Multi Element Analysis procedures: SGS-MN-ME-41 - ICP40B and SGS-MN-ME-41 - AAS41B.

11.4.3 Aftermath

The samples for Aftermath were prepared at ALS Arequipa and analyzed at the ALS Laboratory in Lima. After reception and logging into the system at Arequipa the samples were fine crushed to 70% passing 2 mm and after riffle split to 250 g, were pulverized to 85 passing 75 micrometres (µm).

The following is a summary of the analytical methods used for each Aftermath program:

- A: analyzed at ALS Lima, sample pulps were analyzed using ME-ICP61. For samples > 100 Ag ppm, >1% Cu, > 10% Mn and > 1% Zn, OG-62 was used as the second pass. Very high Ag samples (> 1,500 ppm) were analyzed using Ag_GRA-21 as a third pass.
- B, C, and D: analyzed at ALS Lima, samples were analyzed using OG-62. Very high Ag samples (>1,500 ppm) were analyzed using Ag_GRA-21 as a second pass.

11.4.4 Laboratory summary

Table 11.1 summarizes the preparation and analytical laboratories used in the QA/QC programs categorized by year and company. All laboratories were independent of the company submitting the samples.

Table 11.1 Summary of laboratory accreditation

Company	Year	Laboratory	Location	Accreditation
Silver Standard	2004 - 2005	ALS	Prep - ALS Lima, Peru S.A.	ISO 17025
			Analytical (RC) - North Vancouver	ISO 9001
		Actlabs*	Umpire - Peru	Not known
	2010, 2015	SGS Laboratories	Prep (DD) – Arequipa, Peru	ISO 17025
			Analytical (DD) – Callao, Peru	ISO 17025
Valor	2017	SGS Laboratories	Prep (DD) – Arequipa, Peru	ISO 17025
			Analytical (DD) – Callao, Peru	ISO 17025
Rio Tinto	2019	ALS	Lima, Peru	ISO 17025
Aftermath	2021-22	ALS	Prep – Arequipa, Peru	ISO 17025
			Analytical - Lima, Peru	ISO 17025
		SGS Laboratories (umpire only)	Prep – Arequipa, Peru	ISO 17025
			Analytical – Lima, Peru	ISO 17025

Notes: *The QP is assuming that Actlabs was Actlabs Skyline Peru which was a subsidiary of Actlabs Canada at the time.

11.4.5 Detection limits

Table 11.2 summarizes the detection limits of the various analytical methods used from 2004 to 2022.

Table 11.2 Summary of detection limits

			Detection limit range			
Laboratory	**Year**	**Method**	**Ag (ppm)**	**Mn (ppm)**	**Cu (ppm)**	**Zn (ppm)**
ALS	2004	AA62	1 - 1000	NA	10 - 100,000	NA
		AA62b	1 - 1000	NA	10 - 100,000	NA
		Mn_Mn_AA62b	NA	10 - 50,000	NA	NA
		MnO_AA62b	NA	10 - 50,000	NA	NA
		Ag_GRA21	5 - 100,000	NA	NA	NA
		ICP41	0.2 - 100	5 - 10,000	1 - 10,000	2 - 10,000
		ME-ICP61a	1 - 200	10 - 100,000	10 - 100,000	20 - 100,000
ALS	2005	AA62	1 - 1000	NA	10 - 100,000	NA
		AA62b	1 - 1000	NA	10 - 100,000	NA
		Mn_Mn_AA62b	NA	10 - 50,000	NA	NA
		MnO_AA62b	NA	10 - 50,000	NA	NA
		Ag_GRA21	5 - 100,000	NA	NA	NA
		ICP41	0.2 - 100	5 - 10,000	1 - 10,000	2 - 10,000
		ME-ICP61a	1 - 200	10 - 100,000	10 - 100,000	20 - 100,000
ALS	2010	AA62	1 - 1000	NA	10 - 100,000	NA
		AA62b	1 - 1000	NA	10 - 100,000	NA
		Mn_Mn_AA62b	NA	10 - 50,000	NA	NA
		MnO_AA62b	NA	10 - 50,000	NA	NA
		Ag_GRA21	5 - 100,000	NA	NA	NA
		ICP41	0.2 - 100	5 - 10,000	1 - 10,000	2 - 10,000
		ME-ICP61a	1 - 200	10 - 100,000	10 - 100,000	20 - 100,000
SGS	2015	ICP40B	0.2 - 100	2 - 10,000	0.5 - 10,000	0.5 - 10,000
		AAS41B	10 - 4,000	10 - 20,000	20 - 20,000	100 - 20,000
SGS	2017	ICP40B	0.2 - 100	2 - 10,000	0.5 - 10,000	0.5 - 10,000
		AAS41B	10 - 4,000	10 - 20,000	20 - 20,000	100 - 20,000
ALS	2019	ME-MS61L	0.002 - UKN	0.2 - UKN	200 - UKN	0.2 - UKN
		Zn-OG62	NA	NA	NA	10 - UKN
SGS	2022	ICP40V	1 - 4000	50 - 400,000	50 - 400,000	50 - 500,000
		Ag FAG313	10 - 10,000	NA	NA	NA
ALS	2022	ME-ICP61	0.5 - 100	5 - 100,000	1 - 10,000	2 - 10,000
		Ag-GRA21	5 - 10,000	NA	NA	NA
		Ag-OG62	1- 1,500	NA	NA	NA
		Cu-OG62	NA	NA	10 - 50,000	NA
		Mn-OG62	NA	100 - 60,000	NA	NA
		Zn-OG62	NA	NA	NA	10 - 30,000

Note: UKN = Upper Detection Limit for these analytical methods is not known. NA= Not applicable.
Source: AMC, 2023, using data provided by Aftermath.

11.5 Quality Assurance and Quality Control

11.5.1 Introduction

The following discussion is based on the QP's independent review of the QA/QC databases associated with the pre-2021 QA/QC programs and the 2021-2022 QA/QC programs completed by Aftermath. The Aftermath programs are categorized into six distinct programs of which four are relevant to the data informing the block model:

- A: Certified reference materials (CRMs), coarse and pulp blanks, and field duplicates submitted with the core drilling program.
- B: CRMs and pulp blanks submitted during the re-assay program of the 2017 pulps.
- C: CRMs, coarse and pulp blanks, and coarse reject duplicates submitted during the re-assay program of the 2004-05 coarse rejects.
- D: CRMs, coarse and pulp blanks and coarse reject duplicates submitted during the re-assay program of the 2017 coarse rejects.

CRMs, blanks, and duplicate samples are monitored for Ag, Mn, Cu, and Zn. Programs A – D were analyzed by ALS.

Section 11.6 discusses the results of the re-assayed samples.

A summary of QA/QC samples analyzed in all programs are presented in Table 11.3. Table 11.4 summarizes the insertion rate of the QA/QC samples. The summaries are tabulated by year, drilling type, and company.

Table 11.3 QA/QC samples by year

Year	Company	Drilling type	Drill samples	CRMs	Blanks	Field duplicates	Coarse duplicates	Pulp duplicates	Umpire samples
2004-05	Silver Standard	RC	18,483	948	1,048	524	-	-	559
2010		DD	1,620	95	94	92	-	-	-
2015		DD	1,520	28	40	38	-	-	-
2017	Valor	RC	8,465	148	99	198	-	-	-
2019	Rio Tinto	DD	705	41	36	24	-	-	-
Pre-2021			***30,793***	***1,260***	***1,317***	***876***	***-***	***-***	***559***
2021-22	Aftermath								
	A	DD	5,876	441	441	294	-	-	-
	B	RC	1,206	92	30	-	-	-	-
	C	RC	1,425	71	144	-	72	-	-
	D	RC	208	11	20	-	11	-	
Aftermath			***8,715***	***615***	***635***	***294***	***83***	***-***	***-***
Total			**39,508**	**1,875**	**1,952**	**1,170**	**83**	**-**	**559**

Notes:
- Count of unique samples is based on silver assays. There are small variations in number of analyses between silver and other analyzed elements.
- Samples may have been analyzed by several methods.
- Count of field duplicates include all sample ids submitted whether valid results were returned or not.

Source: AMC, 2023, using data provided by Aftermath.

Table 11.4 QA/QC insertion rates

Year	Company	Drilling type	Drill samples	CRMs	Blanks	Field duplicates	Coarse duplicates	Pulp duplicates	Umpire samples
2004-05	Silver Standard	RC	18,483	5%	6%	3%	-	-	3%
2010		DD	1,620	6%	6%	6%	-	-	-
2015		DD	1,520	2%	3%	3%	-	-	-
2017	Valor	RC	8,465	2%	1%	2%	-	-	-
2019	Rio Tinto	DD	705	6%	5%	3%	-	-	-
2021-22	Aftermath								
	A	DD	5,876	8%	8%	5.0%	-	-	-
	B	RC	1,084	8%	2%	-	-	-	-
	C	RC	1,138	5%	10.%	-	5.1%	-	-
	D	RC	166	5%	10%	-	5.3%	-	-

Notes:
- Count of unique samples is based on silver assays. There are small variations in number of analyses between silver and other analyzed elements.
- Samples may have been analyzed by a number of methods.
- Count of duplicates include all sample ids submitted whether assay results were returned by the effective date of the report.

Source: AMC, 2023, using data provided by Aftermath.

11.5.2 Certified Reference Materials

11.5.2.1 Description

The following CRM description relates to the assays submitted by Aftermath. A summary of CRM performance for the programs prior to 2021 is contained in Section 11.5.2.3.

Five different CRMs (BER-21-1, BER-21-2, BER-21-3, CRM927, and BER_RENO), totalling 711 samples, were submitted by Aftermath. A summary of the CRMs for programs A-D and F is contained in Table 11.5.

Table 11.5 Summary of 2021-2022 CRMs submitted by Aftermath (programs A-D, F)

CRM ID	Source	Number of samples (programs A – D & F	Ag (ppm)		Mn (%)		Cu (%)		Zn (%)	
			Exp. value	SD	Exp. value	SD	Exp. value	SD	Exp. value	SD
BER-21-1	OREAS	93	43	1.43	3.0137	0.1171	0.1828	0.0043	0.1733	0.0062
BER-21-2	OREAS	166	104	3	7.1897	0.2597	0.4274	0.0138	0.4185	0.0153
BER-21-3	OREAS	130	157	5	10.7027	0.2667	0.6419	0.0177	0.628	0.0196
CRM927	OREAS	192	4.08	0.45	0.115	0.004	1.08	0.024	0.0716	0.00358
BER_RENO	KCA	130	347.65	13.06	18.27	0.75	1.44	0.03	0.80	0.04
Total		**711**								

Notes: Count of unique samples is based on silver assays.
OREAS = Ore Research and Exploration; Exp. = Expected.
Source: AMC, 2023, using data provided by Aftermath.

Three CRMs (BER-21-1, BER-21-2, and BER-21-3) were sourced from a high-grade manganese-copper-silver ore, obtained from the Project area, and were blended with barren limestone to achieve the target Mn grade. Aftermath supplied the high-grade mineralization to Ore Research and Exploration (OREAS) in Australia for preparation. Each CRM (5 x 20-gram pulp samples) were submitted to ten laboratories for round robin analysis using 4-acid digestion with ICP-OES or ICP-MS finish.

CRM927 is part of from a suite of 16 copper CRMs prepared from the CSA mine located in western New South Wales, Australia. Mineralization there is hosted in a thinly bedded turbiditic sequence of carbonaceous siltstones and mudstones. The CRM was subjected to round robin testing involving 19 laboratories which analyzed the CRMs using 4-acid digestion with ICP-OES, ICP-MS, or atomic absorption spectroscopy (AAS) finish. Each laboratory was supplied with six samples for analysis.

The BER-RENO CRM was sourced from high-grade composite sample of Berenguela material collected by KCA of Reno during their ownership of the Berenguela project. This composite sample identified as KCA Sample Number 93544 weighed several hundred kilograms and was collected from high-grade mineralization on surface and underground at Berenguela. A 50 kg aliquot of the sample was sourced in 2022 at KCA in Reno and milled to pass 200 µm mesh. Approximately 500 subsamples weighing 100 g each were split off. A round-robin assay program was carried out by KCA – ultimately resulting in the analysis of 5 samples at seven different laboratories using 4 acid-digestion and ICP analysis.

11.5.2.2 Discussion on Aftermath CRMs

CRMs contain standard, predetermined concentrations of material which are inserted into the sample stream to check the analytical accuracy of the laboratory. Industry best practice typically advocates an insertion rate of at least 5 – 6% of the total samples assayed (Long et al., 1997; Mendez, 2011; Rossi and Deutsch, 2014). Insertion rates of CRMs for the Aftermath assay programs meet these requirements.

For each economic mineral, it is recommended to use at least three CRMs with values:

- At the approximate cut-off grade of the deposit.
- At the approximate expected grade of the deposit.
- At a higher grade.

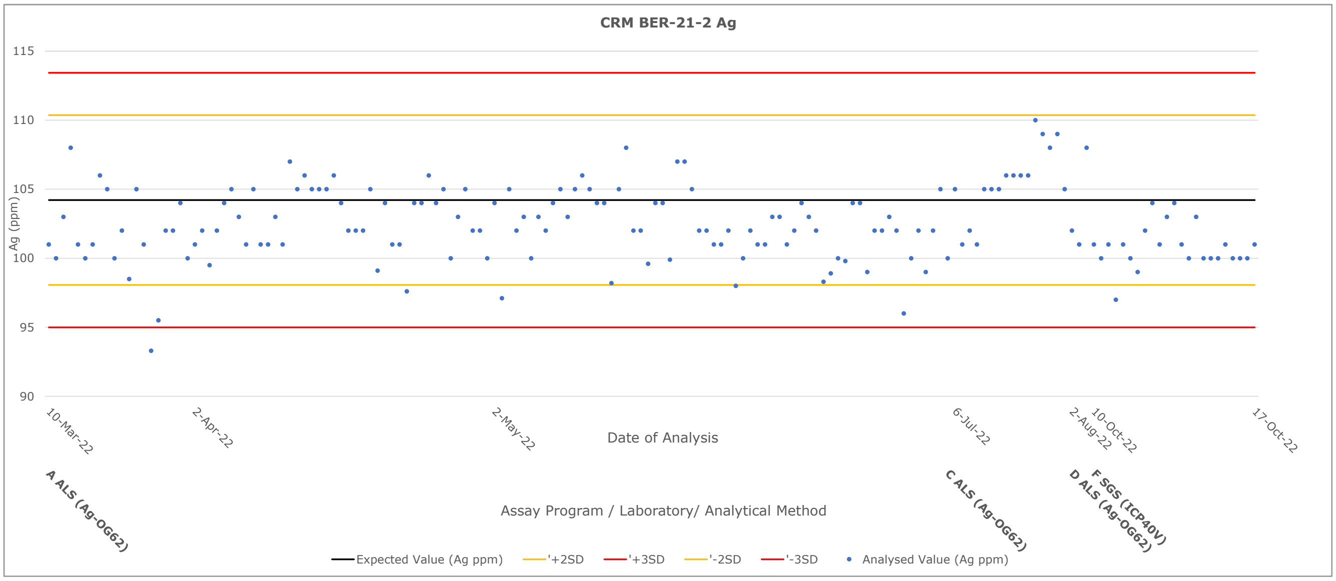
The average grade of the current Mineral Resource is approximately 78 grams per tonne (g/t) Ag, 6.1% Mn 0.67% Cu, and 0.34% Zn. A cut-off grade of 80 g/t silver equivalent (AgEq) has been used to estimate the Resource. This roughly equates to 20 g/t Ag, 1.5% Mn, 0.2% Cu, and 0.1% Zn. The appropriate grade ranges are covered by the submitted CRMs.

Industry best practice is to investigate, and where necessary re-assay, batches where two consecutive CRMs occur outside two standard deviations (warning), or one CRM occurs outside of three standard deviations (fail) of the expected value described on the assay certificate. Aftermath have adopted these failure criteria when assessing CRM results. Aftermath monitored the results of the CRM performance as results were returned. The rate of failure and the constraints of the analytical methods were used to assess whether re-assaying of batches was required. For example, for ALS method ME-ICP61 values within ±10% of the certified value of the CRM are considered reasonable. No re-assaying of batches was undertaken.

Control charts are commonly used to monitor the analytical performance of an individual CRM over time. CRM assay results are plotted in order of analysis along the X axis. Assay values of the CRM are plotted on the Y axis. Control lines are also plotted on the chart for the expected value of the CRM, two standard deviations above and below the expected value (defining a "warning" threshold), and three standard deviations above and below the expected value (defining a "fail" threshold). Control charts show analytical drift, bias, trends, and irregularities occurring at the laboratory over time.

Figure 11.1 to Figure 11.4 show the CRM control charts for BER-21-2 for Ag, Mn, Cu, and Zn, respectively.

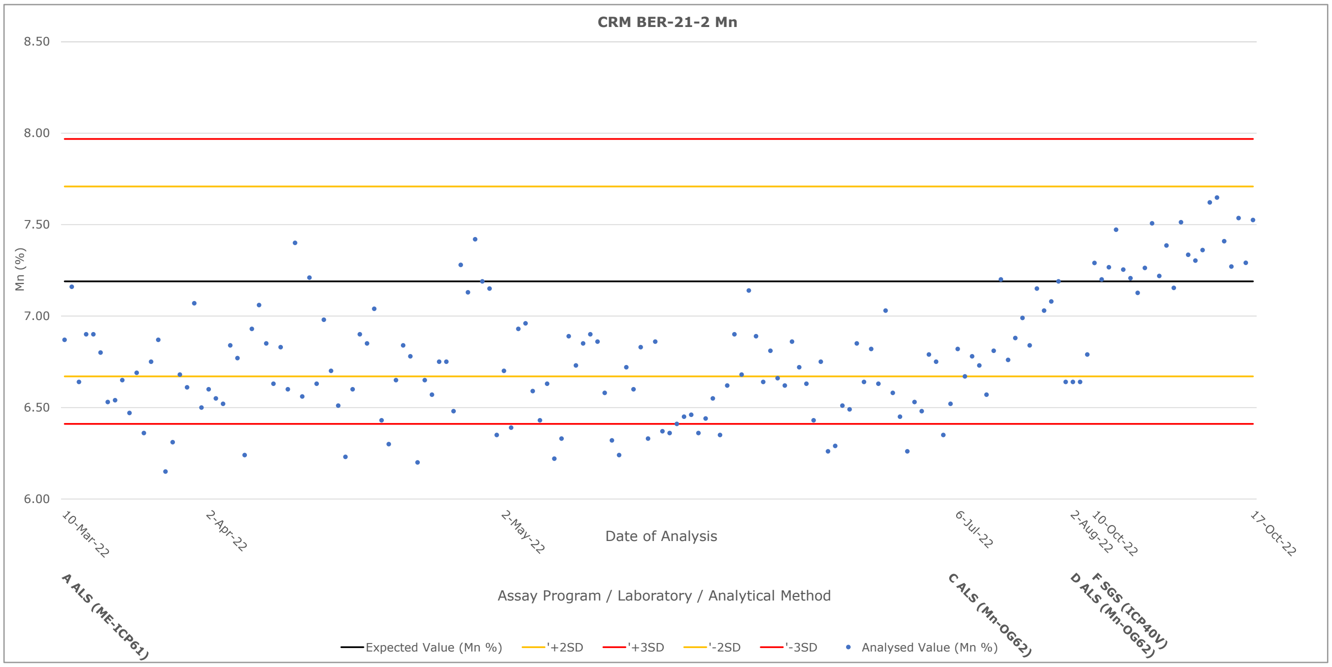
Figure 11.1 Control chart for CRM BER-21-2 (Ag), all Aftermath assay programs



Notes:
- Data shown is from 10 March 2022 – 17 October 2022.
- Assay Programs A, C, D were analyzed at ALS Lima, F was analyzed at SGS Lima.
- This CRM is biased low for silver.

Source: AMC, 2023, using data provided by Aftermath.

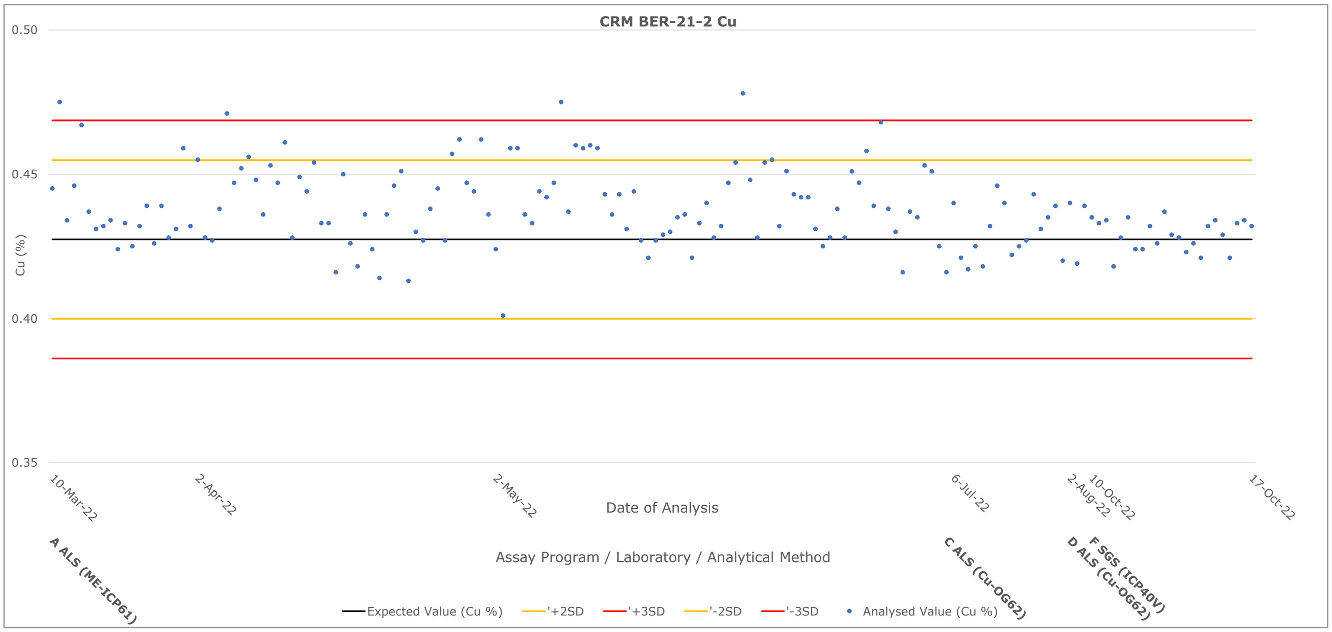
Figure 11.2 Control chart for CRM BER-21-2 (Mn), all Aftermath assay programs



Notes:
- Data shown is from 10 March 2022 – 17 October 2022.
- Assay Programs A, C, D were analyzed at ALS Lima, F was analyzed at SGS Lima.
- This CRM is biased low for manganese.

Source: AMC, 2023, using data provided by Aftermath.

Figure 11.3 Control chart for CRM BER-21-2 (Cu), all Aftermath assay programs

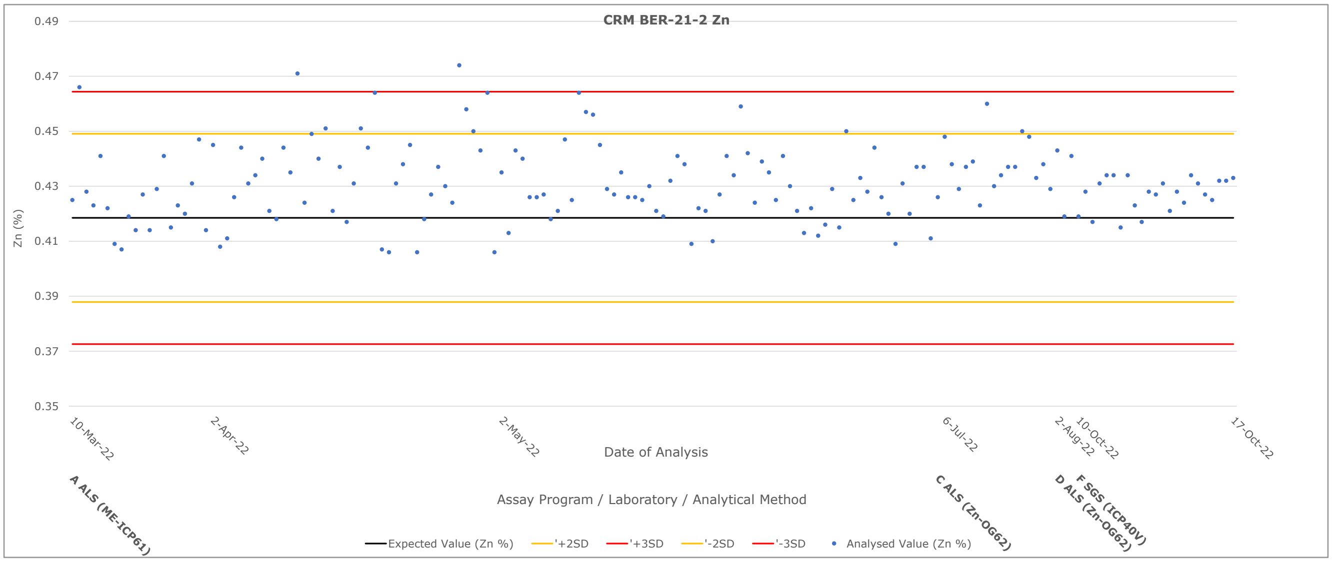


Notes:

- Data shown is from 10 March 2022 – 17 October 2022.
- Assay Programs A, C, D were analyzed at ALS Lima, F was analyzed at SGS Lima.
- This CRM is biased high for copper.

Source: AMC, 2023, using data provided by Aftermath.

Figure 11.4 Control chart for CRM BER-21-2 (Zn), all Aftermath assay programs



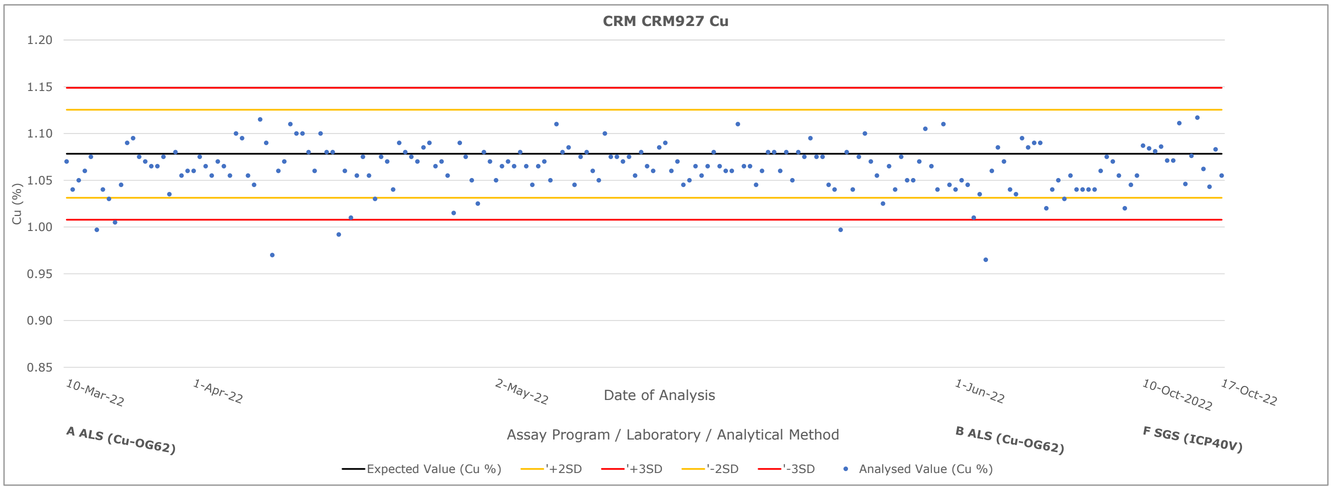
Notes:

- Data shown is from 10 March 2022 – 17 October 2022.
- Assay Programs A, C, D were analyzed at ALS Lima, F was analyzed at SGS Lima.
- This CRM is biased high for Zn.

Source: AMC, 2023, using data provided by Aftermath.

Figure 11.5 shows the CRM control chart for CRM927 for Cu, due to this CRM being a copper CRM only.

Figure 11.5 Control chart for CRM 927 (Cu), all Aftermath assay programs



Notes:
- Data shown is from 10 March 2022 – 17 October 2022.
- Assay Programs A - D were analyzed at ALS Lima and F was analyzed at SGS Lima.

Source: AMC, 2023, using data provided by Aftermath.

Table 11.6 to Table 11.9 summarize the warning / failure rates for all CRMs, categorized by Aftermath's assay program.

Table 11.6 CRM results (Ag)

CRM ID	Program	Number of assays	Low warning (-2SD)	High warning (+2SD)	Low fail (-3SD)	High fail (+3SD)	Fail rate (>3SD)
BER-21-1	A	76	0	4	0	2	3%
BER-21-2	A	123	5	0	1	0	1%
	C	17	0	0	0	0	0%
	D	3	0	0	0	0	0%
BER-21-3	A	95	7	0	2	0	2%
	C	18	1	0	0	0	0%
	D	2	0	0	0	0	0%
BER-RENO	B	61	0	0	0	0	0%
	C	36	0	2	0	0	0%
	D	6	0	0	0	0	0%

Source: AMC, 2023, using data provided by Aftermath.

Table 11.7 CRM results (Mn)

CRM ID	Program	Number of assays	Low warning (-2SD)	High warning (+2SD)	Low fail (-3SD)	High fail (+3SD)	Fail rate (>3SD)
BER-21-1	A*	76	34	0	9	0	12%
BER-21-2	A	123	44	0	23	0	19%
	C	17	4	0	0	0	0%
	D	3	2	0	0	0	0%
BER-21-3	A (10%)	51	11	0	13	0	25%
	A (8.5%)	44	9	0	4	0	9%
	C	18	4	0	2	0	11%
	D	2	0	0	0	0	0%
BER-RENO	B	61	1	0	0	0	0%
	C	36	0	0	0	0	0%
	D	6	10	0	0	0	0%

Notes:
- Assay Programs A - D were analyzed at ALS Lima and F was analyzed at SGS Lima.
- *2 warnings recorded in the same batch / certificate number.
- A: Change in overlimit threshold for Mn analysis, initially 10.5%, reduced to 8.5% after sample 51703025, for all subsequent programs the overlimit of 8.5% Mn was applied, triggering analysis by Mn_OG-62.

Source: AMC, 2023, using data provided by Aftermath.

Table 11.8 CRM results (Cu)

CRM ID	Program	Number of assays	Low warning (-2SD)	High warning (+2SD)	Low fail (-3SD)	High fail (+3SD)	Fail rate (>3SD)
BER-21-1	A	76	3	5	0	1	1%
BER-21-2	A*	123	0	17	0	4	3%
	C	17	0	0	0	0	0%
	D	3	0	0	0	0	0%
BER-21-3	A*	95	0	12	0	10	11%
	C	18	1	0	0	0	0%
	D	2	0	0	0	0	0%
BER-RENO	B	61	3	0	3	0	5%
	C	36	2	0	1	0	3%
	D	6	0	0	0	0	0%

Notes: *2 warnings recorded in the same batch / certificate number.
Source: AMC, 2023, using data provided by Aftermath.

