Technical Report
On the Riotinto Copper Project

Located in Huelva Province, Spain

Prepared For

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. EXECUTIVE SUMMARY

1.1 Project Overview and Introduction

Atalaya Mining Plc. (Atalaya) is a European mining and development company producing copper concentrate and silver by-product at its' wholly owned Riotinto Copper Project ("Proyecto Riotinto" or PRT) in southern Spain.

The current open pit mining operation at the Riotinto Copper Project (PRT) is focused on the Cerro Colorado deposit, including Filón Sur and Filón Norte orebodies. Adjacent deposits to Cerro Colorado are San Dionisio, which has been historically mined by underground (Alfredo Mine) and open pit (Atalaya open cast) methods, and Planes-San Antonio further East. The latter was fully mined underground, but production was never started at San Antonio.

The purpose of this report is to present the updated mineral reserve and resource estimates of Cerro Colorado, which has been completed based on the mined surface of the open pit as of December 31, 2020, and the mineral resource estimates for San Dionisio and San Antonio deposits.

This report has been prepared in accordance with Form 43-101F1 Technical Report, the CIM Definition Standards for Mineral Resources and Mineral Reserves adopted by the CIM Council in May 2014, and the CIM Estimation of Mineral Resources & Mineral Reserves Best Practice Guidelines prepared by the CIM MRMR Committee in November 2019.

1.2 Property Description and Location

The Riotinto Copper Project is located between the municipalities of Minas de Riotinto, Nerva, and El Campillo in the Huelva Province (Andalucía Autonomous Region, southwest of Spain). It is situated approximately 65km northwest of Seville and 70Km northeast of the Huelva port (Figure 1-1). The property is located at the eastern end of the Spanish/Portuguese Iberian Pyrite Belt (IPB), which extends about 230 km between Seville (Spain) in the east and the Atlantic coast near Lisbon (Portugal) in the west.

Atalaya owns and operates the Riotinto Copper Project (PRT) through the wholly owned subsidiary Spanish company, Atalaya Riotinto Minera SLU.

The PRT is within the mineral tenure of Section C type named "Minas de Rio Tinto" Exploitation Concession (CE), number 843, with a total area of 1,992.39 ha, which was granted in April 2014 to Atalaya for 90 years. The tenure of the mineral rights is held 100% by Atalaya, which has exclusive rights of operation and beneficiation of minerals from the soil and subsoil within this mining permit. Atalaya holds surface rights over 2,070.51 ha. of land.

A portion of the San Antonio deposit lies within the current mining permit but part of it is within a set of permits named "Grupo Riotinto" which belongs to the "Grouped Concessions" (Concesiones Agrupadas). The Grouped Concessions were acquired by Atalaya under a contract of sale with the transfer of the permit ownership to Atalaya pending approval of the mining authorities.

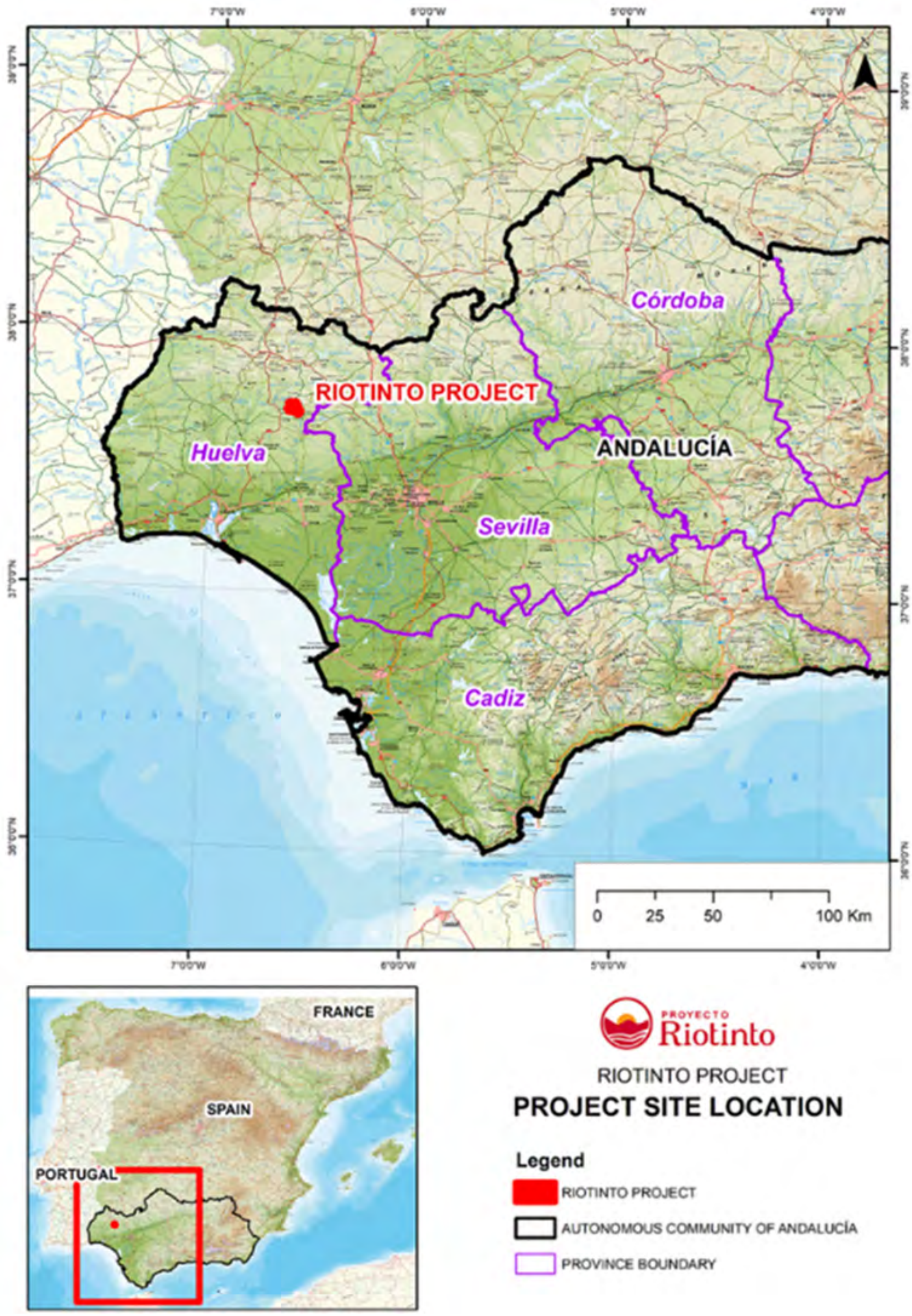


Figure 1-1: Riotinto Copper Project Location (Atalaya, 2018)

1.3 Riotinto Copper Project History

Within the historical Rio Tinto mining district there are five main orebodies: Cerro Colorado, Filón Sur, Filón Norte, San Dionisio, and Planes-San Antonio. They are believed to have once been a single, continuous mineralized zone 5 km long by 750 m wide and about 40 m thick, containing about 500 Mt of pyritic ore, but natural erosion and past mining activity have reduced this to about 250 Mt.

Historic workings at Riotinto date back to at least 1000 BC, and it has been operated by Tartessians, Phoenicians, Romans, British (Rio Tinto Company Limited & Rio Tinto Zinc-RTZ), Spaniards (Compañía Española de Minas de Río Tinto S.A. & Unión Española de Explosivos S. A), Americans (Freeport-McMoRan Copper & Gold, Inc.), and finally in the 1990s by the Spanish workers' co-operative Minas de Río Tinto S.A.L. (MRT).

Since Roman times, ore has been mined from several open-pit and underground mines: Atalaya, Filón Sur, Filón Norte, and Cerro Colorado open pits, and Pozo Alfredo, Filón Sur and Planes underground mines. The latest mining operations were focused on the Cerro Colorado open pit, which started in 1967 and was last operated by MRT in 2001.

In 2008, EMED Mining Public Ltd completed the acquisition of 100% of the Rio Tinto Copper Project through its wholly owned Spanish subsidiary EMED Tartesus S.L.U., who received approval of the Unified Environmental Authorization ("AAU") for Riotinto Copper Project and the transfer of the Riotinto mining rights in 2014. In October 2015 the shareholders approved a name change to Atalaya Mining PLC (Atalaya).

Atalaya declared commercial production as of February 1, 2016 at an initial processing rate of 5 Mtpa. Since then, the commercial production rate has increased to 15 Mtpa following successful completion of the Proyecto Riotinto Expansion Project.

1.4 Geology and Mineralization

The Rio Tinto deposit occurs in the Spanish side of the Iberian Pyrite Belt (IPB), which is part of the South Portuguese Zone (SPZ) of the Iberian Massif. The IPB was formed as a series of marine basins that developed during the left-lateral transcurrent faulting that was generated by the subduction and collision of Laurentia with Gondwana during the Variscan orogeny (Late Devonian−early Carboniferous (Silva, Oliveira, & Ribeiro, 1990).

The oldest rocks in the IPB are a sequence of quartzite and shales (the Phyllite–Quartzite Group, also called PQ) of Devonian age, which are overlain by a thick sequence of volcano-sedimentary rocks (the Volcanic Sedimentary Complex, VSC) that host most of the mineralization of the IPB. The VSC is a highly variable unit up to 1300 m thick of uppermost Devonian to Lower Carboniferous (ca. 356–349 Ma).

The earliest Carboniferous (about 360 to 350Ma) was a transitional period characterized by extension forming different submarine basins and abundant bimodal volcanism that caused the development of Volcanogenic Massive Sulfide (VMS) deposits that were mainly hosted along the fracture zones limiting the basins (Silva, Oliveira, & Ribeiro, 1990).

The IPB contains over 100 massive sulfide and stockwork VMS deposits, in which Rio Tinto is the largest deposit and has been estimated to have held more than 500 Mt of massive pyrite, complex, and stockwork ore types (Williams, 1934).

The Rio Tinto deposit occurs on the Volcano-Sedimentary Complex (VSC) of the IPB where there are several massive sulfide deposits that are associated spatially and genetically. It forms an E-W trending anticline as a result of the Variscan deformation, with the northern flank dipping approximately 50 degrees to the north and the southern flank near vertical. Another E-W syncline fold occurs next to the anticline to the south. The anticline is crosscut by the NW-SE trending Eduardo Fault zone, which dissects the whole body into two sectors: to the east, the Cerro Colorado and Filón Sur areas; and to the west, San Dionisio (Alfredo Mine and Atalaya opencast). The Planes-San Antonio orebodies occur at the eastern end of the anticline, to the East of Cerro Colorado.

Cerro Colorado is bounded on the North by the E-W trending North Fault, which represents a sharp contact between mineralized and non-mineralized volcanics, and is bounded on the South by a synclinal fold that places Culm in contact with Filón Sur.

Mineralization is typical of the VMS deposits and occurs as three different types: sulfide stockworks in the volcanic rocks; massive sulfide orebodies, generally, on top of the stockwork zones and/or intercalated with rocks of the transition series; and weathering products of the mentioned primary mineralization types, which are represented by gossans and secondary enrichment zones. The latter are restricted to within 70 m of the surface (Palomero, 1990).

The stockworks occur as irregular veins, fractures, and fissures filled with quartz and sulfides (pyrite, chalcopyrite, galena, sphalerite), magnetite, quartz, chlorite, calcite, and barite cutting the volcanic host rocks.

Massive sulfide mineralization consists of lenses of massive pyrite overlaying the felsic volcanic and the stockworks, usually with greater lateral extent than the stockwork zones. The primary sulfide mineralization consists mostly of pyrite, with minor chalcopyrite, sphalerite, galena, tetrahedrite, and sulfosalts of Sb and As in intergranular spaces or in microfractures. Chalcopyrite is the dominant copper mineral and mostly occurs within small fractures in the pyrite; on a lesser extent it occurs in isolation.

Gossans and secondary mineralization have formed in places over the stockwork and sulfide mineralization. Leaching and oxidation of an important volume of sulfides in Cerro Colorado and minor amounts in the Atalaya pit developed extensive gossans, which were mined for gold and silver. Gossans and supergene enrichment zones are characterized by the occurrence of secondary minerals, goethite-limonite and chalcocite-covellite respectively.

1.5 Deposit Types

Rio Tinto is a Volcanogenic Massive Sulfide (VMS) deposit located in the IPB (Iberian Pyrite Belt), which forms part of the Hercynian orogenic belt.

According to Atalaya Mining and based on the formation, and the spatial association with felsic volcanics, the Rio Tinto volcanic-hosted pyrite-chalcopyrite (Pb-Zn) deposit could be classified as felsic siliciclastic VMS of Kuroko type.

1.6 Drilling and Exploration

Since 2014, Atalaya has completed exploration, resource, and development drilling programs in the Riotinto mining area. Exploration activities, including exploration drilling, had been carried out in selected prospect areas within the PRT and outside of the current mining area to find new resources and/or to confirm resources exposed by historical reports.

Previous exploration activities, such as historical data compilation and exploration drilling at San Dionisio and Filón Sur, had evolved to resource drilling. No further exploration activities have been carried out in or around the known mineralized areas of Cerro Colorado, San Dionisio, and San Antonio after the last update of the Technical Report in 2018, except for the continuous update of the geological mapping of the current pits and surrounding areas.

Historical drilling at the Riotinto project has been done from 1892 until 1996 by the different companies who owned the project. Atalaya exploration and resource drilling started in April 2014 and continues to present. A summary of the drilling programs completed at the Riotinto Project is shown in Table 1-1.

Table 1-1: Description of the drilling programs undertaken at the Riotinto Project.

Deposit	Drilling Program	Number of holes	Total drilling (m)
Cerro Colorado	Legacy numbered series	682	142,355.30
	CCR series	12	1,480.00
	ETR & RT series	361	28,659.20
	RTD 2017 series	28	5,436.50
	(FS) Filón Sur	43	10,255.10
	Geotech Holes	6	1,170.00
	ARD	3	768.90
	Geotech 2018	11	1,061.05
	Special (PZ&SA)	5	166.95
	RT 2018	41	8,557.40
	RT Penalty 2019	54	11,179.50
	RT Penalty 2020	164	18,880.00
	RT 2021	43	6,800.20
	Total	1453	236,770.10

Deposit	Drilling Program	Number of holes	Total drilling (m)
San Dionisio	Legacy holes	949	65,610.70
	1996 holes	9	1,032.55
	Atalaya	45	16,911.00
	Total	1003	83,554.25
Planes	Atalaya 2016	8	918.20
	Total	8	918.20
San Antonio	Legacy UG holes	157	9,962.67
	Legacy surface holes	20	6,838.17
	Atalaya 2015	8	1,504.20
	Total	185	18,305.04

1.7 Mineral Resource Estimate

1.7.1 Cerro Colorado

The updated copper mineral resource estimate for Cerro Colorado was summarized using a Lerchs-Grossmann (LG) pit shell that was run using a copper price of US$3.50/lb Cu and all resources, including inferred resources. All other slope and economic parameters are the same as those used for the design of the open pit for mineral reserve estimation.

The resulting pit shell is considered to have reasonable prospects for economic extraction, assuming the inferred resource is converted to measured and indicated by drilling and that the copper price is above US$3.50/lb. Resources are estimated from the end of December 2020 topography. The mineral resource estimate is summarized in Table 1-2.

Table 1-2: Mineral Resource Summary – April 2021 estimate, using multiple cutoffs, constrained by the US$3.50/lb Cu pit and the 31 December 2020 topography (Noble & Barrero, 2021).

Riotinto Project
Cerro Colorado Mineral Resources
April 2021 Model (21D) - 31 Dec 2020 Topo - $3.50/lb Cu Pit

% Cu Cutoff	Class	TONNES (1000's)	%Cu	%Zn	%Pb	%S	ppm Sb	ppm As
	Measured	151,621	0.36	0.15	0.03	5.51	23	209
0.14	Indicated	49,094	0.38	0.14	0.03	5.95	28	249
(Base Case)	**M+I**	**200,715**	**0.37**	**0.15**	**0.03**	**5.62**	**24**	**219**
	Inferred	4,428	0.40	0.15	0.04	7.85	32	344
0.15	Measured	146,107	0.37	0.15	0.03	5.51	23	210
	Indicated	47,612	0.38	0.14	0.03	5.92	29	250
	M+I	193,719	0.37	0.15	0.03	5.61	24	220
	Inferred	4,229	0.41	0.15	0.04	7.64	33	347
0.16	Measured	140,257	0.38	0.15	0.03	5.52	23	212
	Indicated	46,264	0.39	0.14	0.03	5.94	29	252
	M+I	186,521	0.38	0.15	0.03	5.63	25	222
	Inferred	4,036	0.42	0.16	0.04	7.60	34	351

1.7.2 San Dionisio

The updated copper mineral resource estimate for San Dionisio was summarized using a Lerchs-Grossmann (LG) pit shell that was run using a copper price of US$3.60/lb Cu and all resources, including inferred resources. Pit optimization was constrained by the Riotinto Project mining permit limits around the Atalaya pit and by the ultimate pit of Cerro Colorado. Metallurgical recoveries and slope and economic parameters are described in detail in Chapter 14.

The resulting pit shell is considered to have reasonable prospects for economic extraction, assuming the inferred resource is converted to measured and indicated by drilling. Resources are estimated from the current topography and the ultimate pit of Cerro Colorado. The mineral resource estimate is summarized in Table 1-3.

Table 1-3: Mineral Resource Summary – December 2021 estimate, using multiple cutoffs, constrained by the US$3.60/lb Cu pit and the current topography and Cerro Colorado ultimate pit (Noble & Barrero, 2021).

Riotinto Project
San Dionisio Total Mineral Resources
July 2021 Model (21G) - 31 Dec 2020 Topo - $3.60/lb Cu Pit

% Cu Cutoff	Class	Tonnes (1000's)	% Cu	% Zn	% Pb	% S
0.14	Measured	50,817	0.92	1.09	0.21	31.12
	Indicated	6,576	0.70	1.31	0.35	34.05
	M+I	57,393	0.89	1.12	0.23	31.46
	Inferred	872	0.77	0.54	0.23	26.98
0.15	Measured	49,661	0.94	1.11	0.22	31.46
(Base Case)	Indicated	6,420	0.71	1.33	0.35	34.45
	M+I	**56,082**	**0.91**	**1.14**	**0.23**	**31.80**
	Inferred	850	0.78	0.55	0.23	27.46
0.16	Measured	48,514	0.96	1.13	0.22	31.79
	Indicated	6,284	0.72	1.35	0.36	34.86
	M+I	54,798	0.93	1.16	0.23	32.14
	Inferred	839	0.79	0.56	0.24	27.66

The San Dionisio underground copper mineral resource was summarized based on the economic block model constructed for pit optimization and considering the underground mining costs. The economic block model was re-blocked to 20x20x20m blocks to simulate mineable shapes and discard isolated potentially profitable blocks with excess dilution.

The resulting inferred mineral resource which might become economically extractable by underground methods assuming that the inferred resource is upgraded to measured and indicated by drilling and by further economic, mining, and technical studies, is summarized in Table 1-4.

Table 1-4: San Dionisio Underground Mineral Resource Summary – December 2021 estimate (Noble & Barrero, 2021).

San Dionisio Underground Mineral Resource Summary

	Tonnes (1000's)	Volume (m^3)	% Cu	% Zn	% Pb	% S
TOTAL Inferred Resource	12,388	3,025,419	1.01	2.54	0.62	40.86
July 2021 Model (21G)						

1.7.3 San Antonio

For the San Antonio deposit, the estimated underground mineral resources are classified as inferred because the resource model is based mostly on historical drilling information and new drilling data is limited. Historical data had been validated and is considered good quality and reliable but should be confirmed with additional new drilling.

The resulting inferred mineral resource, which might become economically extractable by underground methods assuming that the inferred resource is upgraded to measured and indicated by drilling and by further economic, mining, and technical studies, is summarized in Table 1-5 as total volume and tonnes of ore and fill.

Table 1-5: San Antonio Inferred Underground Mineral Resource -December 2021 estimate, non-diluted (Noble & Barrero, 2021).

San Antonio Underground Mineral Resource Summary

	TONNES (1000's)	VOLUME (m^3)	% Cu	% Zn	% Pb	% S
Total Inferred Resource	11,776	2,832,359	1.32	1.79	0.99	35.67

May 2021 Model (21E)

1.8 Mineral Reserve Estimate & Mining Operations

The current Cerro Colorado mineral reserve estimates are based on open pit mining progress through December 31, 2020 and are derived from a resource block model that was updated in the April of 2021 (21D). Ultimate economic pit analyses, open pit optimization, and a production schedule were prepared in March 2021 based on the resource block model dated November 2020 (20K).

Because there is a minimal difference between the block model dated November 2020 (20K) and the updated block model of April of 2021 (21D), updating of the open pit optimization, pit design, and production scheduling based on the 21D block model was not justified.

In this study, mineral reserve is defined as the measured and indicated mineral resource that would be extracted by the mine design and which can then be processed at a profit. All measured resources meeting that standard are herein classified as *proven* mineral reserves, while all indicated resources meeting that standard are classified as *probable* mineral reserves.

Mineral reserve estimation parameters are fully described in Chapter 15. The estimates of proven and probable mineral reserves and the combination of both for the Cerro Colorado open pit are presented in Table 1-6. All Filón Sur backfill material and all material classified as inferred mineral resources were treated as waste.

Total proven and probable mineral reserves are estimated at nearly 185 Mt grading 0.38% Cu. Contained copper is estimated at 702,750 tonnes. Waste rock and backfill are projected at about 342 Mt, resulting in a stripping ratio of 1.84. All the mineral reserves reported in Table 1-6 are contained within the mineral resources reported in Table 1-2.

Table 1-6: Cerro Colorado Mineral Reserve Estimate (Noble, 2021)

Mineral Reserves (0.16 %Cu Cutoff)				Waste	Strip Ratio
Classification	**TONNES (1000's)**	**%Cu**	**Copper Tonnes**	**TONNES (1000's)**	
Proven	138,929	0.38	523,966		
Probable	46,791	0.38	178,785		
Total	185,720	0.38	702,750	341,847	1.84

April 2021 Block Model (21D) - 31 Dec 2020 Topo - March 2021 $3.1/lb Cu Ultimate Pit

TONNES(1000's): thousands of metric tonnes (Kt)

Mining operations at the Riotinto Project site were restarted in June 2015 at Cerro Colorado deposit using conventional, open pit mining methods. Mining benches are on 10-m vertical intervals. Contractors' small- to medium-scale mining equipment is used to execute the development plan, including rock drills capable of drilling 102- to 127-mm-diameter blast holes, hydraulic excavators with bucket capacities of 6-14 m^3, off-highway trucks with 91-tonnes payload capacity, and suitably sized support equipment.

Atalaya Mining is presently using mining contractors for all excavation work, including drilling and blasting, through the joint venture UTE Riotinto. This joint venture includes the companies S&L (Sanchez y Lago S.L.) which handles earthmoving, and Insersa S.A. which is responsible for drilling and blasting. Both companies are significant and well-financed contractors in Spain with extensive metal mining experience. Atalaya Mining is responsible for all grade control and mine planning.

The mining phase reserve estimates by mining phase above 0.16% Cu cutoff, effective December 31, 2020 and based on the November 2020 (20K) block model, are presented in Table 1-7. These phase reserve estimates were used to generate a mine production schedule.

Table 1-7: Mineral Reserve Estimates (Proven & Probable) by Mining Phase (Noble & Barrero, 2021).

Mining	Mineral Reserves (>= 0.16 %Cu)			Waste	Total	Strip
Phase	Tonnes (1000's)	% Cu	Copper Tonnes	Tonnes (1000's)	Tonnes (1000's)	Ratio
1	3,029	0.37	11,165	797	3,825	0.26
2	36,881	0.41	150,200	27,600	64,481	0.75
3	1,706	0.38	6,416	14,077	15,783	8.25
4	23,738	0.33	78,945	27,630	51,367	1.16
5	56,390	0.34	191,343	98,293	154,683	1.74
6	41,561	0.39	162,333	96,239	137,800	2.32
7	21,496	0.45	96,647	77,088	98,583	3.59
Total	184,800	0.38	697,050	341,724	526,523	1.85

NPVS Economic Model and Mining Reserves by phase reported in Datamine-Studio OP (Block Model 20k)

TONNES(1000's): thousands of metric tonnes (Kt)

The mill feed target of 15 Mtpa was assumed for all the periods (years). Stripping requirements had been adjusted for each period to ensure sufficient ore exposure throughout the schedule to meet the mill feed target.

Total contained copper in the schedule's mill feed is estimated at 697,050 tonnes (Block Model 20k), which compares with the reserve estimates total copper tonnes of 702,750 (Block Model 21D) in Chapter 15.

The life of the mine is estimated at 12.5 years, for a projected completion in the second quarter of 2033.

The mining schedule was developed using a cutoff grade of 0.16% Cu, but the mine is now using a cutoff grade of 0.20% copper. Material between 0.16% Cu and 0.2 % Cu is being stockpiled. While the higher cutoff is rational given current prices, there is a high risk that there will be production challenges which could disrupt delivery of ore to the plant. Rescheduling at the higher cutoff is strongly recommended to identify and alleviate scheduling risks.

1.9 Mineral Processing and Recovery Methods

From 1995 to 2001 the Riotinto concentrator processed ore with similar characteristics to what is processed today. In that period, a total of 23.9 Mt of ore at an average 0.54% Cu were processed, which generated information that was used to develop the design criteria and startup plan for the current operation. The old concentrator initially processed 4.5 Mt/y of ore and an expansion increased the concentrator processing capacity to 7.3 Mt/y in 1997; a peak annual throughput of 9 Mt/y was achieved in 1998.

Metallurgical testwork results and current plant performance indicate that Riotinto ore is amenable to conventional crushing, grinding, froth flotation, dewatering, and filtering processes. The ore for the current operation is mined from 5 different zones (CCW, Isla, Salomon, Lago, and QUEB) with different but acceptable metallurgical performance variability when processing it with conventional flotation machines and Isopropyl Ethyl thiocarbamate (IPETC)-based chemistry at basic pH of over 10.5. The optimum target P_{80} in the flotation feed has been set to 175-200 microns as a compromise between copper recovery and throughput.

1.9.1 Polymetallic Testwork

A preliminary metallurgical investigation of polymetallic resources from San Antonio and San Dionisio was started in 2020. As described in Chapters 7 and 14, these deposits contain potentially economically recoverable base metals, lead and zinc, in addition to copper, silver, and gold. The primary ore minerals are chalcopyrite, galena, sphalerite with minor amounts of tetrahedrite, covellite, and other copper complex minerals, many of which are associated or encapsulated in pyrite.

Historical metallurgical testwork evaluated bulk sulfide and differential flotation. The presence of pyrite encapsulation required a fine grind in the range of d80 20–30 microns in order to liberate the ore minerals. While bulk sulfide flotation produced recoveries in the 70–90% range, concentrate grades remained very low due to the inability to selectively recover only the ore minerals.

A 2022 metallurgical test program was conducted by Base Met Labs (Base Met labs, March, 2022) to assess the performance of the polymetallic samples, using various floatation methods to determine the preliminary metallurgical performance of the ore minerals.

Ore from the San Dionisio deposit were used for this test program. Head assays from the sample are shown in Table 1-8.

Table 1-8: Head Assays (Atalaya 2022)

San Dionisio	Assay, percent or g/t										Cu, Dist. %	
	Cu	Pb	Zn	Fe	S	Au	Ag	As	CuOx	CuCN	CuOx	CuCN
Head 1	1.16	0.83	3.60	36.1	50.7	0.57	32	3784	0.07	0.15	6.3	13.1
Head 2	1.16	0.81	3.60	36.1	48.6	0.64	33	3890	0.08	0.13	6.7	11.6
Average	1.16	0.82	3.60	36.1	49.7	0.61	33	3837	0.08	0.14	6.5	12.3

Copper measured 1.16%, with a small portion present as oxide and secondary copper minerals, as indicated by the CuOX and CuCN sequential assays respectively. The presence of secondary copper in a polymetallic flotation process can cause challenges in selective metal recovery, due to the activation of sphalerite from dissolved copper. Lead and zinc measured 0.8% and 3.6%, respectively. Gold and silver measured 0.6 and 33 g/tonne, respectively.

Lock cycle testing provided the better results, which included a combination of bulk rougher flotation, fine regrinding, and then selective flotation of a combined copper-lead concentrate and a zinc concentrate.

Table 1-9: Locked Cycle Test Results (Atalaya 2022)

Product	Weight	Assay – percent or g/t						Distribution – percent					
	%	Cu	Pb	Zn	S	Ag	Au	Cu	Pb	Zn	S	Ag	Au
Feed	100	1.07	0.79	3.25	51	37.2	0.6	100	100	100	100	100	100
Pb Con	0.9	8.5	31.9	6.0	35	654	0.4	7.4	37	1.7	0.6	16.3	0.7
Cu Con	3.3	18.9	3.1	6.2	41	118	0.3	58.2	12.7	6.3	2.7	10.5	1.5
Zn Conc	4.9	1.4	0.5	49.9	37	75	0.5	6.3	2.9	74.7	3.5	9.9	4.2
Zn 1st Clnr Tls	3.0	0.7	0.6	1.7	52	65	0.7	2.0	2.5	1.5	3.1	5.3	3.4
Zn Ro Tail	25.6	0.22	0.33	0.4	52	17.8	0.64	5.3	10.7	2.9	26.3	12.3	26.5
Bulk Ro Tail	63.2	0.35	0.42	0.66	51.6	26.9	0.63	20.9	33.9	12.8	63.8	45.7	63.8

As shown in Table 1-9, the locked cycle test recovered 58% of the copper into the final copper concentrate, grading 19% copper. The lead concentrate graded 32% lead at a recovery of 37%. Zinc recovery measured 75% at a concentrate grade of 50% zinc. Silver recovery trended with lead recovery, and silver credits may be payable particularly in the lead concentrate. Gold recovery was very low, and trended with sulphur recovery, indicating an association with pyrite, possibly in solid solution that would be unrecoverable in flotation. While these data are improved, additional testwork should focus on a sub-10 micron regrind, reagent optimization, and more efficient bulk rougher flotation. An economic trade-off study should also be conducted to determine the financial impacts from these optimizations.

1.9.2 E-LIX TM Technology Summary

E-LIXTM is a process for the leaching of refractory minerals such as the primary sulfides of copper, lead, zinc, and millerite, in particular chalcopyrite, galena, sphalerite, and millerite. Previous methods for leaching of primary sulfides have been met with extremely slow leaching rates and poor recoveries caused by development of a "passivation layer" on the mineral surface that inhibits further dissolution of the mineral. The E-LIXTM technology incorporates systems to solve both the problem of the passivation layer as well as the slow kinetics, resulting in fast reaction rates with high recoveries, and the possibility of selective metal deposition during leaching of complex, polymetallic sulfides.

1.10 Recovery Methods

1.10.1 Process Summary

The Riotinto concentrator processes copper sulfide ore using conventional froth flotation to produce a copper concentrate. The plant employs a combination of existing equipment associated with the historical operations as well as expanded and upgraded facilities.

Relatively coarse primary and secondary grinding, at a P_{80} of approximately 160–220 µm, is used to float the minerals containing chalcopyrite and pyrite to produce a rougher concentrate. This concentrate must then be re-ground to a relatively fine grain size of around 40 to 20 µm in order to increase the concentrate grade.

The Filón Sur Zone (FSUR) located in the Southwest area of Cerro Colorado requires the same processing parameters.

The processing department staff consists of 115 people plus 10 who work in management and supervisory positions, and the balance occupy positions assigned to middle management and operating personnel. The concentrator is being managed through an ongoing improvement system which aims to maintain or improve the historic metallurgical results.

Since refurbishment and re-commissioning in June 2015 (Phase 1), the process was upgraded and successfully expanded to 9.5 Mt/y (Phase 2), and is currently operating at 15 Mt/y.

1.11 Infrastructure

1.11.1 Access

The property is well-connected for road transportation via a high-quality national road system that was recently renovated. The site is located 75 km from the port and the industrial city of Huelva, and 88 km from the regional capital, Seville.

Copper concentrate is transported by road to the Huelva port where it is stored for ocean transport to various commercial destinations. The project also uses other nearby ports such as Algeciras and Cadiz, and international airports in Seville, Madrid, and Faro (Portugal).

1.11.2 Electrical Supply

The main incoming electrical substation operates in 132 kV on the incoming high-voltage side and 6.3 kV and 20 kV on the outgoing low-voltage. The substation was fully reconditioned and updated as part of previous development programs. The substation consists of a 1.3 km line that has been repaired and is currently operating from La Dehesa substation (ENDESA independent power supplier) using 3 outgoing lines on 3 main transformers.

The Company's planned 50 MW solar farm for self-consumption will also help to reduce the Company's long-term power costs while at the same time lowering its carbon emissions. The solar plant, which is expected to provide approximately 22% of the Company's electricity needs, is under construction following the signing of an agreement with an affiliate of Endesa, the Spanish power supply company.

Atalaya received approval for the construction of the solar farm in March 2022. With ground preparation underway and equipment on order, full commissioning of the solar plant is expected during 2023.

1.11.3 Water Systems

Process water is supplied from Gossan Dam through two pumping stations from where it is pumped at a rate of approximately 4,400 m^3/h. Process water from Cobre is pumped either to the Gossan Dam or directly to process tanks. Process water from Aguzadera is also pumped to the Gossan Dam.

Fresh water is supplied from the Campofrio, Aguas Limpias, and Odiel reservoirs. Potable water is supplied by the utility company, GIHASA, which manages the water system for the municipality of Minas de Riotinto.

Acidic water, coming from Corta Atalaya, Cerro Colorado, and waste dump ponds, is pumped through piping and pumping system to the treatment plant and onto the process water storage tank.

1.11.4 National Road (A-461)

Accessing Cerro Colorado mining Phase 5, which defines the ultimate pit limit on the northwest and west areas, requires re-routing of the National Road A-461, the main road in the section between Minas de Riotinto and the town of La Dehesa, and reallocation of the current power lines. The regional government has approved the beginning of the layout of the new road section, but the permitting process is still ongoing. The National Road A-461 must be relocated prior to the beginning of 2024 to prevent disruptions in the mine production schedule. Delays in permitting may delay the mine production schedule.

Additionally, an agreement has been signed with the electricity supply company to change the current layout of the power line, which is going to be carried out prior to the diversion of the road. In addition, there is a communication line (fiber optic) that needs to be reallocated and this is being discussed with the communications supply company.

1.11.5 Tailings Storage Facility

The Tailings Storage Facility (TSF), consists of three adjacent impoundments referred to as Cobre, Aguzadera, and the Gossan facilities. Cobre and Gossan facilities were first constructed in the early 1970s to contain 70 Mt of tailings, and the Aguzadera facility was constructed in the late 1980s to provide a total of 86 Mt of tailings storage. The Gossan facility, which was previously used to store fine gold tailings, acts as a contact water reservoir where the tailings reclaim water from the Cobre and Aguzadera is treated with lime and pumped back to the plant site.

There are two tailings facilities in operation, Cobre and Aguzadera, at crest elevations of 388 masl and 382 masl, respectively. The Cobre facility is nearly filled, and tailings discharge is currently confined to the Aguzadera facility.

The remaining Life of Mine production will be 15 Mtpa which will require additional total tailings storage of approximately 161 Mt. This future development of the tailings facilities will include raising the Aguzadera embankment to an initial crest elevation of 388 masl. From this elevation, both embankments will be raised together with their dividing wall to a final elevation of 417 masl. The approval to raise both facilities to 417 masl has not yet been granted.

1.11.6 Monitoring

Atalaya launched the Minerva Project in 2021 with the aim of creating a multi-disciplinary platform integrating real-time ground monitoring of the TSF. The platform will be managing real-time monitoring data, allowing rapid representation and interpretation of the data and enabling the establishment of a real-time alarm system for ground control management. This Atalaya project is a step toward the digital transition of the Riotinto mine and the safe conduct of mining operations.

1.11.7 Fire Protection, Warehouses, and Maintenance Facilities

The fire protection system was completely renovated as required by the Spanish Royal Decree 1389/1997, of September 5, 1997, which approves the minimum provisions for protecting workers' health and safety at mines.

There are two large warehouses on the mine property along with an outdoor storage area. The locations for replacement parts and material deliveries have been separated and clearly defined. The warehouses feature sufficient shelving units to organize large-size replacement parts and cabinets for small items. All warehouse shelving units are officially approved and newly installed. Two secure areas were prepared within the warehouses to store inflammable products to comply with APQ laws (chemical storage).

The maintenance warehouse was re-conditioned and rehabilitated. All necessary equipment was re-certified as required by the Spanish Royal Decree 1215/1997, of July 18 1997 establishing the minimum health and safety provisions for use by workers.

1.12 Market Studies and Contracts

Atalaya has been actively marketing the copper concentrate product to global consumers. Currently, a small proportion of the concentrate is sold on the open market. The remaining portion of the concentrate production is committed to the following companies according to market-standard offtake agreements that average for the life of mine reserves as reported in the Technical Report on EMED´s Rio Tinto Copper Project dated February 2013:

- IXM, S.A.
- Transamine, S.A. (formerly Transamine Trading S. A.)
- Trafigura PTE Limited

The typical copper concentrate specification is shown below in Table 1-10. This specification is based on actual production by Atalaya during the years 2020 to 2021. It is based on processing all Cerro Colorado ores.

Table 1-10: Copper concentrate typical assay

Element	Unit	Value
Cu	%	21 – 23
Pb	%	0.2 - 0.3
Zn	%	3.5 - 4.5
S	%	29 - 34
Fe	%	28 - 33
As	ppm	1200 - 2800

Element	Unit	Value
Sb	ppm	2000 - 2500
Bi	ppm	220 – 280
Hg	ppm	20 - 25
Au	ppm	0.7 - 1.5
Ag	ppm	50 - 80

The copper concentrate is a complex material containing elevated levels of some penalty elements, including mercury, antimony, arsenic, and bismuth. These elements will limit the quantities of concentrates that can be taken by certain smelters and, therefore, by the off takers. Historically, the concentrates from the mine have been delivered to the Atlantic Copper smelter in Huelva and, to a lower extent, to other smelters within Europe.

Concentrates produced from 2016 to 2022 were mainly delivered to Chinese smelters. Table 1-11 summarizes copper production in concentrates and realized copper price for the same period. Project economics are detailed in Chapter 21 of this report.

Table 1-11: Copper production and market price

		2016	2017	2018	2019	2020	2021
Copper concentrate	tonnes	122,468	165,965	180,661	195,072	256,001	270,713
Contained Copper	tonnes	26,179	37,164	42,114	44,950	55,890	56,097
Market Copper Price	$/lb	2.21	2.80	2.93	2.72	2.80	4.23

1.13 Environmental Studies, Permitting, and ESG (Environmental, Social, and Governance)

The main permits for Riotinto are:

- **AAU (Autorización Ambiental Unificada or Unified Environmental Authorization).** Is an instrument of integrated environmental prevention and control created by the Andalucia autonomous region in 2007. It regulates mining activities and auxiliary facilities associated with mining at an environmental level. The permit was obtained in 2014 and was validated in May 2020. The AAU has undergone several modifications, both non-substantial and substantial. A second substantial modification is currently in progress due to the update to the mining project or "PRT" (Proyecto Rio Tinto), this update includes the construction project to raise both tailings facilities to the 417 masl.
- **The Mining Project/Permit (PRT – Proyecto Rio Tinto) and Final Restoration Plan (FRP):** After receiving the approved Unified Environmental Authorisation ("AAU") for the Riotinto Copper Project and the transfer of the Riotinto mining rights in April 2014, Mining Permit and Restoration Plan approval was granted in January 2015 and validated in May 2020. In July 2020 Atalaya submitted to the competent authority the update of the PRT which includes the construction project to raise the tailings facilities to the 417 masl. The project is under review by the competent authority; final approval of the project has not been granted to date. The Final Restoration Plan (FRT) is an integral part of the PRT, the submitted modification of the PRT includes an update of the FRP (CRS, 2018).

- **Water Concession:** Riotinto has been granted a public water concession for 4.93 hm^3/year, of which 2.5 hm^3/year is sourced from the Odiel, Campofrío, and Aguas Limpias reservoirs, and 2.43 hm^3/year is sourced from rainwater. Similarly, the PRT has obtained a new temporary permit for an additional water supply. Atalaya will request authorization for the modification of the water concession to include this temporary supply in order to consolidate the freshwater resource.

Other permits include:

- The re-alignment of the National Road A-461 outside the mining areas, which is still in progress.
- Construction of a 50MW solar farm. Atalaya received approval for the construction of the solar farm in March 2022.
- The Integrated environmental authorization procedure (Autorización Ambiental Integrada, AAI) for the E-LIX™ plant has been initiated with the regional authority; the estimated date for approval is approximately July 2023.

1.13.1 Autorización Ambiental Unificada (AAU)

The AAU is the main environmental process/approval that was completed prior to the start of the refurbishment, mining, processing, and waste deposition activities.

The AAU regulates mining activities and auxiliary facilities associated with mining and environmental compliance. The AAU was obtained in 2014 and validated in May 2020. The AAU has undergone several modifications, both non-substantial and substantial. A second substantial modification is currently in progress as a result of the update to the PRT. The updated AAU should be approved in 2022. Once the AAU is approved, the Exploitation Project and the Restoration Plan presented in the Second Substantial Modification will be approved.

1.13.2 The Mining Permit (PRT – Proyecto Rio Tinto) and Final Restoration Plan (FRP)

EMED Mining Public Ltd received the approved Unified Environmental Authorisation ("AAU") for the Riotinto Copper Project and the transfer of the Riotinto mining rights in April 2014 through its Spanish subsidiary Emed Tartessus S.L.U.

The Mining Permit and Restoration Plan approval was received in January 2015, and construction and refurbishment operations commenced immediately after.

In October 2015, the shareholders approved the name change to Atalaya Mining Plc, and in March 2016 the change of the corporate name to ATALAYA RIOTINTO MINERA S.L.U was endorsed by the Territorial Delegation of Economy, Innovation, and Science in Huelva.

In July 2020 Atalaya submitted to the competent authority the update of the PRT which includes the construction project to raise the tailings facilities to the 417 masl. In November 2021 during the public information procedure, the Territorial Delegation of Huelva sent a favorable proposed resolution on the waste management plan associated with the revision of the FRP in relation to the PRT project update.

The project is under review by the competent authority; final approval of the project has not been granted to date.

The Final Restoration Plan (FRT) is an integral part of the Riotinto Mining Project (PRT). Both the operating and final restoration plans have been developed to make them compatible with each other and to ensure that final restoration can be completed as soon as possible after the cessation of mining, processing, and waste disposal operations.

Since the beginning of its operation in 2015 Atalaya has implemented an FRP, in accordance with applicable legislation, aimed at the following objectives:

- Landscape and environmental integration of the areas created, preserving the values of the mining landscape which is characteristic of the area, and which is culturally protected.
- To guarantee adequate water quality in the restored areas.
- To ensure the safety and long-term stability of the remaining structures.
- To generate an end user of the land that is beneficial to the socio-economic environment of the area where the mining operation is located.

In addition, Proyecto Riotinto's Restoration Plan envisages the rehabilitation of non-active areas inherited from previous mining activities in the area (mine tailings) and which are not the result of activity by Atalaya Mining.

In accordance with the relevant legislation, the submitted modification of the PRT includes an update of the FRP (CRS, 2018), which is under review for approval by the competent authority.

1.13.3 Waste Rock Storage Facilities

The waste rock storage facilities (WRSF) are described in detail in Chapter 16. In addition, there is old waste-rock material deposited in several areas inside and outside the Atalaya lease areas. Some are specifically designated waste dumps, while others have been 'temporarily' stockpiled adjacent to the excavations.

Although some waste-rock faces have been listed by Culture and Heritage as protected, they will be covered as part of the final restoration plan in order to meet environmental requirements.

1.13.4 Tailings Storage Facility

An operational improvement plan was undertaken by Golder Associates in 2016 which included:

- Replacement of cyclone sand as an embankment wall construction material with rockfill and to form a buttress to improve stability.
- Increasing the capacity of the Cobre and Aguzadera facilities by raising the existing embankments using the centerline method using rockfill on the downstream side and an HDPE liner above a low permeability soil with filters separating the soil from the rockfill.
- Improved reclaim water return system and tailings discharge with discharge spigot points every 50 m and/or single discharge at approximately 100 m spacing.

The facilities are designed as a closed system, with no discharge to the environment. Process water is treated with lime in the Gossan reservoir to reduce the pH and precipitate metals. The facilities are operated without a spillway as there is sufficient flood storage capacity to accommodate storm flows and the external catchment area is limited. A spillway/drainage outlet will be installed at closure.

Seepage from the facilities is collected from four downstream sumps at low points in the valley floor and pumped back to the facility. These sumps would also intercept long-term acid rock drainage from material used in the buttress and previous material used in embankment wall construction.

1.13.5 ESG (Environmental, Social and Governance)

At the end of 2020, Atalaya committed to supporting the Ten Principles of the United Nations Global Compact, referring to Human Rights, Labor Rights, the Environment, and Anti-corruption.

Atalaya is committed to sustainability and to conducting its activities in accordance with the highest Environmental, Social, and Governance standards. The Company approved a specific corporate policy in this area in 2021. This policy was based on a diagnosis developed previously, which made it possible to assess the state of management of the different aspects included in sustainability, as well as some priorities to be undertaken. Among other issues, this policy covers social, environmental, and governance aspects. It also includes commitments to operational safety, occupational health and safety, and innovation

Atalaya has developed a specific sustainability strategy to ensure that the management of its operations and the proposal of new projects are aligned with the principles of the policy. This strategy also aims to ensure that the sustainable exploitation of its projects provides society with essential raw materials required for achievement of the goals established by the main national and international sustainability policies, such as climate change mitigation and energy transition.

Since the approval of this policy, the Company has implemented several steps, including the creation of a specific department responsible for implementing the necessary procedures and practices. This department also has the support of a specific body, the Sustainability Committee, composed of management from the operation and departments of HR, safety, environment, communication, and R&D among others, which are coordinated by the sustainability department. This Committee will ensure compliance with the policy, as well as the priorities that may be established by management.

In April 2022, Atalaya announced the publication of its inaugural Sustainability Report (Atalaya Mining PLC, 2022), which has been prepared following the Global Reporting Initiative Standards (GRI).

1.14 Capital and Operating Costs

The capital and operating costs given in the following tables were extracted from the financial analysis prepared by Atalaya. Euro-based costs have been converted to U.S. dollars at an average life-of-mine exchange rate of €1: US$1.15. Quantities and values are presented in both metric and U.S. customary units unless otherwise specified. No escalation has been applied to capital or operating costs. All costs are before inflation.

The ore reserve discussed in Chapter 15, from the end of December 2020 topography, is estimated at 185.7 Mt averaging 0.38% Cu. Production over the life of mine is summarized in Table 1-12.

Table 1-12: Life of Mine (LOM) Production (total)

Waste	341.8	Mt
Ore	185.7	Mt
Grade Cu	0.38	%
Contained Copper Metal in ore	703	kt
Payable Metal, Cu	606	kt

1.15 Life of Mine Capital Costs

Life of mine capital costs for the overall capital program including sustaining and tailings capital costs are estimated to be US$430M. In addition, the investments pipeline for 2022/2023 includes construction of a 50 MW solar plant exclusively used to provide energy to the mine operations. Total Capital spent to date (December 2021) by category is shown in Table 1-13.

Table 1-13: Development Capital Expenditure to end of 2021, U.S. Dollars (US$)

	Actual Cumulative to Date	Actual Committed to Date	Forecast 2022 and beyond
Sustaining capital	US$26.1M	US$2.9M	US$18.0M
Tailings dams project	US$22.0M	US$3.7M	US$93.2M
Solar Plant	US$0	US$0	US$30.0M
Development capital	US$261.0M	US$0	US$0
Capital Expenditure Total	US$309.1M	US$6.6M	US$114.2M

1.16 Life of Mine Operating Costs

Estimated Life of Mine operating costs are based on the current Riotinto operating budget for 2022. Both fixed and variable costs have been estimated for the life of mine operating and are summarized in Table 1-14.

Mining costs, inclusive of those capitalized, are equivalent to an average unit cost of 4.81 € per tonne of ore. The average unit processing cost is 5.33 € per tonne of ore. Site Operating Costs average the equivalent of US$2.11/lb of copper sold.

Table 1-14: Estimated Life of Mine Operating Costs based on 2022 Budget (Atalaya, 2022).

Site Operating Costs	€ per tonne of ore
Mining	4.81
Processing	5.33
Maintenance	1.93
Compliance	0.15
General & Administration Services	0.72
Environmental	0.07
Laboratory	0.20
Exploration and Geology	0.05
Total Site Operating Costs	13.26
Exchange Rate (€: US$)	*1.15*
Copper Recovery (%)	*86.2*
Average Copper Grade (Cu %)	*0.38*
US$/lb Copper Sold	*2.11*

1.17 Conclusions and Recommendations

1.17.1 Resource Estimation

The three most significant factors for the estimation of the Cerro Colorado resource are high variability of copper grades, highly overlapping zones of low and higher-grade mineralization, and folding of the deposit into a plunging anticlinal shape. The effect of the overlapping grade zones is minimized by assigning grade-zone codes to resource model blocks.

Many years of mining on the Riotinto Project have established that a significant copper resource is present and can be extracted by open-pit mining methods. This conclusion has been confirmed by current mining from 2015 to 2021. Riotinto copper mineralization, however, has high variability, much more like a gold deposit. While the high variability does not preclude estimating the overall resource with a level of accuracy suitable for measured and indicated resource, the mine is likely to experience annual differences in copper grade that are as much as 15% higher or lower than the predicted grade.

1.17.2 Mining

The exploitation plan for the Riotinto Project utilizes conventional truck and excavator open pit mining methods for the Cerro Colorado deposit. A fixed internal cutoff of 0.16% Cu will be employed to maximize the total cash flow of the mining schedule based on a current ore processing rate of 15 Mtpa. At a Cu price of US$3.10/lb, total proven and probable mineral reserves are estimated at nearly 186 Mt grading 0.38% Cu and containing about 703,000 tonnes of Cu metal. Waste rock, including backfill in old workings, totals about 342 Mt for an average stripping ratio of 1.84. The mine's life is estimated at 12.5 years.

1.17.3 Tailings Storage Facility

The current tailings expansion project under application can retain approximately 161 Mt, which extends the LoM to year 2032. The design is robust, but is a centerline method of construction and, therefore, the performance of the facilities is dependent on routine inspection, geotechnical monitoring, and investigations. Ore reserves to date indicate that additional tailings capacity will likely be required beyond the year 2032.

1.17.4 Recommendations

The recommendations that follow are meant to improve operations and/or the economics of the Riotinto Project and to further develop the resources at San Dionisio and San Antonio.

Cerro Colorado:

- Continue evaluation of possible bias in the blast hole samples used for grade control (US$5,000).
- Review the resource model on an annual basis to evaluate the model performance (US$10,000).
- Update the life-of-mine mining plan to use higher cutoffs and maximize revenues (US$15,000).

San Dionisio:

- Complete a Preliminary Economic Assessment based on two phases:
  - A) Copper ore (low zinc) via open pit and existing plant
  - B) Polymetallic ore via open pit and underground with the addition of Cu/Zn/Pb circuit
- Additional infill drilling at San Dionisio, mainly directed to confirm the presence of mined-out areas. Drilling from the existing tunnel will provide fresh core for metallurgical testing, density measurements, data for new resource modeling, etc. The cost of the drilling program and access underground is estimated to be US$2M.
- Conduct pumping and pit dewatering studies, including the potential recovery of dissolved metals (US$50 000).
- Conduct additional pit geotechnical studies that may include new geotechnical drilling and water level monitoring in the south wall with piezometers and stability of future dumps (US$200 000).
- Further optimization of metallurgy for the polymetallic ore, including the integration with E-LIX™ (US$500 000).
- Complete a new resource model, including the results of additional drilling (US$20 000).
- Evaluate additional expanded tailings storage capacity for San Dionisio, including potential space for San Antonio and others (US$50 000).

San Antonio:

- Initiate a 7000 m core drilling program to confirm historical grades, assess core recovery in relation to grade, provide density data related to assays, provide basic geotechnical data through geotechnical logging of the core, etc. (cost estimated at US$1.5M).
- Update the resource model with results of the additional drilling (US$20 000).
- Conduct a hydrogeologic study on the Planes/San Antonio area including pumping tests and treatment of existing mine water (US$100 000).
- Complete an underground mining Preliminary Economic Assessment (US$100 000).

Others, General:

- Complete construction of the first phase of an industrial-scale plant of E-LIXTM and operate with Riotinto and other concentrates.
- Continue permitting, design, and construction of additional waste rock storage.
- Set up an automatic sampler for the final concentrate and extend a sample exchange program with external laboratories to improve analytical reliability.
- Continue to look for opportunities to improve operating costs. Set up a detailed program to monitor the higher cost/use consumables, such as reagents, mill steel, and energy.
- Formalize a social and community development plan that incorporates both company and community issues. Need to develop a post-mine use plan.
- Continue to instill a culture of safety and safe practices both at work and at home. Make environmental compliance equal to safety and production.
- Although management, monitoring, and control of the tailings facilities at Riotinto comply, as reported by APPLUS Norcontrol, with all legal requirements, compliance with the ICMM Global Industry Standard on Tailings Management (GTS) should be adopted in the future by the Atalaya design and management team.

2. INTRODUCTION AND TERMS OF REFERENCE

The property is located at the eastern end of the Spanish/Portuguese Iberian Pyrite Belt (IPB), which extends about 230 km between Seville (Spain) in the east and the Atlantic coast near Lisbon (Portugal) in the west. The Project was last operated in 2001 and restarted operations in 2015 under the ownership of Atalaya. The Riotinto Copper Project location is shown in Figure 2-1.

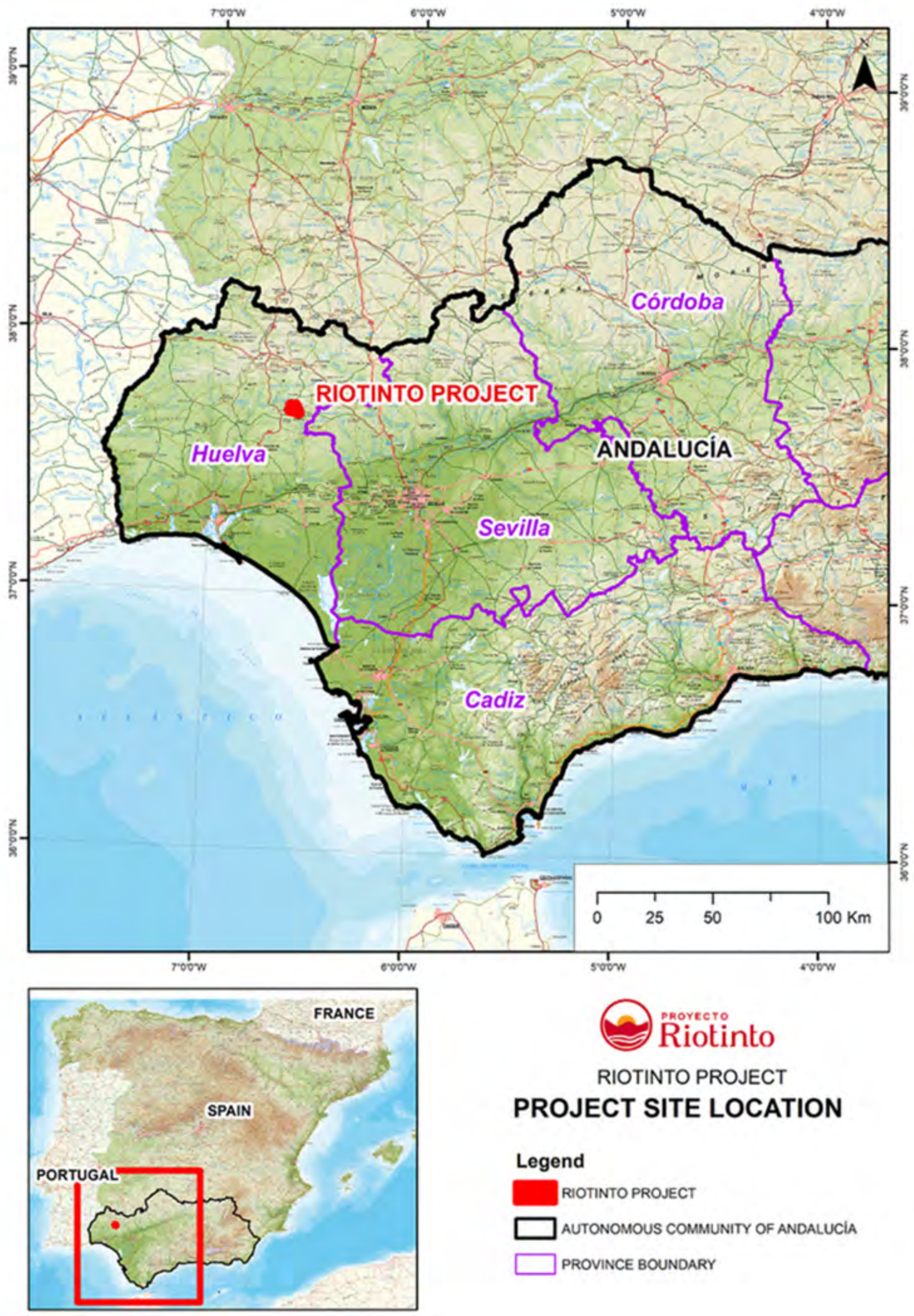


Figure 2-1: Riotinto Copper Project Location (Atalaya, 2018)

2.1 Background Information and Terms of Reference

Mr. Alan C. Noble of Ore Reserves Engineering (ORE) was contacted by Atalaya in July 2021. He was requested to prepare an updated resource estimate for Atalaya's Riotinto Copper Project in the Province of Huelva, Spain, including an update of the Cerro Colorado mineral resource and reserve, and a resource estimate for San Dionisio and San Antonio deposits. These resource and reserve estimates were to be documented in an updated NI 43-101 compliant report.