Table 11.9 CRM results (Zn), all Aftermath programs

CRM ID	Program	Number of assays	Low warning (-2SD)	High warning (+2SD)	Low fail (-3SD)	High fail (+3SD)	Fail rate (>3SD)
BER-21-1	A	76	0	13	0	4	5%
BER-21-2	A*	123	11	0	3	0	2%
	C	17	2	0	0	0	0%
	D	3	0	0	0	0	0%
BER-21-3	A*	95	9	7	4	2	6%
	C	18	0	1	0	0	0%
	D	2	0	0	0	0	0%
BER-RENO	B	61	0	0	0	0	0%
	C	36	0	0	0	0	0%
	D	6	0	0	0	0	0%

Notes:
- Assay Programs A - D were analyzed at ALS Lima and F was analyzed at SGS Lima.
- *2 warnings recorded in the same batch / certificate number.

Source: AMC, 2023, using data provided by Aftermath.

The QP makes the following comments regarding the performance of the CRMs during the Aftermath assay programs:

- BER-21-1:
  - All programs showed a low bias for Mn, with reasonably high failure rates. This indicates that the Mn estimate will be conservative.
- BER-21-2:
  - All assay programs performed well, with very few failures for Ag, Cu, and Zn. Again, there was a low bias for Mn.
- BER-21-3:
  - Program A contained failures for all elements, with a notable high bias for Cu. No failures were recorded for Ag, Cu, and Zn in the other programs.
  - For Mn, a change in overlimit threshold was applied during program A. The overlimit threshold was reduced from 10 to 8.5%. Samples greater than the threshold were analyzed by Mn-OG-62 instead of ME-ICP61. This improved the performance of the CRM for Mn considerably.
- CRM927:
  - This CRM was submitted as a high-grade Cu CRM, with relatively low levels of the other elements.
  - For program A, Cu showed a low bias with a small number of failures. Similar results were recorded for the other programs.
- BER-RENO:
  - This CRM performed very well, no failures for Ag, Mn, and Zn.
  - There were some failures for Cu in program B (ALS Cu_OG-62), all of which were low failures.
- There does appear to be differences in bias based on analytical method, particularly between methods ME-ICP61 and ICP40V. The ICP40V method (although a much smaller sample set) appears to provide a tighter grouping of results with slighter higher grades overall; however, these differences are within acceptable limits.

The QP considers the CRM performance reasonable.

11.5.2.3 Discussion on CRMs prior to 2021

A total of 12 different CRMs were used from 2004 - 2019. Each CRM was subjected to differing levels of round robin analysis. The CRMs used in 2004 and 2005 were not tested as robustly as subsequent CRM material. The insertion rate of CRMs varied across the different programs. Ideally, an insertion rate of 5% of total samples is required. The 2015 and 2017 programs did not meet this requirement, where insertion rates were 2% relative to total samples.

Table 11.10 to Table 11.13 summarize the CRM performance for Ag, Mn, Cu, and Zn, respectively, for the period 2004 – 2019.

Table 11.10 Ag CRM results (2004 - 2019)

CRM ID	Expected value (g/t)	SD	Analytical method	Number of assays	Fail rate (>3SD)
CDN-HZ-2	61.1	2.05	Ag_ICP40B_ppm	66	3%
CDN-ME-12	52.5	2.15	Ag_ICP40B_ppm	61	5%
			Ag_ME-ICP61a_ppm	36	0%
CDN-ME-4	414	8.5	Ag_AAS41B_g/t	44	0%
			Ag_Ag-AA62_ppm	36	3%
			Ag_ICP40B_ppm	21	0%
OREAS600b	25.1	1	Ag_ME-MS61L_ppm	38	0%
OREAS603b	301	10	Ag_Ag-OG62_ppm	3	0%
AMARILLO	145	0.5	Ag_ME-ICP61a_ppm	428	84%
ROJO	640	2	Ag_Ag-AA62_ppm	319	91%
			Ag_Ag-AA62b_ppm	94	88%
			Ag_ME-ICP61a_ppm	20	100%

Note: SD=standard deviation.
Source: AMC., 2021, using data provided by Aftermath.

Table 11.11 Mn CRM results (2004 - 2019)

CRM ID	Expected value (%)	SD	Analytical method	Number of assays	Fail rate (>3SD)
OREAS600b	0.0293	0.0012	Mn_ICP40B_ppm	3	100%
			Mn_ME-MS61L_ppm	35	0%
OREAS603b	0.0142	0.0008	Mn_ME-MS61L_ppm	3	67%
AMARILLO	16.56	0.035	Mn_Mn-AA62b_%	71	77%
			MnO_Mn-AA62_%	338	79%
AZUL	0.036	0.00155	Mn_ME-ICP61a_ppm	92	54%
ROJO	21.38	0.255	Mn_Mn-AA62b_%	72	6%
			MnO_Mn-AA62_%	341	14%

Note: SD=standard deviation.
Source: AMC, 2021, using data provided by Aftermath.

Table 11.12 Cu CRM results (2004 - 2019)

CRM ID	Expected value (%)	SD	Analytical method	Number of assays	Fail rate (>3SD)
CDN-HZ-2	1.36	0.03	Cu_AAS41B_%	66	3%
CDN-ME-12	0.428	0.01	Cu_AAS41B_%	2	100%
			Cu_ICP40B_ppm	59	8%
			Cu_ME-ICP61a_ppm	36	0%
CDN-ME-4	1.83	0.04	Cu_AAS41B_%	65	0%
			Cu_ME-ICP61a_ppm	36	0%
OREAS600b	0.0499	0.0013	Cu_ME-MS61L_ppm	38	0%
OREAS603b	0.0000973	0.0000023	Cu_ME-MS61L_ppm	3	33%
AMARILLO	1.1	0.005	Cu_ME-ICP61a_ppm	428	54%
AZUL	0.0013	0.0001	Cu_ME-ICP61a_ppm	92	50%
ROJO	1.02	0.015	Cu_ME-ICP61a_ppm	433	16%

Note: SD=standard deviation.
Source: AMC, 2021, using data provided by Aftermath.

Table 11.13 Zn CRM results (2004 - 2019)

CRM ID	Expected value (%)	SD	Analytical method	Number of assays	Fail rate (>3SD)
CDN-HZ-2	7.2	0.18	Zn_AAS41B_%	64	2%
			Zn_ICP40B_ppm	2	100%
CDN-ME-12	0.28	0.01	Zn_AAS41B_%	2	100%
			Zn_ICP40B_ppm	59	0%
			Zn_ME-ICP61a_ppm	36	0%
CDN-ME-4	1.1	0.03	Zn_AAS41B_%	65	0%
			Zn_ME-ICP61a_ppm	36	0%
OREAS600b	0.0404	0.0014	Zn_ME-MS61L_ppm	38	0%
OREAS603b	0.199	0.007	Zn_ME-MS61L_ppm	3	100%

Note: SD=standard deviation.
Source: AMC, 2021, using data provided by Aftermath.

Previous technical reports do not explicitly specify what criteria was used by each company to assess the failure of CRM samples. There were no procedures in place to re-run samples if failures did occur. When analyzing the CRM results, the author of the 2018 Technical Report discusses failure rates but does not define what is considered a failed CRM sample.

The following comments are made regarding failure rates:

- Ideally, CRM failure rates should be less than 5%.
- Any CRM with less than 10 samples are not considered in the discussion.
- There is a very high failure rate for CRMs used in the 2004 – 2005 programs.
- The AZUL CRM failures for Cu could be attributed to the CRM value being below the detection limit of the analytical method used.
- There was limited round robin testwork to define Amarillo, Azul, and Rojo CRMs, which brings into question the validity of the statistics. The basis of all the pass / fail analysis is questionable.
- Only a limited number of Mn CRMs were analyzed giving an incomplete data set.
- All CRMs used from 2010 to 2019 performed relatively well for all elements and analytical methods, excluding those analytical methods with limited sampling.

The CRMs used prior to 2021 covered the expected grade ranges; however, there were problems with some CRMs values being near the detection limit of the analytical methods, the veracity with which the CRMs were certified and the low insertion rates of some CRMs.

A review of the control charts found a distinct change in CRM performance between the 2004 - 2005 program against all subsequent programs.

The performance of the 2004 – 2005 CRMs is poor, and the following is noted:

- There does not seem to be a pattern of failure (i.e., not always high or low).
- There was no change in laboratory between the 2005 and 2010; only a change in CRMs used. Company ownership remained the same during this period.
- The change in laboratory in 2015 may account for some of the improvements; however, it is more likely an issue with the CRM.
- No corrective measures (e.g., re-run batches) were completed. It is difficult to pin-point the exact cause of the poor performance.
- The AZUL CRM for Cu shows there might be a problem with the CRM being at the detection limit of the analytical method. The CRM is certified at 13 ppm and the detection limit of the ME-ICP61a analytical method is 10 ppm. It also appears that the lower detection limit (LDL) was 20 ppm at times. All samples for the AZUL CRM were analyzed in 2004.
- The CRMs produced by ALS Chemex for the 2004 – 2005 program (i.e., AMARILLO, AZUL, and ROJO) were subjected to limited round robin analysis compared to the other CRMs (six laboratories and 60 samples versus >15 laboratories and > 100 samples for the CDN and OREAS CRMs). Review of the CRM certificates showed that the RSD % for Azul exceeded 5% for both Cu and Mn.

The performance of the CRMs from 2010 onwards is reasonable. There are differences seen in performance based on analytical methods, most notably:

- For CRM CDN-ME-4 Ag, there was a notable change in bias on account of the analytical method. The analytical method used in 2010 was Ag_Ag-AA62_ppm. All assay results using this method are below the expected value. The method used in 2015 and 2017, Ag_AAS41B_g/t, show all samples as a tight grouping around the expected value.
- For CRM CDN-ME-4 Cu, there was a notable change in bias on account of the analytical method. The analytical method used in 2010 was Cu_ME-ICP61a_ppm. All assay results using this method are significantly scattered around the expected value (within failure limits). The method used in 2015 and 2017, Cu_AAS41B_%, shows all samples analyzed as a tight grouping around the expected value.
- For CRM CDN-ME-4 Zn, there was a notable change in bias on account of the analytical method. The analytical method used in 2010 was Zn_ME-ICP61a_ppm. All assay results using this method are significantly scattered around the expected value but within failure limits. The method used in 2015 and 2017, Zn_AAS41B_%, shows most samples analyzed as below the expected value.
- For the CRM CDN-ME-12 Cu, there was a notable change in bias on account of the analytical method. The analytical method used in 2015 and 2017 was Cu_ICP40B_ppm. All assay results using this method are above the expected value. The 2010 analytical method used was Cu_ME-ICP61a_ppm. Values using this method show a fair degree of scatter around the expected value.

The differences in CRM performance (2010 – 2017) based on analytical method are not considered to be material.

11.5.2.4 Recommendations for CRMs

The QP makes the following recommendations for CRMs in future drill programs:

- Ensure that CRMs are monitored in real time on a batch-by-batch basis, and that remedial action is taken immediately as issues are identified.
- Adjust CRM monitoring criteria such that assay batches with two consecutive CRMs outside two standard deviations, or one CRM outside of three standard deviations are investigated, and, if necessary, re-analyzed.
- Ensure CRM warnings, failures, and remedial action are documented (i.e., table of fails).

11.5.3 Blank samples

11.5.3.1 Description

Aftermath inserted pulp blanks for all assay programs but only those of programs A-D (totalling 259 samples) are discussed here. A total of 376 coarse blank samples were inserted into programs A, C, and D.

The pulp blank (OREAS-21f) was supplied by OREAS and is sourced from quartz sand to which 0.5% iron oxide has been added to produce a pinkish-tan coloured pulp. Three coarse blanks were used and comprised of dolomitic gravels sourced from garden centres in the south of Peru. Testing was done prior to the insertion of the coarse blanks and Mn was reported in the range of 0.03 – 0.06%. This was considered low enough to justify the use of the material as a coarse blank. Other metals of interest were of extremely low (at or below detection) levels.

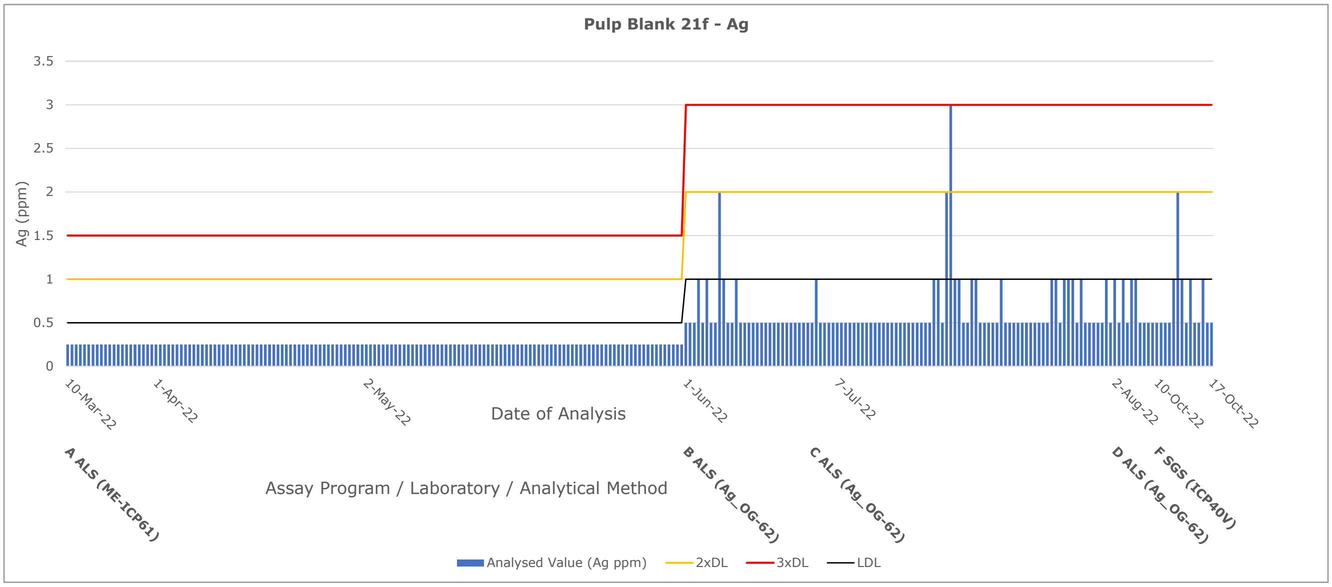
11.5.3.2 Discussion on blanks

Coarse blanks were tested for contamination during both the sample preparation and assay process. Pulp blanks were tested for contamination occurring during the analytical process. Both coarse and pulp blanks should be inserted in each batch sent to the laboratory and comprise 4 - 5% of total samples submitted (Long et al., 1997; Mendez, 2011; Rossi and Deutsch, 2014). Insertion rates for programs A-D were above 5% for coarse blanks and 2.5% for pulp blanks. Program F had a pulp blank insertion rate of ~3%. The insertion rates are considered acceptable.

The generally accepted criteria for assessing blanks are that 80% of coarse blanks should be less than or equal to three times the detection limit and for pulp blanks 90% of samples should be less than or equal to three times the detection limit (Rossi and Deutsch, 2014).

Figure 11.6 shows the pulp blank performance for Ag for all Aftermath assay programs.

Figure 11.6 Aftermath Ag pulp blank sample performance, all assay programs



Note: Red line is 3x detection limit.
Source: AMC, 2023, using data provided by Aftermath.

The performance of blanks prior to 2021 is difficult to assess due to the unknown source of the blank material and the LDL of the analytical methods. A background value of 0.01% was used for Cu and Zn, and a value of 0.05% for Mn to assess the blank performance.

For Aftermath's program A, all samples failed using the LDL supplied by the laboratory for method ME-ICP61, for Mn, Cu, and Zn. The same sorts of failure rates for programs B, C, D, and F were not noted, with very few failures, these samples were analyzed using OG-62 with a higher LDL. The QP reviewed the grade distribution of all samples in conjunction with the pulp duplicates submitted in programs B and F for each element. Pulp duplicates can be used to assess the practical detection limit (PDL) of an analytical method; however, pulp duplicates were not available for the previous technical report. The analysis of pulp duplicates showed that the PDL is considerably lower than the criteria used in the assessment of the pre-2021 blanks; however, there are not enough pulp duplicates recording values at or near the detection limit to use it as the definitive method for determining the PDL. As such, the log histograms and probability plots of each element were used to determine a lower background value of 0.006% Mn, 0.0004% Cu, and 0.0006% Zn to be more consistent with the results of the pulp duplicates. These updated criteria were used to assess the blank performance for the program A for Mn, Cu, and Zn. Table 11.14 summarizes the pulp blank performance for all the Aftermath assay programs.

Table 11.14 Summary of pulp blank performance, all Aftermath assay programs

Program	Ag ppm LDL	No. assays	Assays fail (>3*LDL)	Pass rate
A	0.5	147	0	100%
B	1	30	0	100%
C	1	72	0	100%
D	1	10	0	100%
Program	**Mn % LDL**	**No. assays**	**Assays fail (>3*LDL)**	**Pass rate**
A	0.006 (PDL)	147	1	99%
B	0.01	30	0	100%
C	0.01	72	3	96%
D	0.01	10	0	100%
Program	**Cu % LDL**	**No. assays**	**Assays fail (>3*LDL)**	**Pass rate**
A	0.0004 (PDL)	147	14	90%
B	0.001	30	1	97%
C	0.001	72	5	93%
D	0.001	10	1	90%
Program	**Zn % LDL**	**No. assays**	**Assays fail (>3*LDL)**	**Pass rate**
A	0.0006 (PDL)	147	2	99%
B	0.001	30	1	97%
C	0.001	72	2	97%
D	0.001	10	1	90%

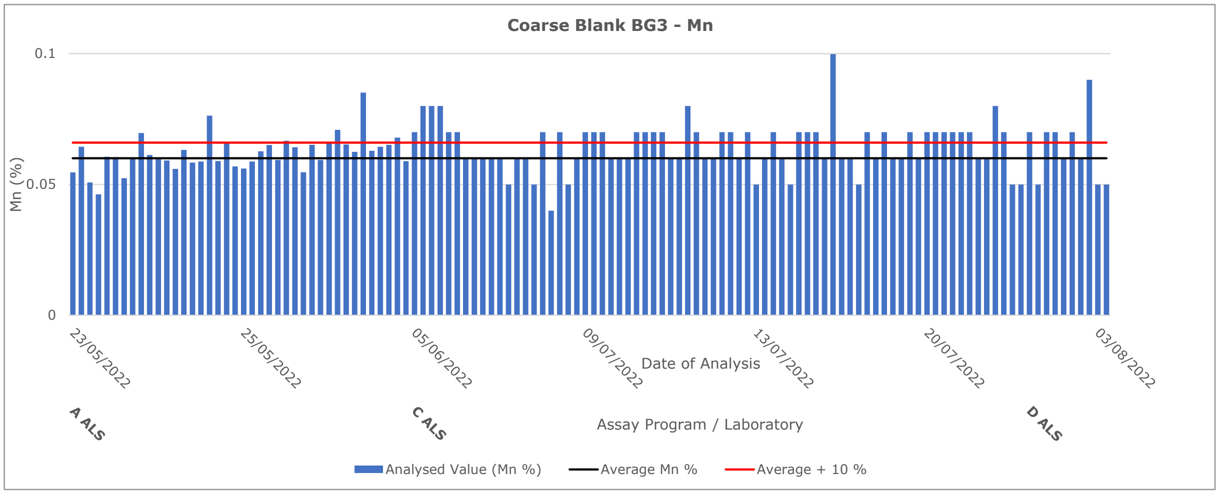
Three coarse blanks were submitted in programs A, C, and D, (BG1, BG2, and BG3). All three coarse blanks were submitted into program A, only BG3 was submitted for programs C and D. Table 11.15 summarizes the coarse blank performance. Where the concentrations of Mn, Cu, and Zn exceeded the LDL (or approximate PDL) in the blank material, the blanks were assessed based on whether the value recorded was within 10% of the expected value. If the concentration of the blank was less than the LDL, three times the detection limit was used to assess the blank performance.

Table 11.15 Summary of coarse blank performance for Aftermath assay programs

Program	Blank ID	Average Ag ppm / LDL	No. assays	Assays > 10% of expected value /3*LDL	Pass rate
	BG1	0.25	63	3	95%
A	BG2	0.25	191	9	95%
	BG3	0.25	40	1	98%
C	BG3	0.5 (LDL)	72	5	93%
D	BG3	0.5 (LDL)	10	0	100%
Program	**Blank ID**	**Average Mn %**	**No. assays**	**Assays > 10% of expected value**	**Pass rate**
	BG1	0.03	63	10	84%
A	BG2	0.0058	191	18	91%
	BG3	0.06	40	7	83%
C	BG3	0.06	72	36	50%
D	BG3	0.06	10	5	50%
Program	**Blank ID**	**Average Cu % / LDL**	**No. assays**	**Assays > 10% of expected value /3*LDL**	**Pass rate**
	BG1	0.00065	63	1	98%
A	BG2	0.001 (LDL)	191	4	98%
	BG3		40	0	100%
C	BG3	0.001 (LDL)	72	3	96%
D	BG3	0.001 (LDL)	10	1	90%
Program	**Blank ID**	**Average Zn %**	**No. assays**	**Assays > 10% of expected value**	**Pass rate**
	BG1	0.002	63	20	68%
A	BG2	0.003	191	13	93%
	BG3	0.003	40	6	85%
C	BG3	0.003	72	32	56%
D	BG3	0.003	10	6	40%

Figure 11.7 shows the performance of the coarse blank sample BG3 for Mn for all Aftermath assay programs. Assays are compared to the average Mn% of the coarse blank (0.06%) with the average +10%. Although many samples are above the 10% line, the results do not indicate a prevalence of sample contamination.

Figure 11.7 Aftermath Mn coarse blank (BG3) sample performance, all assay programs



Source: AMC, 2023, using data provided by Aftermath.

Pulp and coarse blank performance indicate that there are no issues with laboratory hygiene. Analysis of Mn in pulp blanks using ICP40V did not perform as well and could be related to the reported LDL of 0.005%. Coarse blanks inserted for programs C and D returned less than optimal performance for Mn and Zn relative to the average + 10% criteria. This is not considered to be a contamination issue or to have a material impact on the Mineral Resource estimate.

11.5.3.3 Recommendations on blanks

The QP makes the following recommendations for blanks in future drill programs:

- Continue with the current program of coarse and pulp blank testing.
- Investigate sourcing a coarse blank with lower concentrations of Mn and Zn.

11.5.3.4 Blanks prior to 2021

Coarse blank samples were inserted into the sample stream of drill programs completed between 2004 and 2019.

The following is a summary regarding the performance of blank samples prior to 2021:

- The source of the fluvial sand and gravel used as the blank material is unknown. No records are available of any testwork to ensure blank concentrations of Ag, Mn, Cu, and Zn.
- The low blank pass rate for Mn, Cu, and Zn (applying the three times analytical detection) is likely due to a combination of the use of material that was not barren of metals and the low analytical detection limits.
- The use of PDLs (defined by background populations) shows acceptable blank failure rates for Ag, Cu, and Zn, indicating no systematic material contamination occurred during the sample preparation and assaying process.
- Blank material produced high failure rates in Mn. This may be attributable to elevated Mn concentrations within the blank material. No conclusions can be made regarding Mn contamination.

11.5.4 Duplicate samples

11.5.4.1 Duplicate description

Aftermath submitted 294 field duplicates as part of program A. The re-assay programs, (i.e., C and D) included 83 coarse reject duplicate samples. Insertion rates for both field and coarse rejects was 5%. The QP considers this acceptable.

For HQ cores, half of the core was taken for analysis with a quarter-cores used for duplicate samples. For PQ cores, a quarter of the core was taken for analysis with a corresponding quarter used for duplicate samples. The coarse rejects were obtained from the original samples (i.e., program C - 2004/5 coarse rejects and program D – 2017 coarse rejects).

11.5.4.2 Discussion on field duplicates

Field duplicates monitor sampling variance, sample preparation variance, analytical variance, and geological variance.

Duplicate samples should be selected over the entire range of grades seen at the Property to ensure that the geological heterogeneity is understood; however, most duplicate samples should be selected from zones of mineralization. Unmineralized or very low-grade samples should not form a significant portion of duplicate sample programs as analytical results approaching the stated LDL are commonly inaccurate and do not provide a meaningful assessment of variance.

Duplicate sample data can be assessed using a variety of methods. The QP typically assesses duplicate data using scatter plots and relative paired difference (RPD) plots. These plots measure the absolute difference in analyte concentration between a sample and its duplicate. For field duplicates it is desirable to achieve 90% of the pairs having less than 25% RPD between the original assay and check assay (Rossi and Deutsch 2014). In these analyses, pairs with a mean of less than 15 times the LDL are excluded. Removing these low values ensures that there is no undue influence on the RPD plots due to the higher variance of grades expected near the LDL, where precision becomes poorer (Long et al., 1997).

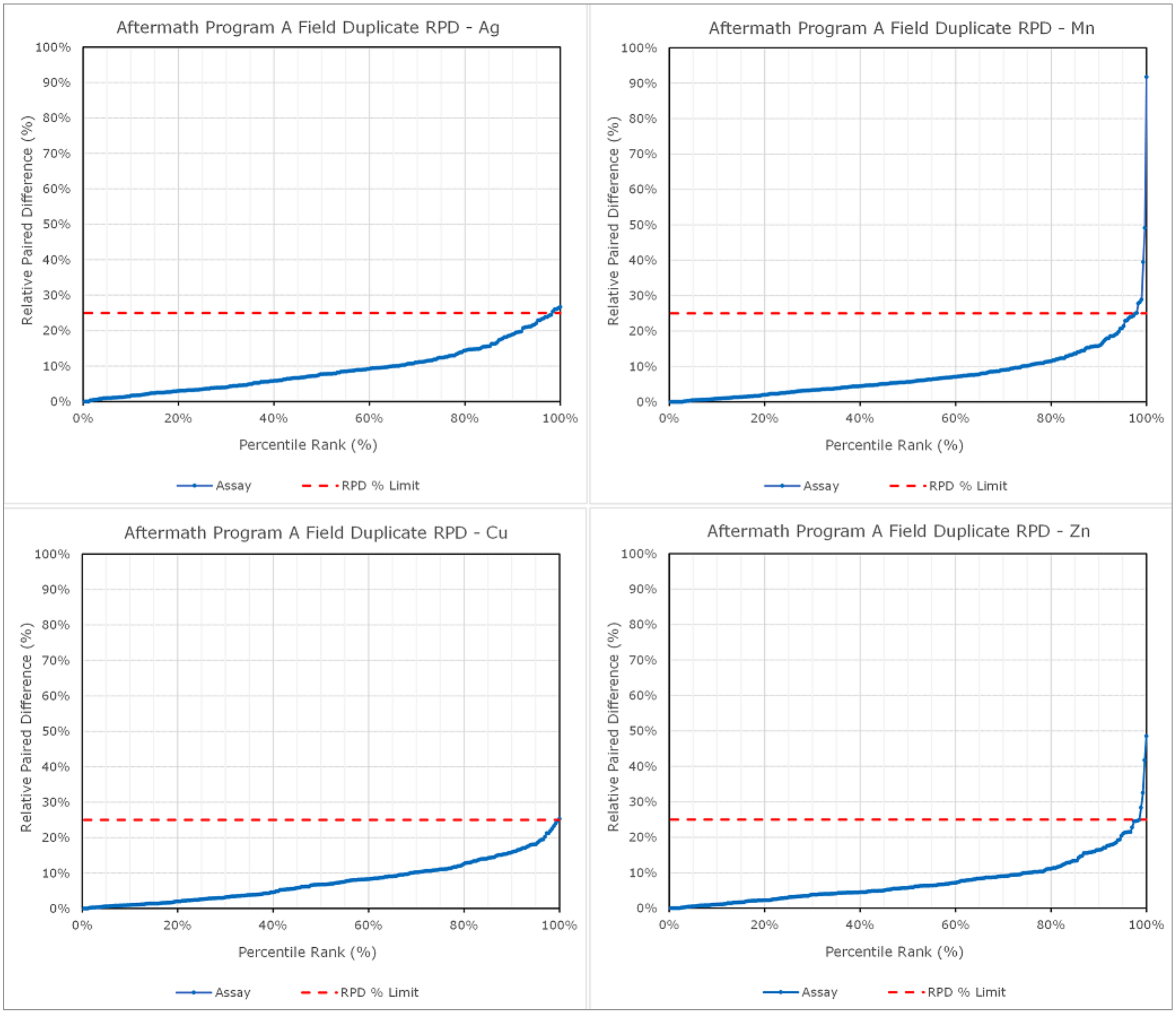
Table 11.16 summarizes the Aftermath program A field duplicate performance for all elements. Figure 11.8 and Figure 11.9 show the RPD and scatter plots for the field duplicates for all elements, respectively for program A. Field duplicate performance is excellent for all elements.

Table 11.16 Summary of field duplicate performance in Aftermath program

					Average		
Element	**ME-ICP61 (LDL / PDL)**	**No. assays**	**Assays > 15*LDL / PDL**	**% Samples < 25% RPD**	**Original**	**Duplicate**	**Bias (%)**
Ag ppm	0.5	294	274	91.97	125.39	123.87	-1.23
Mn %	0.006	294	291	97.59	10.07	10.08	0.10
Cu %	0.0004	294	284	92.25	0.87	0.87	0.48
Zn %	0.0006	294	268	98.51	0.52	0.51	-0.45

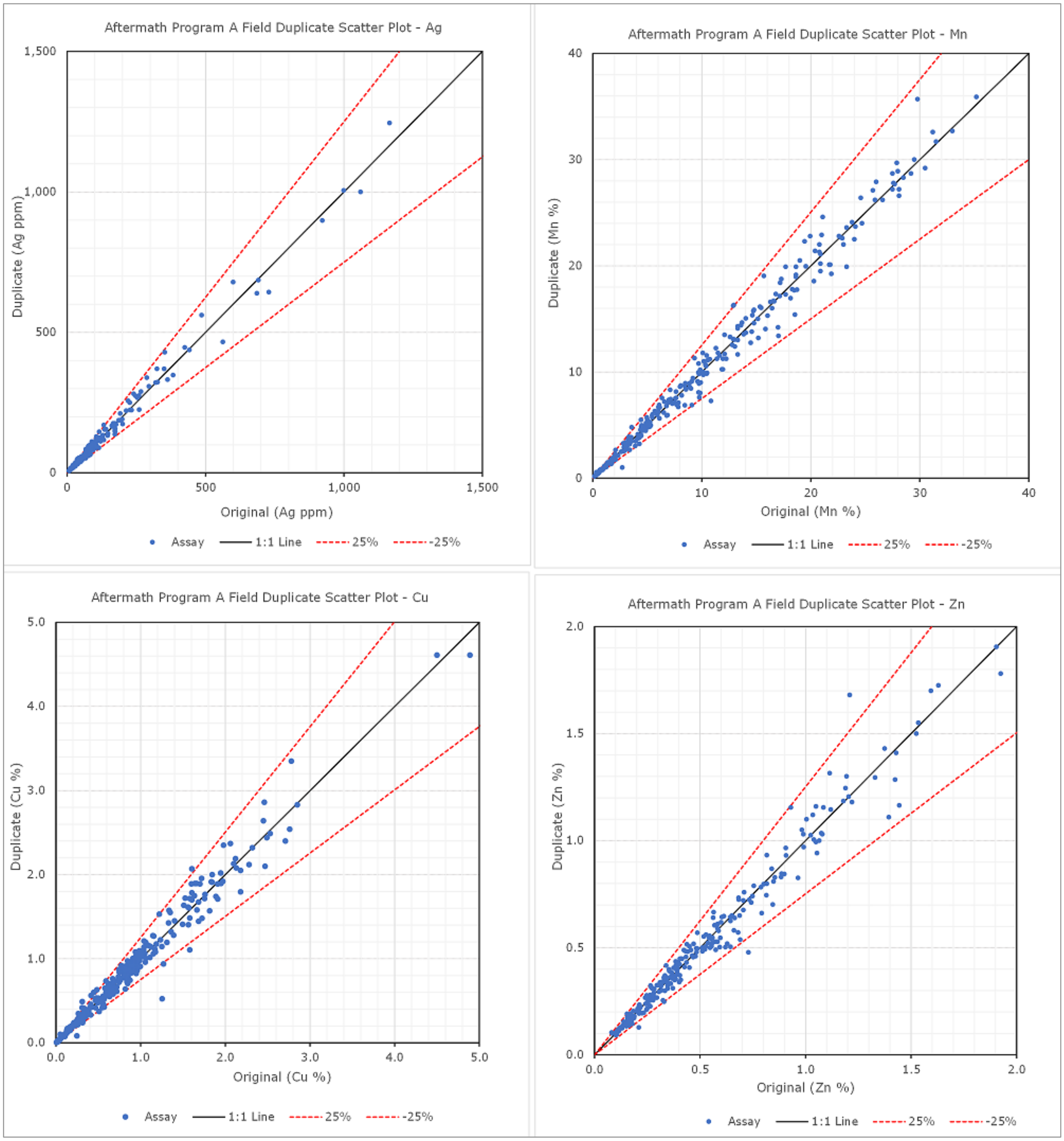
Note: Positive bias indicates higher values in the duplicate assay.
Source: AMC, 2023, using data provided by Aftermath.