Pursuant to accomplishing the above tasks, Mr. Jaye T. Pickarts and Ms. Monica Barrero Bouza traveled to the project in July 2021 and conducted a site visit over a period of four days. During the site visit, the following personal inspections were conducted:

Ms. Barrero:

1. Reviewed the overall project status and historical information of San Dionisio and San Antonio with project personnel
2. Reviewed the geological interpretation with project geologic personnel
3. Reviewed the core of San Dionisio Atalaya drill holes
4. Reviewed drilling methods and exploration with project geologic personnel
5. Visited Atalaya open pit
6. Reviewed operational procedures and grade control of Cerro Colorado
7. Discussed current methods for resource estimation with mine technical staff
8. Visited the assay laboratory and reviewed sample preparation and assaying procedures
9. Reviewed existing mine development plans

Mr. Pickarts:

1. Reviewed the overall project status and history with project personnel
2. Visited the plant and reviewed project plans for updating the plant and expanding production
3. Reviewed project infrastructure
4. Reviewed the core of San Dionisio Atalaya drill holes
5. Reviewed the preliminary polymetallic metallurgical test results
6. Reviewed plant operational procedures
7. Reviewed environmental permitting and compliance procedures
8. Reviewed project safety procedures

Golder and Associates (Golder) was retained by Atalaya to assist in the preparation of the report. Golder's scope was limited to the design and operations management of the tailings management facility. Mr. Roger White visited the site in June 2022 and provided the direction and oversite. Specifically:

Mr. White:

1. Reviewed the tailings management facilities design
2. Reviewed the tailings parameters and design criteria
3. Reviewed the tailings deposition plans
4. Reviewed the closure measures proposed for the tailings management facilities

Atalaya has managed the site activities, including additional drilling, geotechnical, hydrology and environmental investigations. ORE has prepared this Technical Report based on these inputs.

All of the above-listed professionals are independent Qualified Persons according to the definitions of NI 43-101 and have conducted this work as independent consulting engineers and geologists.

2.2 Scope of Work

The scope of work for this technical report included the following:

1. Cerro Colorado deposit:
    a. Documenting the updated resource and reserve estimates for copper
    b. Preparation of a complete open pit mine design, including phasing, road access, annual production schedule, waste dump design, and periodic mine progress maps
    c. Review of the plant facility, plant operations, and plans for improvement of plant performance
    d. Review of environmental, safety, marketing, and costs
2. San Dionisio and San Antonio deposits included:
    a. Verification and assessment of historical and current drilling data
    b. Evaluation of current and historical QA/QC data
    c. Review of current and historical technical and metallurgical information available
    d. Preparation of an open pit mineral resource estimate for copper and potential underground resource for the San Dionisio deposit
    e. Preparation of an underground mineral resource estimate for copper for the San Antonio deposit

Furthermore, the scope includes the preparation of an updated NI 43-101 compliant report to document the above.

2.3 Sources of Information and Data

Electronic data files containing geologic interpretations, drill hole data, surface topography, and plant flowsheets were provided by project technical staff. Other data sources include historical and previous technical reports, independent resource estimation reports, feasibility reports, and plant design documents.

2.4 Units of Measure, Abbreviations, Acronyms, and Symbols.

Currency units are in U.S. dollars (US$), and copper prices are in US$/pound (US$/lb) and copper (454 g). Units of measure of quantities in this report are stated using SI Units[1] including meters (m), kilometers (km), kilograms (Kg), metric tonnes (t), liters (l), etc. unless explicitly stated. The units of measure, currency units, symbols, acronyms, and abbreviations used in this report are listed in Table 2-1.

[1] SI: International System of Units or Système international d'unités.

Table 2-1: List of units of measure, currency units, abbreviations, acronyms, and symbols.

Description	Units of measure
Centimeters	cm
Cubic meter	m^3
Degree	°
Degrees Celsius	°C
Gram	g
Grams per cubic centimeter	g/cm^3
Grams per metric tonne	g/t
Hectare (10,000m^2)	ha
Kilogram	Kg
Kilometer	Km
Megawatt	MW
Meter	m
Metric tonnes	t
Metric tonnes per cubic meter	t/m^3
Metric tonnes per day	t/day
Millimeters	mm
Million	M
Million metric tonnes	Mt
Million metric tonnes per annum	Mtpa
Million years	Ma
Parts per million	ppm
Percent	%
Pound (454 grams)	lb
Square kilometer	km^2
Square meter	m^2
Thousand metric tonnes	kt

Description	Currency Units
Euro	€
United States Dollar	US $

Description	Acronym
Atomic absorption spectroscopy	AA
Before Christ	BC
Diamond Drilling Holes	DDH
Electronic distance meter	EDM
Global Navigation Satellite System	GNSS
Atomic emission spectroscopy	AES
Inductively coupled plasma spectroscopy	ICP
Interferometric Synthetic Aperture Radar	InSAR
QAQC Quality Control & Quality Assurance	QAQC
Reverse Circulation	RC
Rock Quality Designation	RQD
Meters above sea level	masl
Thousand metric tonnes	Tonnes (1000's)

Description	Abbreviation-Symbol
Annum (year)	A
Antimony	Sb
Arsenic	As
Bismuth	Bi
Coefficient of Determination (Regression)	R^2
Copper	Cu
Gold	Au
Lead	Pb
Silver	Ag
Sulfur	S
Zinc	Zn

3. RELIANCE ON OTHER EXPERTS

The authors used their experience to determine if the information from previous reports was suitable for inclusion in this Technical Report.

Except where noted, the authors have relied upon the information provided by Atalaya as being accurate, reliable, and suitable for use in the report. This Report includes technical information, which required subsequent calculations to derive subtotals, totals, and weighted averages. Such calculations inherently involve a degree of rounding and consequently introduce a margin of error. Where these occur, the authors do not consider them to be material.

4. PROPERTY DESCRIPTION AND LOCATION

4.1 Property Location

The Riotinto Copper Project (“Proyecto Riotinto” or PRT) is located between the municipalities of Minas de Riotinto, Nerva, and El Campillo in the Huelva Province (Andalucía Autonomous Region, southwest of Spain). It is situated approximately 65 km northwest of Seville and 70 km northeast of the Huelva port. The property lies at the eastern end of the Spanish-Portuguese IPB (Iberian Pyrite Belt) which forms an arch about 240 km long and 35 km wide between Las Cruces and Lousal mines. Within the IPB there are nine major mining areas, from east to west: Las Cruces, Aznalcollar-Los Frailes, Riotinto, Sotiel-Migollas, Aguas Teñidas-La Zarza, Tharsis, Masa Valverde, Neves Corvo, and Aljustrel (Figure 4-1).

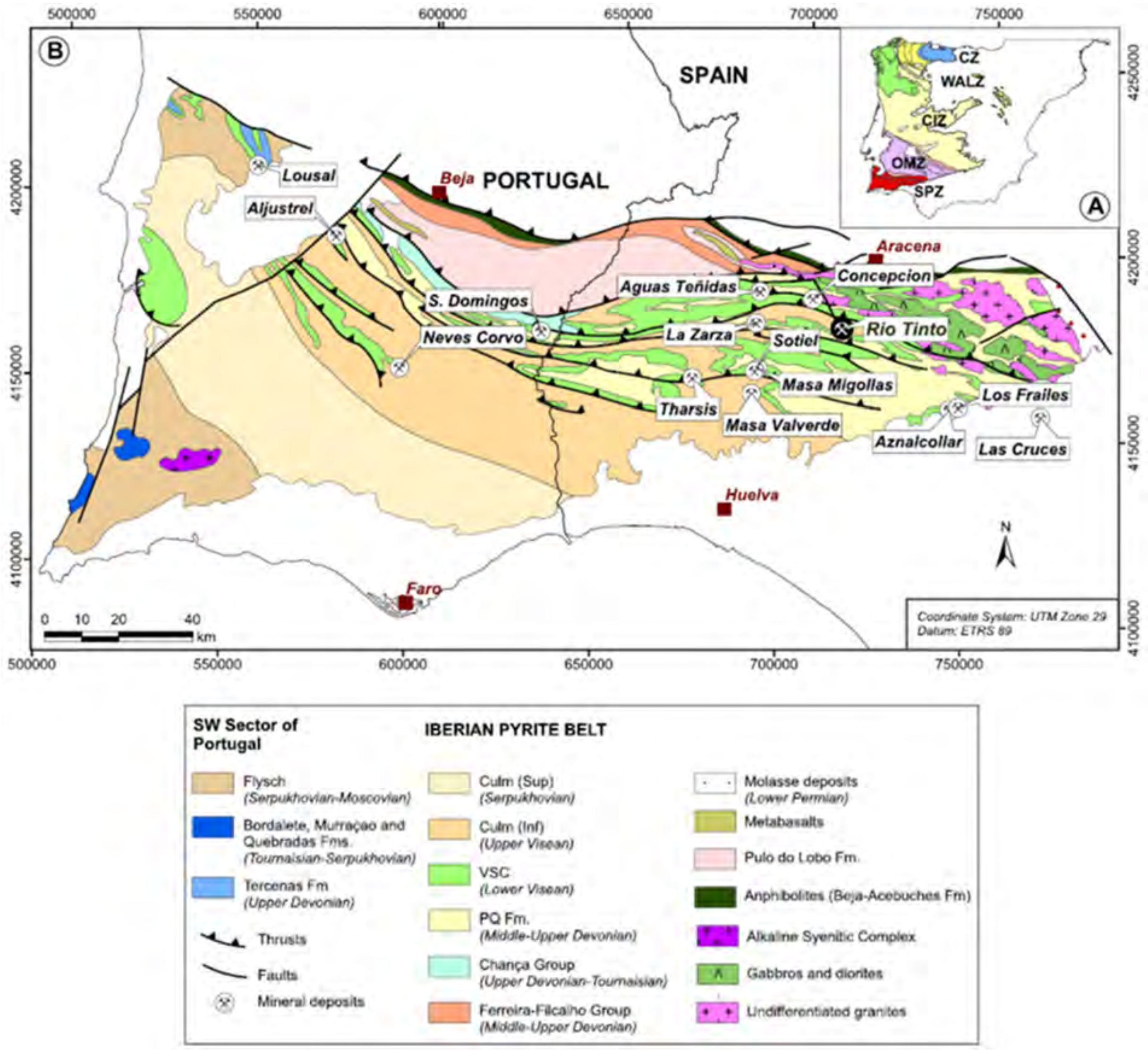


Figure 4-1: Location of the main mining areas and IPB (Martin-Izard, A. et al, 2015)

The Riotinto Copper Project (PRT) includes the Cerro Colorado open-pit mining operation, the Atalaya open pit, several present-day and historical waste dumps, tailings, and water facilities, the beneficiation plant, laboratories, and offices, other maintenance facilities, and general infrastructure. The approximate coordinate locations of the PRT in the UTM[2] ETRS 89[3] reference system are 708,000 to 718,000 East, and 416,900 to 417,900 North (Figure 4-2).

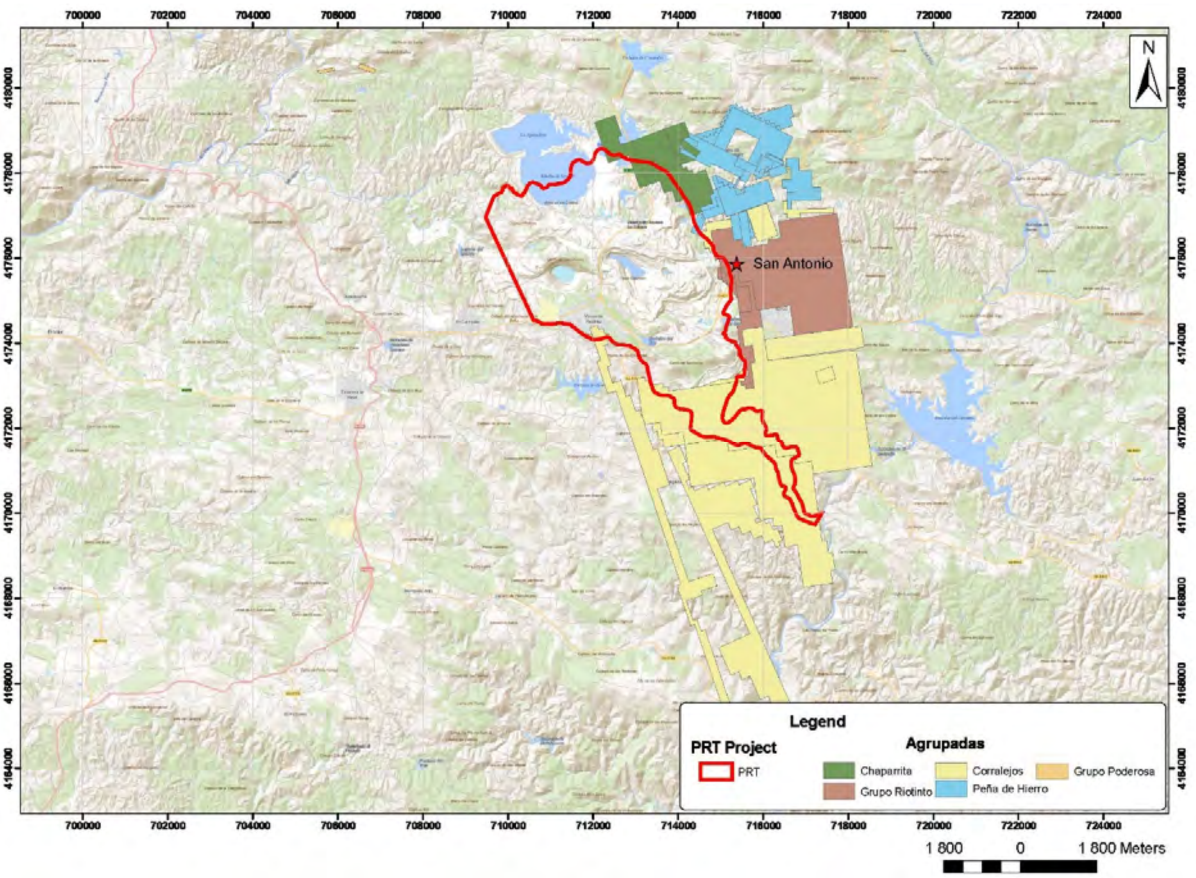


Figure 4-2: Plan map of the Riotinto Copper Project – PRT (Atalaya, 2022).

4.2 Regulatory Framework

The main regulatory framework in Spain for mining and exploration is determined by Spanish Mining Law (22/1973 of 21 July) and its regulations approved by Royal Decree 2857/1978, of 25 August 1978. The permit-concession allowing mining activity depends on the type of mineral commodity or "mineral section". The competent authorities governing mineral exploration and extraction are the General Directorate of Energy and Mines Policy (Ministry for the Ecological Transition) and the Departments of Industry, Environment, Culture, and Public Works of each of the 17 Autonomous Regions of Spain.

[2] Universal Transverse Mercator.
[3] European Terrestrial Reference System 1989.

Metals and industrial minerals belong to Section C. In the investigation (exploration) and extraction of section C resources, the law establishes three types of administrative concessions (MinPol&Partners, 2019):

1. Exploration Permit (PE): Provides the right to carry out studies and preliminary reconnaissance works of regional scope, using all types of techniques except those which might alter the surface of the land. Permits are granted for one year which can be extended to one more.
2. Investigation Permit (PI): Provides the right to carry out all types of research required to define the existence of resources of section C so that a mining concession can be obtained later. The permit can last for a maximum of 3 years and can be extended for another 3, and exceptionally for additional periods.
3. Extraction (Exploitation) Concession (CE): Provides the right to exploit resources of section C, except those which have been previously reserved by the State and applying all mining techniques available. The concession (Mining Permit) is granted for 30 years and can be extended up to a maximum of 90 years.

The described concessions do not grant the surface rights; these must be purchased or leased from the landowners.

The requirements to keep the mineral rights are to comply with the annually approved work plans, fulfill the established fees, and apply for the extensions and renewals on time.

4.3 Project Ownership

Atalaya Mining Plc ("Atalaya") owns and operates the Riotinto Copper Project (PRT) through the wholly owned subsidiary Spanish company Atalaya Riotinto Minera SLU.

The PRT is within the mineral tenure of Section C type named "Minas de Rio Tinto" Exploitation Concession (CE), number 843, with a total area of 1,992.39 ha (Figure 4-3), which was granted in April 2014 to Atalaya for 90 years.

The tenure of the mineral rights is held 100% by Atalaya who has exclusive rights of operation and beneficiation of minerals from the soil and subsoil within this mining permit. Atalaya holds surface rights over an area of land of 2,070.51 ha (Figure 4-3).

A portion of the San Antonio deposit lies within the current mining permit but part of it is within a set of permits named "Grupo Riotinto" which belongs to the "Grouped Concessions" (Concesiones Agrupadas). The Grouped Concessions were acquired by Atalaya under a contract of sale, transfer of the permit ownership to Atalaya is pending approval of the mining authorities (Figure 4-2).

4.4 Environmental Liabilities and other risks

The Council for Environment and Territorial Planning[4] of Andalucía issued the Unified Environmental Authorization (AAU) of the Riotinto Copper Project to reopen the mining operation of Riotinto (Huelva, Spain) in April 2014[5] and validated in May 2020. The AAU states that the project is considered environmentally viable, provided that it is executed and developed according to the actions and measures included in it and in the environmental impact assessment.

The AAU includes a list of mandatory environmental conditions with the aim of avoiding, preventing, and minimizing environmental impacts related to water management, dumps and dams, the effect on flora and fauna, air, noise pollution, and precautions related to cultural heritage.

The AAU establishes the obligation to restore the dumps (WRSFs) simultaneously with the mining activity to minimize acid rock drainage and warrant full integration of the dumps into the mining landscape, and the obligation to ensure that dumps, tailings storage facilities, and pit slopes are safe and environmentally sound through appropriate monitoring and control plans.

Failure to comply with the AAU conditions would lead to the withdrawal of the authorization of the mining operation. Atalaya is not aware of any other factors or any risks that may affect the right to perform further work on the property.

[4] Consejería de Medio Ambiente y Ordenación del Territorio de la Junta de Andalucía (Spain)
[5] https://www.juntadeandalucia.es/boja/2014/91/70

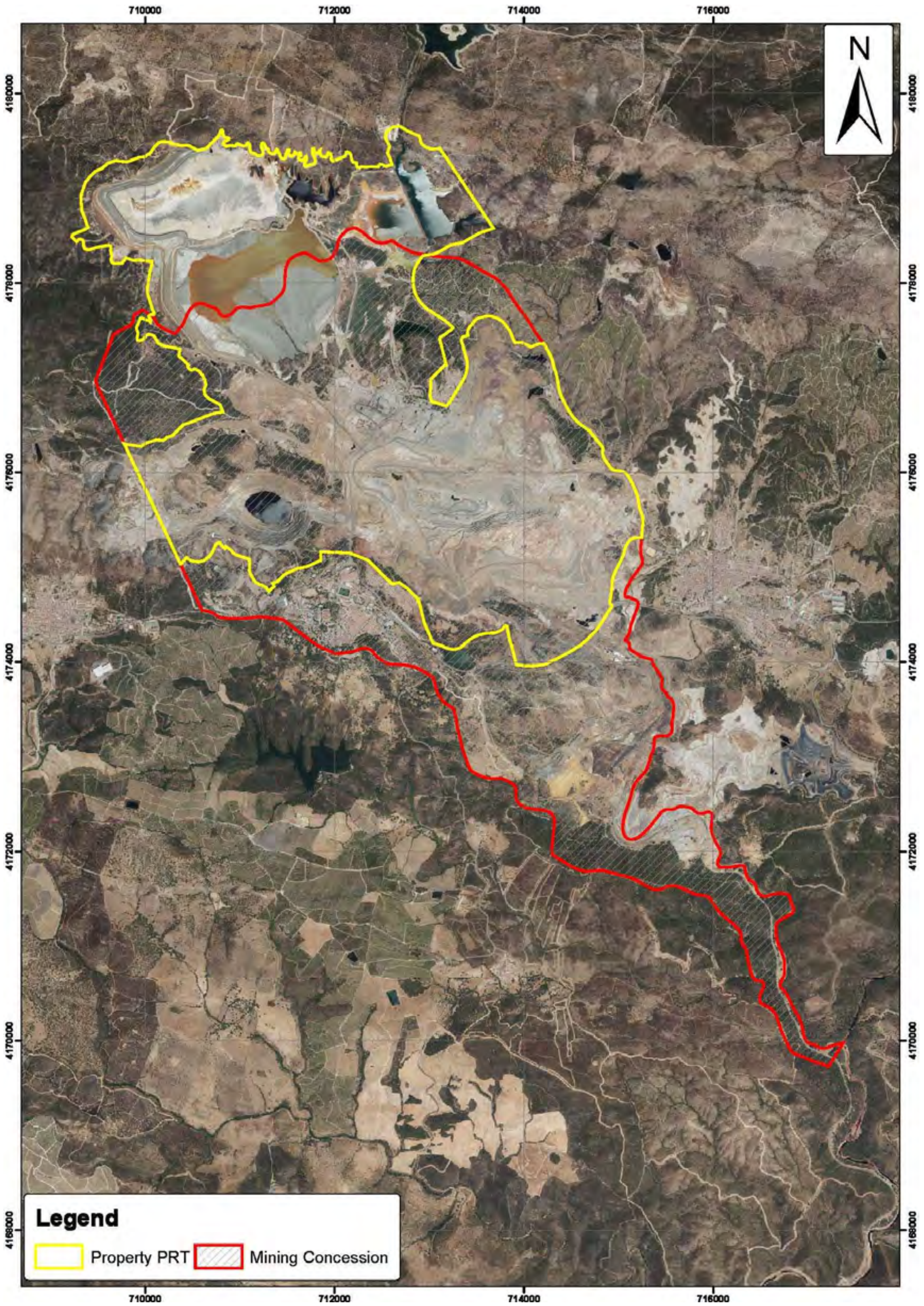


Figure 4-3: Mineral rights and land ownership location map (Atalaya, 2022)

5. ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE, AND PHYSIOGRAPHY

5.1 Accessibility

The project is situated in the Huelva Province of the Autonomous Community of Andalucía in Southern Spain, about 500 km south of Madrid, 65 km north-west of Sevilla, and 70 km north-east of the port of Huelva.

Seville, with a population of 700,000, is the administrative center of the Andalucía region. The Autonomous Community of Andalucía, which is one of the historic Autonomous Communities of Spain, is governed by the Junta de Andalucía with a local parliament and president.

The project is easily accessible through several paved roads and highways to Seville, Huelva, and Aracena. The project is near the towns of Minas de Riotinto and Nerva, as well as several nearby villages, which represent potential sources of labor, accommodation, and general services.

There are many international flights that connect the provincial cities of Seville and Malaga with Madrid and other major cities in Europe and North America. There is a high-speed train service linking the regional towns of Cordoba and Seville with Madrid.

5.2 Climate

The project area climate is Continental Mediterranean, with hot and dry summers and mild winters, with a dry season between May and September. The project site is characterized by an average annual temperature of 17.7°C; the daytime temperature varies from 3°C in January to 40°C in July and August. Maximum rainfall is recorded in autumn and winter, while the summer is very dry. The average annual precipitation is 765.7 mm. Operations are possible all year round.

5.3 Physiography

The Riotinto Project area consists of low, sparsely wooded, E-W trending ridges, separated by wide valleys that support a semi-rural population. The topographic relief is about 500 m from the valley to the highest ridge top.

Vegetation is purely residual. Due to historical mining works, the native soils are practically non-existent. In those areas not affected by the mining activity, the soils are classified as leptosols, which are very shallow soils having hard rock within 30 cm from the soil surface.

The landscape of the project area is strongly influenced by signs of the mining activity that date back 3000 years and is one of the most important mining enclaves in the mining history of Spain. Because of the rich industrial landscape and heritage, it is included in the inventory of cultural georesources[6] derived from the Geodiversity Conservation Strategy of the regional government of Andalucía (Junta de Andalucía). The Riotinto-Nerva mining basin has been declared a Set of Cultural Interest as a Historic Site by the Junta de Andalucía.

[6] Nº 378- "Minas de Riotinto"

5.4 Local Resources and Infrastructure

There is a long history of exploration and mining within this region, known as the IPB (Iberian Pyrite Belt). The modern Riotinto mining complex dates to 1873, when a group of British companies purchased the Riotinto mines from the Spanish Government and established the Riotinto Company Ltd (RTCL). At its peak, there were some 14,000 workers, 150 km of railway track, and a dedicated loading facility at the port of Huelva (70 km southwest of Riotinto), where copper and pyrite ore were loaded for export. The long-established mining town of Minas de Riotinto, with a population of 4000, provides most of the facilities required for mineral exploration and mining activity, and all other facilities are available nearby.

Other mining and exploration companies in the region include Matsa, Tharsis Mining, Cobre las Cruces, and Minera Los Frailes.

The historical copper smelter and refinery which were built in 1970 next to the port of Huelva are currently owned by Atlantic Copper, a subsidiary of Freeport McMoRan, Inc. in Spain. Currently, the smelter processes more than a million tons of ore at the Huelva plant, producing close to 300,000 metric tons of refined copper annually, and other industrial products such as sulfuric acid, precious metals, and iron silicate. Atlantic Copper, directly and indirectly, employs over 1,000 people.

Historically, the main economic engine of the area has been mining and the industrial activities associated with it. Due to the crisis that Rio Tinto Minera S.A. (RTM) faced during the 1980s and 1990s from low copper prices, the municipality has progressively oriented its economy toward other sectors. These include fruit agriculture and tourism through the Río Tinto Foundation, whose main objective is the preservation of the mining legacy and to publicizing the historical and economic importance of the mining activity. Both sectors have proven to be insufficient for sustaining the economy of the area, which has caused both a high unemployment rate and progressive emigration.

5.5 Climate Change

The preliminary estimated carbon footprint for Proyecto Riotinto for 2021 was 115,223 tCO_{2eq}, 7.85% less than in the previous year 2020. This data is under review in accordance with the current regulations.

The 2.94% of the direct total emissions come from activities associated with diesel consumption in the different processes conducted at the industrial plant and in some transport equipment. Electricity consumption is the main source of emissions and accounted for 61.61% of the total. The remaining 35.45% of the total emissions are associated with other indirect emissions generated from sources that are neither owned nor controlled by the company, such as the consumption of energy in contractors' transport activities.

Although the estimated data is under review in accordance with the applicable legislation, preliminary data indicate that CO_2 ratio per ton of metal produced[7] has been reduced from 0.55 in 2019 to 0.45 in 2021. Atalaya has achieved a significant reduction in greenhouse gas emissions from its operation of the Riotinto project in recent years. To continue on this decarbonization path, the Company has developed plans to reduce its carbon footprint by 15% in the period 2021-2025.

[7] tCo_{2eq}/tonne of concentrate

This reduction is attributed to the installation of an expert system in the SAG mill, which reduces energy consumption and CO_2 emissions, and the ongoing construction of the 50MW photovoltaic plant that will provide green energy to the plant. These activities reinforce Atalaya’s commitment to reduce emissions and measure the project energy efficiency to contribute to the fight against climate change as part of the company's commitment to Sustainability.

6. HISTORY

This section was compiled with the assistance of Atalaya Mining technical staff and reviewed by Alan Noble and Monica Barrero Bouza, Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

Historic workings at Riotinto date back to at least 1000 BC when the Tartessians and Phoenicians mined the gossan for gold and silver up to the 6th century BC. Following the defeat of Carthago Nova in 209 BC by Escipion, the Romans occupied the south sector of the Iberian Peninsula, with a strong mining and exploration activity. There is evidence of Roman mining at Riotinto for over 600 years, where they mined the base of the gossan for gold and silver but also for copper in the secondary enrichment zone. This period was marked by the introduction of wheels and buckets for mine dewatering. Following the abandonment of the property by the Romans in 425 (Ortiz Mateo, 2003), there was a long period of inactivity until its rediscovery in 1556 by a royal search party commissioned to investigate Roman workings that were reported in Sevilla province. Despite a positive report by the investigation team, the property went through a period of turbulent property disputes, lack of capitalization, and lack of technical knowledge. There was no significant mining until it was sold to Matheson & Co in 1873, which led to the formation of the Rio Tinto Company Limited (RTCL). Prior to the acquisition by RTCL, extraction at Riotinto was focused at Filón Sur and Filón Norte, and at a later stage around 1839, at Planes.

The Rio Tinto Company led by Scottish banker Hugh Matheson provided significant capital into the project, constructing modern (for that time) mine and plant facilities, a railway from the mine to the port, and a pier for deep-water ships. The company then commenced open-cast mining on the Filón Sur deposit. Despite this work being largely manual, with digging and loading by shovels and baskets, it provided significant cost and productivity advantages over the underground pillar and stall mining practices. Over time, mining practices were improved in both underground and open-pit operations, leading to cut-and-fill mining at Filón Sur, Planes, and San Dionisio, and shovel and train open-pit mining at Filón Sur and Atalaya. RTCL mining activity lasted until 1954, with 108 Mt of ore extracted.