Figure 11.8 RPD plots of field duplicate data for all elements from Aftermath program A



Source: AMC, 2023, using data provided by Aftermath.

Figure 11.9 Scatter plots of field duplicate data for Aftermath program A



Source: AMC, 2023, using data provided by Aftermath.

11.5.4.3 Discussion on coarse reject duplicates

Coarse reject samples monitor sub-sampling variance, analytical variance, and geological variance. It is desirable to have 90% of samples less than 20% RPD for coarse reject duplicates (Rossi and Deutsch, 2014). In these analyses, pairs with a mean of less than 15 times the LDL are excluded. Removing these low values ensures that there is no undue influence on the RPD plots due to the higher variance of grades expected near the LDL, where precision becomes poorer (Long et al., 1997). Coarse reject performance is excellent and indicates good analytical precision.

Table 11.17 RPD plots of reject duplicate data from Aftermath program

					Average		
Element	OG-62 LDL	Number of assays	Samples > 15*LDL	% Assays < 20% RPD	Original	Duplicate	Bias (%)
Ag ppm	0.5	72	62	100	276.37	277.24	-0.32
Mn %	0.01	72	72	99	17.02	17.07	-0.33
Cu %	0.001	72	71	97	1.28	1.28	0.12
Zn %	0.001	72	54	98	0.49	0.49	-0.36

Note: Positive bias indicates higher values in the duplicate assay.
Source: AMC, 2023, using data provided by Aftermath.

Only 11 coarse rejects submitted for program D. This sample size is considered too small to provide any meaningful results.

11.5.4.4 Duplicate performance prior to 2021

Only field duplicates were submitted prior to 2021. The RC field duplicates involved an additional split of the original RC sample. There is no description in previous technical reports or company files as to how the DD field duplicates were obtained. Duplicate sample results vary by program. The following comments are made:

2004 to 2005 program

- Field duplicates collected during the 2004 and 2005 program show sub-optimal performance.
- A number of discrepancies are noted within the 2004 and 2005 duplicate database which suggest possible data entry errors with respect to analytical method and reporting units. This might be negatively influencing the results. This should be investigated by comparing the database to original certificates.
- For Ag, a total of 188 field duplicates from the 2004 and 2005 programs, and 6 from the 2010 program are available. A total of 48% of duplicate samples are less than 20% RPD. Sample duplicates are biased high by between 6 and 11%.
- For Mn, a total of 512 field duplicates from the 2004 and 2005 programs, and 72 samples from 2010 are available. When reviewed by analytical method a total of 56% to 66% of samples are within 20% RPD. Sample duplicates are biased high by between 8 and 12%.
- For Cu, a total of 305 field duplicates from the 2004 and 2005 programs, and 24 from the 2010 programs are available. A total of 43% of duplicate samples are less than 20% RPD for method ME-ICP61a and 55% samples are within 20% RPD for method Cu-AA62B based on 55 samples which is less than optimal. Bias varies dependent on analytical method.
- For Zn, a total of 440 field duplicates from 2004 and 2005, and 28 samples from 2010 are availabl. A total of 55% of samples are within 20% RPD. Sample duplicates are biased low by 11%.

2010 program

Insufficient field duplicates for meaningful analysis.

2015 program

Field duplicates results suggest acceptable performance but very small dataset.

2017 program

Field duplicates results suggest acceptable performance.

2019 program

Field duplicates results suggest acceptable performance but very small dataset.

11.5.4.5 Recommendations for duplicates

The QP makes the following recommendations for duplicates in future drill programs:

- Continue the current program of field duplicate insertion.
- Incorporate the use of coarse reject and pulp duplicate samples into the QA/QC program.
- Continue to ensure duplicate samples are selected over the entire range of grades seen on the Project to ensure that the geological heterogeneity is understood; however, most duplicate samples should be selected from zones of mineralization. Unmineralized or very low-grade samples should not form a significant proportion of duplicate sample programs as analytical results approaching the stated limit of lower of detection are commonly inaccurate, and do not provide meaningful assessment of variance.

11.5.5 Umpire assays

11.5.5.1 Overview

Umpire laboratory duplicates are pulp samples sent to a separate laboratory to assess the accuracy of the primary laboratory. Umpire duplicates also incorporate analytical variance and pulp sub-sampling variance. Two sets of umpire results were available for review. The first was the Silver Standard umpire for the 2004 to 2005 period. Unfortunately, the associated QA/QC samples submitted with these assays preformed below acceptable levels. Aftermath submitted umpire assays for their drilling program. Both the Silver Standard and Aftermath umpire results are discussed in detail below.

11.5.5.2 Silver Standard umpire assays

In 2004 and 2005, Silver Standard submitted pulp samples to Actlabs Lima to confirm assay results from the primary ALS Lima laboratory. Along with the pulp duplicates, other samples sent to the umpire laboratory included field duplicates, CRMS, and blanks. The QP was provided with 559 check assay samples, 28 CRM samples, and 26 blank samples in the submission. It should be noted that the 2005 QA/QC Report states that Silver Standard submitted 1,044 samples to an outside laboratory to confirm assay results including 47 CRMs, 22 field duplicates, and 47 blanks. Check assays were not submitted to a secondary laboratory for the 2010, 2015, 2017, and 2019 sampling programs.

The QP reviewed the provided data.

CRMs included with the umpire samples performed poorly with 89 to 100% of CRMs returning results outside of three standard deviations of the expected value. Poor CRM performance is likely the result of inadequate testing of the CRM during certification as discussed in Section 11.5.2. This does not enable meaningful assessment of the check laboratory accuracy.

The performance of the blank samples mirrored that of the primary laboratory. Poor blank performance is likely the result of using a blank material containing anomalous Mn, Cu, and Zn. This does not enable meaningful assessment of contamination at the check laboratory.

In the previous technical report, the QP recommended re-assaying a selection of historical pulps. This was completed by Aftermath between February 2021 and 2022, the results of which are contained in Section 11.6.

11.5.5.3 Aftermath umpire assays

The QP typically assesses umpire samples using scatter and RPD plots. These plots show the absolute difference in analyte concentration between a sample and its duplicate. For umpire samples, it is desirable to achieve 90% of the pairs having less than 10% RPD between the original and check assays. In these analyses, pairs with a mean of less than 15 times the LDL are excluded. Removing these low values ensures that there is no undue influence on the RPD plots due to the higher variance of grades expected near the LDL where precision becomes poorer (Long et al. 1997).

Umpire samples comprise approximately 4% of total samples submitted for the Aftermath drilling program A. This is considered an acceptable insertion rate.

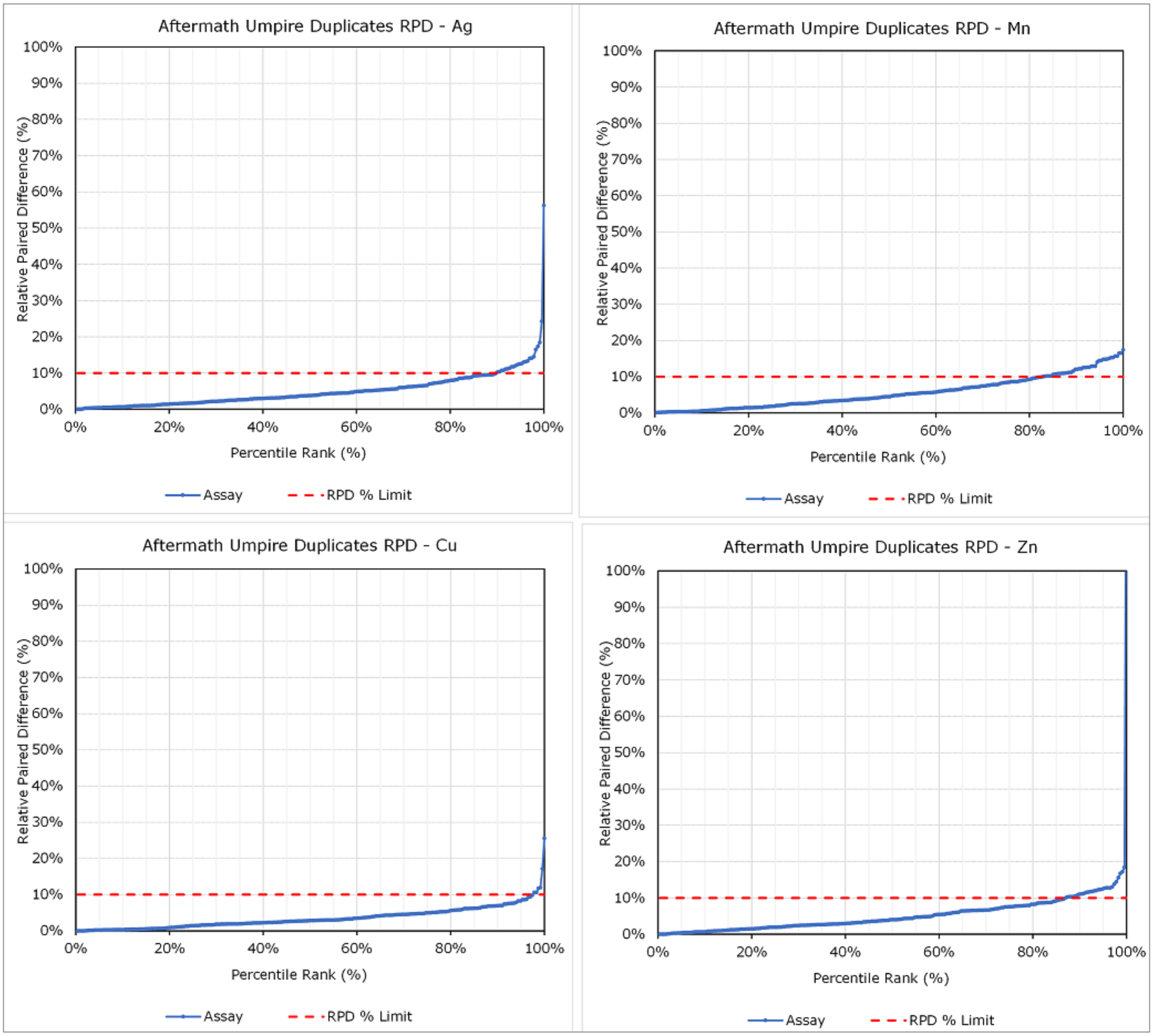
Table 11.18 summarizes the performance of umpire samples for Ag, Mn, Cu, and Zn. Figure 11.10 and Figure 11.11 show RPD and scatter plots for these elements, respectively.

Table 11.18 Summary of umpire duplicate performance from Aftermath

					Average		
Element	**ICPV40 LDL**	**Number of assays**	**Samples > 15DL**	**% Assays < 10% RPD**	**ALS**	**SGS**	**Bias (%)**
Ag ppm	1	235	233	90	208.94	209.35	0.20
Mn %	0.005	235	235	83	13.88	14.26	2.68
Cu %	0.005	235	234	97	1.26	1.25	-0.98
Zn %	0.005	235	232	87	0.54	0.54	0.94

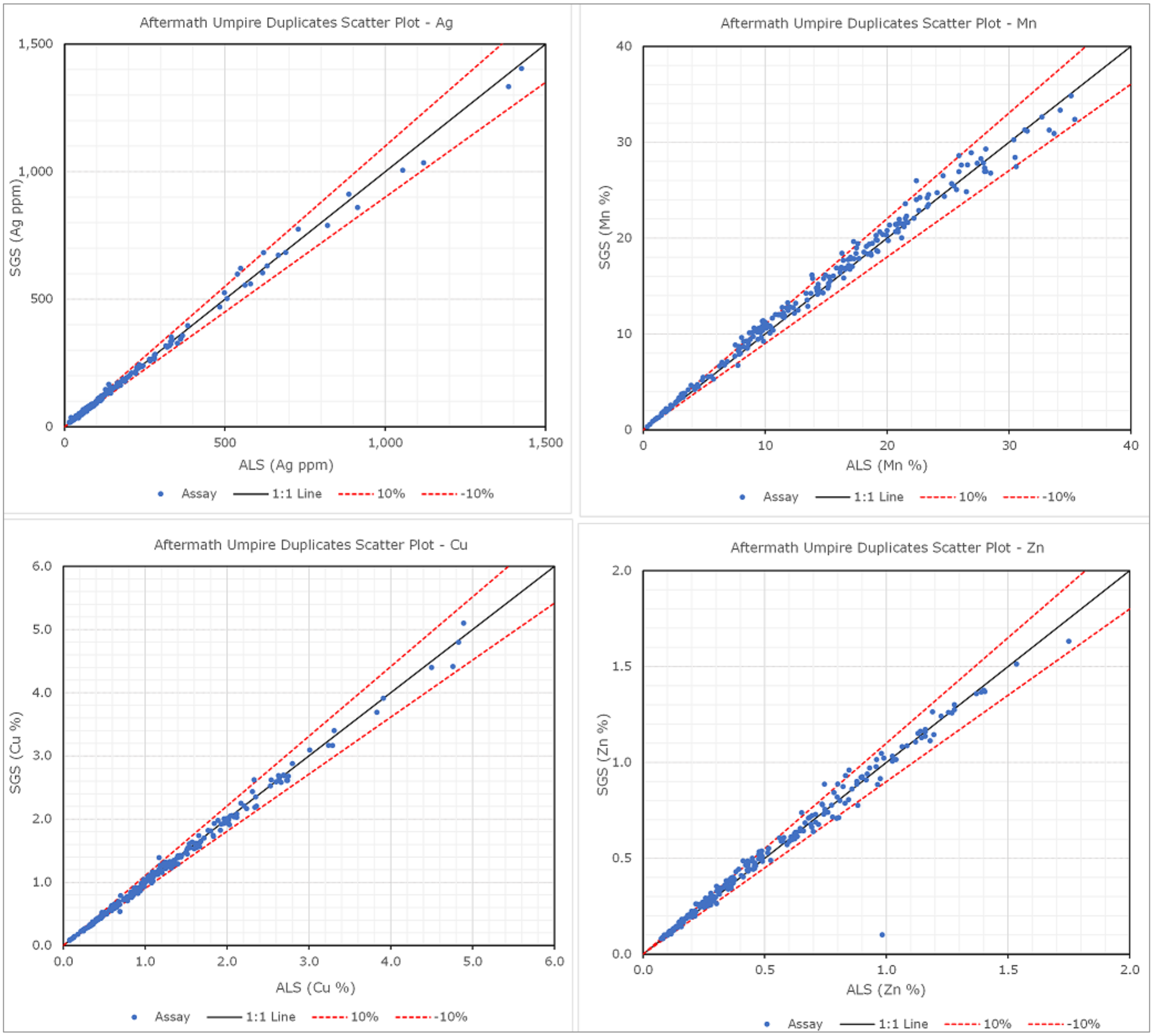
Source: AMC, 2023, using data provided by Aftermath.

Figure 11.10 Aftermath umpire duplicates RPD plot, all elements



Source: AMC, 2021, using data provided by Aftermath.

Figure 11.11 Aftermath umpire duplicates scatter plot, all elements



Source: AMC, 2023, using data provided by Aftermath.

The performance of the umpire samples is acceptable. There is one outlier for Zn from drillhole AFD023 (SGS sample 51709915) and should be investigated. Analysis of Mn% in umpire samples performed poorly after the initial round of analysis. At the request Aftermath, the umpire samples were re-assayed for Mn% by the umpire laboratory, SGS. The re-assaying improved the comparison.

11.5.5.4 Recommendations for umpire assays

The QP recommends continuing the umpire assay programs for future drilling campaigns.

11.6 Aftermath re-assay programs

In 2022, Aftermath re-assayed some of the original pulp and coarse duplicates from the Valor 2017 program and the Silver Standard 2004-05 program. The results are summarized in Table 11.9. The following sections discuss these data and provide recommendations.

Table 11.19 Summary of Aftermath re-assay programs

Program	Company*	Year*	Type	No. re-submitted	Results
B	Valor	2017	Pulp	1,084	Acceptable
C	Silver Standard	2004, 2005	Coarse reject	1,138	Acceptable
D	Valor	2017	Coarse reject	166	Acceptable

Notes *= name of company and the year of the original sample
Source: AMC, 2023, using data provided by Aftermath.

11.6.1 Program B: 2017 pulp re-assay program

Aftermath re-submitted 1,084 pulp samples collected in 2017 by Valor. There were slight differences in the analytical methods used between 2017 and 2022.

The QP checked the results of the re-assayed data against the original samples using the same method of assessment used for pulp duplicates. The comparison between the 2017 and 2022 shows good repeatability and is summarized in Table 11.20. The observed low bias for Mn by ALS was also noted in the CRM performance from program A. The Mn CRM performance improved with higher Mn grade and the implementation of a lower overlimit threshold triggering analysis by OG-62 rather than ME-ICP60.

Table 11.20 Summary of Aftermath program B, 2017 re-assayed pulp samples

					Average		
Element	ALS OG-62	Number of assays	Samples > 15DL	% Assays < 10% RPD	ALS (Aftermath)	SGS (Valor)	Bias (%)
Ag ppm	1	1,084	1,070	86	163.02	159.31	-2.33
Mn %	0.01	1,084	640	83	13.44	14.23	5.54
Cu %	0.001	1,084	1,084	97	1.42	1.43	0.35
Zn %	0.001	1,084	1,059	91	0.62	0.62	-0.82

Source: AMC, 2023, using data provided by Aftermath.

Program B 2022 ALS results were substituted into the assay database for Mineral Resource estimation. There were 166 coarse reject samples from 2017 submitted in program D which correspond to the pulp samples submitted in program B. The 2022 ALS results from program D were substituted into the assay database used for Mineral Resource estimation instead of the analogous samples from program B.

11.6.2 Program C: 2004-05 coarse reject re-assay program

Aftermath re-submitted 1,138 coarse reject samples collected in 2004-05. Samples were selected based on higher-grade intersections with moderate to good recovery in the 2004-05 RC campaign. Summarized in Table 11.21, the 2022 versus 2017 results show excellent repeatability. However, the 2022 results show a moderate bias towards the 2022 results for Ag. All results from the 2022 re-assay were substituted into the assay database for Mineral Resource estimation.

Table 11.21 Summary of Aftermath program C, 2004-05 re-assayed coarse reject samples

					Average		
Element	**ALS OG-62 LDL**	**Number of assays**	**Samples > 15DL**	**% Assays < 20% RPD**	**2022**	**2004-05**	**Bias (%)**
Ag ppm	1	1,138	847	95%	231.18	221.72	-4.26
Mn %	0.01	1,138	1,075	97%	10.96	11.31	3.12
Cu %	0.001	1,138	1,012	97%	1.21	1.22	0.53
Zn %	0.001	1,138	713	99%	0.47	0.48	0.46

Source: AMC, 2023, using data provided by Aftermath.

11.6.3 Program D: 2017 coarse reject re-assay program

A total of 166 coarse reject samples were selected from the 2017 samples once they had been moved and stored in Arequipa. A total of 138 of these coarse rejects also had their corresponding pulps included in program B (see Section 11.6.1). The program D assay exercise was a validation of the preparation method used in 2017. Table 11.22 and Table 11.23 summarize the results of program D. The 2017 and 2022 coarse reject assays compare well. Also, the re-submitted 2017 coarse rejects and pulps comparison indicate that there were no issues with the 2017 sample preparation.

Table 11.22 Summary of Aftermath program D, 2017 re-assayed coarse reject samples

					Average		
Element	**ALS OG-62 LDL**	**Number of assays**	**Samples > 15DL**	**% Assays < 20% RPD**	**2022**	**2017**	**Bias (%)**
Ag ppm	1	165	165	99	137.98	133.72	-3.18
Mn %	0.01	166	72	97	14.15	15.19	6.87
Cu %	0.001	166	166	100	1.60	1.60	0.03
Zn %	0.001	166	161	100	0.39	0.39	-0.99

Source: AMC, 2023, using data provided by Aftermath.

Table 11.23 Summary of Aftermath program D, 2017 coarse rejects and pulps submitted in 2022

					Average		
Element	**ALS OG-62 LDL**	**Number of assays**	**Samples > 15DL**	**% Assays < 20% RPD**	**Pulps**	**Coarse rejects**	**Bias (%)**
Ag ppm	1	138	138	97	147.69	150.07	1.58
Mn %	0.01	138	138	100	19.99	19.78	-1.02
Cu %	0.001	138	138	100	1.64	1.65	0.51
Zn %	0.001	138	135	100	0.41	0.40	-1.74

Source: AMC, 2023, using data provided by Aftermath.

11.6.4 Recommendation for re-assay program

As the re-assay program has confirmed the validity of the original assays, the QP recommends reverting to the original assays for the next Mineral Resource update. Newer assays should only replace older assays when there has been systematic re-assaying of the original dataset.

11.7 Conclusions

The Aftermath program was comprehensive and included CRMs covering the appropriate grade ranges, blanks for assessing laboratory hygiene and field duplicates to monitor analytical precision. The results of the QA/QC program indicate good laboratory performance. The CRMs exhibited relatively low failure rates, with the predominance of these failures showing an underestimation of grade.

There is an issue with the underestimation of Mn for the primary laboratory. This was evident in the results of the CRMs and comparisons with the umpire laboratory. The issue seems to improve with increasing Mn grade. The BER-RENO CRM (18% Mn) did not record any warnings or failures. The change in overlimit threshold from 10 to 8.5% Mn during program A for CRM BER-21-3 showed the failure rate drop by almost two thirds and the low bias improve. The QP does not consider this to be a material issue to the Mineral Resource estimate.

The re-assay programs confirmed the validity of the previously collected assays and generally assuaged any concerns that were highlighted during the review of the QA/QC from these programs.

The QP recommends that the current level of QA/QC sample submission and monitoring continues. The QP also recommends that coarse reject and pulp duplicates are submitted for future drilling programs.

The QP considers that the sample preparation, security, and analytical procedures are adequate, and the assay database is robust and appropriate for use in the Mineral Resource estimate.

12 Data verification

12.1 Site visit

Dinara Nussipakynova, P.Geo. of AMC, completed a site visit to the Project in July 2022. The Arequipa office and warehouse was visited on 23 July and the site inspection was carried out on 26 July 2022. During the inspection the following activities were carried out:

- Review of warehouse in Arequipa.
- Review of field site of Berenguela Project.
- Inspected the core processing facility and core storage in Limon Verde.
- Review of Aftermath QA/QC procedures.
- Review of mineralized intersections from five drillholes as follows:
  - AFD001
  - AFD034
  - AFD043
  - AFD052
  - AFD056
- Held discussions with several staff on site.
- Held discussions on database management procedures.
- Observed the concreted collar location for the recent drillholes on site.

12.1.1 Sample storage

The QP visited the warehouse in Arequipa where RC drilling chips, and coarse and pulp rejects are stored. These samples are well inventoried, organized, and secure. Figure 12.1 shows the warehouse in Arequipa.

Figure 12.1 Arequipa storage facilities

Source: AMC, 2022.

12.1.2 Limon Verde facilities

At the time of the site visit all drill core and RC chips from all post 2004 drilling are stored close to site in what is called the Limon Verde facilities, which are 1 km from Santa Lucía and 5 km from the deposit. Subsequently these samples have been moved to the Aftermath warehouse in Arequipa. The facility consists of various buildings which were part of the old mine infrastructure. These have been adapted to an office, a core shack with logging, sampling, and core cutting areas; storage of DD cores is in an adapted warehouse. This facility is adequate for any new programs going forward and is secure and fenced with a locked gate.

Figure 12.2 Limon Verde core yard and offices

Source: AMC, 2022.

Figure 12.3 Limon Verde core storage

Source: AMC, 2023.

12.2 Database verification

Aftermath rebuilt the database from first principles from a collection of spreadsheets and raw data, and carried out their internal checks. The database entry and control are carried out at the camp office by the geologist responsible for database administering.

The drillhole files have undergone the following checks for inconsistencies by the QP:

- Inconsistent FROM and TO values.
- Incorrect treatment of absent assay values.
- Duplicate records and duplicate holes.
- Downhole surveys.

No inconsistencies were identified by the QP while checking the drillholes in three-dimension (3D). Checking the collar locations against the Digital Terrain Model (DTM) of the topography surface showed no differences in elevation.

12.3 Assay verification

For the drilling carried out from 2004 to 2019 a random selection of drillholes in the database was made by the QP, and Ms M. Morton of AMC compared the original assay results on the assay certificates to those in the database. This selection spanned all the drilling campaigns and assay laboratories used. This verification consisted of comparing 3,574 of the 30,848 assay results in the database, to those in the certificates which is approximately 12% of the total samples. A small discrepancy was discovered in one sample but this is not material.

After the site visit in 2022, Ms M. Morton, under QP supervision undertook a random verification of the assay results of the 2021-22 drillholes and re-assay programs with the original assay results on the assay certificates returned from ALS (Peru). This verification consisted of comparing 779 of the 6,922 assay results in the database to those in the certificates. This is approximately 11.3% of the total samples for that program. No errors were detected.

Table 12.1 Summary of verification of the 2021-22 certificates

Assay Program	Total samples	Checked samples	% Checked
2004 – 2019 (various operators)	30,848	3,574	11.6%
2021-2022 Core Drilling	4,700	512	10.9%
Re-assay 2017 pulp in 2022	918	109	11.9%
Re-Assay 2004-5 Coarse Rejects	1,138	130	11.4%
Re-Assay 2017 Coarse Reject	166	28	16.9%
Total	**37,770**	**4,353**	**11.5%**

Source: AMC, 2023.

12.4 Conclusion

The QP considers the database fit-for-purpose and in their opinion, the geological data provided by Aftermath for the purposes of Mineral Resource estimation were collected in line with industry best practice as defined in the CIM Exploration Best Practice Guidelines and the CIM Mineral Resource, Mineral Reserve Best Practice Guidelines. As such, the data are adequate for use in the estimation of Mineral Resources.

13 Mineral processing and metallurgical testing

13.1 Work to date and recommended flowsheet

The metals of economic interest in the Berenguela orebody are manganese, silver, and copper, with zinc as a minor co-product. Substantial basic metallurgical work has been completed principally by KCA who acquired the Property in 1995 and conducted a bulk sampling program at 25 locations that comprised 214 separate samples. This sample was processed at KCA laboratories during 1995 to 1999 and later used for KCA testwork in 2010 to 2011 on behalf of Silver Standard. Multiple routes for processing the ores have been studied, as discussed in the 2021 AMC Technical Report. and four process flowsheets were derived from the previous work. These are summarized as Flowsheets 1 to 4 below. The two most recent process studies include options to recover Manganese in various forms including manganese sulphate ($MnSO_4$), Electrolytic Manganese Metal (EMM), Electrolytic Manganese Dioxide (EMD), or Chemical Manganese Dioxide (CMD).

Flowsheet 1: limited or no Mn recovery.

- Pelletized ore - segregation roast 750°C - flotation - ship conc.

Flowsheet 2: limited Mn or no recovery.

- Roast - calcine - controlled potential sulphidation (CPS) flotation of ore - ship conc.

Flowsheet 3: Favourable technically and environmentally (no roast) recovers Ag, Cu, and Mn.

- Ore - pre-leach - reductive leach - Cu EW, impurity removal, Zn ppt, Mn recovery (Mn or MnO_2 EW or $MnSO_4$); Ag cyanide leach.

Flowsheet 4: Favourable technically and environmentally (no roast) recovers Ag, Cu, and Mn.

- Ore - high intensity magnetic separation (HIMS) - reductive acid leach - Cu EW, impurity removal, Zn ppt, Mn recovery (Mn or MnO_2 EW or $MnSO_4$); Ag cyanide leach.

An evaluation of the various flowsheets is summarized below:

- **Flowsheet 1** - The Segregation / Roasting process, also called the Torco process, is a process in which salt (sodium chloride) and coal are mixed with the ore which is then roasted. The metal chlorides volatilize and then condense on the coal particles, which are then recovered by flotation. The process is difficult to control and has had only limited commercial application. At least until 1990, there was a very small commercial market for the manganese so recovering it was not considered. In today's environment the Torco process should not be considered.
- **Flowsheet 2** – This involves CPS flotation of sulphidized materials following Torco segregation roast. This route appears to be very costly and produces low grade copper and silver concentrates with no recovery of the manganese. It should not be studied further.
- **Flowsheets 3 and 4** – These processes are very similar. Flowsheet 3 includes a pre-leach chemical treatment process (Mg removal) to minimize issues associated with downstream viscosity, and Flowsheet 4 incorporates a front-end physical beneficiation process (HIMS) to reduce gangue content and subsequent high reagent consumption. The HIMS tests to date are either inconclusive having been carried out on material that does not warrant upgrading or were largely unsuccessful on lower grade samples. Ore sorting should be pursued in preference to wet high intensity magnetic separation (WHIMS) or HIMS methods at this stage.

- **Ore sorting** - Preliminary tests carried out on ore sorting by Valor used sample material that was extremely high in Mn (>16% Mn head grade) and would not be deemed as necessary for sorting in the operational phase. The upgrading results were understandably moderate. Medium-grade mineralized material with Mn grades in the range of 5% to 8% is the primary focus of upgrading by ore sorting method and will form a key component of upcoming testwork.

The above work and conclusions have resulted in the selection of a process route shown in the Figure 13.1, consisting of:

1 Open pit mining followed by crushing and ball-milling.

2 Up-grading of low-grade ores using ore-sorting techniques at the crushing stage, to remove discrete fragments of limestone-dolomite waste.

3 Pre-leaching with sulphuric acid to remove magnesium.

4 Solution / solids separation, with discard of the solution (or possible recycling after Mg removal).

5 Primary reduction leaching of the solids with sulphurous / sulphuric acids.

6 Solution / solids separation.

7 Standard cyanide leaching of the solids, with Merrill-Crowe silver recovery.

8 Discharge of the slurry to a standard tailings pond with reclaim of the solution for recycle to the cyanide leach.

9 Further processing of the solution from step six to recover the copper, iron, zinc, and manganese, as follows:

   a Direct electrowinning or solvent extraction / electrowinning of the copper.

   b Removal of iron by neutralization and air sparging, followed by thickening / filtration to remove the iron precipitate for discard.