In 1954, RTCL transferred two-thirds of the property to a Spanish private equity company and the company became Compañía Española de Minas de Río Tinto S.A. (CEMRT). At that time, Filón Sur, Filón Norte, and Planes were exhausted; only San Dionisio was active, with the Atalaya open cast and the Pozo Alfredo underground mine in production.

In 1966, CEMRT started a new joint venture with two companies: The Patiño Mining Corporation and Rio Tinto Zinc (RTZ), the latter as a result of the merger between RTCL and Zinc Corporation. The name of the new company was Rio Tinto Patiño (RTP), with 55% owned by CEMRT, 40% by Patiño Mining Corporation, and 5% by RTZ. The new company's mission was to investigate and mine the Cerro Colorado copper deposit. Thus, since 1966 the mining activity at Riotinto was managed by two companies: the copper mining by RTP and the pyrite by CEMRT (Arenas Posadas, 2017).

CEMRT had economic difficulties due to problems of marketing pyrites in foreign markets and tried to improve the performance of the pyrites, reducing the costs and finding new clients. In 1970, CEMRT merged with Unión Española de Explosivos S. A. (UEE), and became Explosivos Rio Tinto (ERT). While this happened RTP reduced its activity to copper exploration and plant construction.

In 1970, Corta Atalaya was expanded to extract pyrite, and deep exploration at Pozo Alfredo resulted in the beginning of the ”Cloritas” copper ore extraction (a total of 14 Mt). The introduction of underground loaders and conveyor belt systems led to an important reduction of the workforce in this period. RTP also started copper ore extraction at the Cerro Colorado open pit in 1967, and the copper concentrate plant entered into production with a design capacity of 3 Mtpa, then expanded in a later stage to 10 Mtpa. Shortly after 1970, intensive gossan mining began at Cerro Colorado to extract gold and silver. The ore was treated in a new gold leaching plant using cyanidation, filtering, and precipitation at a designed throughput of 1.5 Mtpa of oxidized (gossan) ores and was later expanded in increments to reach an operating capacity of 6.0 Mtpa. The gold leach plant still exists but is not operational.

In 1976, after the fall of commodity prices, RTP sold its interest in the Riotinto property to ERT. In 1978, the reunified company took the name of Rio Tinto Minera S.A. (RTM), where ERT held 75% of the property and RTZ 25%. Soon after, the RTZ interest increased to 49% as a result of a capital increase to upgrade mining equipment, for new exploration plans, and plant expansions.

Between 1980 and 1987 the pyrite, gold, and silver production continued, but it represented a small proportion of the RTM business; the main mining activity was the copper ore of Cerro Colorado. RTM subsequently accumulated significant losses, mainly due to increased debt, declining commodity prices, and a slowdown of worldwide demand coupled with increasing mining costs due to lower-than-expected copper grades at Cerro Colorado. RTM had economic difficulties and tried different solutions to reduce costs and improve performance with the aim of reducing the financial burden. In 1987, RTM submitted statutory lay-off proceedings and declared suspended payments; and copper production ceased (Arenas Posadas, 2017).

Meanwhile, ERT was acquired by Ercros in 1987, selling 65% of its interests in RTM to Freeport-McMoRan Copper & Gold, Inc. in 1993 (trading as Atlantic Copper in Spain). Freeport’s only interest in the Riotinto project was to acquire the Huelva smelter.

Pozo Alfredo ended in 1991 and the Atalaya pit in 1992; only gossan extraction at Cerro Colorado continued until 1996.

After the acquisition of RTM, Freeport tried to reduce the Riotinto workforce with a reallocation and redundancy plan but met with opposition from the trade unions and did not succeed. The Unions submitted a plan to re-start the mining activity at Riotinto (Plan Esquila) through a purchase or transfer of the property to the mineworkers. In 1995, Freeport sold the company to the workers, who founded Minas de Río Tinto S.A.L. (MRT) as a workers’ cooperative comprising former senior management and unions, with Freeport committing to buy the copper concentrate produced by the new company.

Between 1995 and 2001, MRT mined 25 Mt of ore at an average grade of 0.57% Cu. During this period an annual production of 7.3 Mt was achieved in 1997; a peak annual throughput of 9 Mtpa was achieved in 1998. After many difficulties and challenges faced by MRT and the continued decline of copper price after 1995, MRT suspended payments at the end of 1998; and Cerro Colorado operation ceased in 2001.

After a period of negotiations with the Local and Spanish Governments, and multiple protests and strikes, the mine was permanently closed in 2003. As a result of the closure, more than 400 workers were made redundant. Of these, over 300 were retired and 100 were placed by the Government onto temporary social welfare pending re-employment.

In 2004, the mineral rights and properties were acquired at a public tender by Mantenimiento General del Sur, Mantesur Andevalo S.L. (MSA), the management of which included former managers of MRT. MSA commenced restoration of the primary crushing and ore-feed systems in anticipation of a restart, but the group failed to secure the necessary approvals and the mine remained under care and maintenance. With no electric power available, the work focused on monitoring the tailings dams, filing statutory reports, and maintaining pumping to avoid effluent discharges and to protect the recent capital works from deterioration.

In November 2006, two Australian companies, Oxiana Limited and Minotaur Exploration, entered a memorandum of understanding with MSA to invest in MRT. Both companies withdrew from the project in December 2006 and the project was then introduced to EMED Mining Public Ltd in which Oxiana is a founding shareholder. In May 2007, EMED Mining Public Ltd was granted an option to acquire the Rio Tinto Copper Mine known as Proyecto Riotinto ("PRT").

In October 2008, EMED Mining Public Ltd announced that it had completed the acquisition of 100% of the Rio Tinto Copper Project through its wholly owned Spanish subsidiary EMED Tartesus S.L.U. EMED Mining Public Ltd received the approved Unified Environmental Authorisation ("AAU") for the Riotinto Copper Project and the transfer of the Riotinto mining rights in 2014. The Mining Permit and restoration plan approval was received in January 2015 and immediately commenced with construction and refurbishment operations. In October 2015, the shareholders approved the name change to Atalaya Mining Plc.

6.1 Mining Operations

6.1.1 Cerro Colorado Mine

The latest mining operations were focused on the Cerro Colorado open pit located near the treatment plant. The Cerro Colorado deposit contained one of the largest known concentrations of sulfides in the world. It has been estimated that there were originally about 500 Mt of massive sulfides (pyrite), of which about 20% were leached to form gossans. Cerro Colorado has the potential to increase in size by investigation of the adjacent ancient workings at Filón Sur, Filón Norte (Lago), Cerro Salomon, Planes/ San-Antonio, and Quebrantahuesos.

In the Cerro Colorado pit, altered, grey, felsic volcanics host a major pyrite-chalcopyrite stockwork, part of which extends below the felsic volcanics into mafic volcanics. Alteration closest to the stockworks is chloritic passing to sericitic and silicic further away.

Cerro Colorado was opened in 1967 to extract copper, gold, and silver from the gossans and stockwork for treatment through the concentrator's two separate copper and gold/silver recovery circuits. The mine was developed as an open pit, with a planned production potential of 39 Mt at 0.8% Cu and 18 Mt of gossan (oxide) ore averaging 2.4 g/t Au and 42 g/t Ag that formed the top of Cerro Colorado. The pit was 1,560 m long, 850 m wide, and 230 m deep, and covered an area of about 200 ha. The benches were 10 m high and the ramps 20 m wide. Production was 13 Mtpa, of which 3 Mt was copper ore, 1.5 Mt was gold-silver ore, and 8.5 Mt was waste-rock and marginal ore with < 0.28% Cu. The Cerro Colorado ore was treated in a copper concentration plant with a capacity of 10,000 t/day (3 Mtpa) and a gold-silver concentration plant with a capacity of 4,500 t/day (1.5 Mtpa). Ore from the gossan was crushed in the same plant as the copper ore, in similar units, but separately.

When MRT took over the mine in 1995, they elected to restart copper extraction from Cerro Colorado, starting at 4.5 Mtpa, and the gossans were processed at a rate of 2 Mtpa. Mining of the gossan ore ceased in 1998. Between 1995 and 2001, 23.9 Mt at 0.54% Cu was processed. Some 19 Mt was mined from Cerro Colorado West, with the remainder coming from Salomon (now known as Cerro Colorado East). Figure 6-1 is a photograph of the western part of the Cerro Colorado mine, looking south, and Figure 6-2 shows the Cerro Colorado Pit in plain view.

Figure 6-1. Cerro Colorado mine (Atalaya, 2022)

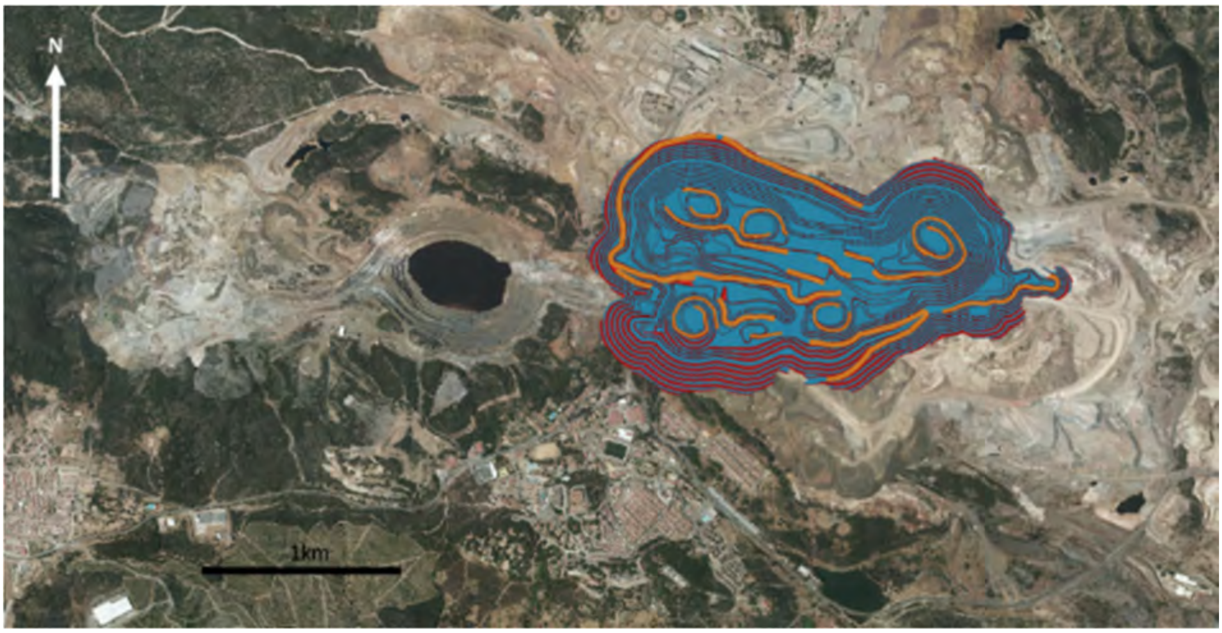


Figure 6-2. Aerial view of the Atalaya pit and Cerro Colorado ultimate pit design (Noble & Barrero, 2021)

6.1.2 Alfredo Mine and Corta Atalaya

Underground mining (Alfredo Mine) in the San Dionisio orebody, the biggest known mass of pyrite in the Iberian Peninsula (Figure 6-3), started in 1881 with 22,090 t of ore produced. In 1909, open-pit mining of San Dionisio commenced (Atalaya opencast), and production continued both by open pit and underground methods.

A room and pillar method mining system was applied to Alfredo mine until the 1930s when mining switched to a horizontal cut and fill method ("bottom slicing and filling with roof settlement") to increase ore recovery and maintain output (Figure 6-4). At San Dionisio, this mining system progressed up to the 26th level until the 1970s when modern machinery was brought in to mine the 31st and 33rd levels using the room and pillar method, which ended in 1979. The total pyrites extracted from San Dionisio up to 1954 was 26.8 Mt at Alfredo underground and 11.3 Mt at the Atalaya opencast.

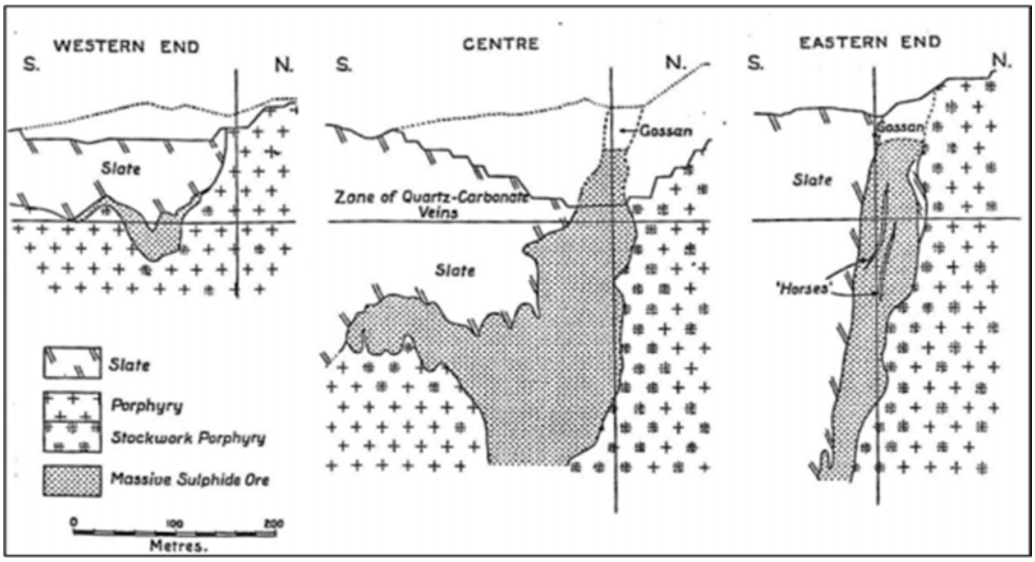


Figure 6-3: Cross-sections through San Dionisio deposit (Williams, 1934)

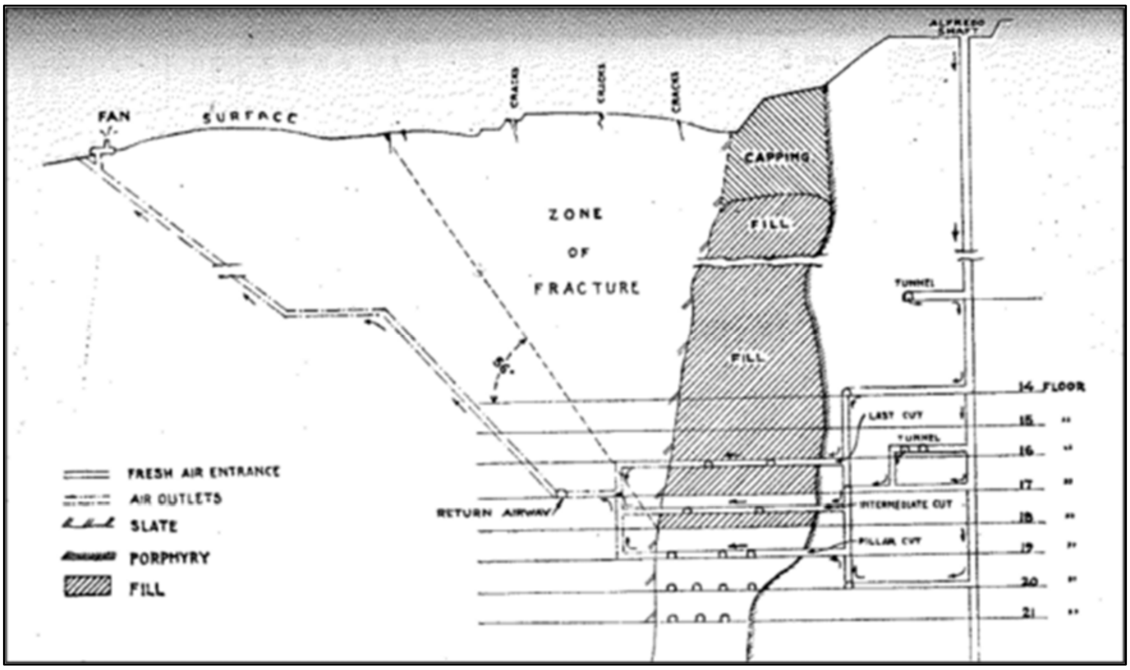


Figure 6-4: Sketch cross-section of the mining system at Alfredo Mine (Julian, 1939-1940)

In 1964 stockwork ("cloritas") orebody extraction started at Alfredo underground mine by sublevel benching between the 17th and the 23rd levels, ending in 1972 with the extraction of one stope. Between 1972 and 1979, "cloritas" mining was carried out using a cut-and-fill system between levels 32 and 30 (Botin & Singh, 1981)

The last extraction period of "cloritas" started in 1981 and ended at the beginning of 1987, with blast hole stoping with hydraulic backfill between the 33rd and the 45th levels to reduce dilution (Figure 6-5). Open stopes were 20 m width, 50 m average length, and 70 m height. The total production of the open stopes was 3.2 Mt at an average grade of 1.85% Cu.

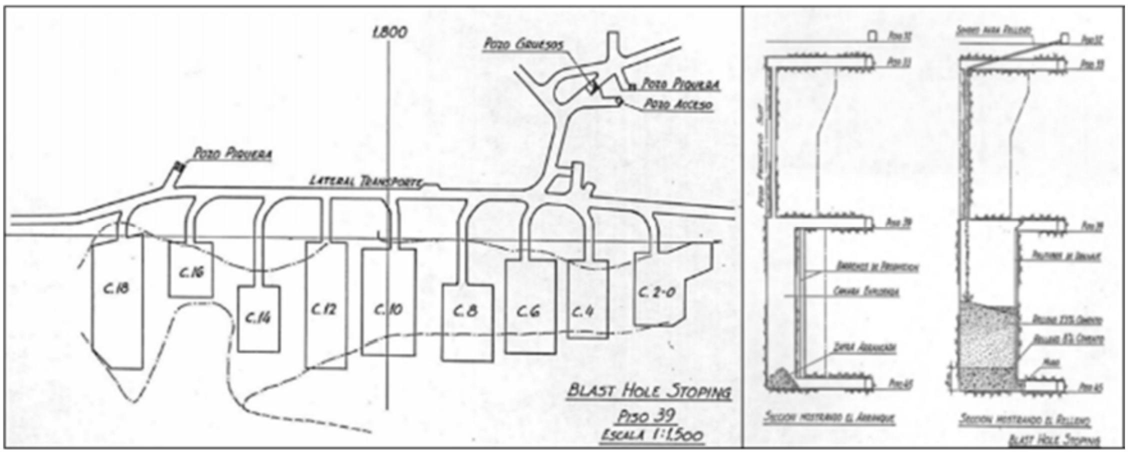


Figure 6-5: Sketch of the blast hole stoping mining system (Internal Report, 1989)

The extraction of San Dionisio polymetallic ore was evaluated in 1986 by JSRedpath Mining Consultants Limited. The evaluation comprised a mining study and metallurgical test work to recover copper and zinc concentrates and a sealable pyrite product from a blend of Cerro Colorado and Alfredo ores. A geotechnical study was carried out by P. Croney and P. Gash, and included excavation of an experimental opening in the massive sulfide orebody on the 39th floor (stope 10), which was completed successfully (Croney & Gash, 1986). In 1987 the Company decided to file the project due to low metal prices at that time.

According to the compiled historical data presented previously, mining was mostly focused on the massive sulfide ore, but there is still unmined massive sulfide mineralization at depth. In addition, there is significant unmined mineralization hosted in the chlorite-altered copper stockwork zone located on the northern flank of the deposit outside the stoping area (Figure 6-6).

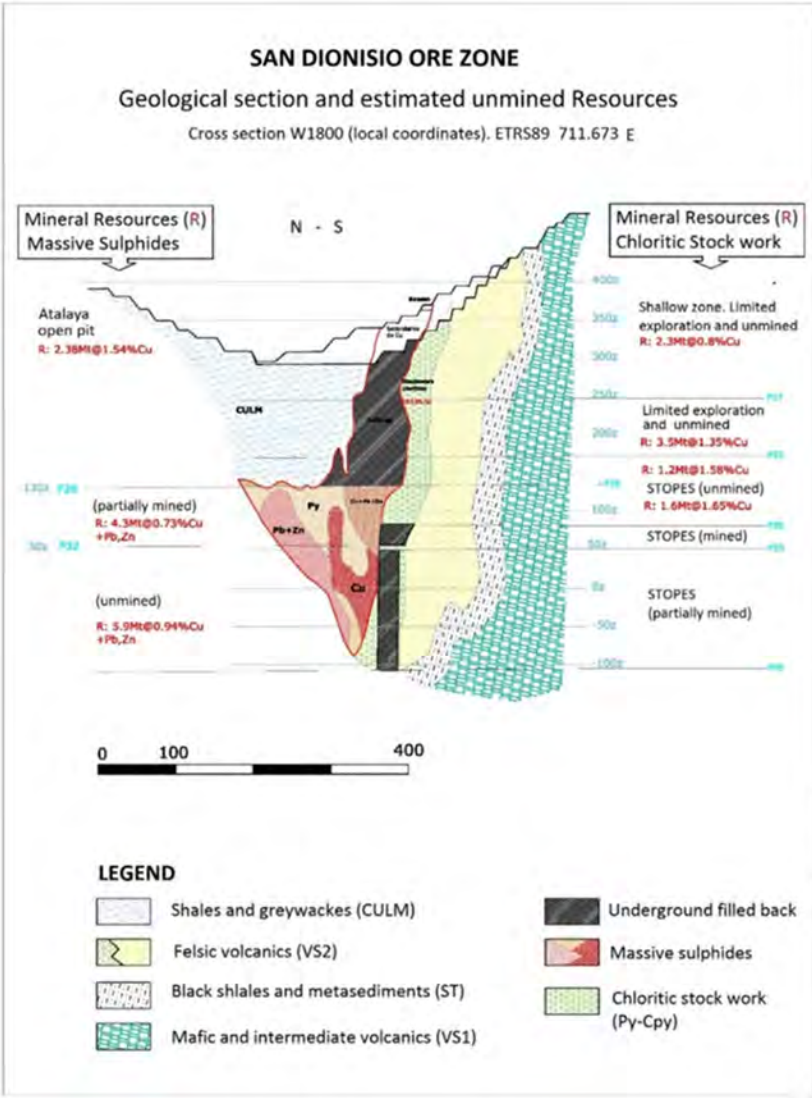


Figure 6-6: N-S vertical section through the San Dionisio deposit showing the unmined portion of the orebody (Atalaya, 2018)

6.1.3 Planes – San Antonio Mine

Underground mining at the Planes orebody, located to the west of Nerva village, commenced in 1922 with a production rate of up to 50,000 tonnes per year. The Planes mine ended in 1954 with a total production of 2.1 Mt of high-sulfur and low-copper ore and the whole orebody extracted (Gil Varon, 1984). Between 1956 and 1963 the mine was allowed to flood to recover copper by dissolution in the acid water, also called cementation or precipitation process (Unthank Salkield, 1987).

The sub-horizontal shape of the Planes deposit favored the formation of a thick alteration zone (gossan) on the hanging wall of the mineralization. The action of the meteoric water generated an enrichment zone with secondary sulfides, usually chalcocite and covellite with traces of gold, which has also been mined in the past by open-pit methods.

In 1962, the San Antonio orebody was discovered during a gravimetric and electromagnetic investigation over the Rio Tinto concession. This orebody represents the eastward extension of the Planes bedded pyrite (Figure 6-7) and is a polymetallic (Pb-Zn-Cu) high-sulfur and high-copper pyritic stratiform sheet. After its discovery in 1962, the orebody was defined by surface and underground holes, and the underground workings between the 1st and 14th levels were completed, including two vertical shafts (Figure 6-8). The deposit dips approximately 25° to the east, occurring at depths between 120 m to 200 m.

Between 1973–1977 the San Antonio deposit was evaluated externally and internally. In 1974 a mining study including a conceptual mine design, scheduling, and metallurgical test work of the massive pyrite and complex ore was carried out by RTZ Consultants. The total estimated mineable resources in the study were 9.5 Mt of ore at an average grade of 1.6 % Cu, 1.05% Pb, and 1.74% Zn (RTZ Consultants Limited, 1974). Production at San Antonio had never been taken up and is currently flooded.

The western part of the San Antonio deposit is within the Riotinto Concession owned by Atalaya, and the eastern part is in the Tejonera Concession which belongs to the “Grupo Riotinto” set of concessions. “Grupo Riotinto” is part of the “Concesiones Agrupadas” or “Grouped Concessions”. The Grouped Concessions were acquired by Atalaya under a contract of sale, transfer of the permit ownership to Atalaya is pending approval of the mining authorities. The boundary between the mining concessions is the Riotinto River (Figure 6-8 and Figure 6-9).

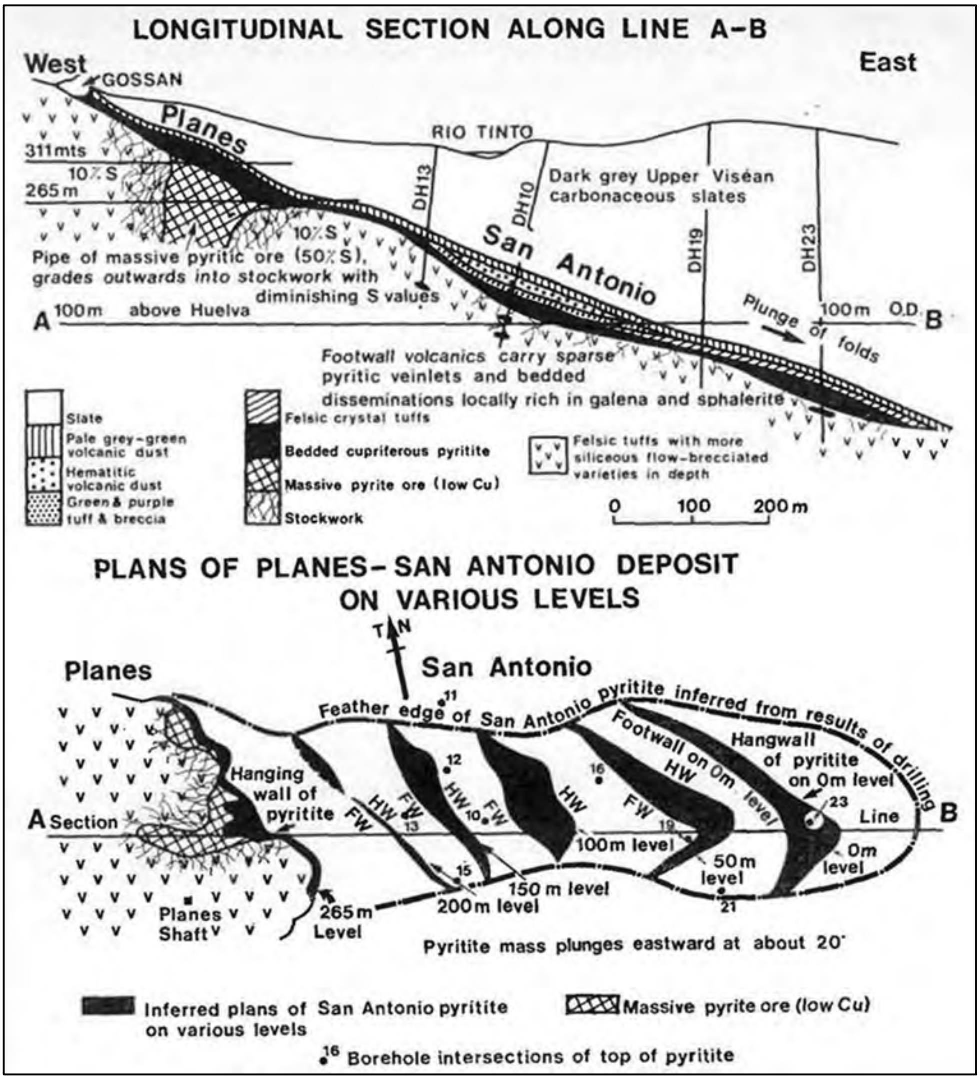


Figure 6-7: Plan and longitudinal cross-section of the Planes-San Antonio deposit (Williams, Stanton, & Rambaud, 1975)

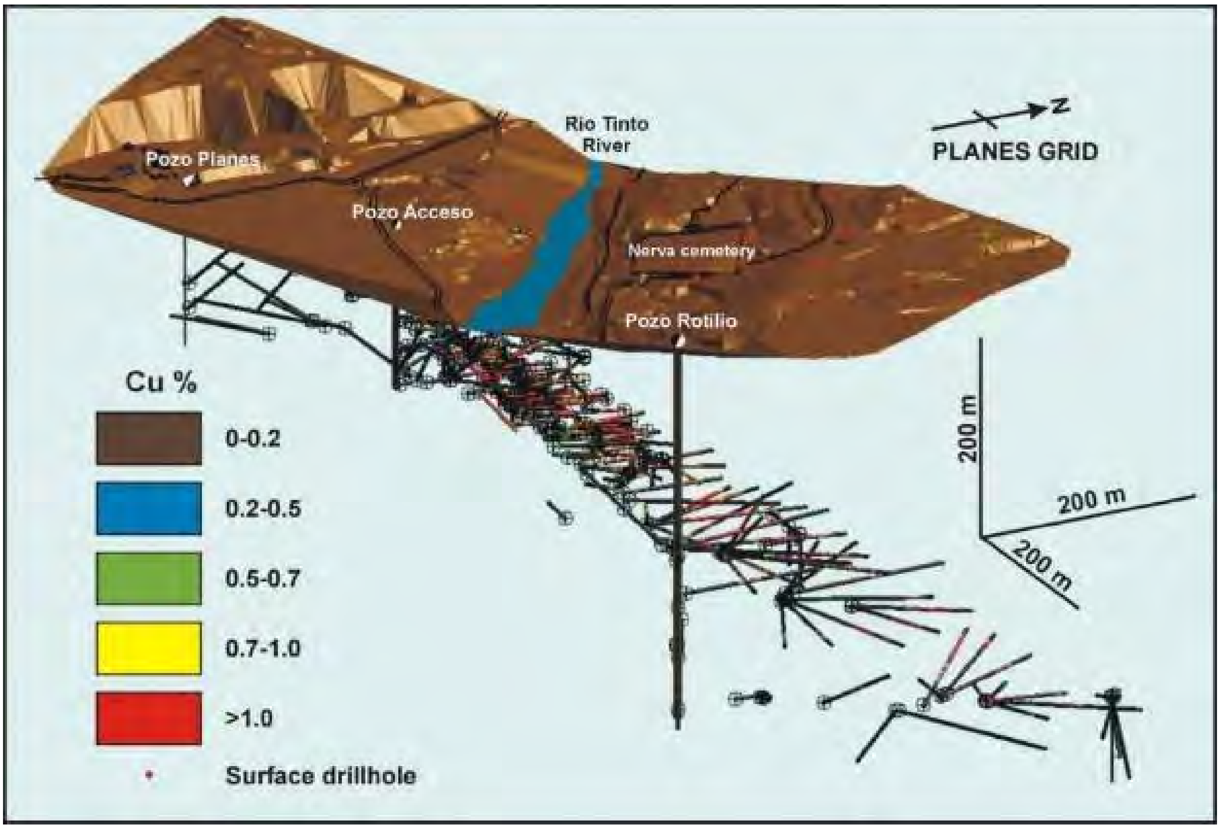


Figure 6-8: 3D view of the location of the San Antonio historical drilling and historical underground drilling (Atalaya, 2016).