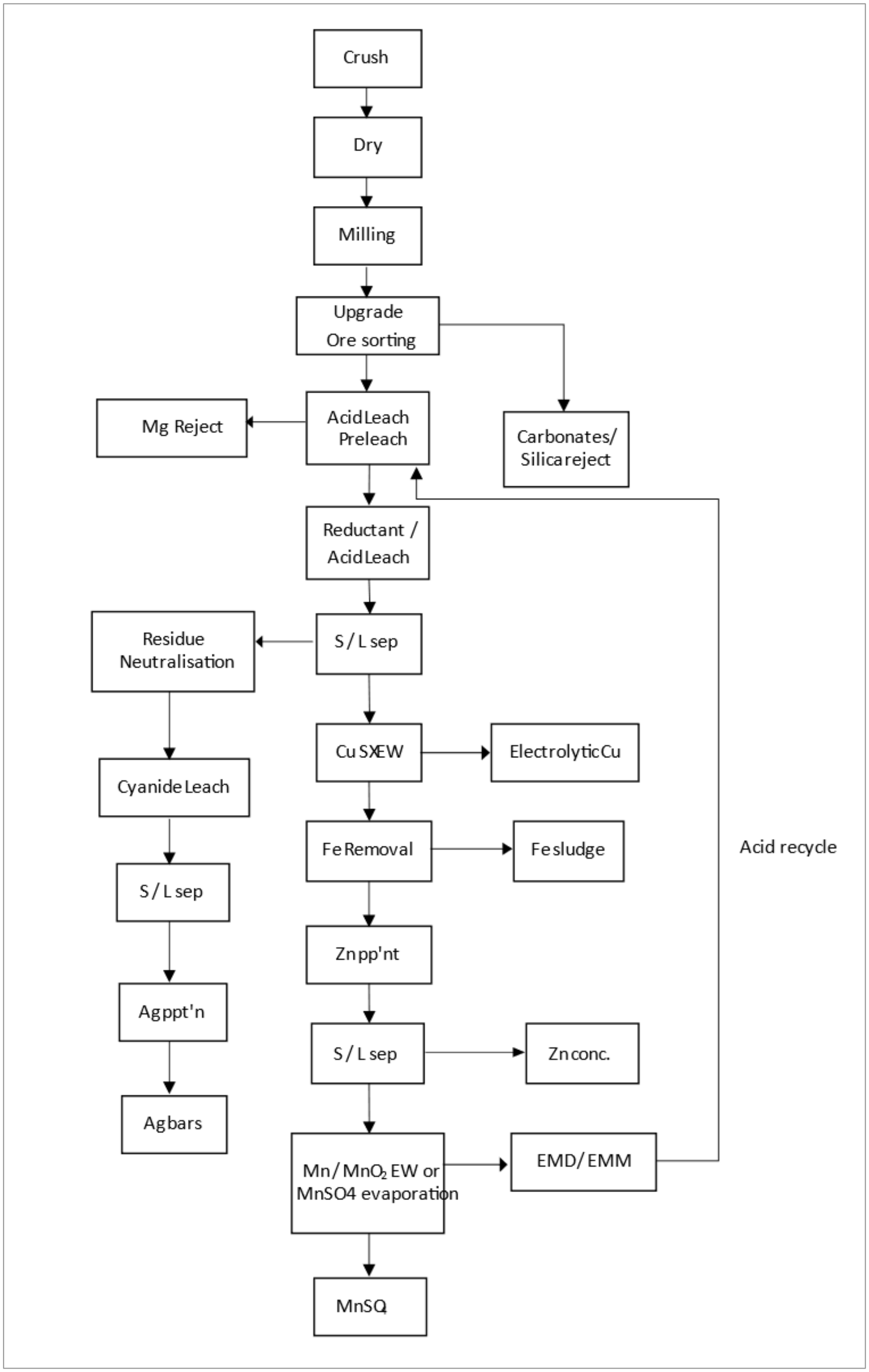
   c Precipitation of the zinc as zinc sulphide using sodium hydrosulphide, followed by thickening / filtration to recover the zinc sulphide as a marketable product.

   d Recovery of manganese in a variety of forms depending on markets:

      – Manganese metal by electrolysis (EMM).
      – Manganese sulphate by crystallization, filtration, drying.
      – CMD powder by electrolysis.
      – EMD by more sophisticated electrolysis.

10 Recycle of the step 9 (d) solution to the step (3) leach.

Figure 13.1 Berenguela proposed process flowsheet



Source: KCA, 2023.

13.2 Validation testwork required for proposed flowsheet

The basic steps in the above process have been studied on a bench scale for Berenguela, and essentially all steps are used in practice in large metallurgical process plants, especially in zinc electrolytic refineries and in commercial plants for producing EMD. However, for plant design and costing purposes, further bench-scale work is required in the following areas:

- For step 2, substantial additional ore-sorting work is required.
- For steps 4, 6, and 9(b), thickening and filtration tests are required to size the necessary equipment.
- For step 4, the discard solution might be concentrated to generate recycle water and a smaller volume of discharge solution (it will not be discharged, but sent to a separate tailings / evaporation pond).
- For step 9(a), evaluation of the alternatives of direct electrowinning or Solvent Extraction / Electrowinning (SX-EW).
- For steps 9(b) and 9(c), these have been studied in a very basic way, so further tests are needed to develop the process conditions.
- For step 9(d), crystallization procedures need to be developed and then tested, and electrolytic procedures need further design and possibly testing.
- An additional consideration may be to apply chloride leach processes to Ag recovery (step 7). should the use of cyanide be considered environmentally sensitive.

Testwork carried out by KCA to date resulted in the following indicated recoveries. Copper: 81% of the copper in the ore recovered in the form of marketable copper sulphate or copper metal. Silver: 81% of the silver in the ore recovered as marketable doré bars. Zinc: estimated 76% of the zinc in the ore recovered as zinc sulphide. Manganese: estimated 81% of the manganese in the ore recovered in a variety of marketable products. These recoveries will be further tested and validated in the upcoming bench-scale testwork which will review the impact of varying head-grades on recovery.

The drilling carried out in 2021-22 by Aftermath delivered large-diameter (PQ) cores of varying mineralization types. Prior to undertaking the complete above laboratory program, a geological / metallurgical team would develop a metallurgical domain model to identify the types of materials that will be sent for processing. This would be done using head-grades, geological domain controls, and ore-sorting testwork results to characterize the various material streams available. Necessary bulk samples will then be prepared for bench scale tests which would weigh about 500 kg of sample per material stream. It is envisaged that the bulk of this sample is already available as large PQ cores but additional RC drilling can be carried out to supply additional material if required. The laboratory program outlined above should evolve in conjunction with a preliminary engineering and economic analysis of the project, with the intention that the testing program will be directed towards practical implementation of the testwork conclusions.

13.3 Introduction

Investigations into extraction of copper and silver from Berenguela ore commenced in the early 1900's. Ownership has changed a number of times with various metallurgical processes tested, as summarized below.

- 1905 to 1965: Lampa Mining processed ore via direct smelt to produce Cu-Ag matte. When Cu grades reduced, Lamp Mining progressed pilot scale trials using segregation roasting to produce a Cu-Ag concentrate for market.
- 1960's & 70's: ASARCO, Cerra de Pasco Corporation and Charter Mining pursued segregation roasting followed by flotation to recover Cu and Ag concentrate.

- 1995 to 1999: KCA focused on hydrometallurgical processes to take advantage of the Mn market for specialty Mn products. A reductive acid leach using SO_2 showed promising results for Cu, Ag, and Mn extraction. Upgrading of the ore using WHIMS was trialed but it resulted in poor recoveries.
- 2003 to 2016: Silver Standard pursued reductive acid leach, segregation roasting, and other options to upgrade the ore feed specification including WHIMS and CPS flotation. KCA, XPS Consulting & Testwork Services (XPS), and Process Research Associates (PRA) were commissioned for various phases of testwork.
- 2016 to 2018: Valor pursued the reductive acid leach process and trialed alternative reductants using both Minero Prospero and Fremantle Metallurgy (FreoMet). To upgrade the feed specification and reject acid consumers (carbonates) and silica, various methods were explored including fine grinding, heavy media separation and WHIMS without success. Some success was reported using dry HIMS.
- 2021: Aftermath carried out further HIMS tests in Australia on material sourced from Valor samples. The results did not indicate significant upgrades of lower grade materials and recoveries were poor.

Key flowsheets that have been pursued during the course of historical testwork for the Berenguela project are outlined in Section 13.1 above.

Given the favourable market for manganese due to the expanding battery market, this testwork summary focuses on the hydrometallurgical approach that includes Mn recovery.

13.4 Sample selection

According to KCA (2010), Lampa Mining Co. extracted approximately 500 thousand tonnes (kt) of ore from the Berenguela mine from 1906 to 1965 to recover Cu and Ag. Subsequently, ASARCO and Chartered Consolidated explored the Property and drilled 52 holes from 1965 to 1966. ASARCO took a 268 tonne bulk sample that represented the different ore types according to ASARCO ore domain classifications which are not clearly obvious to KCA at this juncture. The ore domain classifications are not included in the resource block model and as such the volumetric meaning is not understood.

KCA acquired the Property in 1995 and conducted a bulk sampling program at 25 locations that comprised 214 separate samples. This was the sample processed at KCA's laboratories during 1995 to 1999 period and later used for KCA 2010 to 2011 campaigns.

Silver Standard reported that an RC drilling campaign was conducted to generate metallurgical samples. Samples were nominated according to ASARCO ore domain classifications and used for the PRA (2006) hydrometallurgical and various segregation roasting testwork campaigns.

The 2021-22 drilling campaign as designed by Aftermath has produced an inventory of large diameter half-cores across a broad spectrum of mineralization styles. These cores will comprise the bulk of initial bench-scale testwork going forward.

13.5 Mineralogy

Berenguela mineralogy is complex and KCA commissioned detailed optical microscope analysis in PMET (1996) using dry as well as oil immersion techniques. Results are summarized below.

- The microscopy work indicated that the majority of silver occurs in intimate association (lattice substitution) with the Cu-Zn-Fe-bearing manganese oxides as well as the iron oxides such as goethite. Where present, in much lesser quantities, Cu, Zn, and Ag sulphides typically occur as ultra-fine particles disseminated and encapsulated by the manganese matrix.

- Complex manganese minerals exist with matrices comprising major psilomelane with lesser pyrolusite.
- Argentite is associated with alabandite, psilomelane, pyrolusite, minor clays - ultra-fine (<10 µm) or in solid solution. Minor fine silver.
- Mn minerals have low porosity with poor liberation of Cu and Ag species.
- Existence of potential non-refractory Ag minerals in fine clays. The extent of this has not been established.
- Limited mineralogy on Cu species and no mineralogy on Zn species.

Table 13.1 Summary of Berenguela minerals

Mineral	Formula	Mineral	Formula
Psilomelane	$Mn_5O_{10}.2H_2O$	Jarosite (Jt)	$KFe_3(SO_4)_2(OH)_6$
Pyrolusite	MnO_2	Chalcopyrite	$CuFeS_2$
Alabandite	MnS	Chalcocite	Cu_2S
Chalcophanite	$(Zn,Fe,Mn)Mn_3O_7.3H_2O$	Chrysocolla	$CuSiO_3.2H_2O$
Cryptomelane	$KMn^{4+} Mn^{2+}{}_2O_{16}$	Malachite	$Cu_2CO_3(OH)_2$
Neotocite	$(Mn,Fe)SiO_3.H_2O$	Azurite	$Cu_3(CO_3)_2(OH)_2$
Rhodochrosite	$MnCO_3$	Argentite (acanthite)	Ag_2S
Goethite (Go)	FeO.OH	Sphalerite	ZnS
Hematite (Ht)	Fe_2O_3	Pyrite	FeS_2
Mineral mixtures			
Limonite (FeOx)	Hydrated amorphous mixture Go+Jt+Ht	Manganese wad	Amorphous mixture MnOx & FeOx

Source: Valor 2018, PFS Report Section 6 draft.

13.5.1 Gangue mineralogy

Gangue mineralogy is characterized by the following, and has the listed process impacts:

- 50 - 60% is dolomite ($CaMg(CO_3)_2$) – characteristic peak in x-ray diffraction (XRD).
  - Acid consumer.
  - Causes sulphate precipitates.
  - Reduces liquid solid separation (LSS) performance.
  - Magnesium causes problems in manganese electrolytic cells.
- 10 - 20% calcite ($CaCO_3$), microcline ($KAlSi_3O_8$) and quartz (SiO_2).
- Trace clays kaolinite and sericite.
- Siliceous jasperoid and chalcedony:
  - Colloidal silica in leach solutions reduces LSS performance.
- Other – strontianite ($SrCO_3$), barite ($BaSO_4$).

13.6 Ore characterization

Limited comminution testwork has been conducted. A single sample's Bond ball mill work index (BWi) and abrasion index has been measured, as per Table 13.2. The ore is soft and not abrasive as the mineralogy also suggests.

Table 13.2 Comminution testwork results

Parameter	Unit	Value	Laboratory
Bond ball work index, BWi	kWh/t	8.39	Certimin[1]
Abrasion index, MAi	g/t	144	Metso[2]
Crushability index	%	57.9	Metso
SG – Brown	t/m^3	3.64	Silver Standard[3]
SG – Massive	t/m^3	3.03	Silver Standard
SG - Underground	t/m^3	2.63	Silver Standard
SG - Yellow	t/m^3	2.58	Silver Standard

Notes:
[1] Reporte Metalurgico Bond work index, Certimin 20170628 COT SM 0096 00 17_CERTIMIN.
[2] Abrasion and Friability, Metso 20180220-31-SOMI.
[3] Berenguela Metallurgical Testwork prepared for Silver Standard Resources Inc., PRA 20060131 0404005.

Gangue appears to be a mixture of carbonates and silicates but there is limited information on the variability.

13.6.1 Metallurgical domain classifications

Earlier metallurgical domain classification by ASARCO / Minero Perú contained four categories and these were subsequently simplified by Valor into three Mn grade categories. Given the complexity of the resource these visual classifications appear oversimplified. Defining metallurgical ore classification is considered key to establishing recovery performance throughout the resource. The degree of refractoriness or encapsulation in the Mn matrix may be correlated with Mn grade, manganese dioxide (MnO_2) content, Fe oxides content, Ag cyanide solubility, clay content, etc. Going forward, first pass assay data combined with geological modelling, mineralogy, and initial metallurgical testwork will all contribute to a practical classification. Primary selection of material for mineralogical and metallurgical testwork is being carried out based on metal grades (primarily Mn and Cu, which have different distribution regimes and thus potentially different metallurgical characteristics), and Ca+Mg content (which reflects the quantity of carbonate gangue).

13.7 Magnetic separation

13.7.1 Wet high intensity magnetic separation

WHIMS conducted by PRA (2006) at P_{80} 142 mm and 20,000 gauss intensity showed poor recovery of Ag (44% - 47%) and Mn (44% - 48%) to magnetics for yellow ore (moderate Mn content). To further test the potential of magnetic separation, in 2021 Aftermath requested Mineral Technologies to run tests on the medium and low grade drillhole composites from the Valor drilling program. Mineral Technologies ran both Dry Induced Roll Magnetic Separation (IRMS) tests, and WHIMS tests. Different size fractions of the ore were tested. In all cases, there was a small increase in grade but an overall loss of recovery. The results were marginal, and further magnetic separation tests are not recommended.

13.7.2 High intensity magnetic separation

In 2018, Prospero conducted a metallurgical testwork program which included dry HIMS tested at their in-house laboratory in Brazil. A 944 kg sample was generated by blending drill samples extracted during the 2015 and 2107 drilling campaigns. After crushing and various further treatment involving vertical scrubbing, five size fractions from a 224 kg sub-sample were dried and subject to HIMS at approximately 10,000 gauss intensity.

A mass recovery of 80% to magnetics resulted in high metal recoveries Cu 89%, Mn 94%, Zn 94%, and Ag 86% (Table 13.3). Rejection of carbonates was not measured which would have been highly useful data for this process. The head grade of the sample (14.0% Mn) is not representative of material that would need upgrading for further treatment, nor are the pre-magnetic separation processes typical of those expected on a plant scale.

HIMS performance reported to date is inconclusive. Ore sorting should be initially pursued in preference to this method.

Table 13.3 HIMS (dry) by size fraction

Size	Process / fraction	Distr %	Grade Cu %	Cu % distrib head	Grade Mn &	Mn % distrib head	Grade Zn %	Zn % distrib head	Grade Ag ppm	Ag % disrib head
<4 mm >2.0 mm	Magnetic	9.5	1.6	10.7	19.10	11.3	0.60	11.1	170	10.7
<2.0 mm >1.0 mm	Magnetic	13.8	1.54	15.5	18.30	16.5	0.60	16.3	206	15.8
<1 mm >100#	Magnetic	15.6	1.64	18.1	18.90	18.8	0.60	18.5	190	16.0
<100# >325#	Magnetic	9.4	1.17	10.3	12.10	10.8	0.32	11.1	122	10.1
<325#	Magnetic	31.4	1.39	34.3	13.79	36.1	0.36	37.2	111	33.8
Total	**Total**	**80**	**1.46**	**89**	**14.33**	**93**	**0.30**	**94**	**151**	**86**

Source: Prospero, 2018.

13.8 Sulphuric acid reductive leach

Testwork programs over the years have focused on a reductive acid leach to dissolve Cu and Mn prior to separation of solids and liquids. The solids were then neutralized, and the Ag leached with cyanide. When Mn was effectively reduced (Mn^{4}+ to Mn^{2}+), high Ag cyanide extractions of 90 - 98% were achievable, depending on particle size and conditions.

Table 13.4 presents a comparison of Cu and Mn extractions for reductive and non-reductive acid leach. In the absence of a reductant Mn is not leached.

Silver, like gold, does not leach in sulphuric acid. A salt / hydrochloric acid (NaCl / HCl) or cyanide (NaCN) leach is required.

Table 13.4 Comparison of reductive and non-reductive acid leaches

Laboratory	Feed sample	Reductant	Cu-extraction (%)	Mn extraction (%)	Comment
KCA	Whole ore	Nil	22 – 93	0 – 11	Brown to yellow ore
KCA		SO_2 or SMBS	69 – 97	62 – 99	Brown to yellow
Prospero	HIMS Concentrate	H_2O_2	89 – 98	90 – 94	Blend
FreoMet	Prospero HIMS Concentrate	Nil	80	7	Blend
FreoMet		SMBS	82 – 96	94 – 98	-

13.8.1 KCA testwork

KCA testwork conducted in 1997 (summarized by Valor in 2018) demonstrated greater than 90% Mn was leached into solution in a reductive SO_2 acid leach at pH 2. A subsequent pH of 1 resulted in Cu extraction of greater than 88% and up to 96%. KCA considers SO_2 the best reducing agent, since in the reduction step it is converted to sulphuric acid which is also used in the process. It is also a very inexpensive reagent which may be available locally in Peru or can be easily made from elemental sulphur.

Table 13.5 KCA reductive acid leach testwork results

KCA test number	23766	23768	23770	23772	23774
Conditions					
Feed ID	23108	23108	23108	23108	23108
Ore batch size (g)	300	300	300	300	300
Starting H_2O mass (g)	600	600	600	600	600
SO_2 leach pH target	**5**	**4.5**	**2**	**2**	**2**
Leach time (min)	35	50	100	95	90
SO_2 flow rate (mL/min)	440	440	440	440	440
H_2SO_4 makeup pH target	**1**	**1**	**1**	**1**	**1**
Reagent dose					
Total H_2SO_4 added (kg/t ore)	**324**	**338**	**293.5**	**345.6**	**345.6**
SO_2 consumed (kg/t ore*)	**96**	**138**	**276**	**262**	**248**
Extraction (based on tailings assays)					
Mn (%)	**63.4**	**90.4**	**99.2**	**92.5**	**96.1**
Cu (%)	**77.3**	**83.5**	**96.4**	**87.5**	**91.8**
Ag (%)	0.4	0.5	0.3	0.6	0.5
Fe (%)	7.0	9.2	26.3	25.8	23.9
Ca (%)	---	---	---	---	---
Mg (%)	86.5	88.4	80.2	88.1	91.4
Zn (%)	---	---	---	---	---
Leach filtrate concentrations					
Mn (g/L)	36.6	49.8	53.2	54.5	55.4
Cu (g/L)	3.8	3.9	4.4	4.4	4.5
Ag (mg/L)	0.4	0.5	0.3	0.6	0.5
Fe (g/L)	1.2	1.5	4.1	4.4	4.0
Ca (g/L)	---	---	---	---	---
Mg (g/L)	4.9	4.8	4.3	5.1	5.2
Zn (g/L)	---	---	---	---	---

KCA was subsequently commissioned by Silver Standard to replicate earlier KCA testwork and generate sample for solid-liquid separation. This 2010 reductive acid leach testwork by KCA (Table 13.6) demonstrated high Mn and Cu dissolution with correspondingly high Ag dissolution in a subsequent cyanide leach step. KCA test conditions and observations included:

- P_{80} 140 µm grind and 25 wt% solids.
- Whole of ore pre-leach at pH 4 to remove 60 - 70% of Mg prior to reductive leach.
- Reductive sulphuric acid leach using SO_2 on pre-leach residue.
- Leach residence time 115 min at ambient temperature.
- SO_2 consumption averaged 346 kilograms per tonne (kg/t) (250 kg/t ore).
- H_2SO_4 consumption estimated at 330 kg/t (total).
- Subsequent cyanide leach after neutralization of tailings at 5 grams per litre (g/L) NaCN for 50 hr.
- KCA observed high viscosity, gel-like samples at density greater than 25 wt% solids.

Table 13.6 KCA ore head grades 2010

	Mn (%)	Cu (%)	Ag (g/t)	Fe (%)	Ca (%)	Mg (%)	Zn (%)
24765A	19.0	1.34	342	5.63	8.53	1.74	0.78
23108A	19.0	1.27	377	5.67	8.15	1.80	0.74

13.8.2 Prospero testwork

In 2018, Prospero took the HIMS product described in Section 13.7.2 for subsequent reductive acid leaching. The -1 mm + 150 µm fraction was chosen for testing. KCA considers that the HIMS product was not an effective upgrade due to the relatively non-magnetic nature of the oxide ores and the high head-grade used in the process.

This Prospero reductive acid leach testwork demonstrated high Mn and Cu dissolution with corresponding high Ag dissolution in a subsequent cyanide leach step. Prospero test conditions and observations included:

- HIMS concentrate -1 mm +150 µm fraction; 20 g per test.
- P_{95} 45 µm grind and 9 wt% solids.
- Reductive sulphuric acid leach using H_2O_2.
- Heating at 90°C for 2 hrs leach time.
- On average, over 90% Mn, 85% Cu, and 72% Zn extraction with minimal extraction of Ag.
- Test 9 equates to an acid consumption of 0.55 tonnes H_2SO_4 per tonne of ore. The consumption of H_2O_2 by Prospero is difficult to calculate, but appears to be in the range of 120 kg H_2O_2 (100% basis) per tonne of ore.

Table 13.7 Prospero reductive acid leach results

Sample magnetic <1.0 mm >150 µm			Mn %	18.9	Cu %	1.64	Zn %	0.6	Ag ppm	190
H_2O_2 200 vol	Time	Temp.		Recover %		Recover %		Recover %		Recover %
20 DILU.	02:00	90°C	17.10	90.5	1.58	96.3	0.50	83.3	0.10	0.1
20 DILU.	02:00	90°C	17.30	91.5	1.60	97.6	0.50	83.3	0.10	0.1
20 DILU.	02:00	90°C	17.40	92.1	1.58	96.3	0.50	83.3	0.10	0.1
20 DILU.	02:00	90°C	17.00	89.9	1.61	98.2	0.50	83.3	0.10	0.1
20 DILU.	02:50	90°C	14.70	77.8	0.40	24.4	0.30	50.0	< 0.01	-
20 DILU.	02:00	90°C	17.60	93.1	1.46	89.0	0.40	66.7	< 0.01	-
20 DILU.	02:00	90°C	17.80	94.2	1.45	88.4	0.40	66.7	< 0.01	-
20 DILU.	02:00	90°C	17.45	92.3	1.43	87.2	0.40	66.7	< 0.01	-
20 DILU.	02:00	90°C	17.60	93.1	1.42	86.6	0.40	66.7	< 0.01	-
	Average recovery			**90.5%**		**84.9%**		**72.2%**		**0.1%**

Source: Prospero, 2018.

13.8.3 FreoMet testwork

Subsequent testing commissioned by Valor at FreoMet (Wellham, 2019) laboratories used the same bulk HIMS magnetic concentrate to replicate the Prospero conditions. 100 kg of HIMS magnetic concentrate was shipped to FreoMet in Australia from Prospero in Brazil. It is unclear if this was the same size fraction as Prospero leach.

Hydrogen peroxide as reductant did not liberate Mn, and subsequently Ag, as effectively as SO_2 or sodium metabisulfite (SMBS). FreoMet conditions included:

- HIMS magnetic concentrate leach at grind size assumed to be the same as Prospero P_{195} 45 µm.
- Reductive sulphuric acid leach using H_2O_2 or SMBS.
- Leach residence time 2 to 6 hrs at 90°C.
- Subsequent cyanide leach after neutralization of tailings at 10 g/L NaCN for 24 hr.
- Sample size was limited to 20 g compared with KCA at 250 to 750 g.

FreoMet reductant leach using H_2O_2 did not perform as well as Prospero at the same conditions.

13.8.4 Summary

A summary of the results from KCA, Prospero, and FreoMet are presented in Table 13.8.

Key conclusions include:

- SO_2 was most effective reductant and superior to H_2O_2.
- The SO_2 or SMBS reductant facilitates attack of the Mn matrix and effectively liberates Mn.
- Attack of Mn matrix effectively liberates Ag for dissolution in subsequent cyanide leach.
- H_2O_2 is a large consumer of sulphuric acid and is not the favoured reductant. SMBS is Sodium Metabisulfite, which is identical to SO_2 except it also contains Na (Sodium) ions which are not a desirable additive to the process.
- The reductive acid leach process is considered a viable option to recover Cu and Mn and liberate Ag for subsequent cyanidation.
- It is recommended to prioritize ore sorting over magnetic separation in testwork to significantly reduce reagent consumption and solid-liquid separation difficulties.

Table 13.8 Reductive leaches – best performing from KCA and FreoMet campaigns

Condition	**Acid leach extraction (%)**					**Cyanide extraction (%)**
	Mn	**Cu**	**Fe**	**Zn**	**Ag**	**Ag**
KCA 2010 (50030 **250 g sample,** 50054 **750 g sample**): P_{80} 140 µm Pre-leach + SO_2 leach pH 2 + H_2SO_4 to pH 1 (115 min ambient); 25 wt% solids (50058, 51822) CN leach 5 g/L 50 h	98	88	37	N/A	0.7	92-98
Prospero 2018 (Test 9; 20 g HIMS conc sample), P_{80} 45 µm, H_2O_2 + H_2SO_4 (120 min at 90°C), 9 wt% solids	93	87	N/A	67	0.1	96
FreoMet (B2 490 g sample) **H_2O_2** leach + H_2SO_4 (2 hr 90°C); 4 wt% solids CN leach 10 g/L 24 h	56	92	N/A	N/A	N/A	45
FreoMet (Run 8; **20 g sample**) H_2O_2 leach + H_2SO_4 (2 hr 90°C); 5 wt% solids CN leach 10 g/L 24 h	87	85	N/A	N/A	N/A	10
FreoMet (Run 16; **20 g sample**); SMBS + H_2SO_4 (2 hr ambient); 10 wt% solids CN leach 10 g/L 24 h	79	72	N/A	N/A	N/A	67

KCA noted that at ambient temperature the reductive acid leach generated dithionate ions (S2O62-). Dithionate ions are detrimental to EMD production. However, at increased leach temperature of 80°C or greater dithionate was not formed. The exothermic reaction heats the ambient test to around 60°C.

13.9 Silver extraction

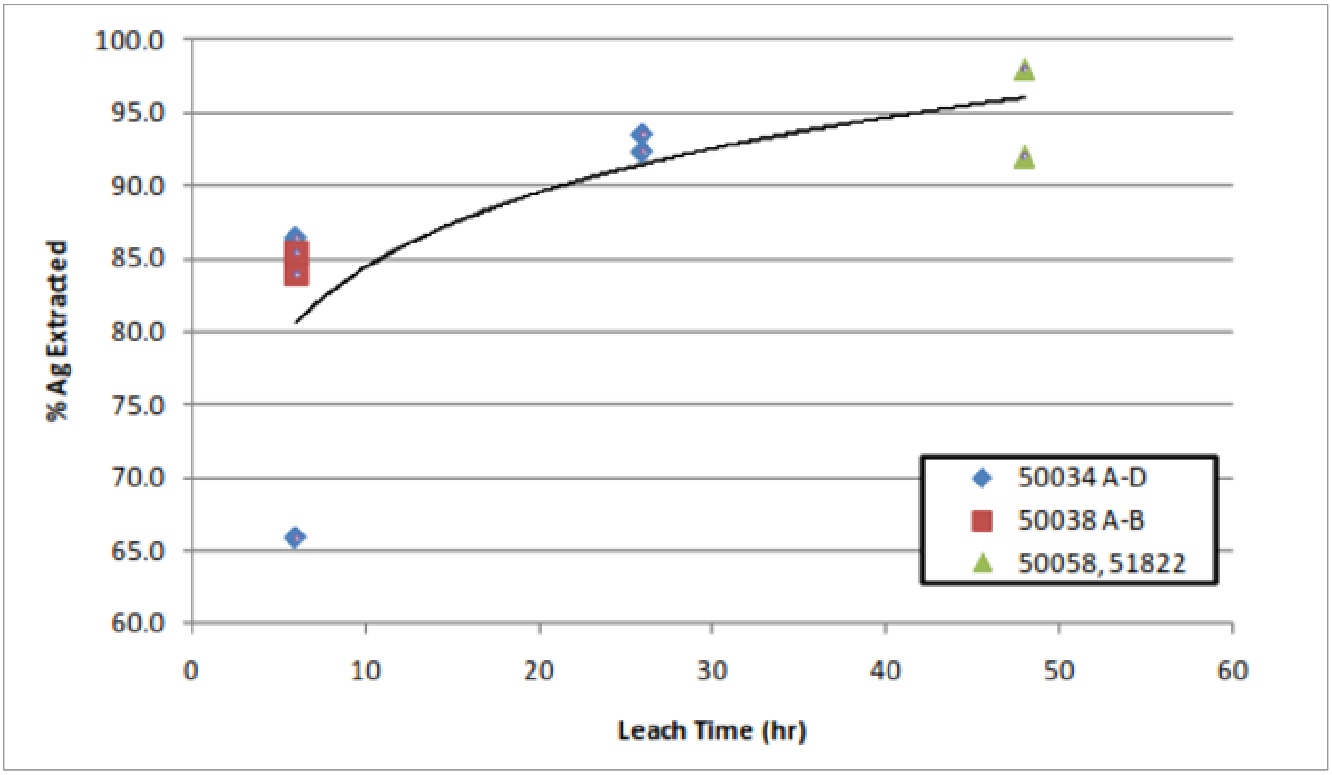
13.9.1 Cyanide leach (post reductive acid leach)

13.9.1.1 KCA

KCA cyanide leach tests were very preliminary. Work in this area should be undertaken as part of the future bench scale program. KCA also considered a chloride leach for recovery of the silver, albeit that cyanide leach is probably the more traditional and tested option.

Following the reductive acid leach, KCA filtered and washed the sample prior to pH adjustment and cyanidation. The general trend of cyanide leach extraction of Ag versus time is presented in Figure 13.2, showing extraction progressing to 48 hrs. The slurry was particularly viscous and had to be diluted to 20 wt% solids. This indicates settling in a counter current decantation (CCD) wash circuit will be problematic. In the past few years, there have been significant advances in the use of large pressure filters for mineral slurries, and this alternative to CCD washing will be studied in the future lab program.

Figure 13.2 Cyanide leach Ag extraction vs time - post reductive acid leach



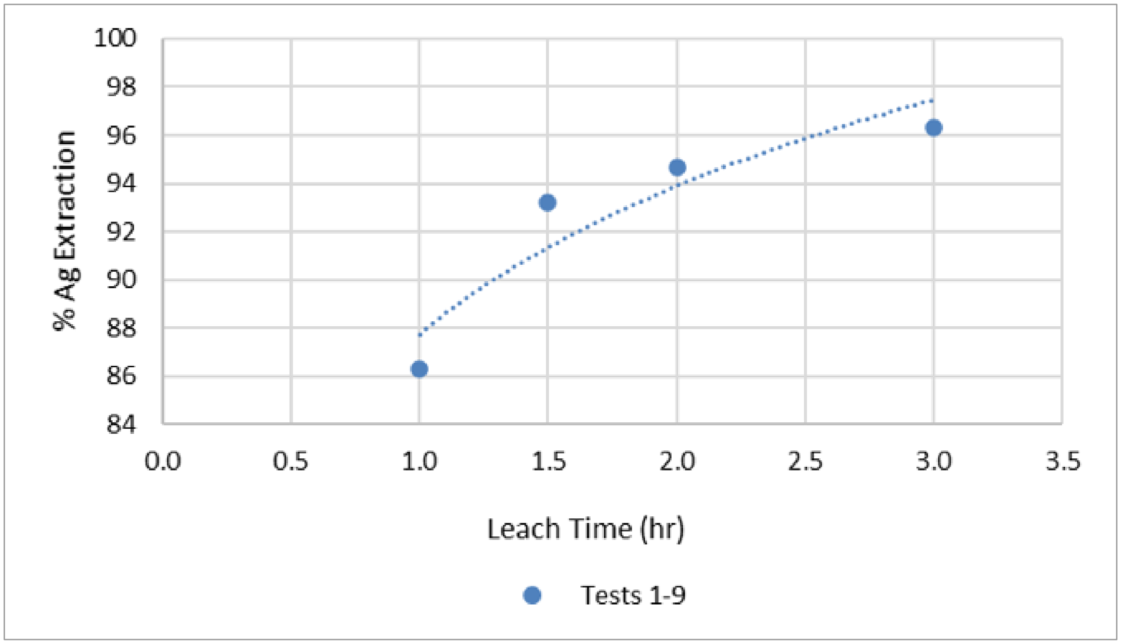
Source: KCA, 2010.

Lime consumption, to neutralize the acidic residue and raise the pH to 10.5, ranged from 11 to 13 kg/t. Cyanide consumption ranged from 3.6 to 4.2 kg/t SO_2-leach residue. KCA also considered a chloride leach for recovery of silver. As well as technical differences, a chloride leach may also be a requirement for environmental permitting of project operations. The chloride leach process will not be studied further unless issues develop with the use of cyanide.

13.9.1.2 Prospero

Following the reductive acid leach, Prospero filtered and washed the sample prior to pH adjustment and cyanidation. The acid leach residue (cyanide leach feed) contained 164 g/t Ag. Leach extraction of the acid leach residue (Figure 13.3) was much faster than that of whole of ore residue as determined by KCA, however Prospero used excessive amounts of leach reagents to accomplish this.

Figure 13.3 Cyanide leach Ag extraction vs time-post HIMS Concentrate reductive acid leach-Prospero



Source: Prospero.

13.10 Copper electrowinning

Direct electrowinning has been carried out on reductive leach PLS by PRA and KCA. Whilst these tests are useful, the upcoming bench-scale program will investigate the implementation of solvent extraction to upgrade the solution prior to electrowinning.

PRA conducted direct Cu EW on reductive leach PLS using EMEW cells. Cu tenors were reduced to low levels within 1.5 hours.

Lower Mn and Fe levels produced >99% Cu purity. Higher Mn and Fe levels caused cathode quality to reduce to 90% Cu with accompanying Mn and Fe plating out. Results show that Cu depletion progresses to low tenors but with decreasing current efficiencies ranging from 77% to 25% (Table 13.9).

Table 13.9 Direct Cu EW at 400 A/m^2 current density in EMEW Cells

Composite sample ID	Test No.	Average levels		Plated Cu (g)	Overall % CCE	Cu tenors (g/L)		
		Mn (g/L)	Fe (g/L)			0 hrs	1 hrs	1.5 hrs
SL6-Y PLS+wash	E1	3.55	3.97	4.40	77	2.95	0.31	N/A
SL7-B PLS+wash	E2	71.0	0.52	8.66	68	3.55	1.85	0.74
SL8-M PLS+wash	E3	10.0	2.78	2.43	25	1.31	0.08	0.01

Source: PRA, 2006.

Figure 13.4 Photo of Cu plated to depletion (PRA, using EMEW Cells)

Source: PRA, 2006.

During KCA's 2010 testwork campaign, extensive Cu electrowinning testwork was conducted directly on reductive acid leach pregnant leach solution using a conventional, parallel plate electrolytic cell. The scope included:

- Batch tests at varying current densities and temperatures to determine selectivity for Cu reduction, acid generation efficiencies and current efficiency relationship.
- Continuous tests investigated plate and powder forms of Cu at varying current density, lean Cu concentration on current efficiency and Cu quality.

Cu was electrowon as Cu powder to >95% purity at a current density of 140 amps per meter squared (A/m^2). However, due to the high contaminant load of Mn and Fe compared with relatively low Cu tenors only 30 - 45% current efficiencies were attained. Very low current density of 35 A/m^2 satisfied generation of plated Cu but with even lower current efficiency 25%.

If direct electrolysis is used, an additional precipitation stage may be required to reduce the lean electrolyte concentration and recover the remainder of the Cu. The more conventional way to recover copper is via a Solvent Extraction process. This will be the primary target of future testwork.

13.11 Iron removal

KCA used ammonium hydroxide (20 kg/t) and air to precipitate iron from barren solution ex-Cu EW (Table 13.10). Hydrated lime, limestone or sodium carbonate typically would be used and will be tested in upcoming bench-scale programs.

Over 98% of Fe was removed with 0.9% Mn and 33% Zn loss. Residual Cu also co-precipitated, as expected.

13.12 Zinc precipitation

KCA tests presented in Table 13.11 serve to confirm the basic process, but the proposed bench scale program should examine this process in more detail. Co-precipitated manganese sulphide can probably be redissolved and converted to zinc sulphide in a two-step process.

KCA used ammonium sulphide ($(NH_4)_2S$) to precipitate Zn from the solution (15 kg/t) at approximately 2x stoichiometric excess. Initial tests were conducted on synthetic solution; the subsequent test on solution ex-Fe removal (Table 13.10). Other precipitants such as sodium hydrosulphide should be investigated.

Over 97% Zn was precipitated, along with residual Cu in solution at an ambient test temperature of 25°C. Earlier KCA work indicated an optimum temperature of 65°C. Up to 15% Mn was precipitated using synthetic solutions. Further work is recommended to examine Mn losses and optimize conditions.

Table 13.10 Solution purification testwork summary

KCA test number	**51859**	**51861**
Conditions		
Feed ID (Cu-barren PLS)	Synthetic	51852
Solution quantity (mL)	664	1,770
pH target	3.5	3.5
Oxidant	Air	Air
(if air, flow rate) (mL/min)	1,000.0	1,750.0
Neutralizing reagent	NH_4OH	NH_4OH
Reaction temperature (°C)	85	85
Reaction time (min)	190	195
Reagent dose		
Neu. reagent added (g)	5.6	16.9
Neu. reagent added (kg/t ore)	**16.7**	**20.2**
Cake weight, dry (g)	12.19	32.53
Pregnant leach solution (feed)		
Volume (mL)	663	1,770
Mn (g/L)	39.6	37.1
Cu (g/L)	0.4	0.4
Fe (g/L)	7.5	5.0
Mg (g/L)	0.6	---
Zn (g/L)	1.2	1.4
Precipitated as solids		
Mn (%)	**0.9**	**3.6**
Cu (%)	83.0	79.4
Fe (%)	**98.6**	**100.0**
Mg (%)	---	---
Zn (%)	33.0	5.5
Pregnant leach solution (product)		
Volume (mL)	615	1,762
Mn (g/L)	39.2	35.8
Cu (g/L)	0.07	0.09
Fe (g/L)	0.1080	0.0017
Mg (g/L)	0.6	---
Zn (g/L)	0.79	1.36

Source: KCA, 2010.

Table 13.11 Zinc precipitation testwork summary

	51871A				51871B				51871C				51871D				51875	
Conditions																		
Feed IC (Cu and Fe-barren PLS)	Synthetic				Synthetic				Synthetic				Synthetic				51861	
Solution quantity (mL)	200				200				200				200				1,672	
Initial pH	4.4				4.4				4.4				4.4				4.2	
Precipitant used	$(NH_4)_2S$				$(NH_4)_2S$				$(NH_4)_2S$				$(NH_4)_2S$				$(NH_4)_2S$	
Quantity of precipitant (mL)	1.95				3.12				4.67				6.22				23.67	
Stoichiometric excess for zinc	**1.25**				**2**				**3**				**4**				**2**	
Reaction temperature (°C)	**25**				**25**				**25**				**25**				**25**	
Reaction time (hr)	**1**	**2**	**6**	**24**	**1**	**2**	**6**	**24**	**1**	**2**	**6**	**24**	**1**	**2**	**6**	**24**	**2**	**6**
Precipitated as solids																		
Mn (%)	**5.1**	**6.4**	**2.5**	**6.6**	**8.3**	**4.9**	**8.7**	**12.6**	**7.8**	**14.4**	**8.7**	**14.9**	**15.5**	**13.4**	**15.1**	**17.2**	**0.0**	**3.6**
Cu (%)	99.2	99.7	99.8	99.5	99.7	99.9	99.9	99.7	99.9	99.8	99.9	99.9	99.8	99.8	99.9	99.9	61.9	98.9
Zn (%)	**95.7**	**96.0**	**93.3**	**82.9**	**99.6**	**99.4**	**99.8**	**99.8**	**99.6**	**99.8**	**99.8**	**100.0**	**99.8**	**99.8**	**99.9**	**99.9**	**97.0**	**97.9**
Reagent dose																		
Neu. reagent added (g)	1.95				3.12				4.67				6.22				23.67	
Neu. reagent added (kg/t ore)	**9.5**				**15.2**				**22.8**				**30.4**				**15.2**	
Feed solution																		
Mn (g/L)	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	39.9	31.7	31.7
Cu (mg/L)	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	196	75	75
Zn (mg/L)	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,358	1,358
Product solution																		
Mn (g/L)	37.8	37.3	38.8	37.2	36.5	37.9	36.4	34.8	36.7	34.1	36.4	33.9	33.7	34.5	33.9	33.0	31.7	30.5
Cu (mg/L)	1.62	0.51	0.36	0.97	0.55	0.23	0.29	0.66	0.24	0.42	0.27	0.26	0.31	0.32	0.20	0.28	29.00	0.84
Zn (mg/L)	**62.8**	**58.3**	**98.2**	**252**	**6.4**	**8.3**	**2.9**	**3.5**	**6.3**	**3.7**	**2.3**	**0.6**	**3.3**	**2.6**	**1.6**	**1.3**	**40.9**	**29.0**

Source: KCA, 2010.

13.13 Electrolytic manganese dioxide from purified solution

KCA tests presented below serve to confirm the basic process, but the proposed bench scale program should examine this process in more detail. Experts in the operation of manganese dioxide electrolysis will be consulted as part of the bench-scale program.

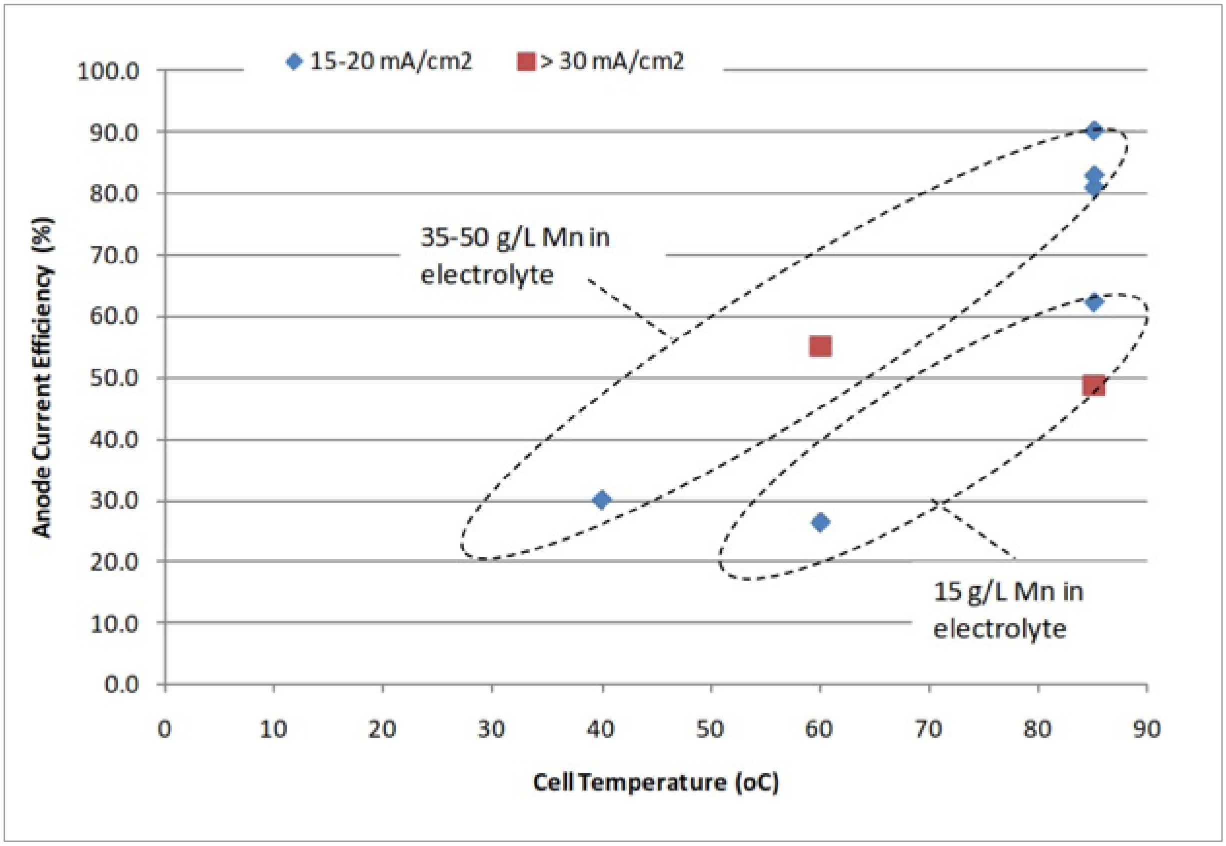
Electrowinning of manganese dioxide can be used to produce battery grade EMD or a lower grade specification Mn product (typically called CMD), which can be used as high grade metallurgical Mn ore. The metallurgical Mn ore market 10 years ago was considered a larger market than the high specification EMD, EMM, or $MnSO_4$ markets. Given the battery market today, this is shifting.

KCA investigated production of EMD to metallurgical Mn ore specification (i.e., CMD electrolytic product) (see Table 13.12).

Observations included:

- Increased cell temperature (85°C) resulted in increased cell efficiency (80 - 90%) (see Figure 13.5).
- A current density <30 mA/cm^2 was required for current efficiency > 55%.
- Graphite anode material provided more coherent manganese dioxide plates than lead.
- Anode product ranged from 85% to 97% MnO_2. EMD specification is 92% with prescriptive impurity limits and crystal structure. KCA feels that with further test work, a process for producing EMD grade material on a reliable basis, can be developed.

Figure 13.5 Effect of temperature, current density, and Mn^{2+} concentration on MnO_2 current efficiency



Source: KCA, 2010.

Table 13.12 Manganese dioxide electrowinning

Sample ID	**51818**	**51824**	**51820**	**51828**	**51854**	**51850**	**51870**	**51903**	**51905**	**51907**
Date	17 Aug 2010	19 Aug 2010	20 Aug 2010	23 Aug 2010	1 Sep 2010	2 Sep 2010	20 Sep 2010	5 Oct 2010	6 Oct 2010	7 Oct 2010
Test description	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW	MnO_2-EW
Single anode (A) or bicell (B) configuration	A	A	A	A	A	A	A	B	B	B
Batch or continuous	Batch	Batch	Batch	Batch	Batch	Batch	Batch	Batch	Batch	Batch
Approximate batch size (mL electrolyte)	600	900	900	900	1,000	900	1,000	1,000	1,000	1,000
Cell conditions										
Anode material	Pb	Pb	Pb	Pb	Graphite	Pb	Graphite	Graphite	Graphite	Graphite
Cathode material	SS316	SS316	SS316	SS316	SS316	Al	SS316	SS316	SS316	SS316
Anode current density (mA/cm^2)	**42.0**	**43.0**	**40.0**	**15.0**	**18.0**	**18.0**	**18.0**	**18.0**	**18.0**	**29.8**
Voltage	5.1	5.1	4.1/5.1	3.3	3.0-3.3	3.0-3.3	3.3	2.4	2.4	2.5
Temperature (°C)	24	60	80	0	85	85	40	85	60	85
Total EW time (hr)	4.0	6.0	6.3	7.5	7.5	6.0	6.0	6.0	6.0	2.0
Solution Desc.	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic
General results										
Theoretical MnO_2 plated (g)	17.40	26.30	32.50	12.90	15.34	10.48	12.09	19.82	19.82	10.90
Actual MnO_2 plated (g)	0.14	14.47	0.00	11.05	12.44	8.70	3.63	12.35	5.21	5.35
Overall anode current efficiency (%)	**0.8**	**55.0**	**0.0**	**90.3**	**81.1**	**83.0**	**30.0**	**62.3**	**26.3**	**48.8**
Extraction ratio (%)	0.1	16.7	0.0	18.4	18.3	14.7	10.2	48.1	27.6	25.8
Acid regeneration efficiency (%)	---	---	---	89.5	80.5	86.2	75.7	78.7	82.6	65.4
Specific energy consumption (kWh/kg MnC)	416.3	5.9	---	2.3	2.4	2.5	7.2	2.4	5.6	3.2
Form of MnO_2	Soft flakes	Soft flakes	Soft flakes	Soft flakes	Hard plates	Soft flakes	Hard plates	Hard plates	Hard plates	Hard plates
Initial electrolyte composition										
Mn (g/L)	40.0	50.0	40.0	40.0	40.0	40.0	36.1	15.0	15.0	15.0
Cu (g/L)	0.2	---	0.2	---	---	0.5	---	---	---	---
Fe (g/L)	5	---	5	---	---	0	---	---	---	---
Mg (g/L)	0.5	---	0.5	---	---	0.5	---	0.5	0.5	0.5
Zn (g/L)	1	---	1	---	----	1	---	---	---	---
H_2SO_4 (g/L)	5.0	5.0	5.0	0.0	0.0	0.0	0.0	45.0	45.0	45.0
Ammonium sulphate (g/L)	---	---	125.0	40.0	40.0	20.0	40.0	---	---	---
pH	1.9	1.5	1.5	2.7	3.5	3.4	3.4	1.0	1.1	1.2

Sample ID	**51818**	**51824**	**51820**	**51828**	**51854**	**51850**	**51870**	**51903**	**51905**	**51907**
Final electrolyte composition										
Mn (g/L)	---	40.1	---	33.8	33.8	34.1	34.5	7.7	10.8	10.3
H_2SO_4 (g/L)	---	21.8	5.3	14.2	13.9	12.6	3.7	54.9	50.0	46.4
pH	1.8	0.9	1.3	1.0	1.4	1.4	2.0	1.0	0.9	1.0
Anode material assay										
Mn (%)	**---**	**60.7**	**---**	**61.4**	**57.8**	**60.2**	**54.4**	**54.3**	**50.1**	**53.6**
Equivalent MnO_2 (%)	**---**	**96.0**	**---**	**96.9**	**91.3**	**95.1**	**86.0**	**85.8**	**79.2**	**84.7**
Pb (%)	---	0.836	---	0.390	---	0.611	---	---	---	---
S (%)	---	---	---	0.660	1.069	0.660	2.210	0.985	2.109	2.632
C (%)	---	---	---	---	1.013	---	4.750	1.050	0.941	0.767

Source: KCA, 2010.

13.14 Crystallization of manganese sulphate

KCA work in the 1990's did not evaluate crystallization of manganese sulphate since the manganese sulphate market was not very large at that time. The currently proposed bench scale program would evaluate this process.

13.15 Liquid solid separation

Pre-leach, reductive leach, and cyanide leach residue from KCA (2010) campaign underwent flocculation selection, static settling tests, vacuum, and pressure filtration. All solids / liquids separation steps should be further evaluated in the proposed bench scale program.

Results and conclusions from the 2010 KCA work are summarized below.

13.15.1 Settling

- Fresh ore slurry settled well to 50 wt% solids at P_{80} 104 µm.
- Reductive leach residue slurry settling rate decreased significantly at ambient or elevated temperature (90°C) compared with non-leached.
- Fine gypsum formation and colloidal silica may be interfering with settling rate and further investigation is warranted.
- Seed recycle to reduce the effect of gypsum was investigated without improvement.

Table 13.13 shows a comparison of underflow densities achieved at given settling times. Low densities were achieved for the leach residues.

Table 13.13 Comparison of static settling tests for various process stages

Sample ID	Stage	Feed slurry solids %	1 hr static settled density (% solids)	Overnight (16 - 24 hr) settled density
Ore-as-is	No processing	20	52.0	63.0
50044-1	Pre-leach	20	23.4	33.9
50078E	**SO_2 leach**	**14.5**	**15.8**	**19.8**
50067	**Cyanide leach**	**19**	**19.5**	**22.5**

13.15.2 Filtration

Vacuum and pressure filtration of leach residues resulted in high moisture levels with relatively poor filtration rates.

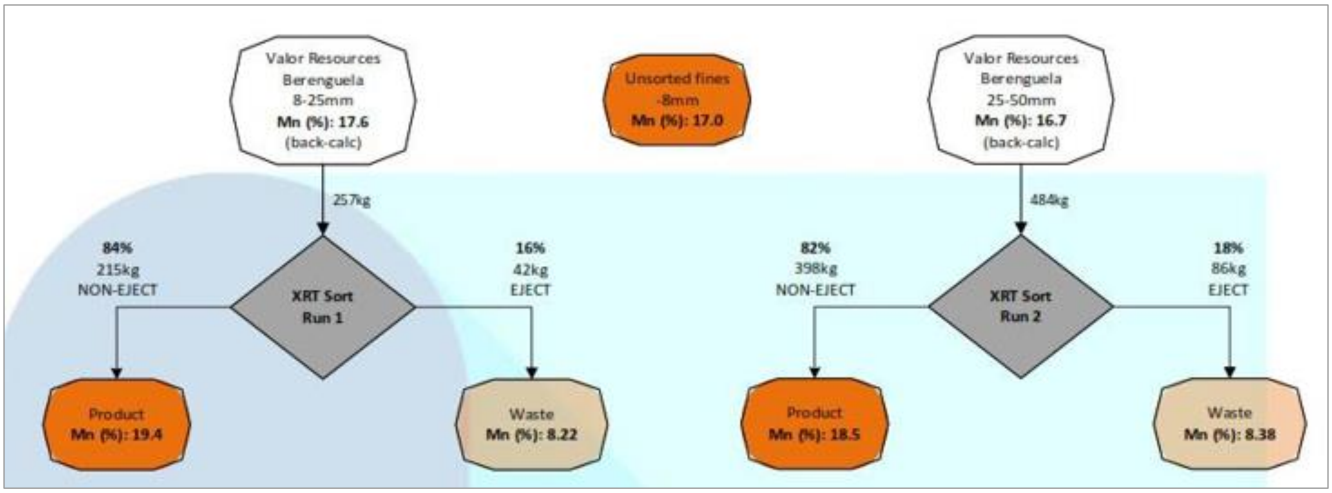
- Cyanide leach residue performed best in vacuum filtration (300 kg/m^2.h at 40 wt% solids) compared with acid residue leach (40 kg/m^2.h and 45 wt% solids).
- Cyanide leach residue performed best in pressure filtration (150 kg/m^2.h at 2.5 cm thick and 55 wt% solids) compared with acid residue leach (80 kg/m^2.h at 2 cm thick and 50 wt% solids). Very high moisture levels were retained for all tests.
- Filtration clarities were poor and ranged 500 – 1,000 milligrams per litre (mg/L) and more. Cyanide leach was improved at 100 mg/L range.

13.16 Ore sorting

The ore sorting tests reported below are useful, but in KCA's opinion the sample did not warrant upgrading. The sample used in these tests assays greater than 16% manganese, which is probably plant feed grade. There are zones of lower grade mineralization (5 - 10% manganese) in which discrete blocks of limestone / dolomite are incorporated as gangue. It should be possible for ore sorting to reject clean limestone fragments and upgrade the lower grade material to plant feed grade.

Preliminary ore sorting was trialed on a bulk sample obtained from near surface, with Mn grade ranging from 4% to 20%. Two size fractions were tested as depicted in Figure 13.6. TOMRA's (2019) COM XRT sorter was used to distinguish between high and low density particles and effectively reject low density carbonates. From the results presented in Table 13.14 concentration of Ca and Mg is observed in the sorter waste stream, however loss of Mn was not favourable. TOMRA noted the quantity of liberated carbonate or Mn-deficient waste was limited in the provided sample.

Figure 13.6 Testwork flow and ore sorting results for Mn



Source: TOMRA, 2019.

Table 13.14 Ore sorting assay results

Size	Run	Fraction	Mn (%)	Ca (%)	Mg (%)	Mass (kg)
N/A	N/A	Total feed	17.00	9.87	11.15	905
8 – 25 mm	Run 1	Sorter feed	17.6	10.6	3.8	257
		Product	19.4	10.3	3.41	215
		Waste	8.22	12	5.55	42
25 – 50 mm	Run 2	Sorter feed	16.7	10.9	3.9	484
		Product	18.5	10.6	3.54	398
		Waste	8.38	12.2	5.7	86
-8 mm	Unsorted	Fines	17	5.79	3.8	164

Source: TOMRA, 2019.

TOMRA tested only X-ray Density as a sorting indicator. There are many other ore sorting indicators that can be tested.

13.17 Recommendations

13.17.1 Flowsheet considerations

Considering the four key flowsheets, Flowsheets 3 and 4, are the most favourable technically, environmentally (no roast) and they recover Ag, Cu, and Mn. Some form of beneficiation or upgrade is recommended (ore sorting will be tested) to reduce acid consumption and also reduce issues with LSS performance. Product options to recover Mn include $MnSO_4$, EMM, EMD, or CMD.

Flowsheet 1: limited or no Mn recovery.

- Pelletized ore - segregation roast 750°C - flotation - ship conc.

Flowsheet 2: limited Mn or no recovery.

- Roast - calcine CPS flotation or ore - CPS flotation - ship conc.

Flowsheet 3: Favourable technically & environmentally (no roast) recovers Ag, Cu, and Mn.

- Ore – ore sorting - pre-leach - reductive leach - Cu EW, impurity removal, Zn ppt, Mn recovery (Mn or MnO_2 EW or $MnSO_4$); Ag cyanide leach.

Flowsheet 4:

- Ore - HIMS - reductive acid leach - Cu EW, impurity removal, Zn ppt, Mn recovery (Mn or MnO_2 EW or $MnSO_4$); Ag cyanide leach.

Given the amount of testwork that has been completed over the years, the increased marketability for Mn metal and the effective reductive leach results obtained by KCA, the generalized reductive acid leach flowsheet presented in Figure 13.1 is the basis for further testwork recommendations.

Most flowsheet components have been tested with reasonable success. The comminution and upgrade stages are less defined. These need to be defined to enable confirmation of downstream parameters and will be included in the upcoming bench-scale testwork. LSS was very poor and requires extensive consideration given the number of separation stages required in the hydrometallurgical process route. This will also be investigated in the bench-scale testwork.

The links between resource, domain classifications and metallurgical variability require significant further work. Aftermath has a considerable core inventory available to carry out tests that would enable these links to be established. This is a key focus for the next stage.

13.17.2 Expected recoveries

The 2010 KCA summary of laboratory results is included earlier in this section as Table 13.13 and Figure 13.3, and shows the following leach results:

Manganese % recovery into solution:	99.2%, 96.1% (tests 23770, 23774)
Copper % recovery into solution:	96.4%, 91.8% (tests 23770, 23774)
Silver, % recovery into cyanide solution:	92%, 93%, 92%, 97 % (tests 50034 A-D, 50058. 51822)

Subsequent KCA testwork showed than once the metals entered solution, there was no significant loss of metals to plant residues (i.e., into intermediate waste precipitates), except for a small loss of manganese to iron precipitate. Reasonable assumptions of at least 90% recovery into solution for Mn, Cu, and Ag and 85% for Zn, coupled with a plant recovery of at least 90% of the metals which entered solution, results in the following estimates of overall recovery as products. Copper (81% of the copper in the ore) will be recovered in the form of marketable copper sulphate or copper metal. Silver (81% of the silver in the ore) will be recovered as marketable doré bars. Zinc (estimated 76% of the zinc in the ore) will be recovered as zinc sulphide. Manganese (estimated 81% of the manganese in the ore) will be recovered in a variety of marketable products. Further testwork in the upcoming bench-scale program will test and validate these recoveries and also review the impact of varying head-grades on recovery.

13.17.3 Mn marketing

Aftermath has received an Mn marketing study from CRU in 2022 which will be applied with the various metallurgical outcomes for Mn to initiate trade-off studies for final Mn products.

The generalized flowsheet is presented in Section 13.1 and recommendations for further work in Section 13.2.

14 Mineral Resource estimates

14.1 Introduction

The Mineral Resource estimates for the Berenguela deposit have been prepared by Mr David Briggs and Deon Van Der Heever, of Rockridge Partnership & Associates (RockRidge). Ms Dinara Nussipakynova, P.Geo., of AMC, has reviewed the methodologies and data used to prepare the Mineral Resource estimates and after some adjustment to the parameters and classification, she is satisfied that they comply with reasonable industry practice. Ms Nussipakynova takes responsibility for the estimates and acts as the QP.

The result of the current estimate is summarized in Table 14.1. Mineral Resources are stated at a cut-off grade of 80 g/t AgEq which equates to a 3.55% manganese equivalent cut-off grade. The relative value in the Mineral Resource by metal is as follows, Ag=26%, Mn=44%, Cu=26%, Zn=4% using metal prices for Agri-$MnSO_4$ which generally trades at a considerable discount to battery grade manganese sulphate. The model is depleted for historical mining activities and constrained by a pit shell as discussed in Section 14.9.1.

Table 14.1 Berenguela Ag-Cu-Mn deposit Mineral Resource as of 31 January 2023

Classification	Tonnage Mt	Grade				Contained metal			
		Ag (g/t)	Mn (%)	Cu (%)	Zn (%)	Ag (Moz)	Mn (Mt)	Cu (Mlb)	Zn (Mlb)
Measured	6.152	101	8.89	0.85	0.30	20.0	0.55	115.3	41.2
Indicated	34.024	74	5.60	0.63	0.34	81.2	1.90	473.7	258.1
Measured and Indicated	**40.176**	**78**	**6.10**	**0.67**	**0.34**	**101.2**	**2.45**	**589.0**	**299.3**
Inferred	22.287	54	3.57	0.42	0.25	38.8	0.80	204.3	122.8

Notes:
- CIM Definition Standards (2014) were used for reporting the Mineral Resources.
- The effective date of the estimate is 31 January 2023.
- The Qualified Person is Dinara Nussipakynova, P.Geo., of AMC.
- Mineral Resources are constrained by an optimized pit shell using the assumptions in Table 14.14.
- No dilution or mining recovery applied.
- AgEq formula is AgEq = Ag+ Cu%*121.905+Mn%*22.809+Zn%*41.463 based on the parameters in Table 14.14.
- Cut-off grade is 80 g/t AgEq.
- Bulk density used was estimated and variable. but averaged 2.30 t/m^3 for mineralized material and 2.25 t/m^3 for waste.
- Drilling results up to 13 October 2022.
- Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
- The numbers may not compute exactly due to rounding.
- Mineral Resources are depleted for historic mined out material.
- The relative value in the Mineral Resource by metal is as follows, Ag=26% Cu=26%, Mn=44%, Zn=4%.