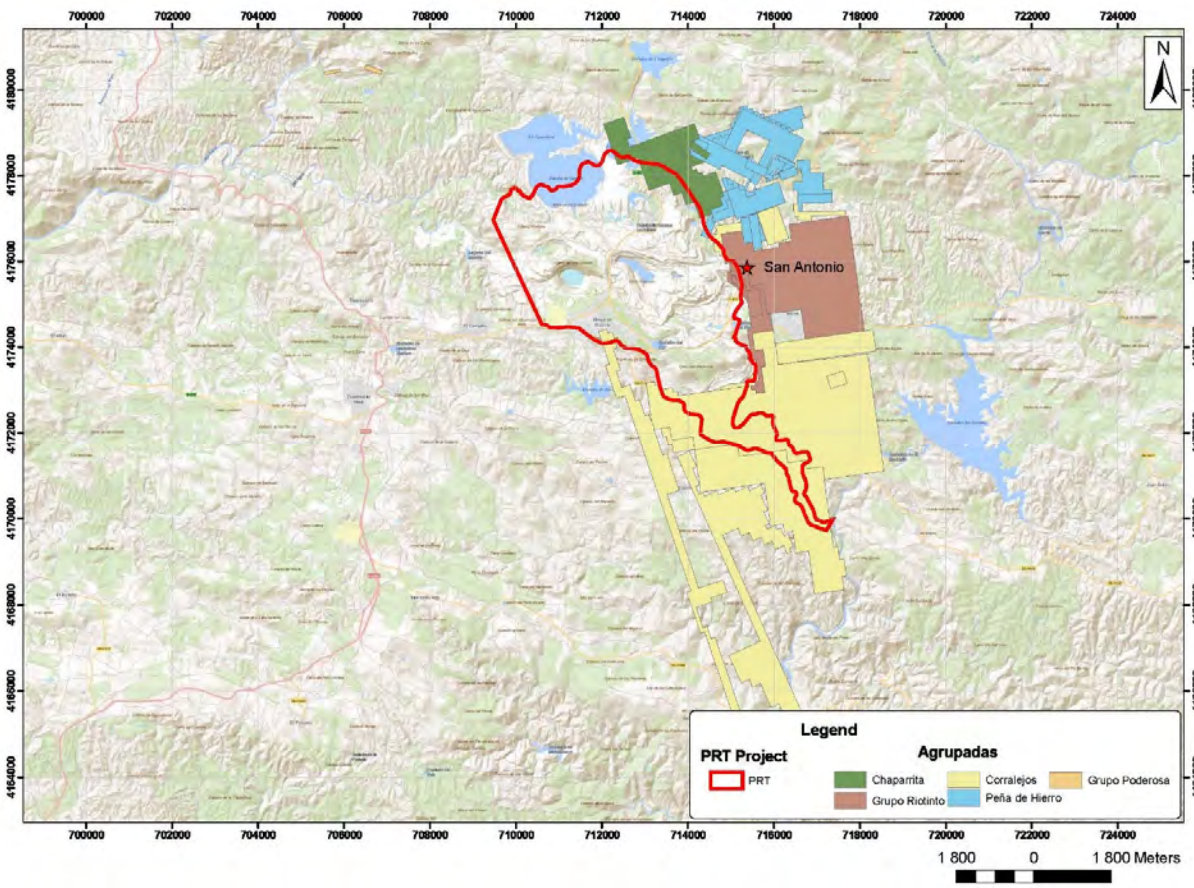


Figure 6-9: Plan map with the location of the San Antonio deposit within the Grupo Riotinto Exploitation Concession (Atalaya, 2022).

7. GEOLOGICAL SETTING AND MINERALIZATION

This section was compiled by Atalaya Mining technical staff and reviewed by Alan Noble and Monica Barrero Bouza, Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

7.1 Regional Geology

The Rio Tinto massive sulfide deposit occurs on the Spanish side of the Iberian Pyrite Belt (IPB), which is part of the South Portuguese Zone (SPZ) of the Iberian Massif. The Iberian Massif resulted from the collision of three continental blocks that originated from the fragmentation of a Late Proterozoic mega-continent (Murphy & Nance, 1991) into a series of plates: the SPZ, the Ossa Morena Zone (OMZ), and the ensemble of the Central Iberian Zone (CIZ), West Asturian–Leonese (WALZ) and Cantabrian (CZ) zones (Figure 7-1).

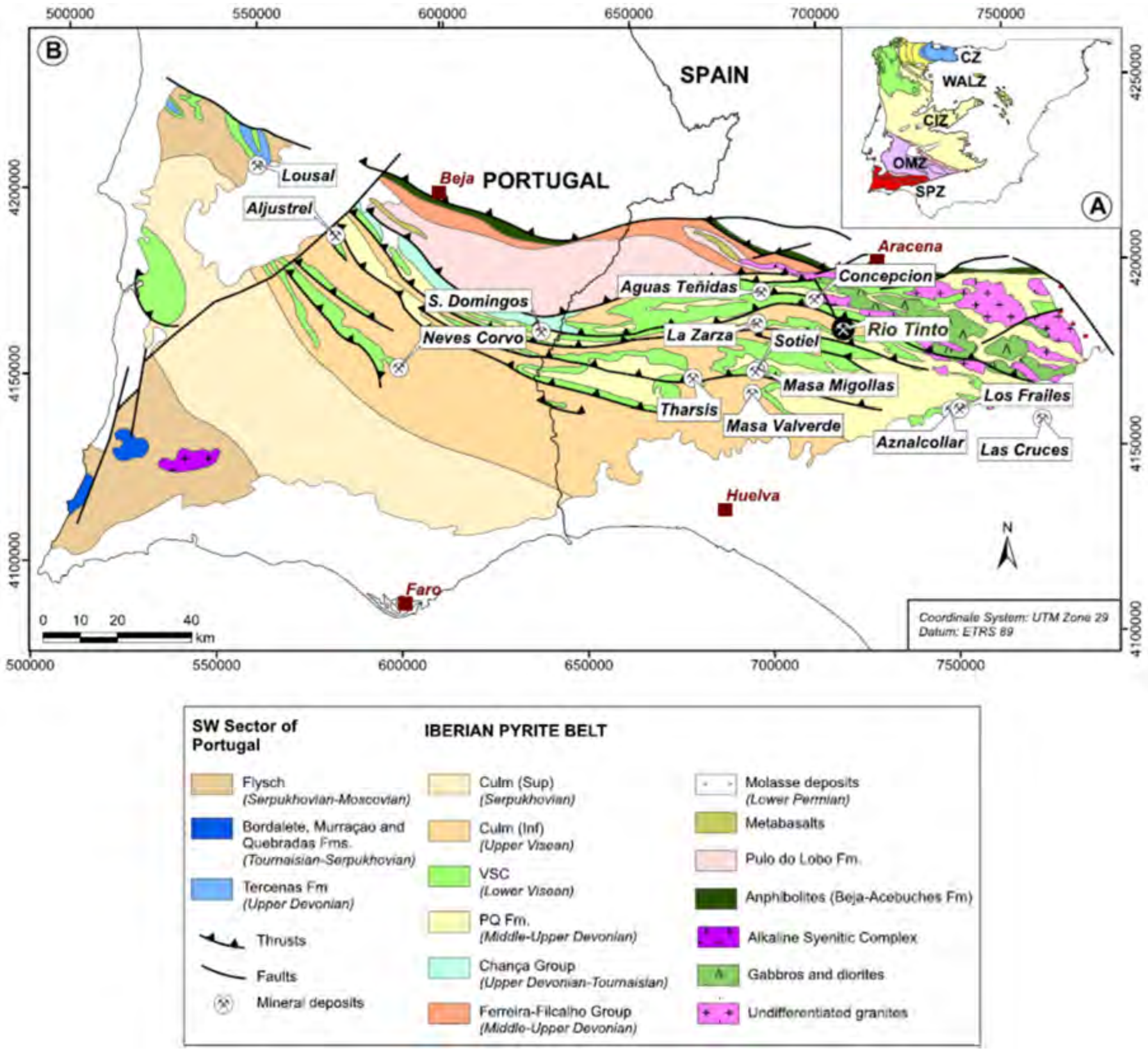


Figure 7-1: Zones of the Iberian Massif (Martin-Izard, A. et al, 2015)

The IPB was formed as a series of marine basins that developed during the left-lateral transcurrent faulting that was generated by the subduction and collision of Laurentia with Gondwana during the Variscan orogeny (Late Devonian−early Carboniferous (Silva, Oliveira, & Ribeiro, 1990). These basins were formed within the passive margin of Laurentia, now represented by the SPZ and adjacent to the collision suture (Martin-Izard, A. et al, 2015).

The oldest rocks in the IPB are a sequence of quartzite and shales (the Phyllite–Quartzite Group, also called PQ) of Devonian age, which are overlain by a thick sequence of volcano-sedimentary rocks (the Volcanic Sedimentary Complex, VSC) that host most of the mineralization of the IPB. The VSC is a highly variable unit, up to 1300 m thick of uppermost Devonian to Lower Carboniferous (ca. 356–349 Ma).

The VSC is formed by dacitic–rhyolitic dome complexes, basaltic lava flows, mafic sills, thick pumice, and crystal-rich felsic volcanoclastic units interbedded with detrital sedimentary rocks, mostly mudstone with some greywacke and sandstone. The depositional environment appears to be dominated by submarine mass-flow tuffs as indicated by Schermerhorn, L.J.G, et al. (1971).

The earliest Carboniferous (about 360 to 350Ma) was a transitional period characterized by extension forming different submarine basins and abundant bimodal volcanism that caused the development of Volcanogenic Massive Sulfide (VMS) deposits that were mainly hosted along the fracture zones limiting the basins (Silva, Oliveira, & Ribeiro, 1990). Some of these basin-forming faults were reactivated as thrusts during later Variscan shortening (Gumiel, P. et al., 2010).

The IPB contains over 100 massive sulfide and stockwork VMS deposits. Over 10 giant (world-class) VMS deposits, with more than 50 million metric tons (Mt) of ore, are hosted by volcanic rocks or associated shales and were formed as exhalative ores in brine pools on the sea floor or as filled veins and replacement style mineralization (Tornos, 2006). Riotinto is the largest deposit in the IPB and has been estimated to have held more than 500 Mt of massive pyrite, complex, and stockwork ore types (Williams, 1934).

7.2 Geology of the Riotinto Deposit

7.2.1 Stratigraphy

The Rio Tinto deposit occurs on the Volcano-Sedimentary Complex (VSC) of the IPB, which regionally is formed by a lower mafic volcanic unit composed of basaltic and spilitic pillow lavas and dolerite sills intercalated with bands of slate and chert of Lower Carboniferous and an overlying felsic volcanic unit composed by rhyodacite lavas and pyroclastic rocks (Figure 7-2).

Based on historical drilling at Riotinto and on available drill-core logs compiled, the Exploration Department of Atalaya Mining has identified eight main litho-stratigraphic units from the Volcano-Sedimentary Complex (VSC). In chrono-stratigraphic order from top to bottom, these units are as described in Table 7-1.

The Rio Tinto deposits lie in the upper Paleozoic unit containing volcanics (VS2, andesites, and rhyolites) at the base of the Carboniferous. Within this unit, there are several sulfide deposits that are associated spatially and genetically.

A geological map of the Rio Tinto district is presented in Figure 7-3.

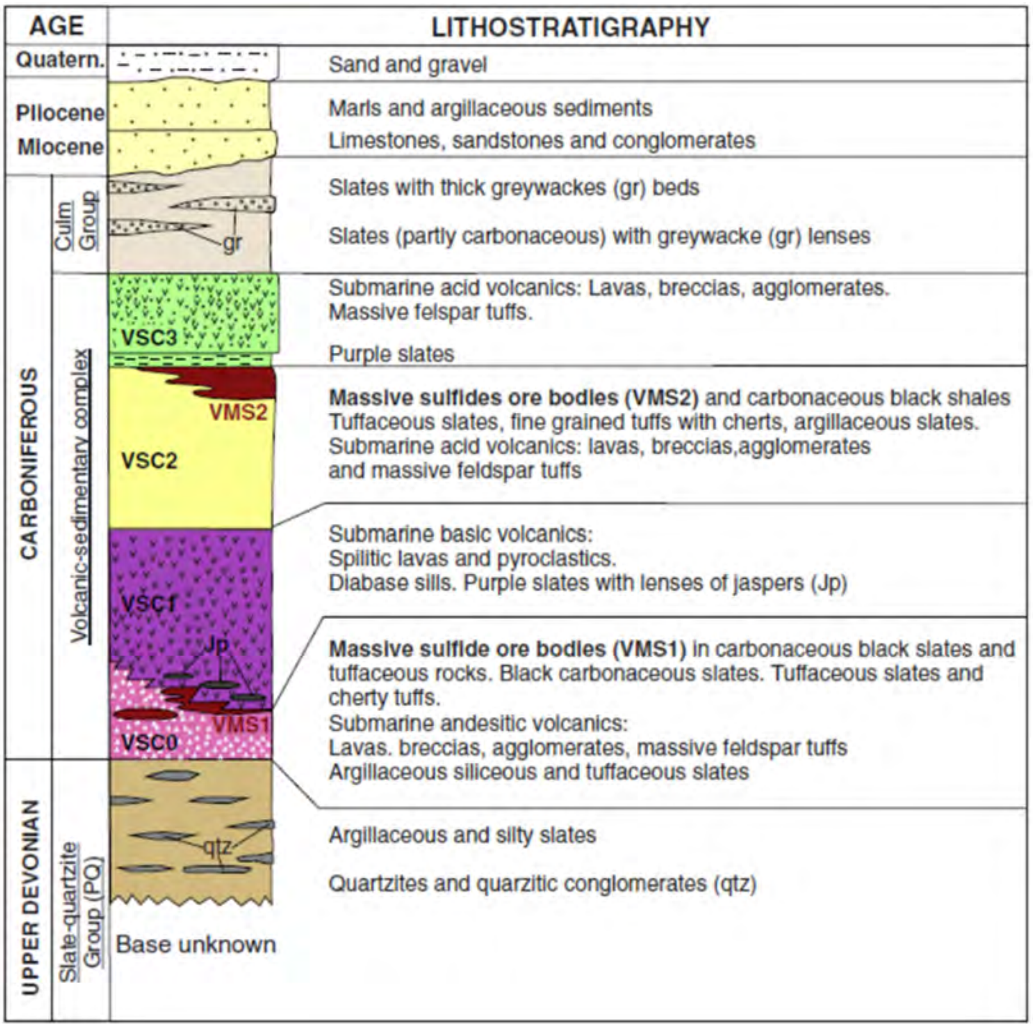


Figure 7-2: The lithostratigraphic sequence of the IPB (Martin-Izard, A. et al., 2016).

Table 7-1: Rio Tinto Deposit Lithostratigraphic Units (Atalaya, 2018).

CULM	A sequence of shales, slates and fine greywackes with turbiditic features (syn-orogenic flysh sequence which covers the volcano-sedimentary complex). The Culm Group ranges in age from Late Visean to Middle-Late Pennsylvanian.. The sequence is very thick. Drilling at Rio Tinto indicated thickness of about 400m in the southern limb, and more that 800m in the northern limb, at Dehesa.
VS3	Felsic and intermediate volcanic cinerites, tuffites and domes that represent the last volcanic event of the IPB.
PJ	Purple shale, cinerites and jaspers. A volcano sedimentary unit formed by purple shales (Fe-Mn rich) with interbedded lenses of jaspers, which represents the lateral extension of the latest volcanism VS3.
VS	Volcano sedimentary unit consisting of green shales and tuffaceous shales. This unit represents the zones most distal from the volcanic centers where deposition of sediments dominates. Laterally they grade to the felsic unit (VS2). Thickness is highly variable, depending on distance from the feeders.
Massive sulfides	The Massive sulfide bodies are located at the top of the volcanic sequence- VS2 . They occur as dismembered lenses underlying stockworks and the felsic volcanic domes and pyroclastic rocks. Although at present most of the massive sulfides have been mined, the largest lenses are located in Cerro Colorado area, Filón Sur Lode, San Dionisio, and Planes-San Antonio areas.
Stockwork	Hosted in volcanic rocks from the VS1 and VS2. It consists of irregular veins, fractures and fissures filled with quartz and sulfides (mainly pyrite and chalcopyrite).
VS2	Felsic Volcanic Unit. Rhyolitic lavas, rhyodacites and felsic volcanic pyroclastic and epiclastic rocks. At Cerro Colorado and the eastern prospects rhyodacitic domes and lavas from the pyroclastic tuffs are dominant, whereas the western zones are mostly pyroclastic. Thickness is very variable, from some 75 m at western Corta Atalaya, up to 400 m in Cerro Colorado close to the northern fault.
TS	Transition Series. Mostly a sedimentary unit formed by black shales, slates with radiolarian, conglomerates and mafic pyroclastic. Approximate thickness is 50m.
VS1	Lower Mafic Volcanic Unit. Mostly formed by basaltic rocks and pillow lavas with some interbedded black slates and tuffaceous shales. Estimated thickness is over 250m.

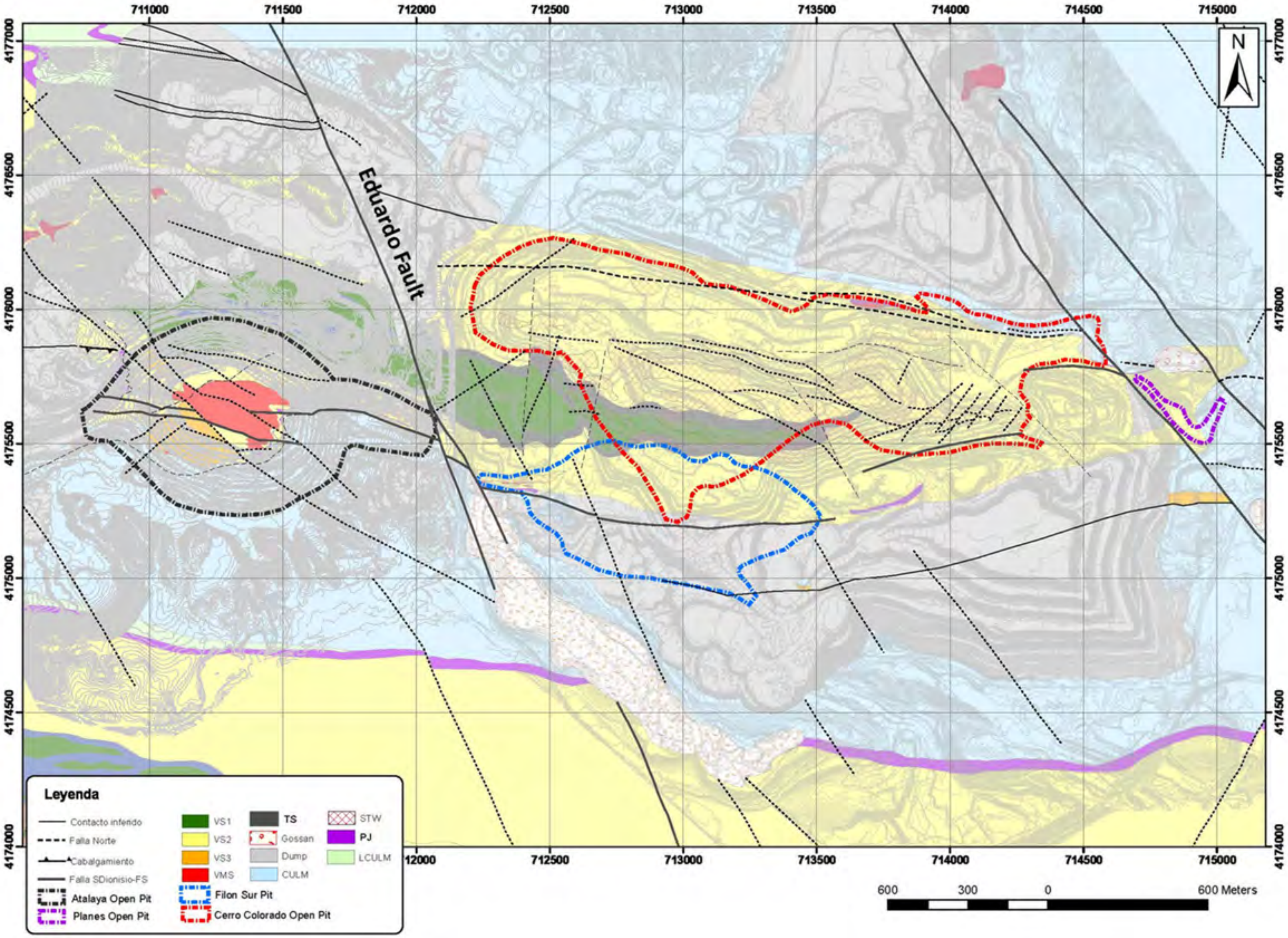


Figure 7-3: Geological map of the Riotinto Project, ETRS 89 (Atalaya, 2022).

7.2.2 Structure

The Rio Tinto deposit was formed in an extensional tectonic setting associated with volcanism that took place in the late Devonian-earlier Carboniferous period in an oceanic seafloor environment. After the extensional period, a compressional event took over during the Variscan-Hercynian orogeny that formed the Iberian Massif.

Rio Tinto is characterized by having a high intensity of Variscan deformation that generated S to SSW vergence folding structures. The Rio Tinto deposit forms an E-W trending anticline, with the northern flank dipping approximately 50 degrees to the north and the southern flank near vertical. Another E-W syncline fold occurs next to the anticline to the south.

The anticline is crosscut by the NW/SE-trending Eduardo Fault zone (Figure 7-3), which dissects the whole body into two sectors: to the east, the Cerro Colorado and Filón Sur areas; and to the west, San Dionisio (Alfredo Mine and Atalaya opencast). The Planes-San Antonio orebodies occur at the eastern end of the anticline, to the East of Cerro Colorado.

Cerro Colorado is bounded on the North by the EW-trending North Fault, which represents a sharp contact between mineralized and non-mineralized volcanics. Cerro Colorado is bounded on the South by a synclinal fold that places Culm in contact with Filón Sur.

7.2.2.1 NW Fault

During a detailed review of blasthole grade distributions on bench plan maps the authors observed a NW-trending structure that is the dividing line between high arsenic grades to the east and lower arsenic grades to the west. This structure has not been previously reported or mapped in geologic reports but is clearly visible on the pit floor and pit walls in addition to blasthole grades (Figure 7-4). This fault has been confirmed by the authors of this report based on blasthole grade patterns and subsequent observation in the pit. The NW Fault has been surveyed by the mine surveying department and subsequently modeled to provide a well-defined 3D surface for resource modeling. While the NW Fault is a strong control for arsenic mineralization, it also may be a weaker control for copper and zinc mineralization.

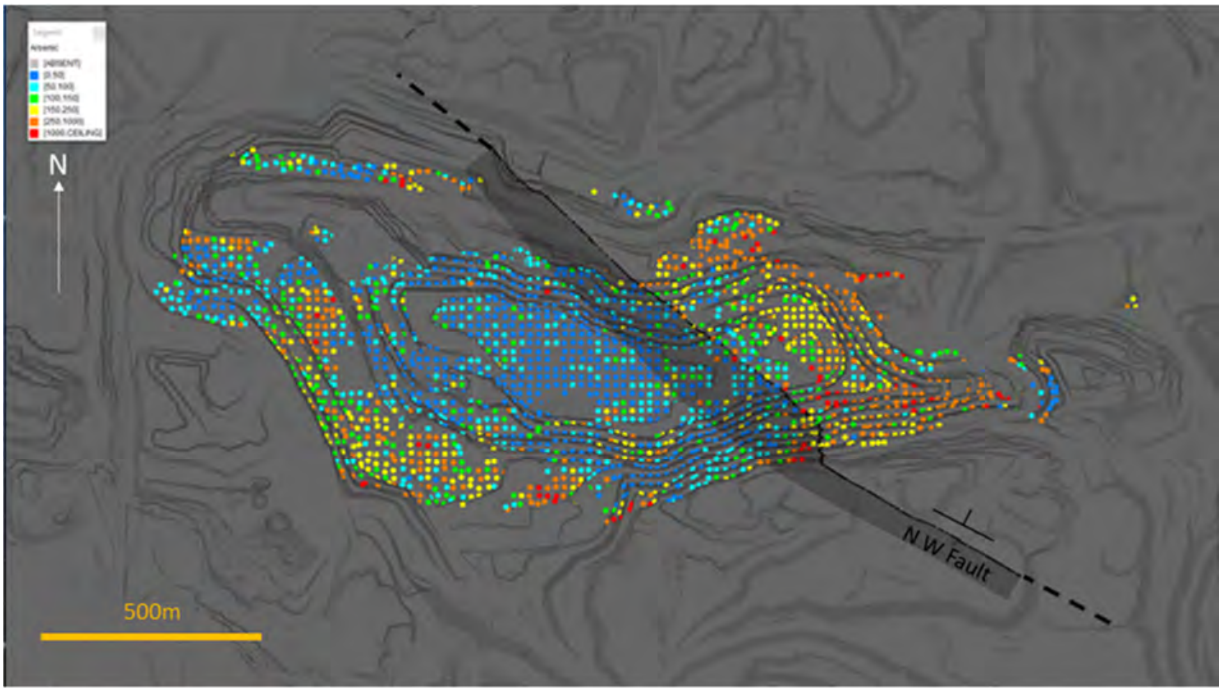


Figure 7-4: Plan view of Cerro Colorado pit: the NW fault and arsenic blasthole grades (Noble & Barrero, 2020)

7.2.3 Metamorphism

The metamorphic grade in Rio Tinto is mostly very-low-grade, prehnite-pumpellyite facies. However, in the northern part of the IPB and near thrusts, deformation is more intense and the rocks are recrystallized within the greenschist facies.

7.2.4 Mineralization

In the Rio Tinto area, mineralization occurs in five separate zones along the anticline: San Dionisio, Cerro Colorado - Filón Sur - Filón Norte, and Planes-San Antonio. Mineralization is typical of the VMS deposits and occurs as three different types of mineralization: sulfide stockworks in the volcanic rocks, massive sulfide orebodies, generally, on top of the stockwork zones and/or intercalated with rocks of the transition series, and weathering products of the mentioned primary mineralization types which are represented by gossans and secondary enrichment zones. The latter are restricted to within 70 m of the surface (Palomero, 1990).

7.2.4.1 Sulfide Stockwork

The stockworks occur as irregular veins, fractures, and fissures filled with quartz and sulfides (pyrite, chalcopyrite, galena, sphalerite), magnetite, quartz, chlorite, calcite, and barite cutting the volcanic host rocks. The top of the stockwork marks the base of the massive sulfides. The veins become thicker towards the surface. Close to the massive sulfides, most stockworks are made up of veins with lesser amounts of strongly replaced volcanic rocks. The stockworks can extend up to 400 m downwards from the contact with the massive sulfides down to the basic volcanic unit.

There is a spatial zonation within the stockwork where three types of stockwork can be distinguished:

- Pyritic stockwork zones, also referred to as pyrite chimneys or pyrite feeder zones, consisting of intense pyrite mineralization and local chalcopyrite (e.g., Planes). Average sulfur content of this type of stockwork is 20%.
- The cupriferous stockwork (average 2% Cu content and 30% S). This is a vein-type mineralization with a high concentration of chalcopyrite and is usually adjacent to and parallel to the contact with the massive sulfides. This copper envelope is locally referred to as "cloritas" (Botin & Singh, 1981). The "cloritas" stockwork is highly developed at the base of the San Dionisio massive sulfide body (Figure 7-5) where veining is parallel to contact with the massive sulfides. It is also found below the Filón Sur and Filón Norte deposits.
- The lower stockwork zone consisting of a sericitic envelope restricted to the acid volcanic rocks contiguous to the "cloritas" cupriferous stockwork. Copper and sulfide contents are much lower than in the previously described stockwork types. The lower stockwork is the main mineralization of Cerro Colorado (Figure 7-6). Zone 2a described at the footwall of the "cloritas" of the Alfredo underground mine is also a stockwork of this type.

The Planes-San Antonio deposit has a poorly developed stockwork of reduced size compared with San Dionisio. A semi-massive pyrite zone without base metals is located at the base of the Planes deposit.

7.2.4.2 Massive Sulfide

Massive sulfide mineralization consists of lenses of massive pyrite overlaying the felsic volcanic and the stockworks, usually with greater lateral extent than the stockwork zones. The sulfide minerals are frequently recrystallized with relicts of primary textures within the pyrite.

The primary sulfide mineralization consists mostly of pyrite, with minor chalcopyrite, sphalerite, galena, tetrahedrite, and sulfosalts of Sb and As in intergranular spaces or in microfractures. Chalcopyrite is the dominant copper mineral and mostly occurs within small fractures in the pyrite; on a lesser extent it occurs in isolation.

The massive sulfide deposits are present as dismembered lenses along the axis and the flanks of the anticline and are overlain by shales of the Culm series. Currently, massive sulfides remain only at San Dionisio (Figure 7-5) and San Antonio. At Filón Sur, Filón Norte, and Planes the massive sulfides have almost entirely been removed by mining. In the core of the anticline at Cerro Colorado-Salomón open pit (Figure 7-6), it is believed that the deposits originally formed an almost continuous lens of massive sulfides of about 5 km long, 750 m wide, and 40 m thick, containing more than 500 million tonnes of sulfide mineralization.

The San Dionisio sulfide body is the largest deposit at Rio Tinto. It is a homogeneous pyritic body containing sphalerite and chalcopyrite with minor amounts of galena, arsenopyrite, and tetrahedrite. While the distribution of Pb-Zn is not regular, the copper content increases toward the contact with "cloritas", and maximum copper grade is found at the contact between the massive sulfides and "cloritas". This footwall contact is gradational to locally abrupt. The upper contact is usually sharp and mineralization in the hanging wall rocks is very rare. The San Dionisio deposit has been described in the literature as a stratiform massive sulfide orebody with a syncline shape derived from folding. An extensive study of the geology and the mineralogy of the San Dionisio sulfide body by R.A. Read in 1967 strongly indicates that the deposition of sulfides is a replacement of a favorable folded volcanic horizon.

San Dionisio Massive sulfides have been extensively mined at the Atalaya pit and the Alfredo underground mine up to the 26th floor, approximately down to 135 m elevation.

At the Planes-San Antonio deposit, the massive sulfides are planar and are represented by two orebodies. The first is the Planes deposit, which is overlying the pyrite stockwork and is completely mined out; and the second is the San Antonio deposit, which occurs outside the limits of the stockwork and is intercalated with pyroclastic volcanic rocks. The San Antonio deposit is a pyritic stratiform sheet, apparently formed as a chemical sediment on the sea floor (Williams, Stanton, & Rambaud, 1975). The San Antonio massive sulfide mineralization contains more than 40% S, is enriched in Cu, Pb, and Zn, and has a maximum thickness of 38 m. Laterally, the massive orebody splits in several bands separated by barren tuffs (Figure 7-7).

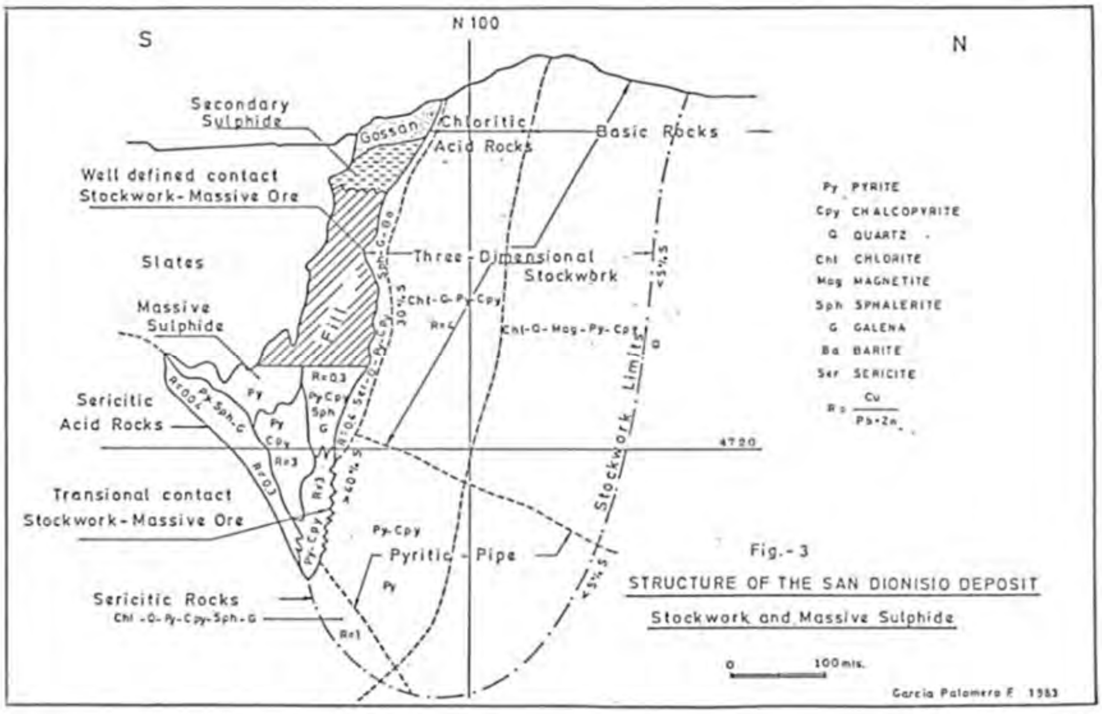


Figure 7-5: Schematic N-S cross-section through the San Dionisio deposit (Palomero, 1990)

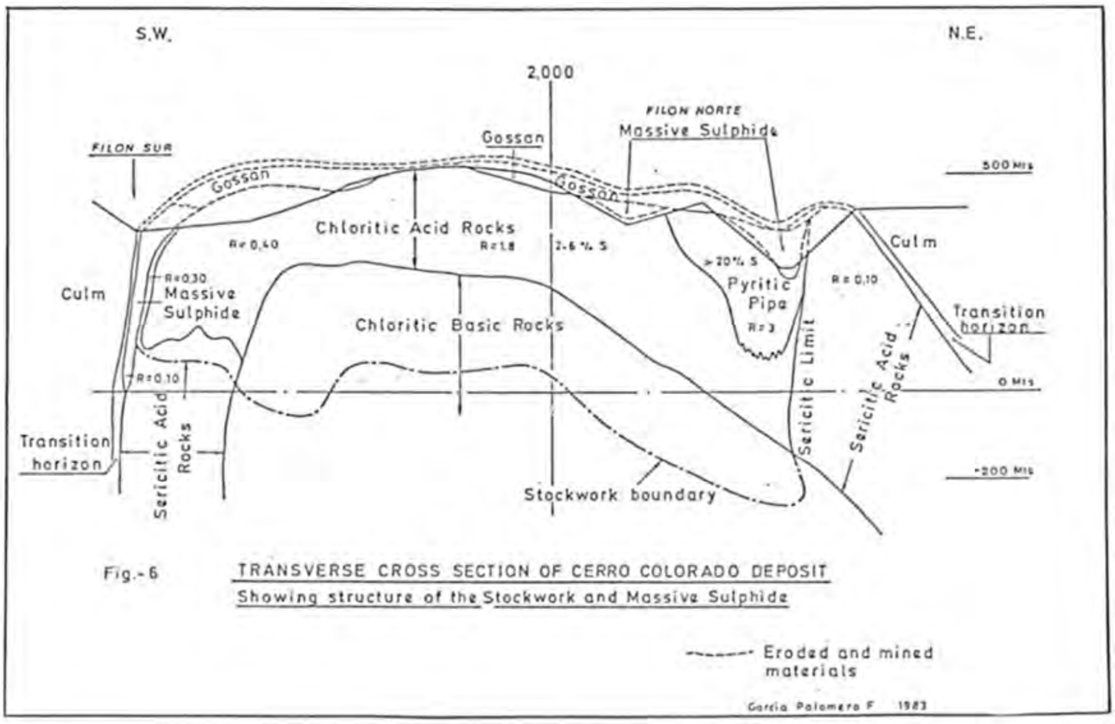


Figure 7-6: Schematic NE-SW cross-section through the Cerro Colorado deposit (Palomero, 1990)

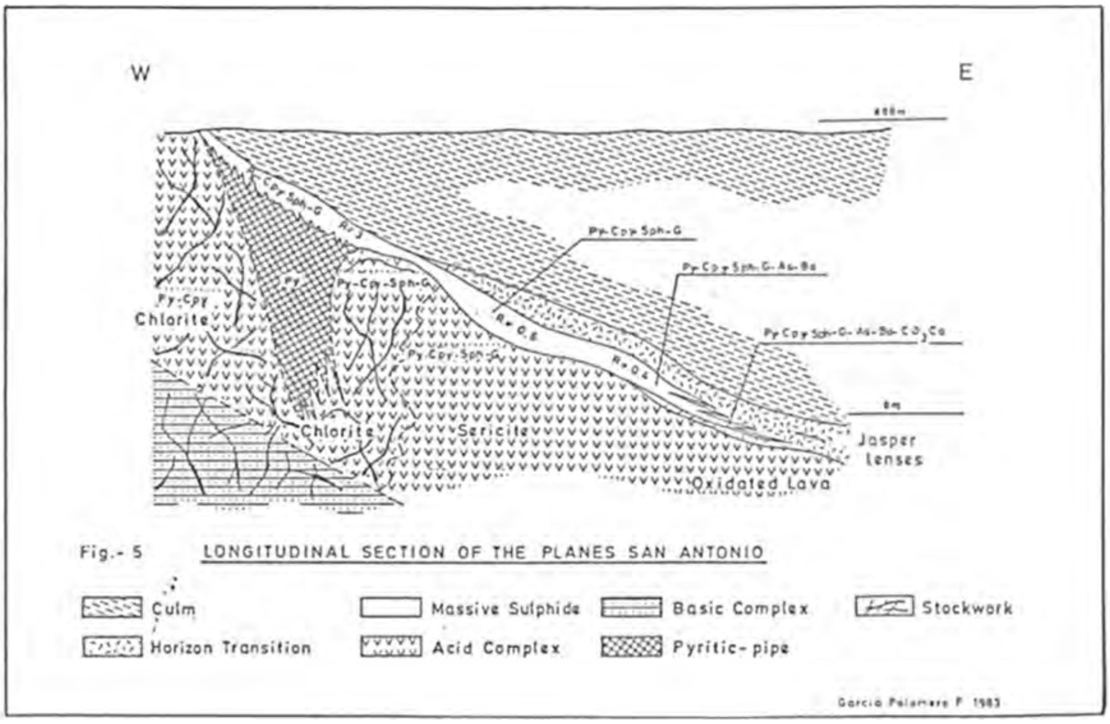


Figure 7-7: Longitudinal E-W section through the Planes-San Antonio deposit (Palomero, 1990).

7.2.4.3 Gossan

Gossans and secondary mineralization have formed in places over the stockwork and sulfide mineralization. Leaching and oxidation of an important volume of sulfides in Cerro Colorado and minor amounts in the Atalaya open pit developed extensive gossans, which were mined for gold and silver as described in Chapter 6. Gossans and supergene enrichment zones are characterized by the occurrence of secondary minerals goethite-limonite and chalcocite-covellite respectively.

The location of the gossans is indicated in Figure 7-5 and Figure 7-6 which show schematic cross sections through the San Dionisio and Cerro Colorado deposits. Gossan has also been mined at Planes 50 m west of the Planes shaft (Williams, Stanton, & Rambaud, 1975). Gossans and secondary mineralization have been mined out and are no longer a significant resource.

8. DEPOSIT TYPES

This section has been reviewed by Alan Noble and Monica Barrero Bouza, both Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

Riotinto is a Volcanogenic Massive Sulfide (VMS) deposit located in the IPB (Iberian Pyrite Belt), which forms part of the Hercynian orogenic belt. The IPB is one of the largest of the world's massive sulfide provinces (Leistel, J. M. et al., 1988).

VMS deposits form in or near the seafloor where circulating hydrothermal fluids are formed in extensional tectonic settings of oceanic sea floor, driven by magmatic heat and quenched through mixing with bottom waters or porewaters in near-seafloor lithologies. They are generally stratiform and may occur as multiple lenses. They were and are actively formed in extensional settings on the seafloor, including mid-ocean ridges, volcanic arcs, back-arc basins, rifted continental margins, and pull-apart basin environments. The volcanic-hosted massive sulfide mineralization derives from a single genetic process, but shows different morphological forms (stockworks, stratiform massive sulfides, disseminations) that may occur in a close spatial relationship or be isolated (USGS, 2012).

At Riotinto there are several deposits genetically related, with different morphologies and lithological relationships between the sulfides and the host rocks.

Filón Sur and San Dionisio are massive sulfide bodies closely associated with black slate, with local incorporation of slate in the massive sulfide and local impregnations of sulfide in the slate.

Filón Norte covers several deposits: Salomón, Quebrantahuesos, Dehesa, Lago, Mal Año and Argamasilla. Sub-sea floor replacement of the country-rock by massive pyrite has been described as the process responsible for the genesis of Salomón and Quebrantahuesos bodies. Remnants of stockwork-type mineralization within chloritic felsic lithologies near Dehesa and the presence of sericitic volcanic rocks in the hangingwall side suggest a replacement genesis for the Filón Norte deposit (Adamides, 2013).

Sub-seafloor replacement of pelitic units has been described by several authors as the most efficient mechanism of deposition at Filón Sur and San Dionisio (Williams, 1934), but an extensive study of the geology and the mineralogy of the San Dionisio sulfide body by R.A. Read in 1967 strongly indicates that the deposition of sulfides is the replacement of a favorable previously folded volcanic horizon.

The best development of copper or cupriferous stockwork underlies the massive sulfide body of San Dionisio and is characterized by intense pyritic veining in sericitic and chloritic felsic volcanic rocks ("cloritas") but is also locally observed at Filón Sur and Filón Norte. Lower copper grade stockwork is extensively developed at Cerro Colorado and extends over a surface area around 3 km^2.

Planes–San Antonio represents the transition from a proximal massive sulfide zone replacing felsic tuffs (Planes) into a distal sedimentary association with massive sulfide interlayered with volcaniclastic lithologies (San Antonio), suggesting formation by exhalative processes in the sea bottom (Williams, 1934).

The sulfide deposits are dominantly pyrite, with minor chalcopyrite, sphalerite, and galena in various proportions depending on the location. Chalcopyrite is the dominant sulfide at Cerro Colorado, where Pb and Zn are important components of the San Dionisio and San Antonio deposits. The relationships between the orebodies and country rocks suggest that the Riotinto deposits display a spectrum of ore types from massive sulfide deposited by subsurface replacement of the volcanic host rocks, through deposition at or close to the rock/seawater interface in close association with black shales, into typical sedimentary exhalative deposition at some distance from the source of the hydrothermal fluids (Adamides, 2013).

According to Atalaya Mining and based on the environment of formation, and the spatial association with felsic volcanics, the Riotinto volcanic-hosted pyrite-chalcopyrite (Pb-Zn) deposit could be classified as felsic siliciclastic VMS of Kuroko type.

9. EXPLORATION

This section has been reviewed by Alan Noble and Monica Barrero Bouza, both Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

9.1 Summary

Since 2014, Atalaya has completed exploration, resource, and development drilling programs in the Riotinto mining area. Exploration activities, including exploration drilling, had been carried out in selected prospect areas within the PRT and outside the current mining area to find new resources and/or to confirm resources exposed by historical reports.

Previous exploration activities such as historical data compilation and exploration drilling at San Dionisio and Filón Sur had evolved to resource drilling, which is discussed in Chapter 10.

No further exploration activities have been carried out in or around the known mineralized areas of Cerro Colorado, San Dionisio, and San Antonio after the last update of the Technical Report in 2018, except for the continuous update of the geological mapping of the current pits and surrounding areas. The updated geological map that covers Cerro Colorado and Atalaya pit is shown in Figure 9-1.

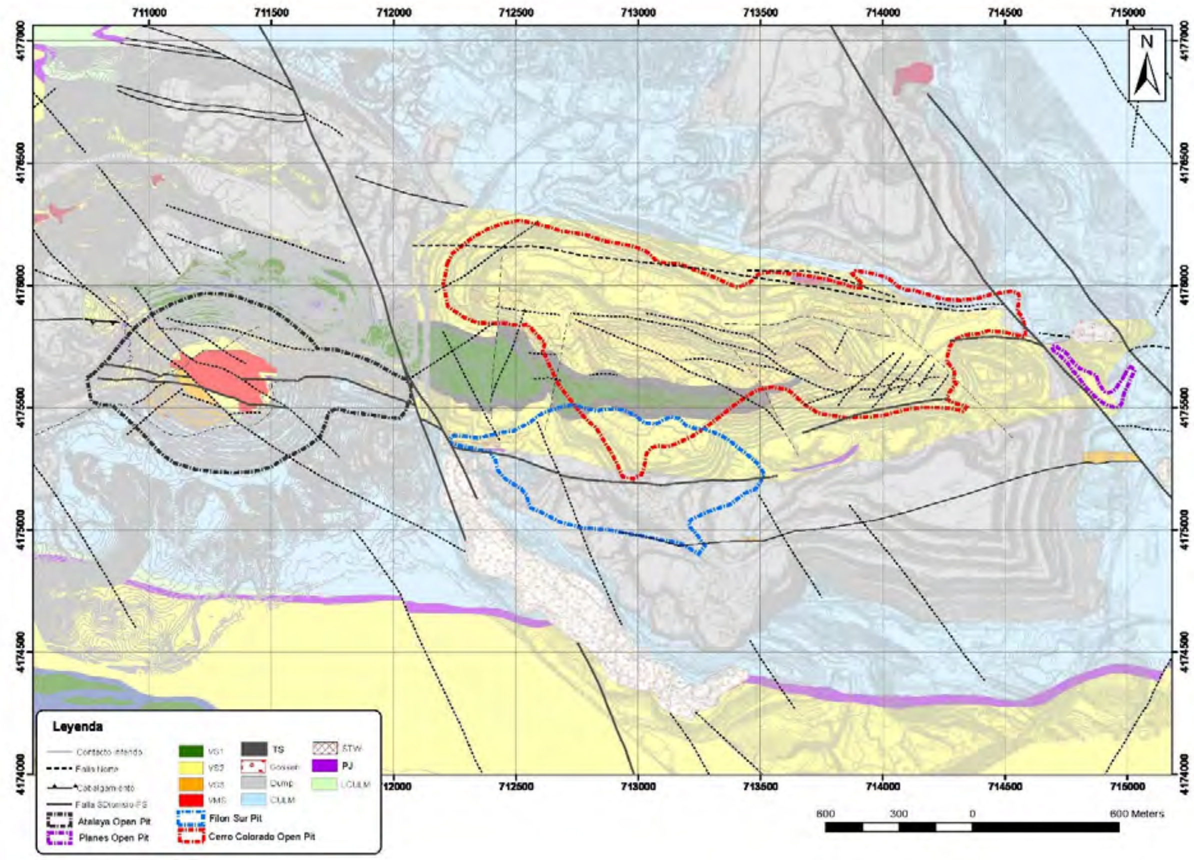


Figure 9-1: Geological map of the Riotinto Project area, ETRS 89 (Atalaya, 2022).

10. DRILLING

This section was compiled by Atalaya technical staff and reviewed and updated by Alan Noble and Monica Barrero Bouza, both Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

This chapter describes the validated historical drilling and Atalaya's resource development drilling. The Atalaya development drilling was done to define resources in areas of Cerro Colorado with scarce data for trace elements, to gain confidence in defined copper resources, and to better define the boundaries and shapes of the mineralization.

10.1 Drilling Programs Description

Historical drilling at the Riotinto project has been done from 1892 until 1996 by the different companies who owned the project, as described in Chapter 6. The historical drilling data was compiled and validated by EMED between 2008 and 2011. Further drill hole data validation has been done by Atalaya and, more recently, by Alan Noble and Monica Barrero Bouza for the San Dionisio and San Antonio drilling data.

Atalaya exploration and resource drilling started in April 2014 and continues to present. A brief description of the historical drilling data and Atalaya drilling programs for the different deposits is given below, and a summary of the drilling programs completed at the Riotinto Project is shown in Table 10-1.

Table 10-1: Description of the drilling programs undertaken at the Riotinto Project.

Deposit	Drilling Program	Number of holes	Total drilling (m)
Cerro Colorado	Legacy numbered series	682	142,355.30
	CCR series	12	1,480.00
	ETR & RT series	361	28,659.20
	RTD 2017 series	28	5,436.50
	(FS) Filón Sur	43	10,255.10
	Geotech Holes	6	1,170.00
	ARD	3	768.90
	Geotech 2018	11	1,061.05
	Special (PZ&SA)	5	166.95
	RT 2018	41	8,557.40
	RT Penalty 2019	54	11,179.50
	RT Penalty 2020	164	18,880.00
	RT 2021	43	6,800.20
	Total	1453	236,770.10

Deposit	Drilling Program	Number of holes	Total drilling (m)
San Dionisio	Legacy holes	949	65,610.70
	1996 holes	9	1,032.55
	Atalaya	45	16,911.00
	Total	1003	83,554.25
Planes	Atalaya 2016	8	918.20
	Total	8	918.20
San Antonio	Legacy UG holes	157	9,962.67
	Legacy surface holes	20	6,838.17
	Atalaya 2015	8	1,504.20
	Total	185	18,305.04

10.1.1 Cerro Colorado

Atalaya's drilling programs completed since 2014 are:

1. 2014-2015 Cerro Colorado drilling program: Consisted of expansion and infill drilling, mainly RC drilling, in areas of known mineralization within the Cerro Colorado pit. The purpose of this program was to better define shallow mineralization, to provide more detailed information to optimize the mine production during the initial mining phases in 2015, and to define resources containing penalty elements, such as Sb and As, that might need special metallurgical treatment.
2. 2016-2018 RT-Resource drilling program: RC and Diamond infill drilling in the Cerro Colorado open pit area to convert inferred resources to indicated and measured. The program also

includes deep drilling at Filón Sur, up to 800 m depth, to define the massive sulfide at depth and its eastern extension.

3. 2019-2021 RT-Resource drilling program: RC and diamond drilling in the Cerro Colorado open pit for infill drilling and penalty element evaluation.

The location of the RC and diamond drill holes completed during historical and Atalaya drilling programs are shown in Figure 10-1.

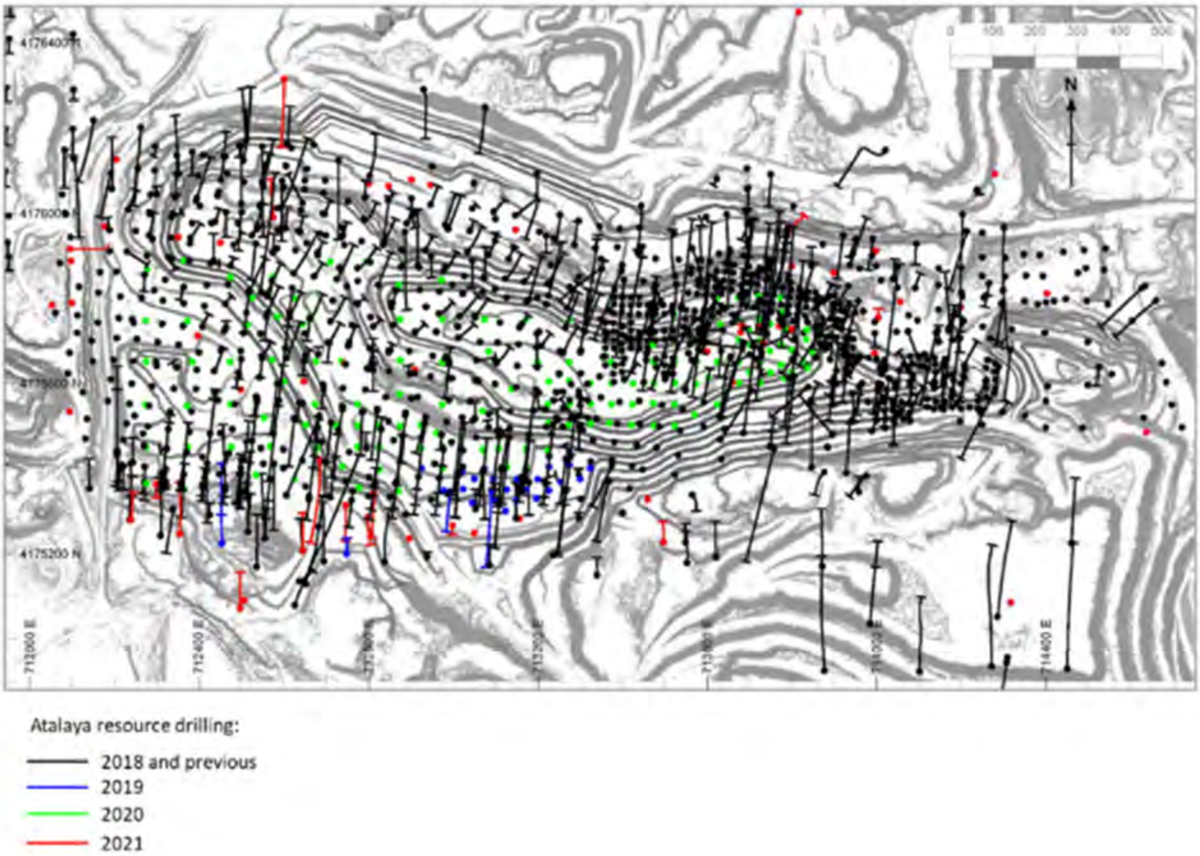


Figure 10-1: Plan view of the Cerro Colorado historical and recent drilling (Noble & Barrero, 2021)

Since the last Mineral Resource and Reserves update in 2018[8], new resource drilling included a total of 302 holes with a total of 45,417.10 meters; 164 of the 302 infill holes were targeted to define the shape and size of the Antimony and Arsenic enriched zones.

[8] "Technical Report Update On the Mineral Resources and Reserves of the Riotinto Copper Project, July 2018"

10.1.2 San Dionisio

In 2021, the historical EMED drill hole database was reviewed and checked against the available hard-copy data consisting of geological drill hole logs, laboratory certificates, drill hole sections, and several reports. A total of 949 historical holes were validated (65,610.70 m of drilling).

Atalaya resource drilling started in April 2015 to confirm and evaluate the shallow stockwork resources located at the northern flank of the deposit and to gain confidence for resource evaluation of the unmined portion of the deposit. A total of 45 surface holes (16,911m of drilling) have been completed by Atalaya at San Dionisio from 2015 to the present, these holes have been reviewed and validated during 2021.

A plan view of the different drilling programs accomplished at the San Dionisio deposits is shown in Figure 10-2.