Source: AMC, 2023.

The QP is not aware of any known significant factors or risks that might affect access or title, or the right or ability to perform work on the Property, including permitting and environmental liabilities to which the project is subject. However, it is recognized that there is social unrest in Peru currently, although the situation is improving.

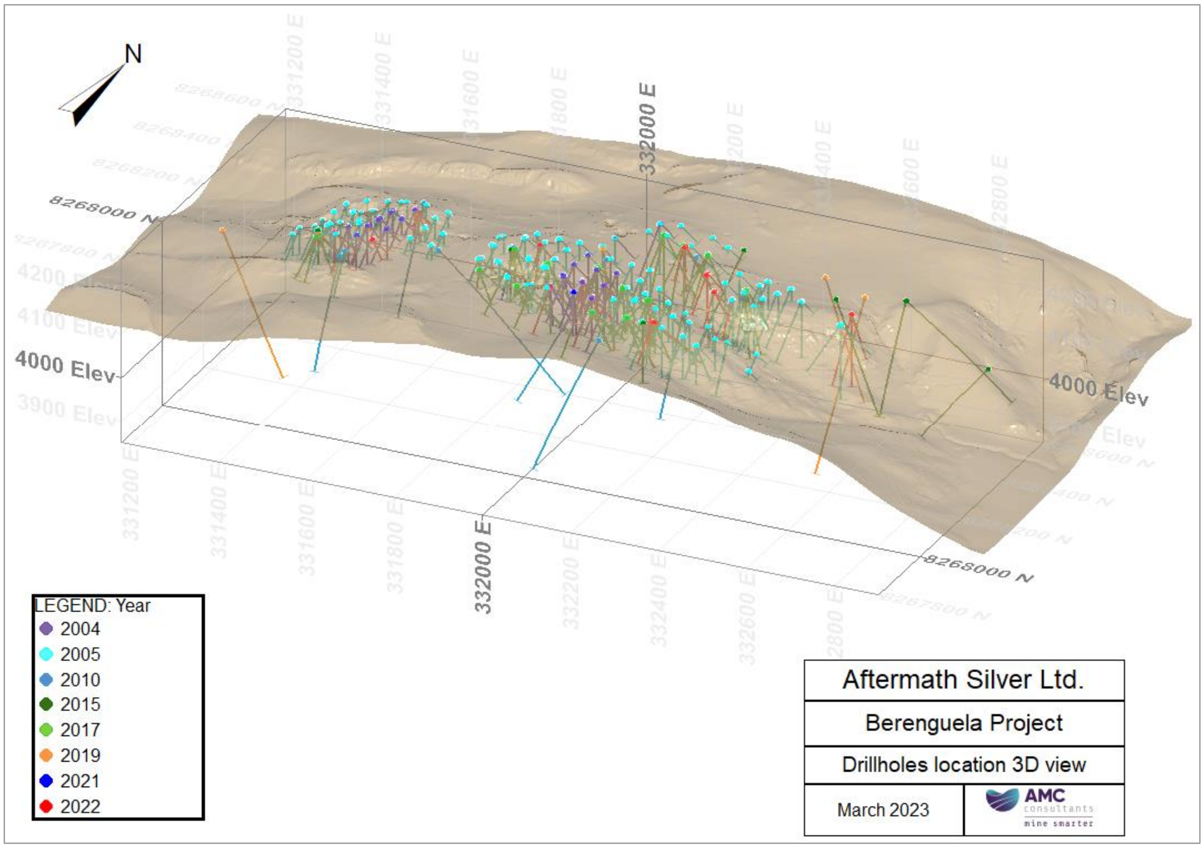
14.2 Data used

14.2.1 Drillhole database

The Mineral Resource estimation is supported by a single database which contains the results of both diamond drill core and RC chips. The electronic database for Berenguela contains a total of 386 surface drillholes with an average length of 42,533 m and 610 channels completed from 2004 to present. The drillholes are typically drilled in a fan, so as to be oriented normal to the strike of the plane of mineralization at a wide range of dips. All drillhole collars are located in x, y, z coordinates by the mine surveyors in truncated WGS 84, Zone 19 UTM grid and elevation above mean sea level (AMSL). Viewing the drillholes in 3D space shows an average spacing of approximately 25 m to 50 m between pierce intersections of the plane of the mineralization.

Drillhole information in this database includes some data gathered by operators of the project before the Aftermath exploration campaign. This has been both validated by twinning and verified. Drilling data was provided in the UTM WGS 84, Zone 19 grid coordinate system. A 3D view showing the drillhole locations within the resource boundary is presented in Figure 14.1. The extent covered in the figure is 1,600 m on the long axis.

Figure 14.1 3D view of drillhole locations



14.2.2 Database used for estimation

The database was supplied by Aftermath in the form of .csv files for each of the drilling database tables comprising of collars, downhole surveys, assays, lithology, stratigraphy, and density. Records were checked to ensure each drillhole had assay, survey, and collar information. The database was audited to generate master data tables in .csv format suitable to be imported into LeapFrog© software and Datamine software. For statistical analysis and grade estimation, missing assays were either omitted, or in the case where unsampled intervals would impact the estimate, set to an arbitrary below detection value.

Table 14.2 shows the drillhole summary represented by drilling years. During this period from 2004 to 2022, 262 RC and 84 DD holes were drilled.

Table 14.2 Summary of drillholes, used in the estimation

Year drilled	No. of drillholes	Drill type	No. of assays	Metres drilled (m)
2004	47	RC	4,098	4,256
2005	152	RC	12,368	12,610
2010	17	DD	1,884	5,546
2015	11	DD	1,540	1,876
2017	63	RC	7,497	7,630
2019	4	DD	782	1,427
2021	8	DD	585	781
2022	55	DD	4,312	5,387
Total	**357**	**RC-262, DD-95**	**33,066**	**39,513**

14.2.3 Bulk density

Bulk density values derived from core measurements of lithologies predominantly from within the mineralized zone, sourced from holes located in each of the estimation domains, were used to estimate a density value of blocks. A total of 506 density measurements were collected from 63 drillholes that were evenly distributed across domains. Table 14.3 shows the statistics of the density by rock type.

Table 14.3 Density sampling statistics

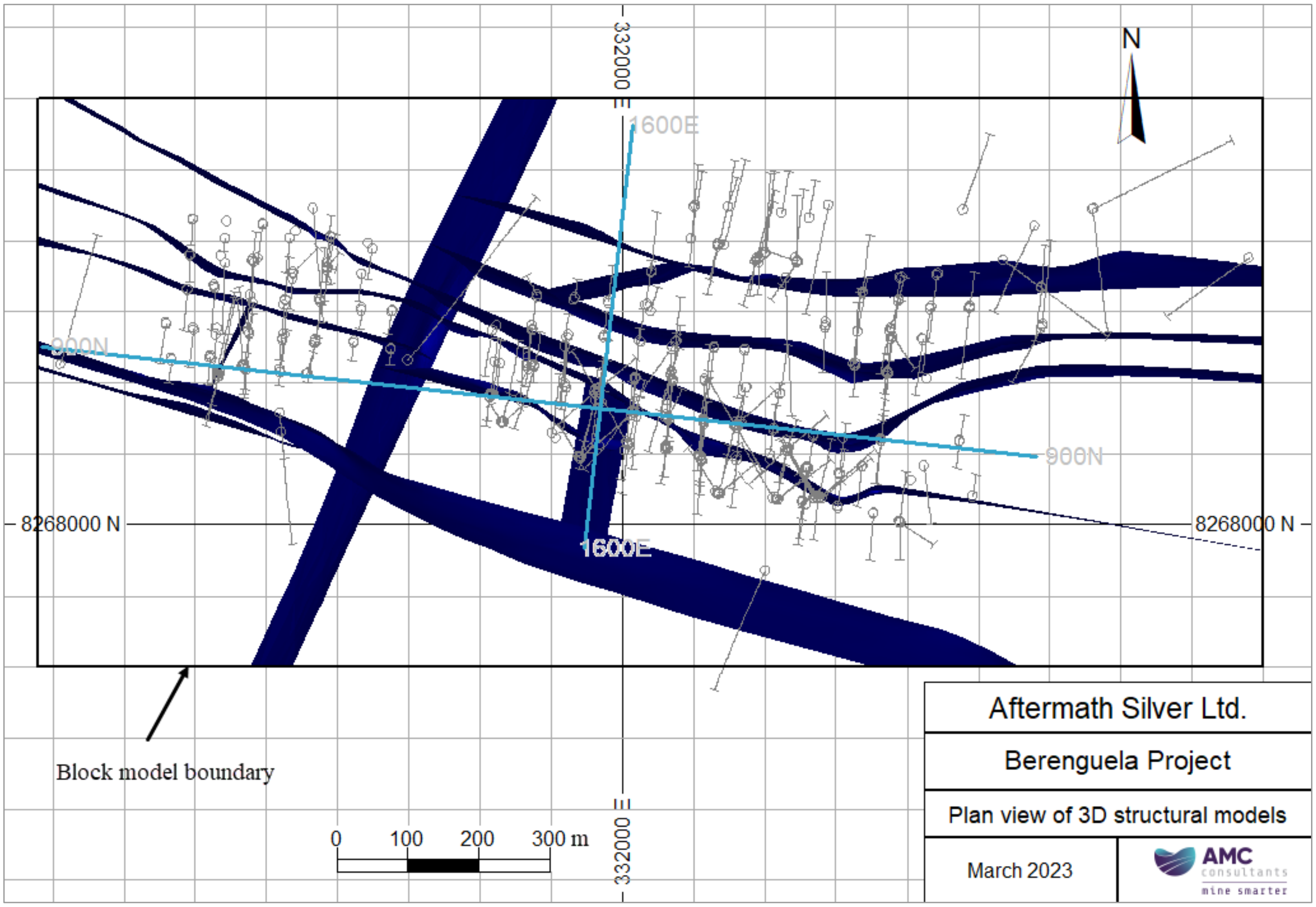
Lithology code	Description	Number of samples	Minimum	Maximum	Mean
OV	Overburden	2	1.86	1.96	1.91
BXI, BXO, BXH, BXS, BXT	Breccia various	86	1.75	3.19	2.49
IOO	Intrusive rock	1	2.73	2.73	2.73
SEV	Evaporite	32	2.12	2.58	2.26
SLS	limestone	260	1.77	3.32	2.32
SSI	Siltstone	58	1.83	2.74	2.20
SST	Arenite	67	1.81	2.59	2.18
Total /average		**506**	**1.80**	**3.08**	**2.31**

14.3 Geological interpretation

14.3.1 Structural model

Structural domains were modelled using surface maps, geology maps, locations of surface workings, logged lithologies in drillholes, and geological interpretations on sections. A total of 14 major structures were identified within the block model limits as shown in Figure 14.2.

Figure 14.2 Plan view of structures 3D models



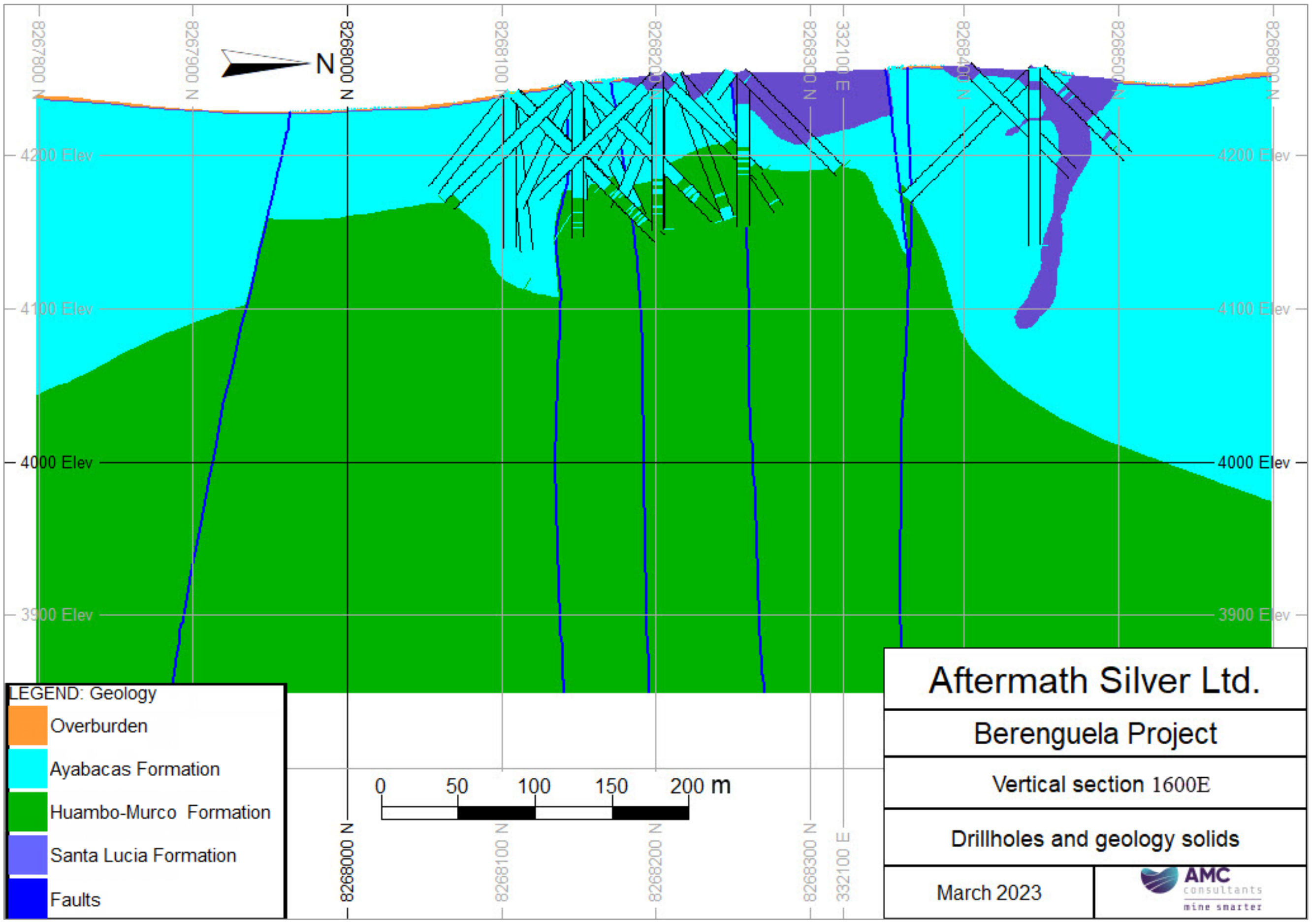
14.3.2 Lithology model

Aftermath has provided the modelled 3D wireframes for three distinct stratigraphic units that were formed by grouping together similar assemblages identified from the drill logging records:

- Ayabacas Formation (AYA) – Middle late Cretaceous. Folded and massive dolomitic limestones with sedimentary breccias, siltstones, and minor evaporites.
- Huambo - Murco Formation (SAR-HUA) – Middle late Cretaceous. Red arenites with evaporite intercalations and sedimentary breccias.
- Santa Lucía clastics (VOL).

These units were modelled within the block model limits. The internal constraints on the interpretation were the previously created fault blocks. Interpreted geological cross sections and long sections were geo-referenced and used in conjunction with drillholes coded with lithology and modeled in 50 m steps. A surface geology map was also used to define contacts on the topographic surface. Mineralization was confined to the AYA unit, so it was decided to only model the base of AYA and the intrusive using a combination of the Erosion method of creating lithological units in LeapFrog to create the base of AYA and the Intrusion method to create the intrusive (VOL) unit. Manual edits were used to clean up contacts to coincide with contacts on the interpreted sections. Figure 14.3 is a cross section on Line 1600E which shows the geological solid wireframes and drillhole traces. The section line is shown in plan view in Figure 14.2.

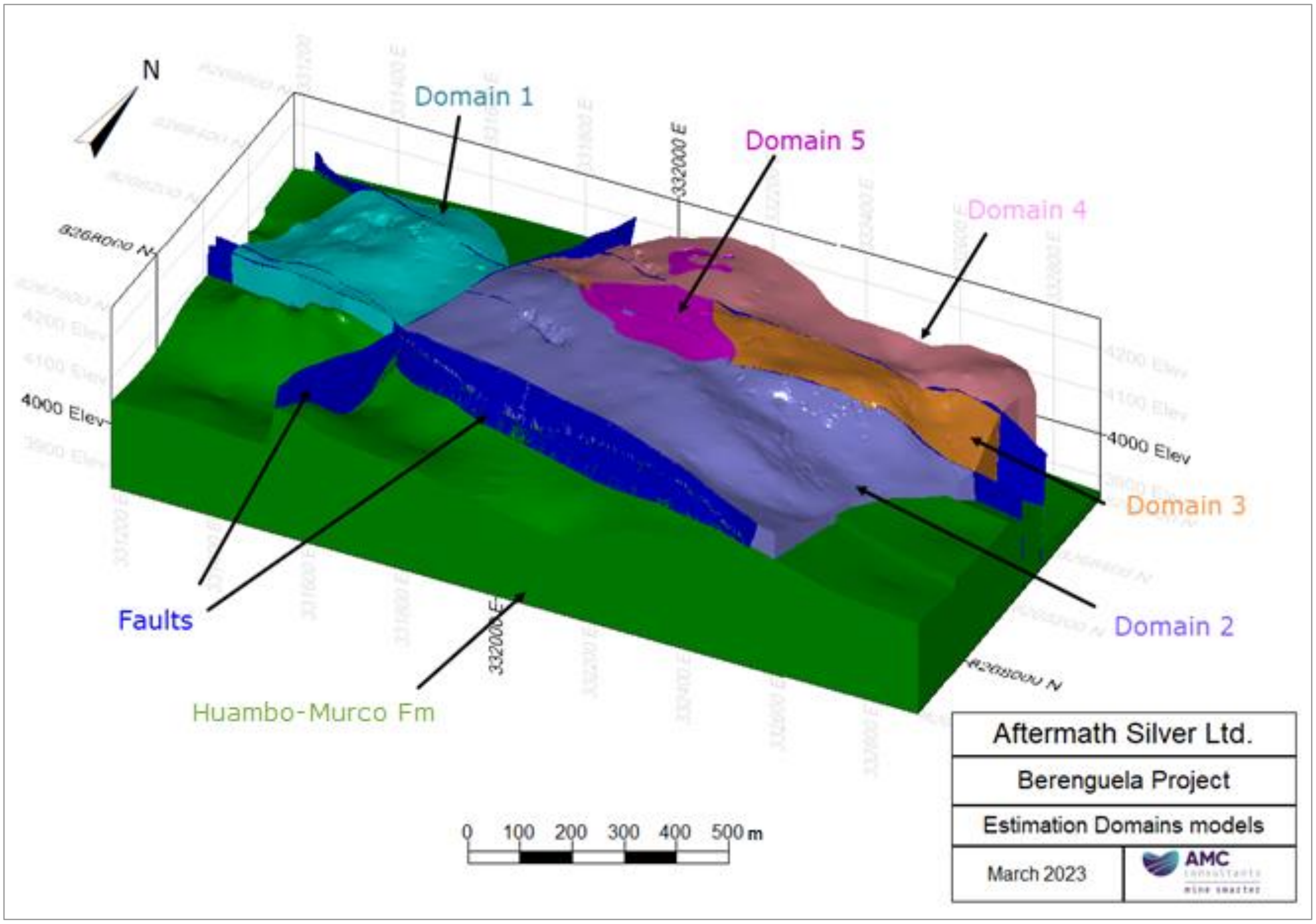
Figure 14.3 Cross Section 1600E with geology



14.3.3 Estimation domains

A total of five domains were used in the block model estimation. The domains were built based on the main faults and clipped by the underlying Huambo -Murco Formations. The lithological solid for the Santa Lucía clastics is called Domain 5 and only contains some low grades. Figure 14.4 shows a 3D view of the estimation domains, structural faults, and underlying Huambo -Murco Formations.

Figure 14.4 3D view for estimation domains



14.4 Statistics of raw samples, compositing, and capping

14.4.1 Selected samples

Samples were selected within each domain by the QP for review. In the selected drillholes, the missing values were replaced by detection limit values except in the areas of underground voids. Table 14.4 shows the statistics for the raw samples selected within the five domain wireframes, for the four reported metals as well as for Ca and Mg.

Table 14.4 Statistics of the selected samples

Domain	Item	Ag (g/t)	Mn (%)	Cu (%)	Zn (%)	Ca (%)	Mg (%)
1	No Samples	5,212	5,212	5,212	5,212	5,212	5,212
	Minimum	0.0001	0.000001	0.000001	0.000001	0.025	0.005
	Maximum	7,890	50	11.85	2.07	33.90	12.85
	Mean	**115.84**	**6.59**	**0.67**	**0.24**	**12.69**	**3.20**
	Standard Dev.	292.44	8.90	0.90	0.27	7.25	2.53
	Coef. Var.	2.52	1.35	1.35	1.13	0.57	0.79
2	No Samples	14,980	13,261	13,261	13,261	13,261	13,261
	Minimum	0.0001	0.000001	0.000001	0.000001	0.025	0.005
	Maximum	6,856	42	8.53	2.77	34.70	13.35
	Mean	**71.81**	**6.31**	**0.65**	**0.26**	**11.69**	**3.54**
	Standard Dev.	208.98	8.13	0.83	0.30	5.72	2.31
	Coef. Var.	2.91	1.29	1.29	1.16	0.49	0.65
3	No Samples	4,714	4,714	4,714	4,714	4,714	4,714
	Minimum	0.0001	0.000001	0.000001	0.000001	0.025	0.005
	Maximum	1,967	40.5	4.91	2.49	33.90	12.35
	Mean	**47.18**	**3.32**	**0.54**	**0.25**	**14.38**	**3.73**
	Standard Dev.	92.65	5.05	0.63	0.28	7.61	2.52
	Coef. Var.	1.96	1.52	1.17	1.13	0.53	0.68
4	No Samples	3,372	3,372	3,372	3,372	3,372	3,372
	Minimum	0.0001	0.000001	0.000001	0.000001	0.025	0.005
	Maximum	3,370	38.75	4.98	5.82	35.90	12.20
	Mean	**39.48**	**3.79**	**0.34**	**0.41**	**12.88**	**4.22**
	Standard Dev.	116.25	5.71	0.46	0.57	5.47	2.52
	Coef. Var.	2.94	1.50	1.37	1.40	0.42	0.60
5	No Samples	673	673	673	673	673	673
	Minimum	0.2	0.039	0.0014	0.01168	0.42	0.38
	Maximum	3,830	5.58	10.50	0.49	21.90	7.85
	Mean	**16.88**	**0.30**	**0.10**	**0.20**	**4.26**	**0.89**
	Standard Dev.	154.49	0.54	0.55	0.06	1.75	0.47
	Coef. Var.	9.15	1.80	5.68	0.32	0.41	0.53

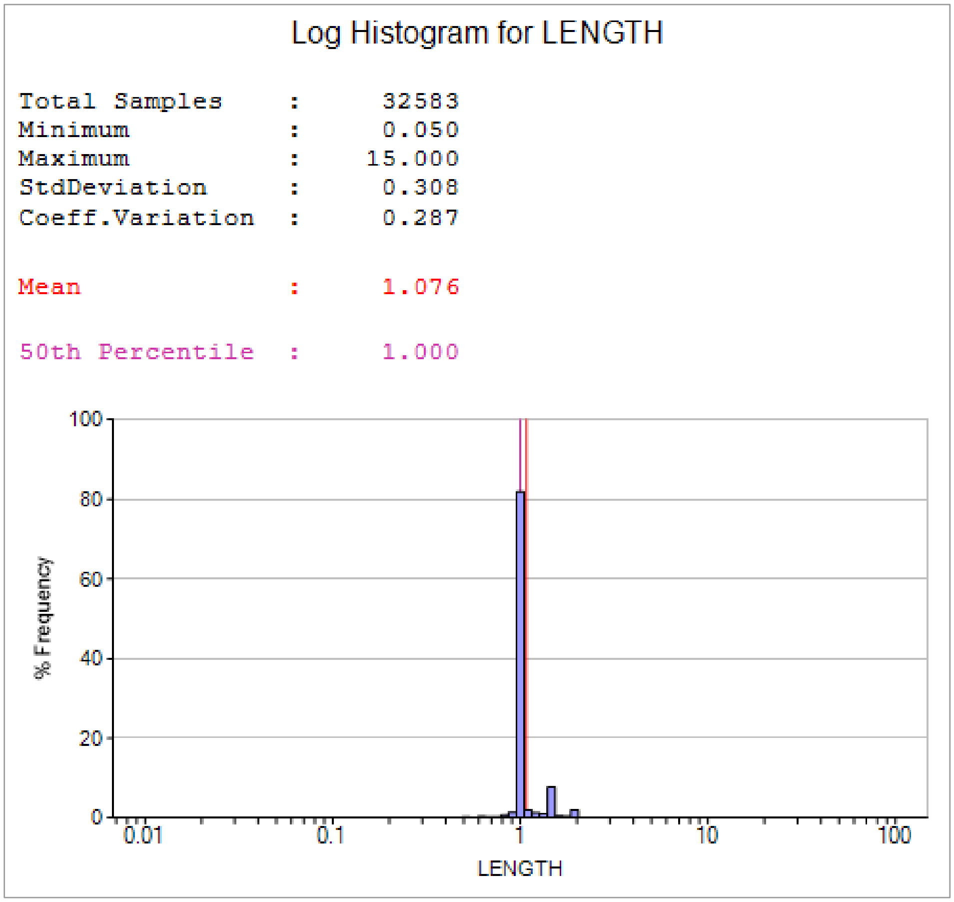
Source: AMC, 2023.

14.4.2 Compositing

Compositing was performed by RockRidge after selecting the raw samples. The compositing length was chosen at 1.0 m for all domains based on the average value of the sampling length. Composites were made using an option in Datamine to create equal length composites in each hole with these being close to the 1.0 m selected. This feature adjusts the composite length within a hole to avoid generating discards. After compositing, the total number of samples increased from 28,951 to 30,533.

Figure 14.5 shows the histograms and statistics for samples length.

Figure 14.5 Log histogram for sample length

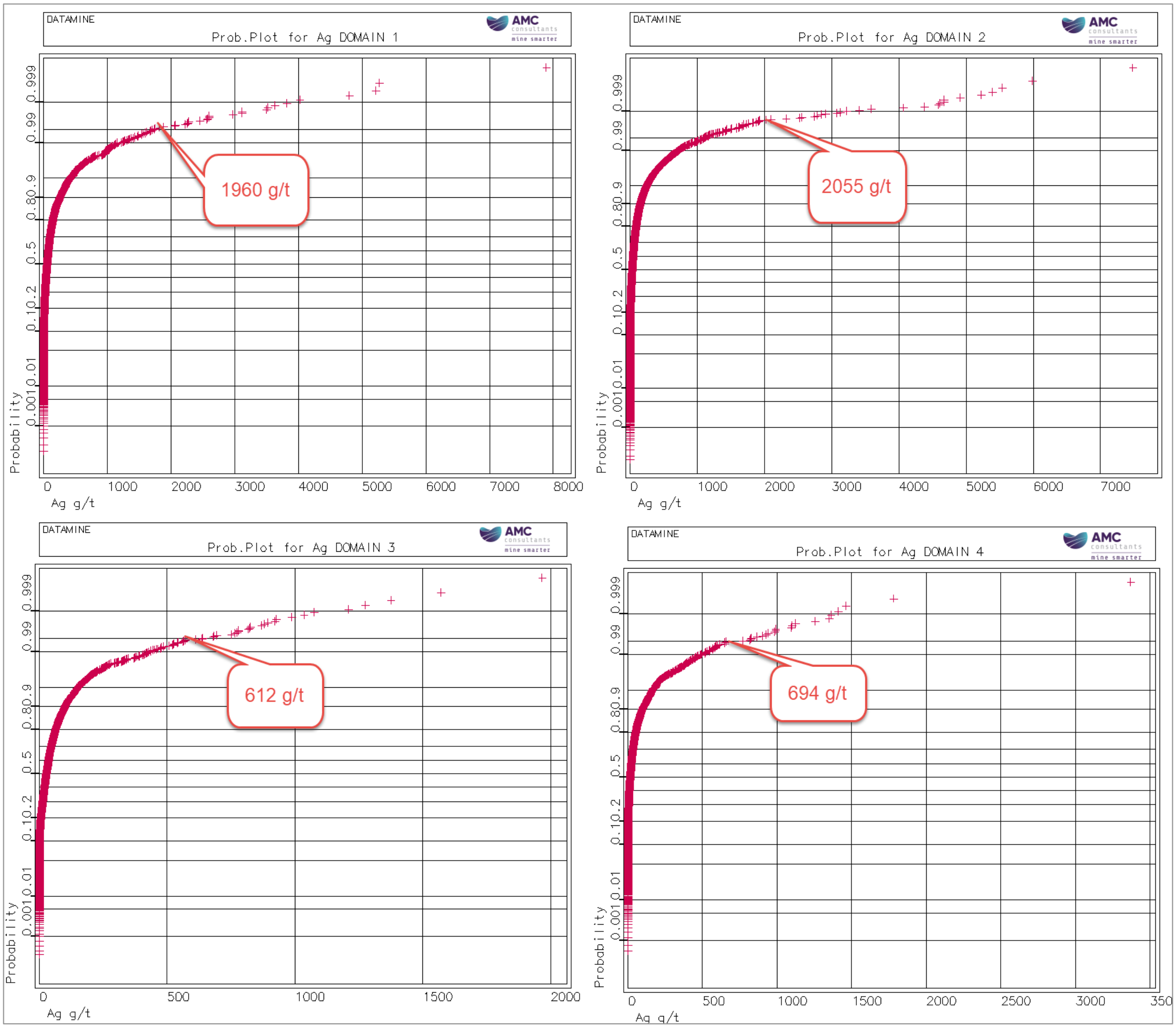


Source: AMC, 2023.

14.4.3 Capping

Capping was applied after compositing. The location of the high-grade outliers was not concentrated in one area, but rather disseminated throughout each domain for all estimation domains and for all elements. The capping grades were selected by RockRidge using variation plots, probability plots, and decile analysis plots. The QP created the probability plots to check the capping values. The applied capping values were appropriately determined. Figure 14.6 shows the Ag probability plots for Domains 1 to 4.

Figure 14.6 Probability plots for Ag grades



Source: AMC, 2023.

Capping was applied on the composites for each of the six elements in each estimation domain. The summary of the capping values, number of capped composites, mean grade before and after capping, and percent difference are shown in Table 14.5. The mean grades differences varied from 4.1% to 4.8% for Ag in the estimation Domains 1 to 4. The mean grades for Mn were not impacted by capping. The maximum difference in Mn grades is 0.1%. The differences of Cu mean grades after the capping reached 0.6%.

Domain 5 has higher percentage differences; however, the mean grades are very low, therefore the capping has not influenced the estimation process.