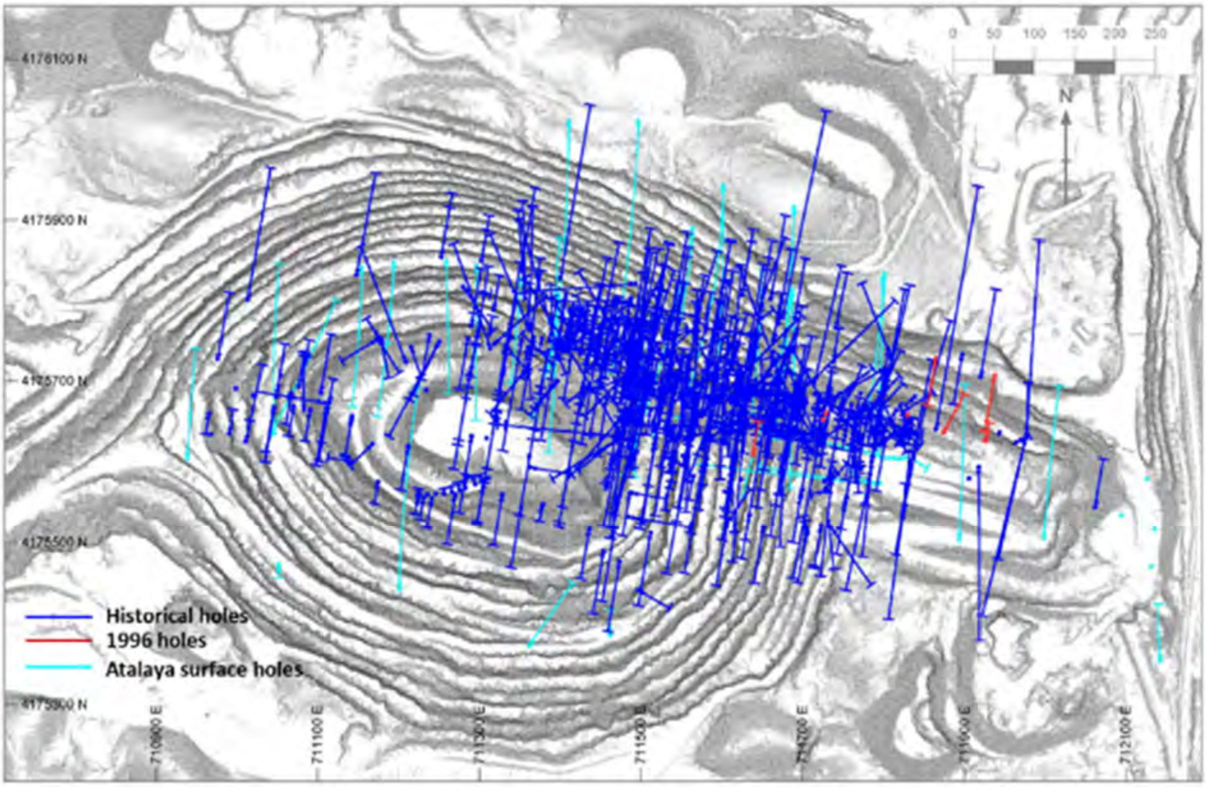


Figure 10-2: San Dionisio: Plan view of the historical and Atalaya drill holes (Noble & Barrero, 2021).

10.1.3 Planes

In 2016 Atalaya performed a short drilling program to explore the stockwork below the mined massive sulfides and to assess the remaining mineralized and unmined areas. The program consisted of 8 drill holes for 918.2 m of drilling, both reverse-circulation, and diamond drilling. The mineralized intercepts were considered very limited, and the program was concluded. This drilling is not considered for resource definition.

10.1.4 San Antonio

During 2021, the historical EMED drill hole database was reviewed and checked against the available hard data, which included geological drill hole logs, laboratory certificates, drill hole sections, and several reports. None of the core of the historical holes is available for inspection. A total of 177 historical holes have been validated, including 157 underground holes (9,962.67m of drilling) and 20 surface holes (6,838.17m of drilling).

In 2015, Atalaya performed limited drilling program in the western part of the deposit, with the aim of confirming grades and intercepts. Drilling included 8 diamond drill holes for 1,504.2 m of drilling. The orebody was intersected by most of the holes; however, grades were slightly lower than expected.

A plan view of the different drilling programs accomplished at the San Antonio deposits is shown in Figure 10-3.

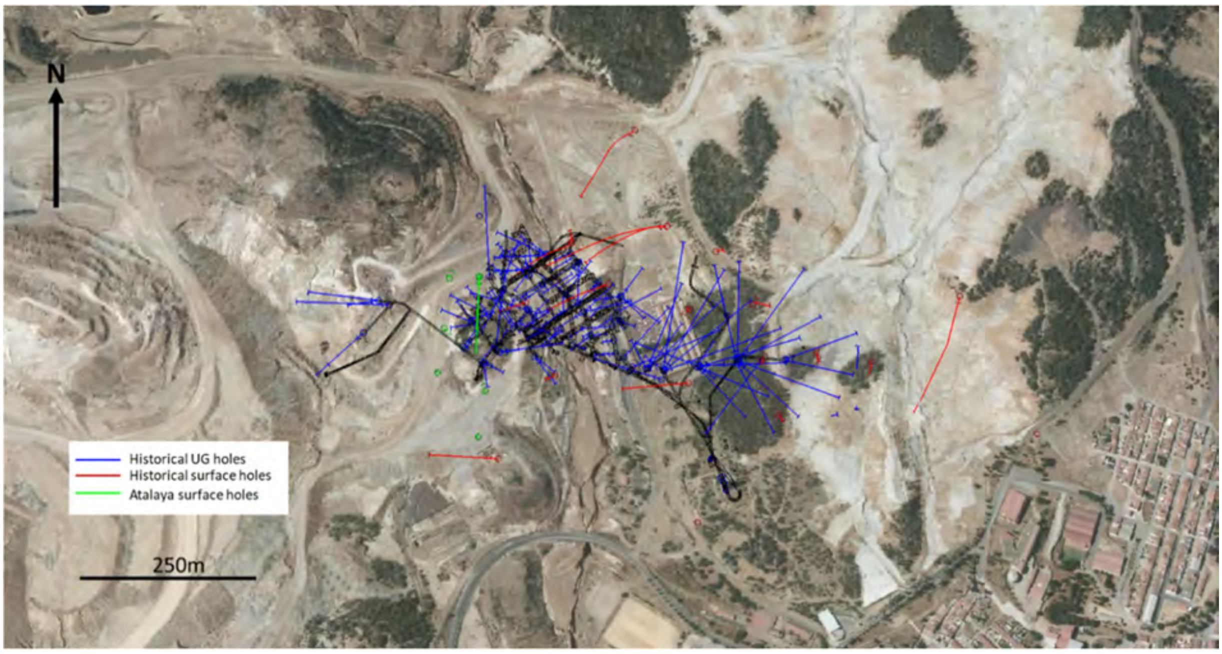


Figure 10-3: San Antonio: Plan view of the historical and Atalaya drill holes (Noble & Barrero, 2021).

10.2 Atalaya Drilling Procedures

The main objectives of Atalaya drilling programs are to confirm or gain confidence and expand the historical resource of the project through confirmation, infill, and exploration drilling. Drilling programs are planned and monitored by the Exploration Department of Atalaya.

Atalaya began its drilling programs in 2014, completing several drilling programs within the Riotinto Project. Reverse Circulation (RC) has been the main drilling method (Figure 10-4), although diamond (DDH), and mixed RC-DDH drill holes have also been drilled when necessary. The main drilling operator for Atalaya Mining is SPI (Sondeos y Perforaciones Industriales del Bierzo S.A.).

The Atalaya's Exploration Department has well established procedures that comply with international industry standards for drilling management[9], chip & core logging, sampling and sample preparation, and sampling and assaying QAQC.

Figure 10-4: SPI RC drill rig, Cerro Colorado pit (Atalaya, 2022).

10.2.1 Collar Surveys

The collar coordinates of the historical holes are in local reference systems (Filón Sur-EGM, Planes, and San Dionisio). Transformation equations from local to UTM[10] ETRS 89[11] coordinates have been provided by Atalaya which have been derived and verified by surveyor consultants IPH. The transformation equations have been used to validate the position of drill holes and underground development from legacy plans and sections to the current UTM ETRS 89 system.

Atalaya drill hole collar locations are defined by the Exploration Department in the ETRS 89 system and transferred in the field by a geologist with a hand-held GPS or by the surveyor with a differential GPS. The collar location is marked with a wooden peg and fluorescent paint. If the hole is inclined, the geologist marks the direction with tape and paint. Once the rig is positioned, the geologist checks and adjusts the drill rig position with the compass if necessary.

[9] PQ-EXG-02: "Procedimiento de perforación con sondeos de Circulación Inversa", (Atalaya, 2020)
[10] UTM: Universal Transverse Mercator
[11] ETRS89: European Terrestrial Reference System 1989

10.2.2 Geological and Geotechnical Logging

Historical hole logs exist as scanned copies of the original forms. The information includes a handwritten record of the collar coordinates, hole sample intervals, core recovery, description of lithology, mineralization, and structure, and % Cu and % S assayed values of the original samples (Figure 10-5).

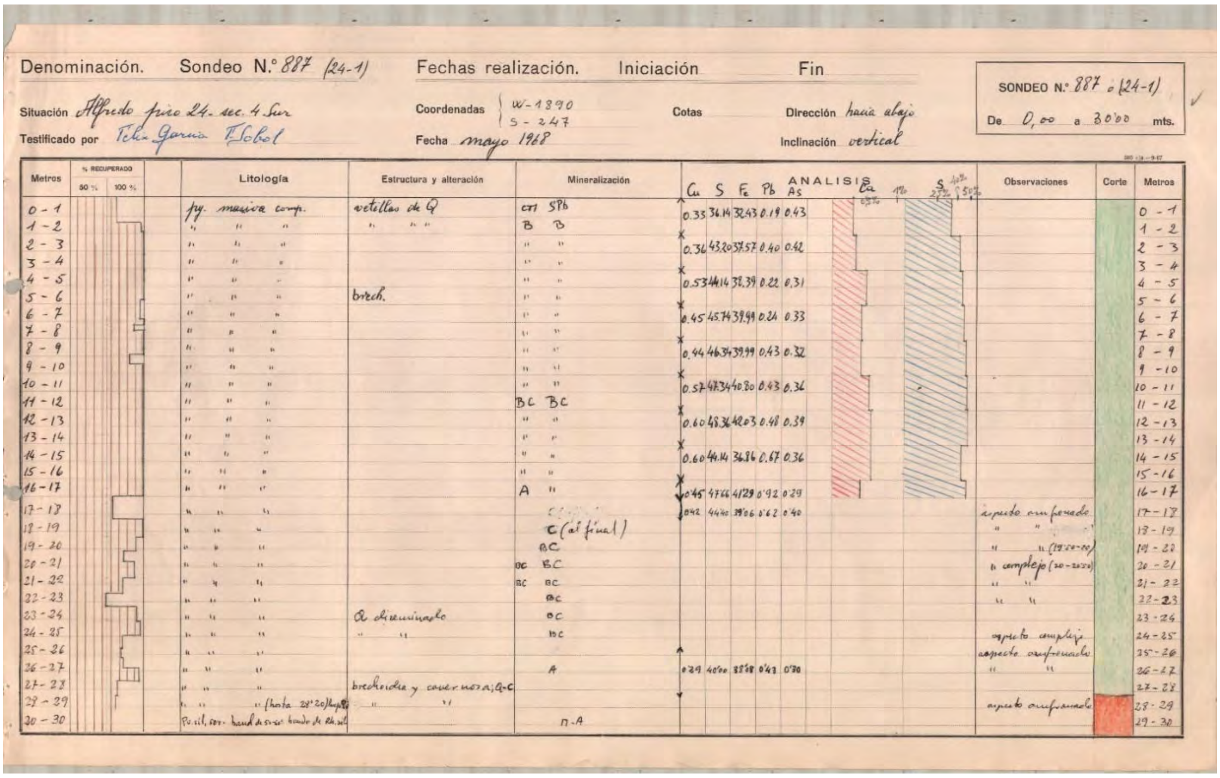

Denominación. Sondeo N.° 887 (24-1) Fechas realización. Iniciación Fin
SONDEO N.° 887 (24-1)
De 0,00 a 30'00 mts.
Situación
Testificado por
Coordenadas
Fecha mayo 1968
Cotas
Dirección hacia abajo
Inclinación vertical
Metros | % RECUPERADO | Litología | Estructura y alteración | Mineralización | ANALISIS | Observaciones | Corte | Metros

Figure 10-5: Scanned copy of a handwritten geological log of hole 887 dated 1968 (Atalaya, 2021).

Atalaya has two appropriate forms for logging the data from the drill samples produced by RC and diamond drilling.

For each drill hole the following data are recorded:

- Location, including the easting-northing coordinates and the elevation.
- Log, including lithology, alteration, and other relevant information.
- Date of sampling.
- Sample Weights (only for RC samples) are recorded twice, once from the wet sample and a second weight after oven drying.
- The name of the person responsible for collecting the samples (geologist, supervisor, assistant, etc.)
- Elements to be assayed, including assay method used (AA, ICP, etc.), laboratory, etc.
- Assay results.

RC chips are logged in an appropriate logging form that includes lithology, alteration, mineralization, and other notable characteristics. Every sampled interval is stored in chip trays and photographed, clearly showing the sample numbers and sample interval.

Diamond core is logged using a more detailed geological form that includes lithology, stratigraphy, detailed structure, alteration, and mineralization. In addition to the geological logging, geotechnical features such as recovery and RQD, Total Core Recovery, Solid Core Recovery, discontinuity type, joint sets, and rock strength codes are recorded in a separate form. Logging and sampling data is stored in the CORE logging system, which is an iOS application for logging CORE and RC that runs on iPads that are synchronized with a central computer.

Drilling data is entered daily in a spreadsheet that includes drilling program (planned holes), location, drill progress (holes completed), type of drilling, coordinates, dip, azimuth, sampling interval, and other relevant information.

Since 2017, the Exploration Department of Atalaya has implemented the "CORE" logging system, which is an iOS application for logging core and RC that runs on iPads that are synchronized with a central computer.

The application is designed to replace all paper data entries with digital data before, during, and after the logging process. The application includes a series of modules for all logging data entry: collar location, lithology, stratigraphy, mineralization, alteration, structure, geotechnical parameters, quick-log, laboratory submissions, drilling report (assays), and data export. The data entered in the device (iPad) goes to the server, and all the data is compiled and synchronized into a combined database.

10.2.3 Core Recovery

The core recovery is not included in the historical drilling database, even though information on sample recovery was found in scanned core logs provided by Atalaya and several reports. These data have not been incorporated into the current database.

Regarding the San Antonio deposit, there is some historical information about core recovery (RTZ Consultants Limited, 1974). ERT reported an apparent correlation between poor recovery and high lead and zinc values, especially in the smaller diameter cores (36 mm). In any case, RTZ Consultants considered that ore recovery had no correlation with metal values and did not affect the reserve calculations. No raw recovery data is available for review.

Atalaya reported low core recoveries in the 8 surface drill holes performed in 2015, but there is no digital data recorded.

Core recovery of the Atalaya drill core holes is recorded as part of the geotechnical logging form; this data is not incorporated into the drill hole database provided by Atalaya. The overall average core recovery of the San Dionisio drill core holes is 85% (of 13,779 meters logged), although the recovery is much lower when the drilling goes through previously mined and filled areas.

The recovery for RC samples is calculated for each hole using the real weight of the bulk samples in relation to the theoretical weight, which depends on volume and the density of the samples (estimated based on sulfur content). The data is entered and processed into a spreadsheet that directly estimates the recovery of each sample. The resulting recoveries, estimated for each hole, are plotted in charts as shown in Figure 10-6. These charts indicate that the RC recovery is generally very good, although there is usually a significant reduction in the recovery when water is encountered at depth. Low recovery at shallow depths in some holes is usually related to drilling unconsolidated dump material.

If the amount of water is excessive and the sample cannot be collected properly in a bag, the drilling company incorporates a second compressor and/or a booster to resolve the water excess. If the extra power and air volume is sufficient to inhibit water inflow, drilling continues; if not, RC drilling ceases and drilling is resumed using diamond core drilling.

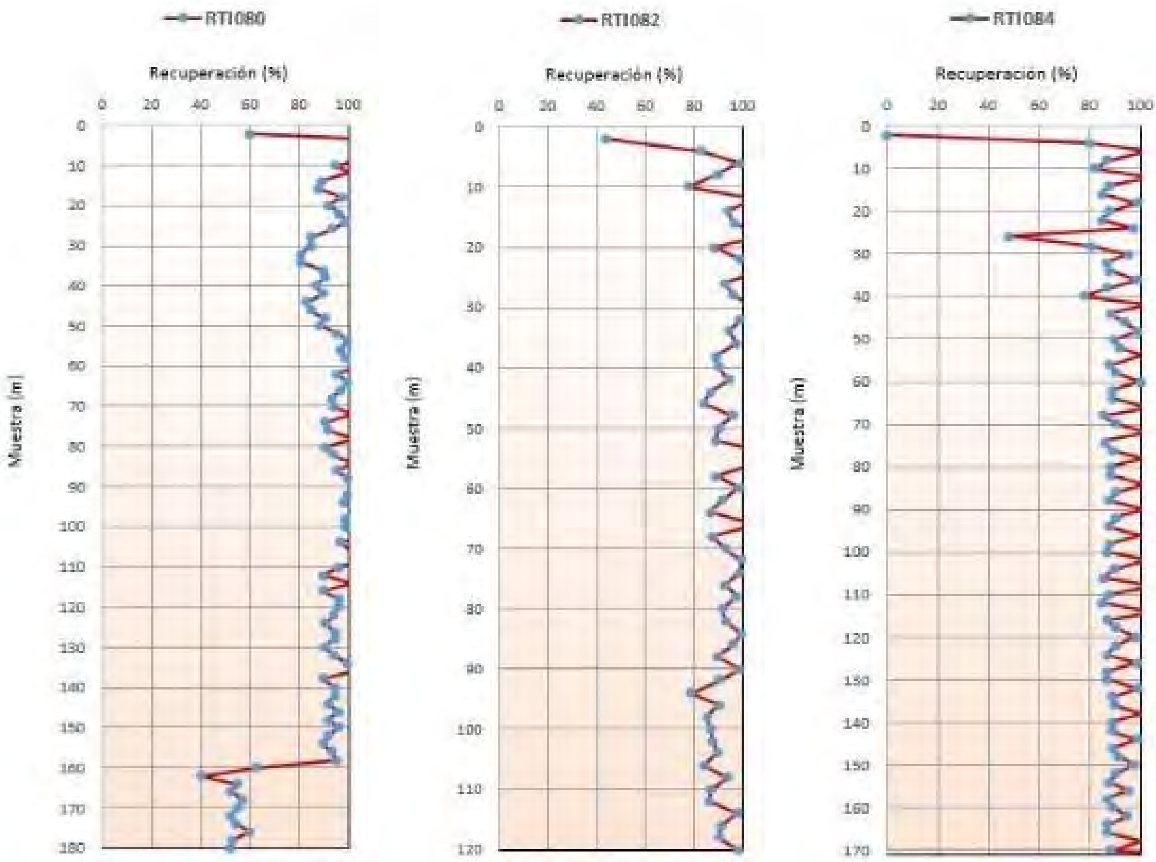


Figure 10-6: RC Recovery charts for holes RTI080, RTI082, and RTI084 (Atalaya 2018).

Regarding historical holes, there is very little information about downhole survey data and methods used. There are records of downhole survey data in the historical documentation, indicating that the company was using some method to determine the downhole deviations of the holes.

The downhole survey is performed by the drilling contractor using Reflex EZ-Shot and Reflex EZ-Trac both (Reflex Instruments Europe Ltd), which are single and multi-shot driller-operated magnetic survey tools. Equipment Calibration certificates were provided and are up to date. Downhole survey interval is usually 50 m.

10.2.4 Reverse Circulation (RC) sampling

Reverse circulation drilling is performed by an experienced drilling company (SPI), with an RC Spidrill 260 Rig. As part of the auxiliary drilling equipment on site, there is an air compressor and a booster, which are used to collect dry RC samples when drilling is below the water table. When the compressor and booster cannot keep the RC sample dry, RC drilling is stopped, and the drilling continues with diamond core drilling.

A sampling interval of 5 m was used for the early Cerro Colorado drilling program in 2015. After the completion of the 2015 drilling program, Atalaya changed the sampling interval to 2 m for both RC and diamond drilling. While the 5 m interval used in 2014-2015 is considered a reliable sample, Atalaya believes that a 2 m interval gives more confidence and detail in the sampling. As such, the sampling interval used for the Resource Drilling is generally 2 m.

The RC samples are taken by an Atalaya's rig operator. The RC rig has a riffle splitter attached to the cyclone of the rig, which is used to split samples on site.

10.2.5 Diamond Drill Core Sampling

Diamond core drilling is performed SPIB with a Spidrill drill Rig and HQ (63.5 mm) core size.

Diamond core is collected from the drill rig by a trusted driller who is directly contracted by Atalaya. The core is placed by the driller in core boxes. Markers are placed in the core boxes, clearly indicating the drill depth at the end of each drill run. Each box is identified using a permanent marker with a box number and from-to depths.

The core is transported to a secure core shed, located at the Riotinto Project facilities, by two workers from the Atalaya Exploration Department using a pickup truck. Once the core boxes are delivered to the main core storage facility, Atalaya personnel photograph all the core boxes (Figure 10-7), the core is geologically logged, and sampling intervals are defined and marked in the box.

Figure 10-7: Photographic record of the core boxes after delivery. Core is HQ diameter (Atalaya, 2019).

11. SAMPLE PREPARATION, ANALYSES, AND SECURITY

This section was compiled by Atalaya technical staff and reviewed and updated by Alan Noble and Monica Barrero Bouza, Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

11.1 Summary

The Project drill hole database includes sample data from reverse circulation and core drilling, both surface and underground. Drilling was performed historically from 1892 until the current time by a variety of operators.

Little documentation is available on diamond core drilling, sampling procedures, and security methods employed by Riotinto Company and RTZ, Freeport-McMoRan, and MRT. However, drilling was conducted by companies experienced in exploration and production and is considered reliable. Riotinto had its own company standards at that time that were followed throughout exploration projects and operations in Spain and elsewhere. The historical documentation confirms that the procedures were above the industry standards of that time and close to the current standards.

Drilling, sampling, assaying, and security procedures employed by Atalaya are described and documented in this report and are considered to have been performed to industry standards and are sufficient to support resource estimation.

11.2 Sample Storage and Security

There is no information on sample storage or sample security or core from the historical holes.

Security of Atalaya samples is based on procedures designed by the company and relies on the principle that sample collection and transport, sample handling, and sample preparation are completed by company personnel and using company vehicles. Samples are always attended or locked at the company facilities.

Samples collected at drill holes are initially transported and delivered to the main logging shed for logging purposes (Figure 11-1). Once the logging and sampling has been performed, core samples are transferred to the permanent core shed for storage (Figure 11-2). Both facilities are locked and secure.

Coarse rejects from reverse circulation (RC) drilling are stored on site in plastic drums to prevent moisture, and in a fenced and secure yard, which is shown in Figure 11-3.

Figure 11-1: Core boxes prepared for logging and sampling at the logging shed (Atalaya 2018).

Figure 11-2: Outside and inside views of the permanent storage core shed (Atalaya 2018)

Figure 11-3: Storage Yard for RC Cuttings rejects (Atalaya 2018)

11.3 Sample Handling and Preparation

No information is available on the sampling and sampling preparation procedures employed historically at the Riotinto project, but the mine had its own sample preparation facility and an in-house laboratory. There are no details available for the sampling methodology and whether it met current industry standards, but the company had its own company standards at that time.

Since the project has been owned by Atalaya, RC and core samples are prepared and assayed at the Atalaya laboratory using the sample collection and preparation flow charts shown in Figure 11-4 and Figure 11-5, respectively.

Before delivery to the Atalaya laboratory, the samples are sorted, and the control samples are inserted into the batch of samples by the project geologist (standards, blanks, and duplicates) for QC purposes. For RC samples, the QC procedures also include the insertion of 2 individual samples of 1 m drill interval per hole, to check the representativeness of the 2 m sampling interval.

A submission order is generated when the batches are submitted to the Atalaya laboratory facility located at Minas de Riotinto for further sample preparation and assaying.

The RC and core samples are reduced through splitting, crushing, pulverizing, and quartering to get a final pulp sample of approximately 125 g that is assayed at the Atalaya's laboratory on site.

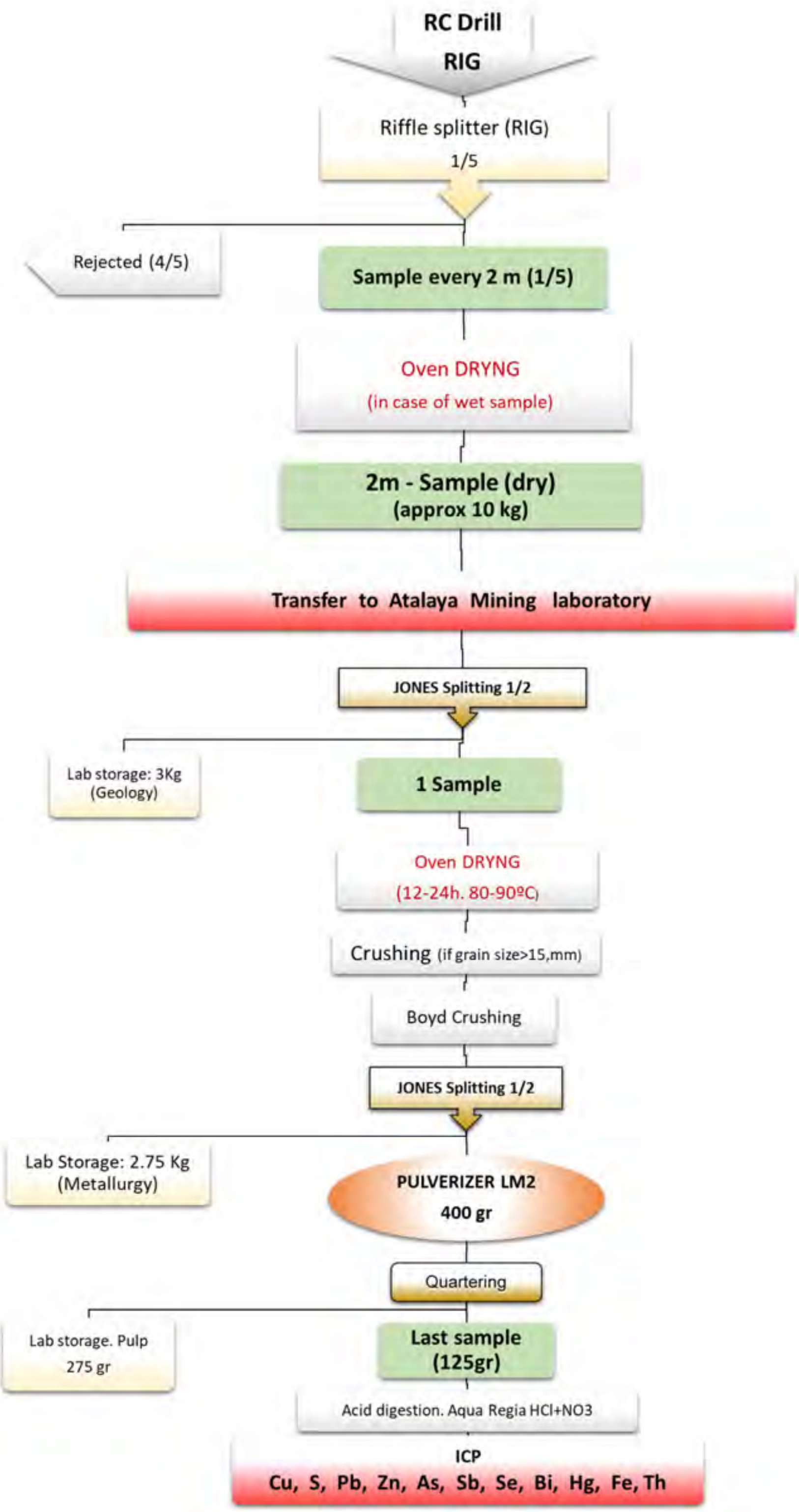


Figure 11-4: Sample Collection and Preparation Flow Chart for RC samples (Atalaya 2022)

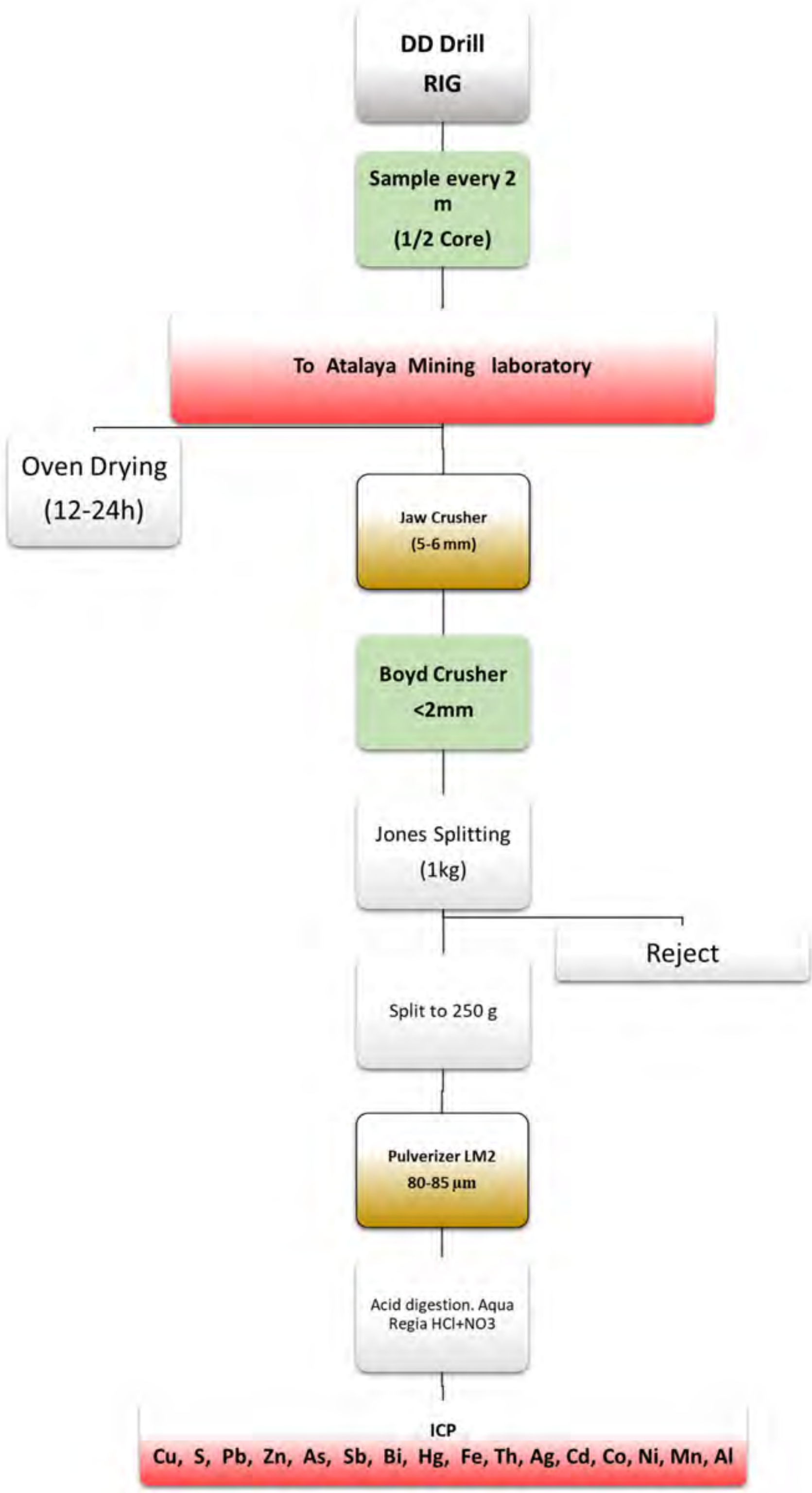


Figure 11-5: Sample Collection and Preparation Flow Chart for drill core samples (Atalaya 2022).