Table 14.5 Grade capping summary

Domain	Element	Capping value	No capped composites	Mean grade before capping	Mean grade after capping	Difference of means (%)
1	Ag (g/t)	1,960	23	116.33	111.60	-4.1
	Mn (%)	38.50	5	6.59	6.59	0.0
	Cu (%)	5.50	11	0.67	0.67	-0.6
	Zn (%)	1.40	19	0.24	0.24	-0.2
	Ca (%)	NA	144	13.08	12.74	-2.6
	Mg (%)	11.00	146	3.27	3.18	-2.6
2	Ag (g/t)	2,055	24	71.81	68.82	-4.2
	Mn (%)	38.90	5	6.52	6.52	0.0
	Cu (%)	6.95	5	0.67	0.67	0.0
	Zn (%)	2.30	7	0.26	0.26	0.0
	Ca (%)	NA	106	11.71	11.63	-0.7
	Mg (%)	12.00	111	3.53	3.51	-0.7
3	Ag (g/t)	612	28	47.24	46.00	-2.6
	Mn (%)	34.20	7	3.34	3.34	-0.1
	Cu (%)	3.75	5	0.54	0.54	0.0
	Zn (%)	1.67	7	0.25	0.25	-0.1
	Ca (%)	NA	71	14.54	14.34	-1.4
	Mg (%)	11.00	83	3.81	3.76	-1.4
4	Ag (g/t)	694	19	42.31	40.28	-4.8
	Mn (%)	31.80	5	4.06	4.05	-0.1
	Cu (%)	2.69	13	0.36	0.36	-0.4
	Zn (%)	3.70	10	0.43	0.43	-0.3
	Ca (%)	NA	58	13.01	12.83	-1.4
	Mg (%)	10.50	74	4.24	4.18	-1.4
5	Ag (g/t)	25	63	16.93	5.79	-65.8
	Mn (%)	0.30	147	0.31	0.17	-43.4
	Cu (%)	0.10	81	0.10	0.03	-71.7
	Zn (%)	0.19	325	0.20	0.17	-13.4
	Ca (%)	3.00	532	4.27	2.86	-33.1
	Mg (%)	0.70	485	0.89	0.67	-25.1

Source: AMC, 2023.

Table 14.6 shows the statistics of composites before and after applying capping for Ag, Mn, and Cu by domain.

The statistics for Zn, Ca, and Mg are shown in Table 14.7.

Table 14.6 Statistics of the composite and capped composites for Ag, Mn, and Cu

Elements		Ag (g/t)		Mn (%)		Cu (%)	
Domain	**Item**	**Composite**	**Capped**	**Composite**	**Capped**	**Composite**	**Capped**
1	No Samples	5,591	5,591	5,591	5,591	5,591	5,591
	Minimum	0.0001	0.0001	0.000001	0.000001	0.000001	0.000001
	Maximum	7,002	1,960	45.20	38.50	10.36	5.50
	Mean	**116.33**	**111.60**	**6.59**	**6.59**	**0.67**	**0.67**
	Standard Dev.	271.78	215.26	8.63	8.62	0.86	0.83
	Coef. Var.	2.34	1.93	1.31	1.31	1.28	1.24
2	No Samples	14,980	14,980	14,980	14,980	14,980	14,980
	Minimum	0.0001	0.0001	0.000001	0.000001	0.000001	0.000001
	Maximum	6,856	2,055	40.19	38.90	7.86	6.95
	Mean	**71.81**	**68.82**	**6.52**	**6.52**	**0.67**	**0.67**
	Standard Dev.	208.98	152.87	7.99	7.99	0.82	0.82
	Coef. Var.	2.91	2.22	1.23	1.23	1.22	1.21
3	No Samples	5,127	5,127	5,127	5,127	5,127	5,127
	Minimum	0.0001	0.0001	0.000001	0.000001	0.000001	0.000001
	Maximum	1,911	613	39.88	34.20	4.19	3.75
	Mean	**47.24**	**46.00**	**3.34**	**3.34**	**0.54**	**0.54**
	Standard Dev.	86.24	73.22	4.86	4.84	0.61	0.61
	Coef. Var.	1.83	1.59	1.45	1.45	1.13	1.12
4	No Samples	4,139	4,139	4,139	4,139	4,139	4,139
	Minimum	0.0001	0.0001	0.000001	0.000001	0.000001	0.000001
	Maximum	2,629	694	34.85	31.80	4.02	2.69
	Mean	**42.31**	**40.28**	**4.06**	**4.05**	**0.36**	**0.36**
	Standard Dev.	107.92	85.14	5.73	5.71	0.47	0.46
	Coef. Var.	2.55	2.11	1.41	1.41	1.28	1.26
5	No Samples	696	696	696	696	696	696
	Minimum	0.392	0.392	0.039095	0.039095	0.003	0.003
	Maximum	2,569	25	5.30	0.30	7.05	0.10
	Mean	**16.93**	**5.79**	**0.31**	**0.17**	**0.10**	**0.03**
	Standard Dev.	122.49	7.41	0.54	0.08	0.48	0.03
	Coef. Var.	7.23	1.28	1.76	0.48	4.99	1.16

Source: AMC, 2023.

Table 14.7 Statistics of the composites and capped composites for Zn, Ca, and Mg

Elements		Zn (%)		Ca (%)		Mg (%)	
Domain	**Item**	**Composite**	**Capped**	**Composite**	**Capped**	**Composite**	**Capped**
1	No Samples	5,591	5,591	5,447	5,591	5,447	5,591
	Minimum	0.000001	0.000001	0.3882	0	0.025	0
	Maximum	1.83	1.40	33.59	33.59	12.79	11.00
	Mean	**0.24**	**0.24**	**13.08**	**12.74**	**3.27**	**3.18**
	Standard Dev.	0.27	0.26	6.81	7.03	2.41	2.43
	Coef. Var.	1.10	1.09	0.52	0.55	0.74	0.76
2	No Samples	14,980	14,980	14,874	14,980	14,874	14,980
	Minimum	0.000001	0.000001	0.3147	0	0.015017	0
	Maximum	2.74	2.30	34.70	34.70	13.22	12.00
	Mean	**0.26**	**0.26**	**11.71**	**11.63**	**3.53**	**3.51**
	Standard Dev.	0.29	0.29	5.46	5.53	2.21	2.23
	Coef. Var.	1.28	1.29	1.55	1.49	0.90	0.90
3	No Samples	5,127	5,127	5,056	5,127	5,056	5,127
	Minimum	0.000001	0.000001	0.22	0	0.025	0
	Maximum	2.32	1.67	33.90	33.90	12.19	11.00
	Mean	**0.25**	**0.25**	**14.54**	**14.34**	**3.81**	**3.76**
	Standard Dev.	0.27	0.27	7.20	7.34	2.41	2.43
	Coef. Var.	1.08	1.08	0.49	0.51	0.63	0.65
4	No Samples	4,139	4,139	4,081	4,139	4,081	4,139
	Minimum	0.000001	0.000001	0.96	0	0.025	0
	Maximum	5.61	3.70	35.90	35.90	11.75	10.50
	Mean	**0.43**	**0.43**	**13.01**	**12.83**	**4.24**	**4.18**
	Standard Dev.	0.58	0.57	5.01	5.20	2.40	2.43
	Coef. Var.	1.34	1.32	0.38	0.41	0.57	0.58
5	No Samples	696	696	696	696	696	696
	Minimum	0.012	0.012	0.44	0.44	0.38	0.38
	Maximum	0.48	0.19	21.65	3.00	7.96	0.70
	Mean	**0.20**	**0.17**	**4.27**	**2.86**	**0.89**	**0.67**
	Standard Dev.	0.06	0.02	1.72	0.33	0.47	0.06
	Coef. Var.	0.31	0.13	0.40	0.12	0.53	0.09

Source: AMC, 2023.

14.5 Block model estimation

14.5.1 Block model parameters

RockRidge constructed and estimated the block model in LeapFrog EDGE. The model was provided to the QP for review in Datamine format. The block model is a sub-celled model and is not rotated. The parent block size was 10 m by 10 m by 5 m with sub-blocking resulting in minimum cell dimensions of 2.5 m by 2.5 m by 0.005 m. The model dimensions and statistics are shown in Table 14.8.

Table 14.8 Block model parameters

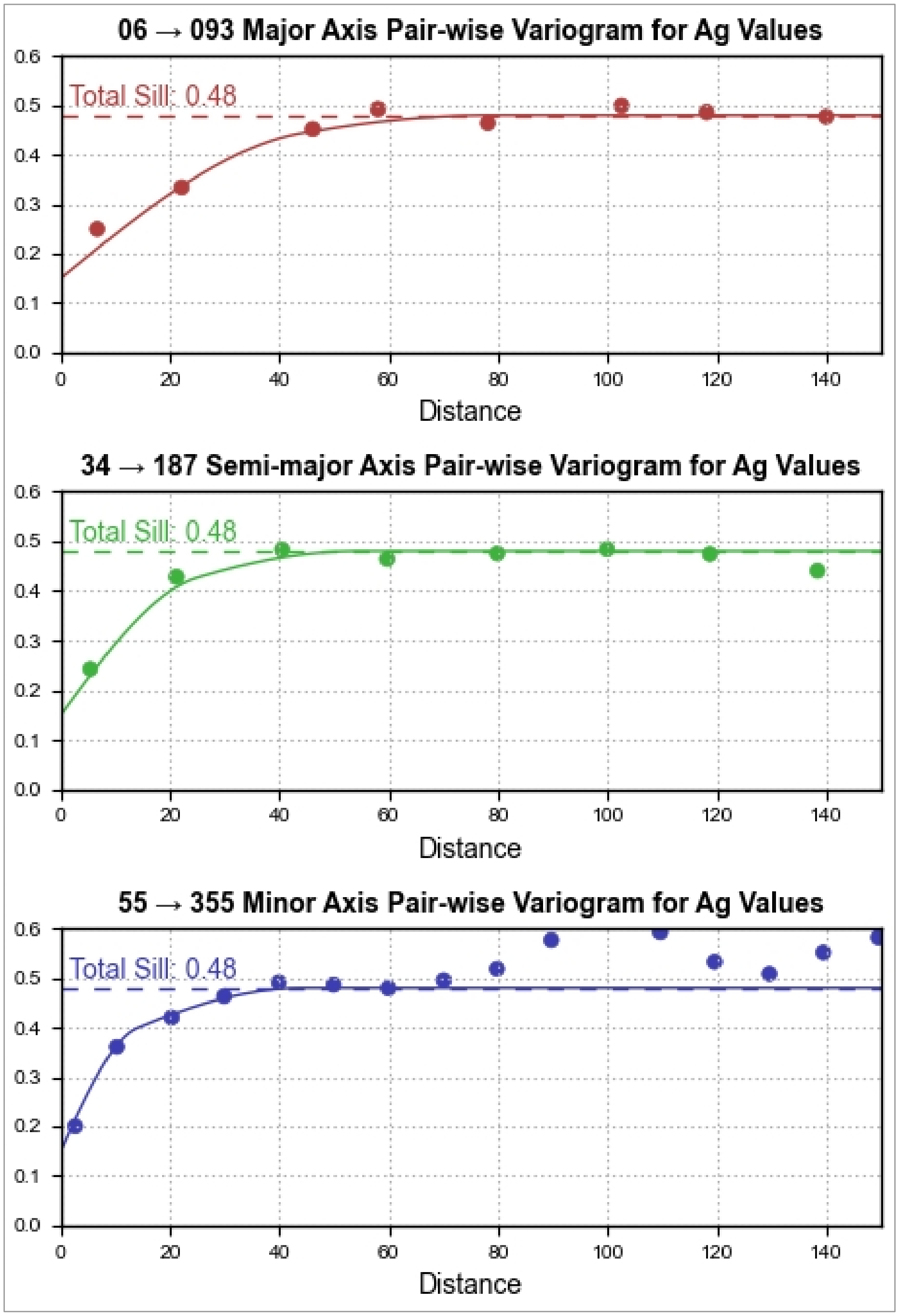
Parameter	X	Y	Z
Origin (m)	331,180	8,267,800	3,850
Maximum block size (m)	10	10	5
Minimum block size (m)	2.5	2.5	0.005
No. of blocks	172	80	84

Source: AMC, 2023.

14.5.2 Variography

Experimental pairwise relative semi-variograms were calculated and modeled for each metal in each mineralized domain in LeapFrog EDGE. Spherical two structure models were fitted to experimental semi-variograms in most cases and for all metals except the Domain 5 where data was limited. An example of experimental semi-variograms for Ag with fitted models for the three principal directions is shown in Figure 14.7.

Figure 14.7 Domain 1 variograms for Ag



Source: RockRidge, 2023.

All the domains had sufficient samples to create good experimental semi-variograms for each metal except for Domain 5. Strong anisotropy was observed for the most part and directional variogram models were used. The nugget values were established from downhole variograms.

Nugget values were on average around 27% of the total sill value for all elements in all domains. The major axes range for the short first structures of all the variograms were approximately 30 m, and the ranges for the second structure were 80 m on average. All variogram model parameters are listed per element in Table 14.9.

Table 14.9 Variograms summary for Ag, Cu, Mn, Zn, Ca, and Mg

Element	Domain	Direction in degrees			Nugget	First structure				Second structure			
		Dip	Dip azimuth	Plunge		Sill	Major	Semi	Minor	Sill	Major	Semi	Minor
Ag	1	20	20	35	0.18	0.30	26	18	10	0.29	80	74	36
	2	10	22	170	0.2	0.41	24	16	12	0.32	80	46	30
	3	35	175	10	0.15	0.18	44	25	14	0.15	78	54	44
	4	55	338	145	0.18	0.21	28	22	16	0.26	86	68	54
Cu	1	20	20	35	0.26	0.28	26	18	10	0.42	80	74	36
	2	10	22	170	0.2	0.26	24	16	12	0.44	80	46	30
	3	35	175	10	0.23	0.21	44	24	14	0.16	78	54	44
	4	55	338	145	0.18	0.21	28	22	16	0.26	86	68	54
Mn	1	20	20	35	0.26	0.20	26	26	10	0.46	80	74	36
	2	10	22	170	0.23	0.26	24	24	12	0.39	80	46	30
	3	35	175	10	0.23	0.24	44	44	14	0.24	78	54	44
	4	55	338	145	0.16	0.24	27	28	16	0.53	86	68	54
Zn	1	20	20	35	0.09	0.17	26	26	10	0.29	80	74	36
	2	10	22	170	0.15	0.12	24	24	12	0.26	80	46	30
	3	35	175	10	0.16	0.21	44	44	14	0.19	78	54	44
	4	55	338	145	0.13	0.21	27	28	20	0.32	86	68	54
Ca	1	20	20	35	0.06	0.14	26	26	10	0.16	80	74	36
	2	10	22	170	0.09	0.07	24	24	12	0.12	80	46	30
	3	35	175	10	0.05	0.09	44	44	14	0.06	78	54	44
	4	55	338	145	0.18	0.21	28	28	16	0.26	86	68	54
Mg	1	20	20	35	0.17	0.23	26	26	10	0.18	80	74	36
	2	10	22	170	0.18	0.14	24	24	12	0.18	80	46	30
	3	35	175	10	0.18	0.22	44	44	14	0.07	78	54	44
	4	55	338	145	0.09	0.10	28	28	16	0.24	86	68	54

Source: RockRidge, 2023.

14.5.3 Grade interpolation

Grade interpolation for Ag, Mn, Cu, Zn, Ca, and Mg were carried out using OK within the five domains. The estimation was carried out by RockRidge in LeapFrog EDGE software. The bulk density was estimated into the block model using inverse distance cubed (ID^3). A bulk density of 2.25 tonnes per cubic metre (t/m^3) was assigned globally to the waste blocks. The grades for all elements were estimated based on search distances and directions derived from the Ag variogram models. Three passes were employed for each domain. The search distances for the first estimation pass were set to half of the variogram range in each direction. The second pass doubled the search distance, so that they were equal to the variogram model ranges. The third pass search distance was equivalent to 4x the variogram range.

The dynamic anisotropy method was utilized during interpolation where search directions aligned with the base of Ayabacas Formation. Table 14.10 shows the search parameters summary for each domain.

Table 14.10 Search parameters

General		Ellipsoid ranges (m)			No of samples		Maximum per hole	Number of drillholes
Domain	Pass	Major	Semi-major	Minor	Minimum	Maximum	No samples	
1	1	40	37	18	8	16	2	4
	2	80	74	36	6	16	2	3
	3	320	296	144	4	16	2	2
2	1	40	23	15	8	16	2	4
	2	80	46	30	6	16	2	3
	3	320	184	120	4	16	2	2
3	1	39	27	22	8	16	2	4
	2	78	54	44	6	16	2	3
	3	312	216	176	4	16	2	2
4	1	43	34	27	8	16	2	4
	2	86	68	54	6	16	2	3
	3	344	272	216	4	16	2	2
5	1	39	27	22	8	16	2	4
	2	78	54	44	6	16	2	3
	3	312	216	176	4	16	2	2

Source: RockRidge, 2023.

The QP reviewed the variograms and search parameters employed in Berenguela estimation, and agreed with them.

14.6 Mining depletion

Underground development solids were provided in Datamine format. These volumes were subtracted from the model, where development intersected mineralization. While no stope outlines were provided, it is understood that minimal if any stoping occurred. No large voids were intersected in the drilling, confirming this. Open pit mining depletion has been accounted for in the detailed topographic survey.

14.7 Mineral Resource classification

Mineral Resources were classified as Measured, Indicated, and Inferred, by the QP. Classification was carried out based on the three search passes used for the estimation, with a manual review creating volumes based on sample density and continuity.

The first step was interpolation of the silver grades using the inverse distance squared (ID^2) method. Table 14.11 shows the estimation parameters that were used for ID^2 interpolation.

Table 14.11 Search parameters for classification

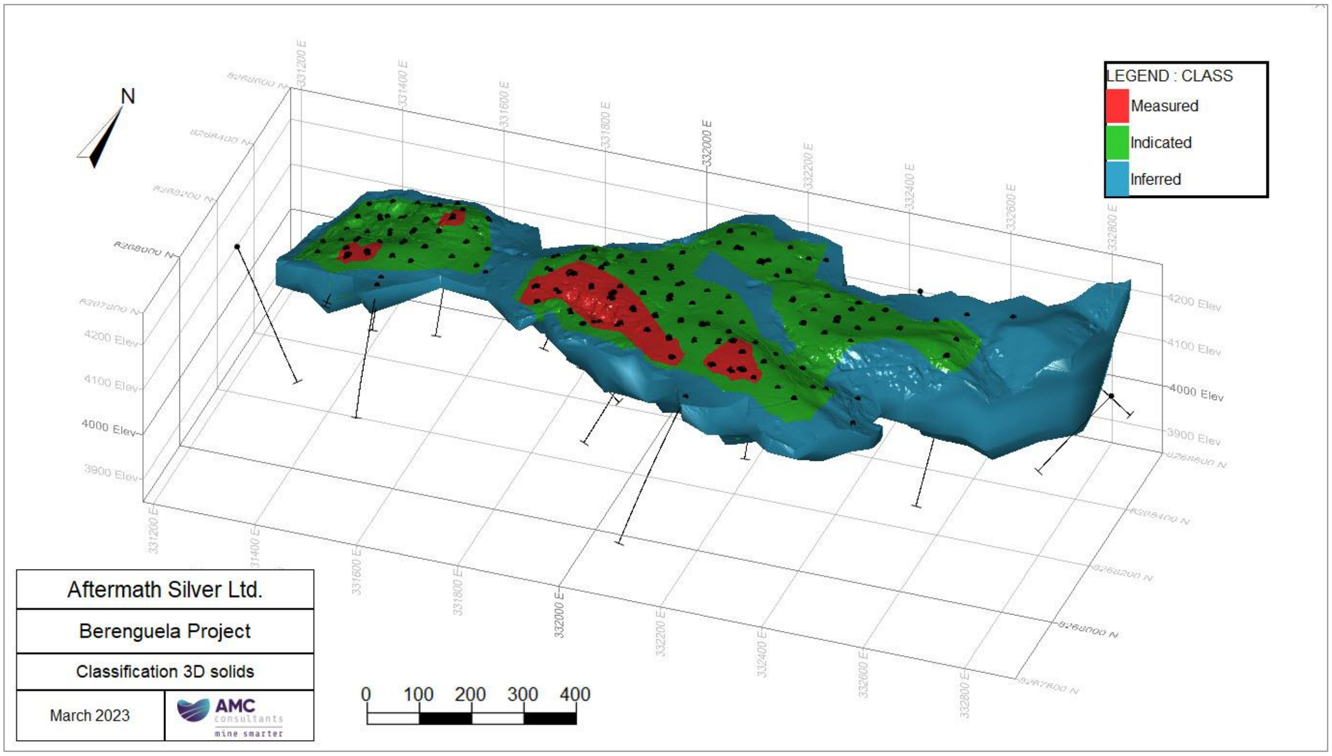
Pass	X (m)	Y (m)	Z (m)	Minimum number of samples	Maximum number of samples	Minimum number of drillholes
1	25	25	10	10	16	5
2	50	50	20	6	12	3
3	100	100	30	3	20	2

Source: AMC, 2023.

The second step was the manual adjustment of the blocks by constructing the wireframes solids based on three passes. The CLASS attribute was assigned to the block model. The values for the classification are 1 for Measured, 2 for Indicated, and 3 for Inferred.

Figure 14.8 presents the 3D view of the classification solids applied to the block model and drillholes traces.

Figure 14.8 3D view of the classification solids



14.8 Block model validation

The block models were validated by the QP in three ways. First, visual checks were carried out to ensure that the grades respected the raw assay data. Secondly, swath plots were reviewed. Thirdly, the estimate was statistically compared to the composited assay data, with satisfactory results.

14.8.1 Visual validation

The QP carried out visual checks on vertical sections comparing the block model estimates and drillhole grades. The grades for Ag, Mn, Cu, Zn, Ca, and Mg were checked. The screen checks demonstrated a good agreement between the drillhole data and the estimated block model grades.

Figure 14.3 and 14.10 are cross sectional views on Line 1600E which shows the block model grades and the drillhole traces with composite grades. The section line is shown in plan view in Figure 14.2 The section line is drawn across the core of the deposit and Figure 14.9 is the comparison for Ag and Figure 14.10 shows the comparison of Mn grades. The model shows only the classified blocks with a clipping distance of 25 m.

This visual comparison shows good agreement between the raw drillhole grades and the estimated block model grades.

Figure 14.9 Ag in the block model and drillholes in cross section 1600E

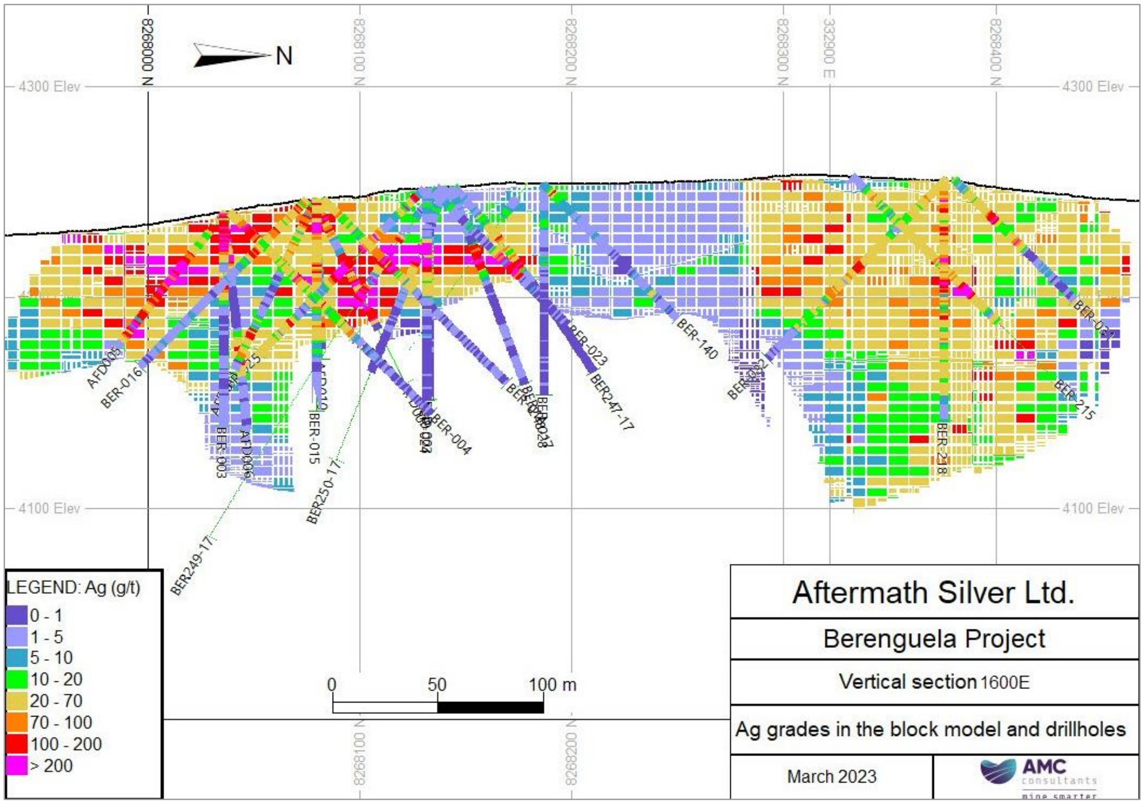
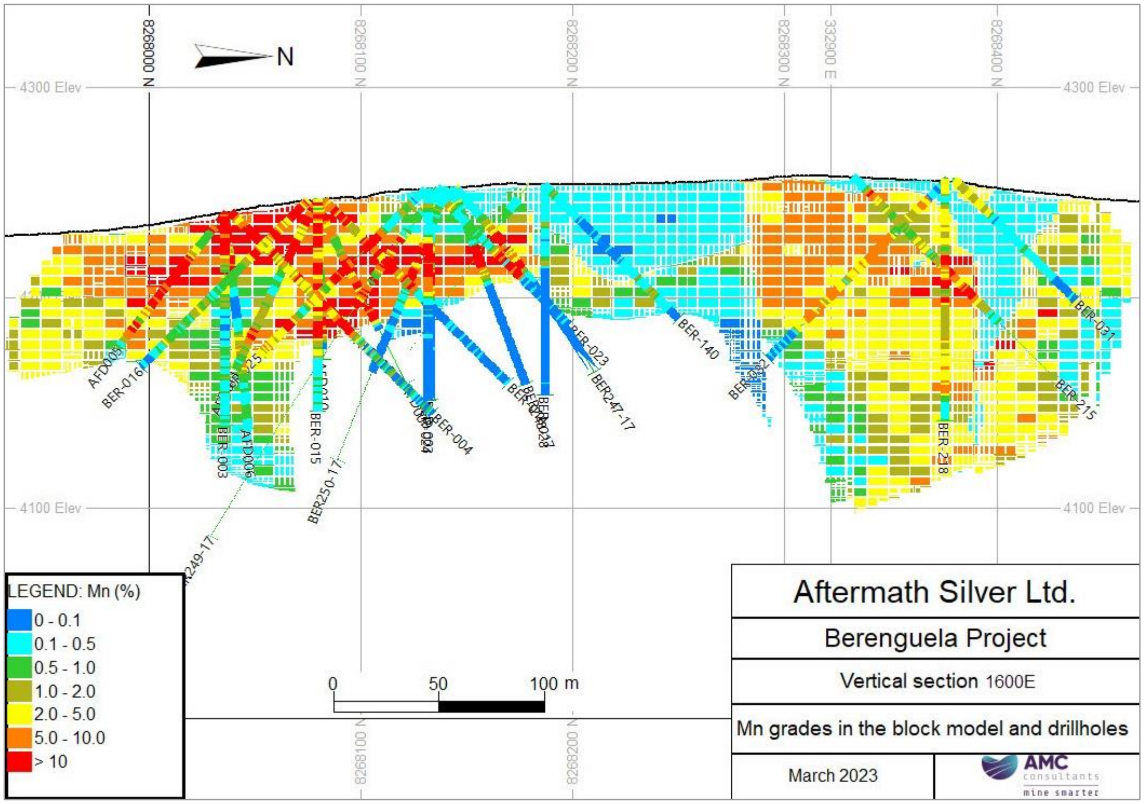


Figure 14.10 Mn in the block model and drillholes in cross section 1600E



14.8.2 Statistical comparison

The estimated grades in the block models are Ag, Cu, Mn, Zn, Ca, and Mg. The QP compared the statistics of the classified blocks against composites selected respectively to the blocks.

The main tendency is that the mean grades in the block model are lower than mean grades in the composites for Ag, Mn, Cu, and Zn. Table 14.12 shows the statistics of the block model and composites for Ag, Mn, and Cu. Given that the Measured and Indicated comparison is close in the swath plots as shown in Section 14.8.3, this may be a feature of data density as well as a declustering issue.

Table 14.12 Block model and composites statistics for Ag, Mn, and Cu

Elements		Ag (g/t)		Mn (%)		Cu (%)	
Domain	**Item**	**Model**	**Composite**	**Model**	**Composite**	**Model**	**Composite**
1	No Samples	128,325	5,376	128,325	5,376	128,325	5,376
	Minimum	0.441	0.0001	0.03	0.000001	0.002	0.000001
	Maximum	1,475	1,960	29.68	38.50	3.58	5.50
	Mean	**93.66**	**111.92**	**5.45**	**6.64**	**0.54**	**0.67**
	Standard Dev.	111.92	216.45	5.24	8.67	0.49	0.83
	Coef. Var.	1.19	1.93	0.96	1.31	0.92	1.25
2	No Samples	252,103	13,463	252,103	13,463	252,103	13,463
	Minimum	0.222	0.0001	0.01	0.000001	0.001	0.000001
	Maximum	1,513	2,055	31.29	38.90	4.37	6.95
	Mean	**60.82**	**68.53**	**4.64**	**6.33**	**0.49**	**0.65**
	Standard Dev.	80.96	155.73	4.52	7.92	0.46	0.80
	Coef. Var.	1.33	2.27	0.97	1.25	0.93	1.24
3	No Samples	133,146	4,921	133,146	4,921	133,146	4,921
	Minimum	0.026	0.0001	0.00	0.000001	0.000	0.000001
	Maximum	458	613	30.85	34.20	2.65	3.75
	Mean	**37.80**	**46.13**	**2.78**	**3.34**	**0.43**	**0.54**
	Standard Dev.	37.18	73.77	2.90	4.88	0.38	0.61
	Coef. Var.	0.98	1.60	1.04	1.46	0.87	1.13
4	No Samples	147,990	3,518	147,990	3,518	147,990	3,518
	Minimum	0.064	0.0001	0.01	0.000001	0.001	0.000001
	Maximum	492	694	21.59	31.80	2.13	2.69
	Mean	**26.83**	**38.72**	**2.36**	**3.93**	**0.25**	**0.35**
	Standard Dev.	33.73	84.75	2.66	5.64	0.20	0.44
	Coef. Var.	1.26	2.19	1.13	1.43	0.80	1.27
5	No Samples	30,714	696	30,714	696	30,714	696
	Minimum	0.503	0.3920	0.05	0.039095	0.004	0.003
	Maximum	25	25	0.30	0.30	0.10	0.10
	Mean	**5.61**	**5.79**	**0.17**	**0.17**	**0.03**	**0.03**
	Standard Dev.	6.07	7.41	0.06	0.08	0.03	0.03
	Coef. Var.	1.08	1.28	0.36	0.48	0.89	1.16

The mean grades for Zn, Ca, and Mg are shown in Table 14.13. The mean grades for Zn in the block model are higher than in the composites. The mean grades for Ca and Mg are higher in the composites than in the model, however the overestimation of these elements is not impacting the Mineral Resource.

Table 14.13 Block model and composites statistics for Zn, Ca, and Mg

Elements		Zn (%)		Ca (%)		Mg (%)	
Domain	**Item**	**Model**	**Composite**	**Model**	**Composite**	**Model**	**Composite**
1	No Samples	128,325	5,376	128,325	5,376	128,325	5,376
	Minimum	0.002	0.0000	1.32	0	0.155	0
	Maximum	1.12	1.40	29.97	33.59	8.81	11.00
	Mean	**0.20**	**0.24**	**13.98**	**12.71**	**3.42**	**3.20**
	Standard Dev.	0.16	0.26	4.62	7.04	1.34	2.44
	Coef. Var.	0.80	1.08	0.33	0.55	0.39	0.76
2	No Samples	252,103	13,463	252,103	13,463	252,103	13,463
	Minimum	0.001	0.0000	1.19	0	0.223	0
	Maximum	1.69	2.30	29.91	34.70	10.40	12.00
	Mean	**0.22**	**0.26**	**13.31**	**11.69**	**3.87**	**3.55**
	Standard Dev.	0.18	0.29	3.87	5.52	1.34	2.24
	Coef. Var.	0.82	1.12	0.29	0.47	0.35	0.63
3	No Samples	133,146	4,921	133,146	4,921	133,146	4,921
	Minimum	0.001	0.0000	1.17	0	0.199	0
	Maximum	1.21	1.67	30.00	33.90	9.74	11.00
	Mean	**0.20**	**0.25**	**15.14**	**14.40**	**3.79**	**3.72**
	Standard Dev.	0.15	0.27	4.47	7.43	1.30	2.43
	Coef. Var.	0.75	1.08	0.30	0.52	0.34	0.65
4	No Samples	147,990	3,518	147,990	3,518	147,990	3,518
	Minimum	0.004	0.0000	3.58	0	0.369	0
	Maximum	2.69	3.70	27.30	35.90	9.82	10.50
	Mean	**0.27**	**0.42**	**13.88**	**12.87**	**4.17**	**4.18**
	Standard Dev.	0.27	0.56	2.74	5.32	1.19	2.47
	Coef. Var.	1.01	1.33	0.20	0.41	0.28	0.59
5	No Samples	30,714	696	30,714	696	30,714	696
	Minimum	0.040	0.0120	0.75	0.444	0.431	0.38
	Maximum	0.19	0.19	3.00	3.00	0.70	0.70
	Mean	**0.18**	**0.17**	**2.87**	**2.86**	**0.68**	**0.67**
	Standard Dev.	0.01	0.02	0.16	0.33	0.03	0.06
	Coef. Var.	0.08	0.13	0.06	0.12	0.05	0.09

14.8.3 Swath plots

The QP ran swath plots to compare the average composites grade with the estimated grade for each domain for Measured and Indicated categories. The swath plots were produced for all estimated elements contained in the block model. The swath plots show a good agreement of distribution of the grades between the composites and block model. Figure 14.11 shows the swath plots for silver for all domains, classified as Measured and Indicated. The swath plots show good agreement between drillhole grades and block model grades.

Figure 14.11 Swath plot for Ag in Measured and Indicated blocks

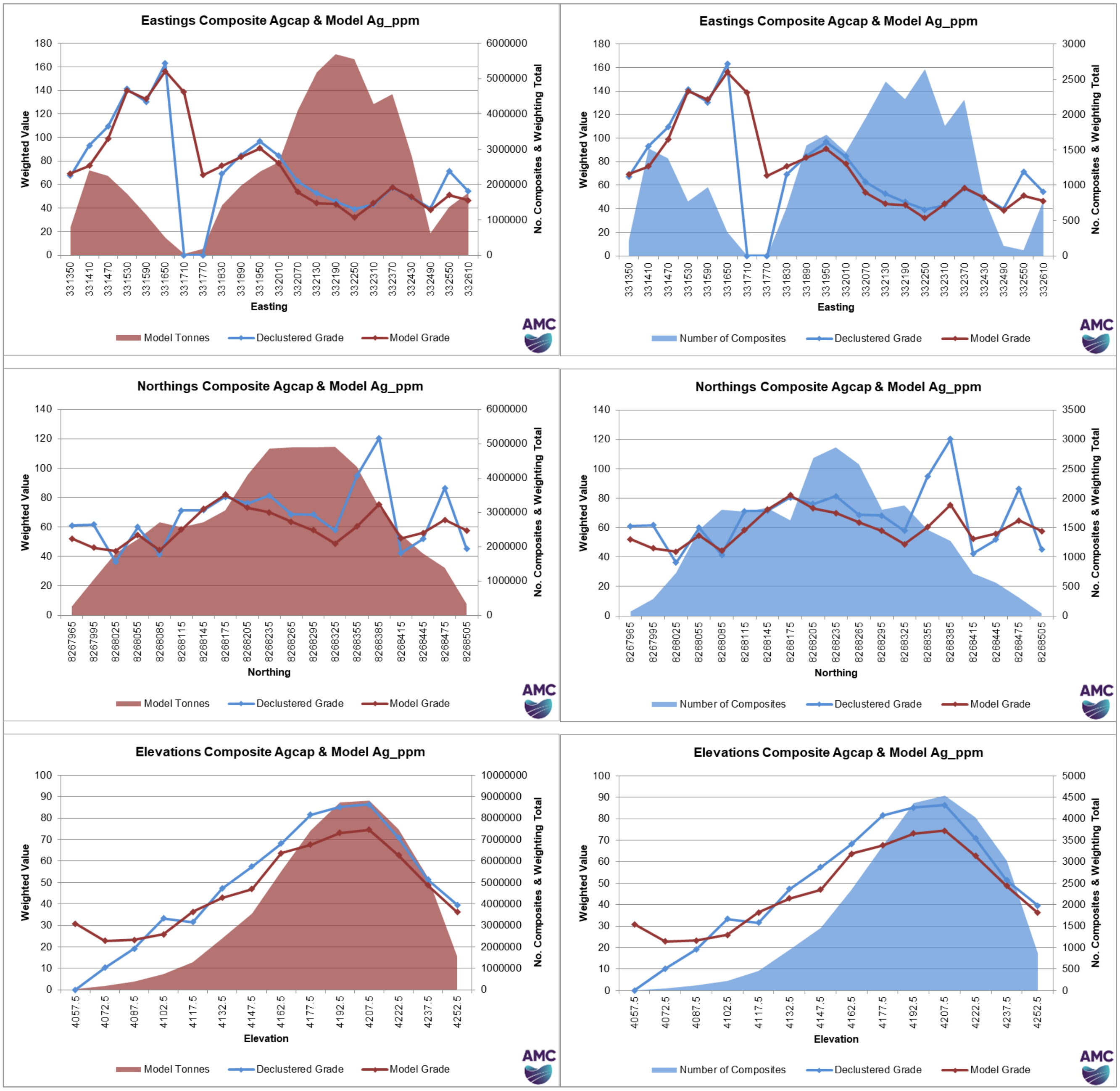
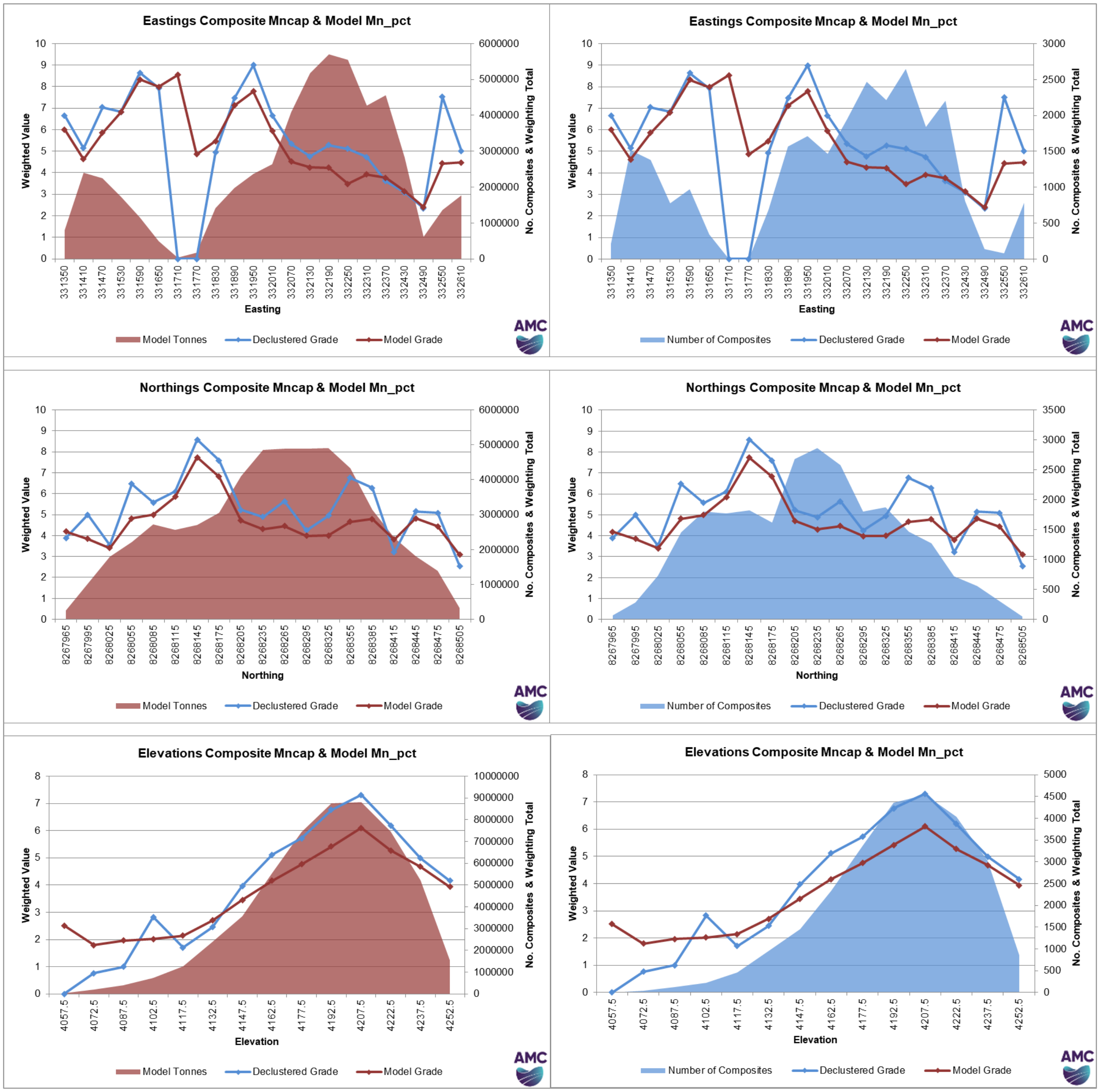


Figure 14.12 shows the swath plots for manganese for all domains, classified as Measured and Indicated.

Figure 14.12 Swath plot for Mn in Measured and Indicated blocks



14.9 Mineral Resource reporting

14.9.1 Economic considerations

The Mineral Resource estimate used conceptual open pit mining constraints for reporting purposes. The parameters used for the pit optimization and deriving the cut-off are shown in Table 14.14. The relative calculated value in the Mineral Resource by metal using these parameters is as follows, Ag=26%, Mn=44%, Cu=26%, Zn=4% using metal price for Agri-$MnSO_4$ which generally trades at a considerable discount to battery grade manganese sulphate.

The assumptions for the open pit optimization exercise to constrain the Mineral Resource and confirm reasonable prospects for eventual economic extraction are shown in Table 14.14.

Table 14.14 Input parameters for pit optimization

Activity	Items	Unit	Value
Mining	Mining (all types)	$/t material	2.25
	Pit slopes	degrees	45
Processing	Processing - Cost	$/t ROM	41.0
	Processing rate	Mtpa	2.5
	Process Recoveries - Ag	%	81.0
	Process Recoveries - Cu	%	81.0
	Process Recoveries - Zn	%	76.0
	Process Recoveries - Mn	%	81.0
Metal prices	Ag	$/oz	22.50
	Cu	$/lb	4.00
	$MnSO_4$ (Agri-$MnSO_4$)	$/t	530
	Zn	$/lb	1.45
Other costs	Admin and Support (G&A)	$/t ROM	4.0
	Land Freight	$/t Product	30.0
	Port Charges	$/t Product	20.0
	Marketing	% of Revenue	0.50
	Royalty – Silver Standard	% of Revenue	1.00
	Royalty – VDM Partners	% of Cu revenue	2.00
Other	Conversion	Mn:$MnSO_4$ %	32

Notes:
- Sustaining capital cost has not been included.
- Measured, Indicated and Inferred Mineral Resources included.

Source: AMC, 2023.

14.9.2 Mineral Resource statement

The Mineral Resource for the Berenguela deposit has been estimated by Ms Dinara Nussipakynova, P.Geo. Principal Geologist of AMC, who takes responsibility for the estimate. The Mineral Resource estimate within the conceptual open pit is presented in Table 14.15. Mineral Resources are stated at a cut-off grade of 80 g/t AgEq which equates to a 3.55% manganese equivalent cut-off grade. The model is depleted for historical mining activities.

Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

Table 14.15 Berenguela Ag-Cu-Mn deposit Mineral Resource as of 31 January 2023

Classification	Tonnage (Mt)	Grade				Contained metal			
		Ag (g/t)	Mn (%)	Cu (%)	Zn (%)	Ag (Moz)	Mn (Mt)	Cu (Mlb)	Zn (Mlb)
Measured	6.152	101	8.89	0.85	0.30	20.0	0.55	115.3	41.2
Indicated	34.024	74	5.60	0.63	0.34	81.2	1.90	473.7	258.1
Measured and Indicated	**40.176**	**78**	**6.10**	**0.67**	**0.34**	**101.2**	**2.45**	**589.0**	**299.3**
Inferred	22.287	54	3.57	0.42	0.25	38.8	0.80	204.3	122.8

Notes:
- CIM Definition Standards (2014) were used for reporting the Mineral Resources.
- The effective date of the estimate is 31 January 2023.
- The Qualified Person is Dinara Nussipakynova, P.Geo., of AMC.
- Mineral Resources are constrained by an optimized pit shell using the assumptions in Table 14.14.
- No dilution or mining recovery applied.
- AgEq formula is AgEq = Ag+ Cu%*121.905+Mn%*22.809+Zn%*41.463 based on the parameters in Table 14.14.

- Cut-off grade is 80 g/t AgEq.
- Bulk density used was estimated and variable. but averaged 2.30 t/m^3 for mineralized material and 2.25 t/m^3 for waste.
- Drilling results up to 13 October 2022.
- Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.
- The numbers may not compute exactly due to rounding.
- Mineral Resources are depleted for historic mined out material.
- The relative value in the Mineral Resource by metal is as follows, Ag=26% Cu=26%, Mn=44%, Zn=4%.

Source: AMC, 2023.

14.10 Conclusion and recommendations

The QP has reviewed the RockRidge block model and validated and accepted the Mineral Resource estimation with an updated resource classification. The QP recommends the following:

- Include additional bulk density measurements in next estimate.
- Carry out infill drilling to upgrade both Indicated to Measured and Inferred to Indicated, in specific areas.

15 Mineral Reserve estimates

There are no Mineral Reserves on the Property.

16 Mining methods

As there are no Mineral Reserves, this section is not required.

17 Recovery methods

As there are no Mineral Reserves, this section is not required. Potential recovery methods are discussed in Section 13.

18 Project infrastructure

As there are no Mineral Reserves, this section is not required. Logistics and infrastructure are discussed in a summary fashion in Section 5.

19 Market studies and contracts

As there are no Mineral Reserves, this section is not required.

20 Environmental studies, permitting and social or community impact

As there are no Mineral Reserves, this section is not required.

21 Capital and operating costs

As there are no Mineral Reserves, this section is not required.

22 Economic analysis

As there are no Mineral Reserves, this section is not required.

23 Adjacent properties

There are no Adjacent Properties to discuss.

24 Other relevant data and information

There is not any additional information or explanation required at this time to make the technical report more understandable and not misleading.

25 Interpretation and conclusions

25.1 Overview

The Property, in which the Berenguela deposit is located, is in the province of Lampa in the department of Puno in the Republic of Peru. The land position consists of a total of 21 mining concessions including four pending applications, with the focus of work to date being on the deposit. While exploration and exploitation has been carried out dating back to colonial times, the work since 2004 forms the basis for any current evaluation. The deposit represents an unusual type of hypogene Mn-oxide mineralization along with base metal and silver mineralization. The deposit type is considered a carbonate-replacement deposit with strong lithological control. The silver-manganese-copper zinc mineralization lies at or close to the surface and has been drilled by several operators in recent times. Only the data gathered by Silver Standard, Valor, Rio Tinto, and now Aftermath is being considered current and has been used in the Mineral Resource estimate.

The Berenguela deposit is defined by exploration drilling and has a conceptual pit-constrained Mineral Resource, using an 80 g/t AgEq cut-off (which is equivalent to a 3.55% manganese equivalent (MnEq) cut-off), of a Measured and Indicated Resource of 40.18 million tonnes grading 78 g/t silver, 6.3% manganese, 0.67% copper, 0.34% zinc; and Inferred Mineral Resource of 22.29 million tonnes grading 54 g/t silver, 3.6% manganese, 0.42% copper, 0.25% zinc.

Mapping and diamond drilling programs by the Issuer in 2021 and 2022 included twinning older RC holes with diamond core holes where recovery issues were evident. The diamond drilling carried out as a twinning exercise has replaced RC data in the database. In addition, a re-assay program was carried out on pre-existing coarse reject samples and pulps. This demonstrated the validity of the historical data. The re-assayed data replaced the original assays in the database.

Logging, mapping, sampling, and analytical procedures of Aftermath's on-going exploration programs follow common industry practice. Results of Aftermath's QA/QC programs are deemed acceptable by the QP.

The results of multiple metallurgical test programs suggest that the mineralization from the Berenguela deposit would be amenable to processing using a preconcentration method as a precursor, followed by primary reduction leaching, subsequently followed by a series of hydrometallurgical processes. Ultimately recovery would be by a Merrill Crowe plant for silver, direct electrowinning or solvent extraction / electrowinning of copper, precipitation of the zinc as zinc sulphide, and recovery of manganese in a variety of forms depending on markets including manganese sulphate by crystallization, CMD powder by electrolysis, and EMD or EMM by more sophisticated electrolysis. This area requires considerable testwork.

Risks and opportunities relating to this project are discussed below.

25.2 Risk and uncertainties

25.2.1 Geology

The geological understanding of the mineralization has been enhanced by interrogating and analyzing pre-existing data, new mapping, assay validation, drilling, geological modeling, and geometallurgical characterization.

Several risks have been mitigated by an assay validation exercise and redrilling strategic holes as twins to RC holes, which have been replaced.

While it was seen that the data collection, sampling, sample preparation, security, and analytical procedures adopted by Silver Standard, Valor, and Rio Tinto for their exploration programs in part fell short of accepted industry standards, this data has been validated or discarded. Drilling in 2021-22 was all diamond core drilling and large size, HQ or PQ sized, and drilled with a triple tube core barrel to enhance recovery. The data used to inform the resource model are considered acceptable.

Though no significant risks and / or uncertainties have been identified, the Inferred portion of the Mineral Resource may be impacted by additional drilling. This could positively or negatively affect the results. Mineral Resources should be updated after each significant drilling campaign.

Continued exploration may lead to the identification of new mineralization zones elsewhere on the Property. There is also exploration potential for porphyry copper-style mineralization at depth to the east of the known mineralization.

25.2.2 Metallurgical

The complexity of the Berenguela process mineralogy has been demonstrated over the years of historical metallurgical testing. Silver, copper, and zinc minerals are shown to be encapsulated in the manganese mineral matrix. Processing post reductive acid leach has demonstrated acceptable extractions of Cu, Mn, and Ag at a laboratory scale. However, the variability across the resource area and corresponding metallurgical response is not yet understood for example the grade-recovery relationship. Preconcentration by ore sorting, although untested, offers opportunity though the outcomes are unknown. Further geometallurgical work should include a structured mineralogical characterization and metallurgical testwork program. The existing metallurgical testwork has demonstrated that there will be no insurmountable technical hurdles to operating the process as proposed. However, the variability of the ore types to be processed, and the continual evolution of the market mix for manganese products, will require that the plant design must include substantial flexibility and conservatively robust equipment selections, to address commercial risk.

25.3 Conclusion

The QPs conclude that further work including a Preliminary Economic Assessment (PEA) should be considered. The proposed metallurgical testing program will be an integral and necessary part of any further work.

26 Recommendations

The following recommendations are listed by activity. The exploration activity will mainly consist of targeted holes to collect data for geometallurgical considerations and ensuing metallurgical testwork. Some drilling will be to gather data for a geotechnical study. The metallurgical testwork will be important for development of a PEA which is the next major step in the project.

26.1 Geology and drilling

No major resource drilling or modelling is envisaged other than the modelling of geometallurgical domains in the current model. However, the following recommendations are made.

- Carry out infill drilling in specific areas to upgrade both Indicated to Measured and Inferred to Indicated.
- Drill eastern extensions of the known mineralization especially in areas of good outcrop and old workings.
- Include additional bulk density measurements in next estimate.
- Drill to the south-east of the deposit where more drilling is required to understand the dimensions and significance of this potential extension.
- Investigate the area 200 - 500 m south of the deposit where there are indications from the WV3 imagery of further anomalies of psilomelane in fold noses of the Ayabacas Formation.
- Advance knowledge of the eastern margins of the mineralization by geophysics and potentially scout drilling to test for potential porphyry-style occurrences.

26.2 QA/QC and database

There has been a great improvement in the QA/QC process and the QP recommends that the current level of QA/QC sample submission and monitoring continues. There are, however, some recommendations to improve the protocols.

- Ensure that CRMs are monitored in real time on a batch-by-batch basis, and that remedial action is taken immediately as issues are identified.
- Adjust CRM monitoring criteria such that assay batches with two consecutive CRMs outside two standard deviations, or one CRM outside of three standard deviations are investigated, and if necessary, re-analyzed.
- Ensure CRM warnings, failures, and remedial action are documented. This to include a table of fails.
- Investigate sourcing a coarse blank with lower concentrations of Mn and Zn.
- Incorporate the use of coarse reject and pulp duplicate samples into the QA/QC program.
- Ensure that a large portion of the duplicate samples be selected from zones of mineralization.
- As the re-assay program has confirmed the validity of the original assays, the QP recommends that for the next Mineral Resource update to revert to the original assays. Newer assays should only replace older assays when there has been systematic re-assaying of the original dataset.

The QP considers that implementation of the above recommendations is part of the overall cost of any additional drilling programs.

26.3 Metallurgical testwork

Given the amount of testwork that has been completed over the years, the increased marketability for Mn metal and the effective reductive leach results obtained by KCA, the generalized reductive acid leach flowsheet is the basis for further testwork for which recommendations follow.

- Explore geometallurgical classification domains that are linked to the target flowsheet.
- Develop ore characterization composites based on domain classification from pre-existing material.
- Confirm characteristics of composites are in line with domain classification or adjust accordingly.
- Develop a geometallurgical model to link the resource database variability to metallurgical performance variability.
- Conduct sufficient variability test work to validate the geometallurgical model.
- Establish typical ore hardness parameters for major ore classes / types.
- Conduct ICP head assay suite and extensive mineralogy including such techniques as Quantitative Evaluation of Minerals by Scanning (QEMSCAN), XRD, Scanning Electron microscopy (SEM), for microscopic examination of mineral and gangue.
- Consider silica and carbonate rejection via ore sorting.
- Validate rejection of carbonates, silica, and metal recovery to establish feed for downstream testing.
- Evaluate flowsheet options and conduct associated trade-off studies to determine the most effective processing route.
- Engage in a marketing study.

The cost of these recommendations is listed in Table 26.1.

26.4 PEA

Complete the additional elements of a PEA when the metallurgical work is advanced. In addition to the above these will involve the following:

- Mine engineering work - pit design, schedules, equipment selection, and costing.
- Process design – design of process plant, tailings, and associated infrastructure.
- Infrastructure engineering – roads, power, water, and all support buildings and infrastructure.
- Environmental studies and permitting.
- Overall costing and economics.
- Trade-off studies as required.
- Reporting.

These costs are incorporated into Table 26.1.

26.5 Program costs

An estimate to progress the project to a PEA level of study is estimated at approximately $3.7M, and a rough breakdown is shown in Table 26.1.

Table 26.1 Cost summary

Item	Cost (US$)
Drilling	1,250,000
Assays	150,000
Follow up metallurgical testing	700,000
Geophysics - magnetic survey	120,000
Geometallurgical modelling, including block model	150,000
Mine engineering including costing	250,000
Process design including costing	250,000
Infrastructural engineering incl costing	100,000
Environmental studies and permitting	250,000
Completion of PEA reporting	150,000
Subtotal	**3,370,000**
Contingency – 10%	337,000
Grand total	**3,707,000**

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28 QP Certificates

CERTIFICATE OF AUTHOR

I, Dinara Nussipakynova, P.Geo., of Vancouver, British Columbia, do hereby certify that:

1 I am currently employed as a Principal Geologist with AMC Mining Consultants (Canada) Ltd., with an office at Suite 202, 200 Granville Street, Vancouver, British Columbia V6C 1S4.

2 This certificate applies to the Technical Report titled "Berenguela Mineral Resource Estimate NI 43-101 Report" with an effective date of 30 March 2023 (the "Technical Report"), prepared for Aftermath Silver Ltd. ("the Issuer").

3 I am a graduate of Kazakh National Polytechnic University (Bachelor of Science and Master of Science in Geology in 1987). I am a member in good standing of the Association of Engineers and Geoscientists of British Columbia (Registration #37412) and the Association of Professional Geoscientists of Ontario (Registration #1298). I have practiced my profession continuously since 1987 and have been involved in mineral exploration and mine geology for a total of 35 years since my graduation from university. My experience is principally in Mineral Resource estimation, database management, and geological interpretation.

I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

4 I visited the off-Property core storage on 23 July 2022 and the Property on 26 July 2022.

5 I am responsible for Sections 2 - 12, 14 (except 14.9.1), 15 - 24 and parts of 1, 25, 26, and 27 of the Technical Report.

6 I am independent of the Issuer and related companies applying all of the tests in Section 1.5 of the NI 43-101.

7 I have not had prior involvement with the property that is the subject of the Technical Report.

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

9 As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: 30 March 2023
Signing Date: 11 April 2023

Original signed and sealed by

Dinara Nussipakynova, P.Geo.

Principal Geologist

AMC Mining Consultants (Canada) Ltd.

CERTIFICATE OF AUTHOR

I, Wayne Rogers, P.Eng., of Vancouver, British Columbia, do hereby certify that:

1 I am currently employed as a Principal Mining Engineer with AMC Mining Consultants (Canada) Ltd., with an office at Suite 202, 200 Granville Street, Vancouver, British Columbia V6C 1S4.

2 This certificate applies to the Technical Report titled "Berenguela Mineral Resource Estimate NI 43-101 Report" with an effective date of 30 March 2023 (the "Technical Report"), prepared for Aftermath Silver Ltd. ("the Issuer").

3 I am a graduate of the University of Western Australia in Perth, Australia (Bachelor of Mining Engineering in 2005) and the University of Queensland in Brisbane, Australia (Master of Philosophy (MPhil) in Mining Engineering in 2014). I am a member in good standing of the Engineers and Geoscientists British Columbia (Registration #49953). I have worked as a Mining Engineer for a total of 18 years since my graduation from university and have relevant experience in project management, feasibility studies, and technical report preparations for mining projects. My expertise includes strategic and tactical mine planning, mine design, mine optimization, feasibility studies, and drill and blast.

I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.

4 I have not visited the Property.

5 I am responsible for Section 14.9.1 and parts of 1 of the Technical Report.

6 I am independent of the Issuer and related companies applying all of the tests in Section 1.5 of the NI 43-101.

7 I have not had prior involvement with the Property.

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

9 As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: 30 March 2023
Signing Date: 11 April 2023

Original signed by

Wayne Rogers, P.Eng.
Principal Mining Engineer
AMC Mining Consultants (Canada) Ltd.

CERTIFICATE OF AUTHOR

I, Daniel W. Kappes, of Reno, Nevada, do hereby certify that:

1. I am currently employed as President of Kappes, Cassiday & Associates, an engineering consulting firm with offices at 7950 Security Circle, Reno, NV 89506.
2. This certificate applies to the Technical Report titled "Berenguela Mineral Resource Estimate NI 43-101 Report" with an effective date of 30 March 2023 (the "Technical Report"), prepared for Aftermath Silver Ltd. ("the Issuer").
3. I am a graduate of Colorado School of Mines (Engineer of Mines, 1966) and of Mackay School of Mines (MS Mining Engineering, 1972). I am a Registered Professional Engineer (Mining Engineer #3223, Metallurgical Engineer #3223) in the State of Nevada, USA. I have practiced my profession continuously since 1966, and have been involved in the field of extractive metallurgy since 1972. As Founder and President of Kappes, Cassiday & Associates, a firm with over 80 employees including 23 engineers, I have participated in all phases of project development from lab testing and flowsheet design, through plant construction management and operations, on many projects throughout the world.

   I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfill the requirements to be a "qualified person" for the purposes of NI 43-101.
4. I visited the Berenguela Property several times during the period 1998 through 2003, but have not visited since then.
5. I am responsible for Section 13 and parts of 1, 25, 26, and 27 of the Technical Report.
6. I am independent of the Issuer and related companies, except that a Company that I am affiliated with has a carried passive royalty on any copper production which should occur from the project.
7. I was a principal in the company which owned the project during the period 1996-2003 and became extensively familiar during that time with the process metallurgy which was needed for project development. That company sold the project to a company which is unrelated to the present owner for which this study is being prepared.
8. I have read NI 43-101 and attest that the sections of the Technical Report for which I am responsible have been prepared in compliance with NI 43-101.
9. As of the effective date of the Technical Report, to the best of my knowledge, information, and belief, the sections of the Technical Report for which I am responsible contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: 30 March 2023
Signing Date: 12 April 2023

Original signed and sealed by

____

Daniel W. Kappes
Nev Reg Prof Engineer #3223
President, Kappes, Cassiday & Associates

Our offices

Australia

Adelaide
Level 1, 12 Pirie Street
Adelaide SA 5000 Australia

T +61 8 8201 1800
E adelaide@amcconsultants.com

Brisbane
Level 21, 179 Turbot Street
Brisbane Qld 4000 Australia

T +61 7 3230 9000
E brisbane@amcconsultants.com

Melbourne
Level 29, 140 William Street
Melbourne Vic 3000 Australia

T +61 3 8601 3300
E melbourne@amcconsultants.com

Perth
Level 1, 1100 Hay Street
West Perth WA 6005 Australia

T +61 8 6330 1100
E perth@amcconsultants.com

Canada

Toronto
140 Yonge Street, Suite 200
Toronto ON M5C 1X6 Canada

T +1 647 953 9730
E toronto@amcconsultants.com

Vancouver
200 Granville Street, Suite 202
Vancouver BC V6C 1S4 Canada

T +1 604 669 0044
E vancouver@amcconsultants.com

Singapore

Singapore
9 Straits View
#05-07 Marina One (West Tower)
Singapore 018937

T +65 3157 9130
E singapore@amcconsultants.com

United Kingdom

Maidenhead
Registered in England and Wales
Company No. 3688365

Building 3, 1st Floor
Concorde Park, Concorde Road
Maidenhead SL6 4BY United Kingdom

T +44 1628 778 256
E maidenhead@amcconsultants.com

Registered Office:
The Kinetic Centre
Theobald Street
Elstree
Hertfordshire WD6 4PG United Kingdom