11.3.1 Reverse Circulation

The sample is collected from a splitter that is directly connected to the cyclone of the RC rig. The splitter divides the bulk sample into 1/5 and 4/5 portions (Figure 11-6). The two portions are weighed (bulk weight) and dried, and the data is recorded in a spreadsheet for further recovery estimation. The 1/5 portion is further split before being delivered to the sample preparation laboratory, and the 4/5 portion is rejected. The 1/5 portion sample represents a 1 m length sample.

Figure 11-6: RC rig sample splitter (Atalaya, 2022).

After the 1 m samples are taken, Atalaya's rig operators prepare a composite sample every 2 m for assay. The procedure includes a further split of the two 1 m samples, mixing and homogenizing the sample, and further splitting before the sample is prepared for assaying (Figure 11-4).

Depending on recovery, the weight of the final 1/5 dried sample varies between 6 and 10 kg. The RC sample preparation procedure is shown in Figure 11-4.

11.3.2 Diamond Drilling

Diamond core is collected at the drill rig by a trusted driller who is directly contracted by Atalaya. The core is placed by the driller in core boxes. Markers are placed in the core boxes clearly indicating the drill depth at the end of each drill run. Each box is identified using a permanent marker, with a box number and from-to depths.

The core is transported to the secure core shed by two workers from the Atalaya exploration department using a pickup truck, where a digital photograph is taken of each core box. The core is inspected and logged by the Atalaya project geologists. The typical sampling length used for the resource drilling program is 2 m, but can vary according to lithological variations and program requirements. The drill core samples are split into two halves using commercial diamond saws (Figure 11-7), with one half placed in a new plastic bag along with a sample tag and the other half is placed back into the core box. The sample bags containing the selected half-core are submitted to the Atalaya laboratory for sample preparation.

Figure 11-7: Core Sawing facility (Atalaya, 2022).

11.3.3 Density Determination

There are historical records, mainly in technical and internal reports, with density data of the mineralized and unmineralized core intervals. There is no evidence of which method was used for density determination.

Atalaya performs density determinations on core samples of 15–20 cm length using the water immersion method, consisting of weighing the wet core samples in air and then weighing the core sample submerged in water. Weight readings are performed with a calibrated high-precision scale. The density determination is obtained by dividing the weight of the core sample in air by the apparent weight of the sample submerged in water.

The samples for density determinations are selected by the Project Geologist. The density determination is performed by a senior field assistant under the supervision of the Project Geologist.

Density measurements were completed using raw core samples; samples are not coated or sealed in plastic covering prior to immersion. Where there is significant porosity in the samples, measuring density without coating or sealing the samples results in density measurements that are biased high. While porosity appears to be minimal, it should be considered whether coating or sealing is justified for future density measurements.

Additional discussion of the density values and density formulas based on the sample assay data is provided in Chapter 14.

11.4 Analytical Methods

No information is available on the analytical methods used for the historical holes of San Dionisio and San Antonio. Scanned handwritten and typed laboratory sheets and Laboratory Books[12] were provided as part of the historical hard data; many of them are signed off by the Riotinto laboratory manager at that time (Figure 11-8).

Compañía Española de Minas de Río Tinto, S.A.

LABORATORIO GENERAL — 21 de Junio de 1.974

INFORME N.º QB.29/33 QB.34/44 — Sr. Jefe de GEOLOGIA — REV AGR

Resultados obtenidos en los análisis de las muestras que se citan, procedentes de ese Departamento:

Fecha 29-5-74

ALFREDO 32 PISO – SONDEO 1212

Muestra N.º	DESCRIPCIÓN	% Cu	% S
28	De 54 a 56 metros	0.08	1.93
29	56 58	0.09	1.25
30	58 60	1.40	6.58
31	60 62	0.10	1.50
32	62 64	0.06	5.33
33	64 66	0.08	2.20
34	66 68	-0.05	1.00
35	68 70	0.11	2.10
36	70 72	0.07	2.18
37	72 74	0.05	0.80
38	74 76	0.12	2.95
39	76 78	0.12	3.70
40	78 80	0.92	12.20
41	80 82	0.60	7.18
42	82 84	0.25	4.68
43	84 85.85	0.16	3.45

c.c.Geologia (3)

El Jefe del Laboratorio.

Figure 11-8: Laboratory sheet dated 1974 of hole 1212 of San Dionisio deposit (Atalaya, 2021).

Atalaya holes are assayed according to the assay method defined by the Exploration Department. Samples are submitted in batches to the onsite Atalaya Laboratory, where laboratory personnel follow the laboratory internal assay protocols[13] IT-LAB11 and IT-LAB-28, which have been provided by Atalaya for review. The assay method consists of acid digestion in a digestion block-DigiPREP MS (Figure 11-9) and ICP or AA finish. The laboratory provides protected laboratory certificates of the sample batches in Excel format of Cu, S, Pb, Zn, As, Sb, Bi, Hg, Fe, Th, and Ag assays.

[12] Dated in 1986

[13] IT-LAB-11-Instrucción Técnica: Método de ataque químico de muestras de mina, geología y exploración.
IT-LAB-28-Instrucción Técnica: Método de ataque químico en digestor para muestras de planta, metalurgia, comerciales, mina, geología y exploración

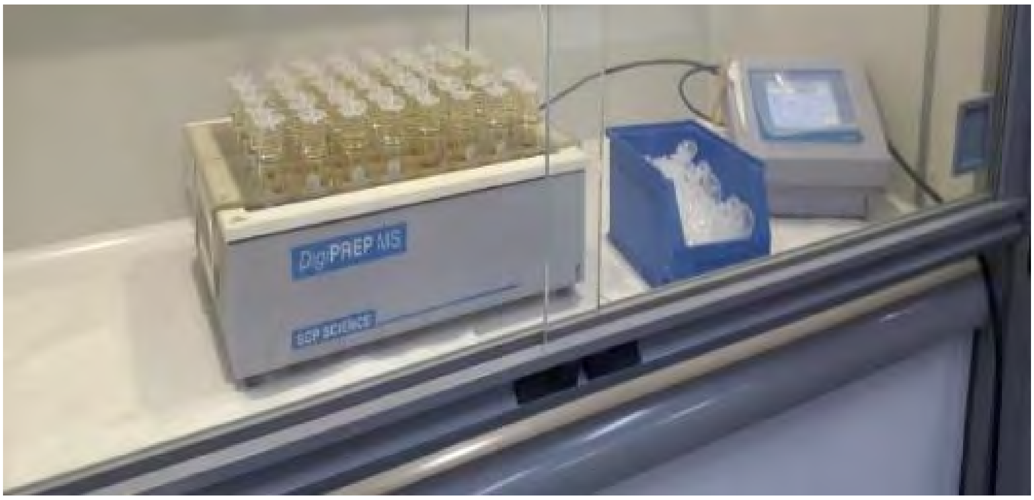


Figure 11-9: Atalaya Laboratory digestion equipment (Atalaya, 2019).

Sample pulps are stored securely at the laboratory facility on site for further external or internal checks or duplicates if needed.

The Atalaya Laboratory has its own QA-QC system consisting of duplicates, blanks, and standard reference material samples inserted in each laboratory batch as specified in the laboratory protocol (IT-LAB-11 and IT-LAB-28). The laboratory also submits external checks of the sample pulps periodically to OMAC Laboratories Ltd trading as ALS Loughrea (Galway, Ireland). The external checks are assayed following the ME-ICP41[14] analytical method, which includes aqua regia digestion and ICP-AES finish. Protected ALS certificates have been provided for inspection.

11.5 Quality Assurance and Quality Control

11.5.1 Sample Labelling

Atalaya follows a sample labeling practice where each sample is labeled according to a code bar system according to the scheme presented in Figure 11-10; this system is described in the internal protocol IT-EXG-05[15].

[14] https://www.alsglobal.com/en/services-and-products/geochemistry

[15] IT-EXG-05-Instrucción Técnica Exploración y Geología: "Etiquetado y Control de Calidad para las muestras de circulación inversa (RC), testigo continuo (DD) y muestras puntuales".

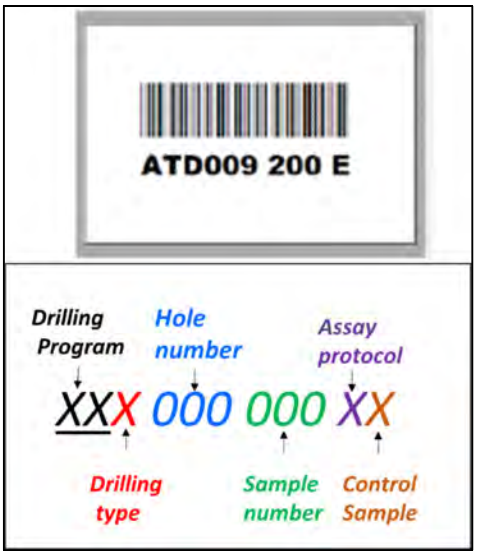


Figure 11-10: Sample Bar Coding (Atalaya, 2021).

Where:

1. Drilling Program: is a code used to identify a zone or a specific program (RT, ETR, FS, AT etc.)
2. Drilling Type: indicates the type of drilling, (I) for RC drilling, (M) for combined RC + DDH, and (D) for DDH.
3. Hole Number
4. Sample Number: corresponds to the depth of the sample, in meters.
5. Assay Protocol: indicates to the laboratory that the sample is being submitted for analysis, as per the established Exploration protocol (E).
6. Control Sample Indicator: CRMs, the standard reference material, blank, or duplicate (AE, BLE, or DE), 1 m sample (G) that corresponds to a 1 m RC sample; while the standard sampling interval is 2 m, two samples of 1 m length are analyzed in each hole to verify the quality of the 2 m-composite. G-samples typically are chosen from ore-grade mineralization based on visual examination. The drill samples are delivered to the Atalaya laboratory in batches that usually represent individual holes.

11.5.2 QAQC Procedures

Between 2016 and 2017, the QA/QC procedures of Atalaya included the insertion of blanks, standards, and duplicate samples with a frequency of insertion of a standard and a duplicate sample per hole. If the number of samples per hole exceeded 100 samples, then the frequency of insertion is of a standard, and a duplicate sample every 100 samples.

Atalaya used In-house Reference Material (In-house RM) for quality control. The In-house RMs are made of material from Riotinto holes and were certified by AGQ Laboratories (Seville, Spain). The list of In-House RM is presented in Table 11-1, where B1 has been used as blank material because of the low copper content.

Table 11-1: List of In-House RM

Sample Code	In-house RM	Cu_%	StdDev
ETR 076 066E	A1	4.7199	0.00029
ETR 078 036E	A2	2.6751	0.00036
CCR 001 151E	B1	0.0075	0.00051
ETR 068 116E	B2	1.1790	0.00040
ETR 074 106E	M1	1.7108	0.00029
ETR 072 046E	M2	0.1465	0.00073

In April 2018[16], the QA/QC protocol was modified, increasing the number of control samples to be inserted in a sample batch. The new insertion frequency is one CRM and a blank every 50 samples, and a duplicate sample in every hole. In-house RMs have been replaced by Certified Reference Materials (CRMs)[17]; the current CRMs are listed in Table 11-2. The In-House B1 has still been used as the material representing blank samples.

Table 11-2: List of CRMs

CRMs (Geostats Pty Ltd)		
Geostats Number	**Grade Cu ppm**	**Std. Dev.**
GBM316-10	4,554	146
GBM906-10	1,916	81
GBM910-5	7,952	89
GBM910-6	10,084	309
GBM914-5	12,920	501

Additional discussion about the results of the QC of the Atalaya drilling data is provided in Chapter 12.

For San Antonio drilling data, there is no current QA/QC data available. Atalaya did not insert control samples in the 8 holes drilled in 2015. Historical assay controls performed by RTZ Consultants have been reviewed, and comments are provided in Chapter 12.

[16] IT-EXG-05-Instrucción Técnica Exploración y Geología: "Etiquetado y Control de Calidad para las muestras de circulación inversa (RC), testigo continuo (DD) y muestras puntuales".
IT-EXG-05-F-01: Instrucción Técnica Exploración y Geología: "Envío de muestras al laboratorio de Atalaya en Riotinto".

[17] Geostats Pty Ltd (Australia)

12. DATA VERIFICATION

Alan Noble, Jaye Pickarts, and Monica Barrero Bouza, all Qualified Persons for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects, reviewed and observed various data collection procedures, and are of the opinion that they meet current industry standards and requirements. The Atalaya technical staff are very competent and consistently follow the procedures and protocols necessary to ensure that the data being collected is of the highest quality.

12.1 Drill Hole Assays

The Atalaya's Exploration Department has well-established procedures in place according to international industry standards for assaying QA/QC.

12.1.1 Historical Drill Hole Assays

In 2021, Monica Barrero Bouza reviewed and checked the historical EMED assay database for San Dionisio and San Antonio against the available hard data consisting of geological drill hole logs, laboratory certificates, drill hole sections, plan maps, and several reports.

For San Dionisio, the drill hole database consists of 958 holes (underground and surface holes). 45.7% of the drill hole copper assay database has been checked against hard data; a small number of minor errors were found that were resolved. The only available QA/QC information for San Dionisio are laboratory certificates of quarter core assay checks which are discussed later in this report.

100% of the assays for the 20 surface holes and 21.5% of the assays for the 156 underground holes belonging to San Antonio deposit were checked and validated with laboratory sheets. A very few typing errors were found. Regarding QA/QC, information exists on check assays on core splits and on crushed reject splits (RTZ Consultants Limited, 1974); the information about these checks is addressed later in this report.

The historical assay database of San Dionisio is considered adequate for resource and reserve estimation. San Antonio assay data is considered adequate for the current resource estimation, but additional confirmatory drilling is recommended before feasibility studies or reserve estimation.

12.1.2 Atalaya Drill Hole Assays

Atalaya drill hole assays and in-house laboratory certificates have been provided in electronic format. The entire electronic assay database has been verified against the laboratory certificates. Only minor errors related to rounding have been detected.

Atalaya's Exploration Department QA/QC procedures for the drilling sample data include the insertion of control samples into the sample batch that is submitted to the in-house Atalaya laboratory. The control samples are represented by standard reference material, blanks, and internal duplicates.

For Cerro Colorado, formal QA/QC procedures were implemented for the 2017 drilling; during 2015, however, QA/QC consisted only of inserting the in-house standards. Duplicate samples were added in 2016. Both In-house Reference Materials (In-house RMs) and Certified Reference Materials (CRMs) have been used as standard reference materials for QC.

Between 2016 and 2017, the QA/QC procedures of Atalaya included the insertion of blank, standards, and duplicate samples, with the insertion of a standard and a duplicate sample per hole. If the number of samples per hole exceeded 100 samples, then the frequency of insertion is a standard, and a duplicate sample every 100 samples. In April 2018, the QA/QC protocol was modified to increase the number of control samples inserted in a sample batch. The new insertion frequency is one standard and a blank every 50 samples, and a duplicate sample in every hole. In-house RMs have almost been replaced by Certified Reference Materials (CRMs)[18].

CRMs are inserted by the laboratory into the sample batch following the instructions of the Exploration Department. Internal duplicates of RC samples are prepared and inserted by Exploration Department personnel before submitting the sample batch to the laboratory.

For the San Dionisio drilling campaigns, Atalaya only used blanks and standard reference samples as control samples. No assay QA/QC procedures were applied to the 2015 San Antonio drilling program.

One pulp sample from every 50 is retained at the on-site Atalaya laboratory for assaying at an external, umpire laboratory (OMAC Laboratories Ltd trading as ALS Loughrea, Ireland). Pulps are shipped to the external lab in batches of 100 samples that include four certified reference samples and a blank. The external assay checks include drill hole (RC and core) and grade control samples.

12.1.3 San Dionisio Historical QC Data

The copper, sulfur, lead, and zinc assay data of half- and quarter-core check assays dated in 1986 were extracted from laboratory certificates from the in-house laboratory of RTM and double-checked in historical Laboratory Books. These check assays are from only three holes and are a very small sample of the total drilling. In addition, it is very difficult to make a quarter-core split from a previous one-half core split without introducing sampling bias. Thus, these results must be viewed with caution. The results of half-core splits compared with quarter-core splits are presented in Table 12-1.

The comparison of results shows that the quarter-core copper assays are 12% lower than half-core assays, and that the differences are statistically significant.

The quarter-core sulfur assays are 2% lower, and the differences are also statistically significant.

The lead is 11% lower on average, but the differences are not statistically significant.

The core assay checks are inconclusive for zinc. The quarter-core assays are 11% lower, but the differences are not statistically significant above 0.5% Zn; thus, the zinc assays are believed to be acceptable. When the data pairs of zinc assays are compared graphically, it is noted that there is a group of assays which do not align around the 1:1 line (Figure 12-2); this is probably due to a transcription error on the decimal point of the original assays.

While the above differences are significant on both a practical and statistical basis, it is quite possible that they are related to sampling biases when splitting the quarter-core samples.

[18] Geostats Pty Ltd (Australia)

Table 12-1: San Dionisio Historical: comparison of half and quarter core splits (Noble & Barrero, 2022).

Grade Range		Number	1/2 core Cu_%		1/4 core Cu_%		Difference			Relative	
Min	Max	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	Differenc	Ratio(X/Y)
0	10	78	1.203	0.994	1.063	0.871	0.140	0.183	0.00%	11.6%	1.132
0.5	10	50	1.706	0.905	1.494	0.808	0.213	0.187	0.00%	12.5%	1.142
1	10	35	2.085	0.820	1.831	0.737	0.254	0.196	0.00%	12.2%	1.139

Grade Range		Number	1/2 core S %		1/4 core S %		Difference			Relative	
Min	Max	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	Differenc	Ratio(X/Y)
0	100	78	47.227	9.218	46.202	9.237	1.024	2.190	0.01%	2.2%	1.022
20	100	75	49.040	1.279	47.991	2.101	1.049	2.228	0.01%	2.1%	1.022
45	100	74	49.059	1.277	48.080	1.968	0.980	2.160	0.02%	2.0%	1.020

Grade Range		Number	1/2 core Pb_%		1/4 core Pb_%		Difference			Relative	
Min	Max	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	Differenc	Ratio(X/Y)
0	10	78	0.671	0.991	0.596	0.850	0.075	0.376	8.25%	11.2%	1.126
0.1	10	49	1.023	1.111	0.900	0.951	0.123	0.469	7.29%	12.0%	1.137
0.2	10	29	1.636	1.077	1.431	0.912	0.204	0.599	7.70%	12.5%	1.143

Grade Range		Number	1/2 core Zn_%		1/4 core Zn_%		Difference			Relative	
Min	Max	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	Differenc	Ratio(X/Y)
0	10	78	1.476	1.950	1.252	1.845	0.223	0.623	0.2%	15.1%	1.178
0.5	10	42	2.465	2.218	2.204	2.092	0.261	0.831	4.8%	10.6%	1.118
1	10	25	3.548	2.303	3.318	2.066	0.230	1.036	27.8%	6.5%	1.069

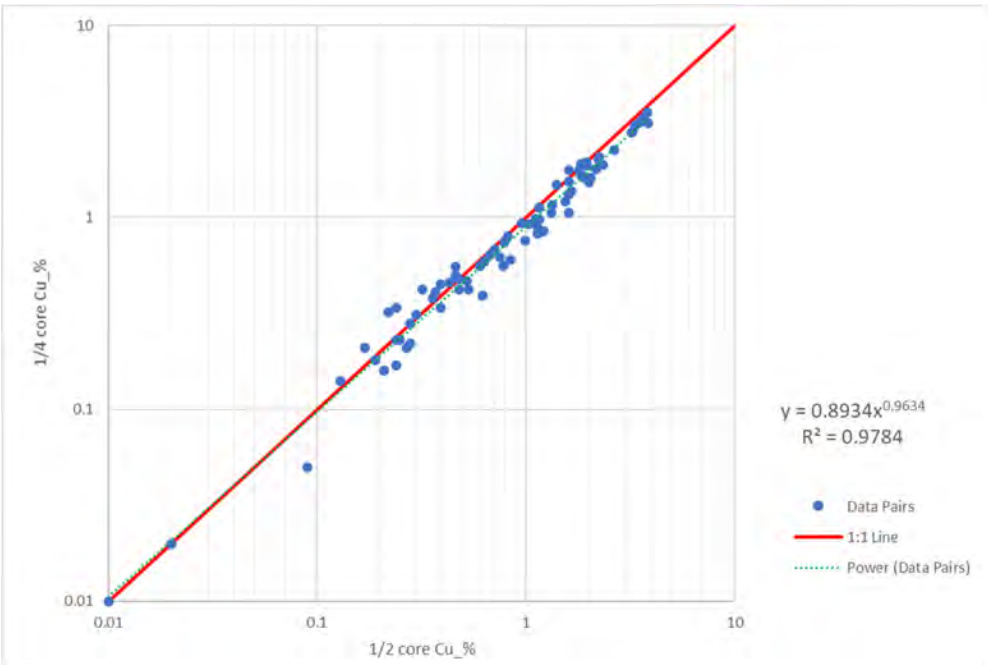


Figure 12-1: Logarithmic plot comparing the copper assays of half and quarter core splits (Noble & Barrero, 2022).

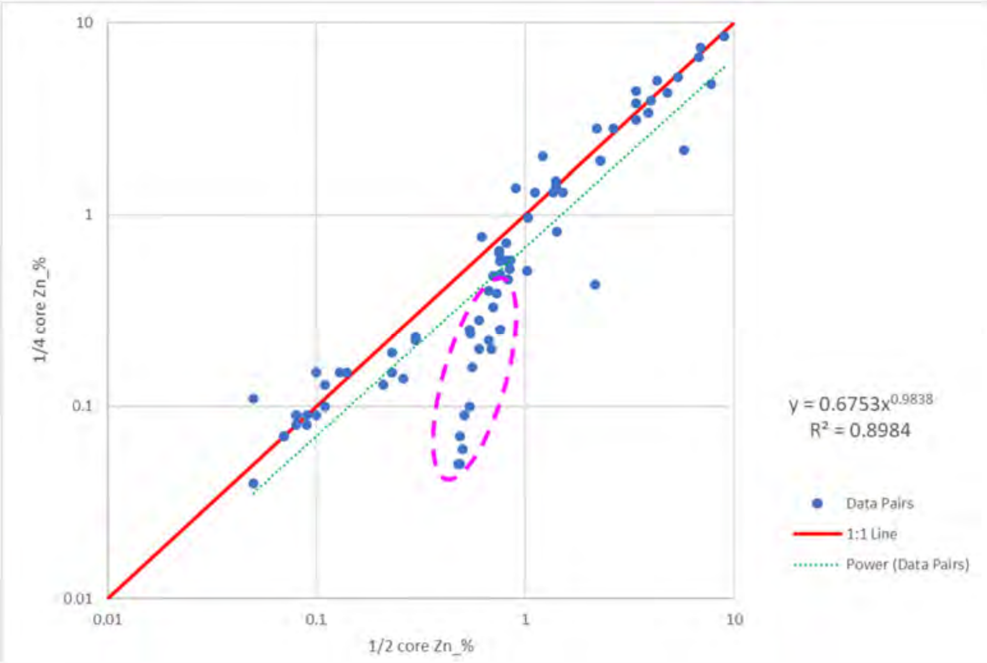


Figure 12-2: Logarithmic plot comparing the zinc assays of half and quarter core splits (Noble & Barrero, 2022).

12.1.4 San Antonio Historical QC Data

QC measures on historical core samples of San Antonio drilling have been extracted from legacy reports (RTZ Consultants Limited, 1974). The statistics of copper and sulfur assays of the crushed duplicate pairs show no statistically significant bias between the pairs, as summarized in Table 12-2.

Table 12-2. Historical crushed duplicates (Noble & Barrero, 2022)

Historical San Antonio crushed duplicates (RTZ Consultants Limited,1974)								
Primary	Duplicate	Count	Average Primary (ERT)	Average Duplicate (RTZC)	Mean Diff (ERT-RTZC)	Std Dev Diff	Relative Diff	t-dist[1]
Cu_P	Cu_D	9	2.006	2.053	-0.0478	0.276	-2.4%	62.0%
S_P	S_D	9	39.580	38.567	1.0133	1.532	2.6%	8.8%

[1]A t-test value less than 5% indicates that the difference is statistically significant from zero.

Check sampling was carried out on core splits to determine if there was a significant difference between the two halves of the core. The data pairs do not show a statistically significant difference, as summarized in Table 12-3.

Table 12-3: Historical check assays on core splits (Noble & Barrero, 2022)

Historical San Antonio check assays on core splits (RTZ Consultants Limited,1974)											
Grade Range		Number	Cu_% (ERT)		Cu_%(RTZC)		Difference			Relative	Ratio(X/Y)
Min	Max	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-dist[1]	Difference	
0	10	7	2.61	1.57	2.54	1.49	0.07	0.27	52%	2.63%	1.03
0	2	4	1.44	0.31	1.47	0.55	-0.03	0.33	87%	-2.09%	0.98
2	10	3	4.17	0.91	3.97	0.93	0.20	0.09	15%	4.80%	1.05

[1]A t-test value less than 5% indicates that the difference is statistically significant from zero.

12.1.5 Results of Internal Duplicate Samples

The geology department prepares duplicate samples of RC cuttings as an independent QA/QC procedure from the internal QA/QC done at the Atalaya laboratory. The duplicate pairs for the Cerro Colorado drilling assay data between 2018 and 2021 show no statistically significant bias between the pairs, either on an overall basis or within grade ranges, except for the assays below 0.1% Cu, as summarized in Table 12-4.

Table 12-4: Statistical Summary of Duplicate Samples Prepared by Geology Department (Noble & Barrero, 2022)

Grade Range		Number Pairs	Primary Sample % Cu		Duplicate Sample %Cu		Difference			Relative Difference
Minimum	Maximum		Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	
0	0.1	100	0.033	0.025	0.030	0.022	0.003	0.011	2%	8.4%
0.1	0.2	24	0.149	0.034	0.154	0.047	-0.005	0.028	41%	-3.3%
0.2	0.5	36	0.328	0.071	0.325	0.106	0.003	0.089	85%	0.9%
0.5	100	62	1.488	1.353	1.376	1.191	0.112	0.475	6.9%	7.5%
0	100	222	0.499	0.947	0.467	0.852	0.032	0.257	6.2%	6.5%
0.1	100	122	0.882	1.145	0.825	1.019	0.057	0.345	7.3%	6.4%

The results are shown graphically in Figure 12-3. Three outliers are observed in these data; these are likely the result of a misplaced decimal point or bad coding. It is recommended that Atalaya re-assay the entire batch that included these samples to resolve the question.

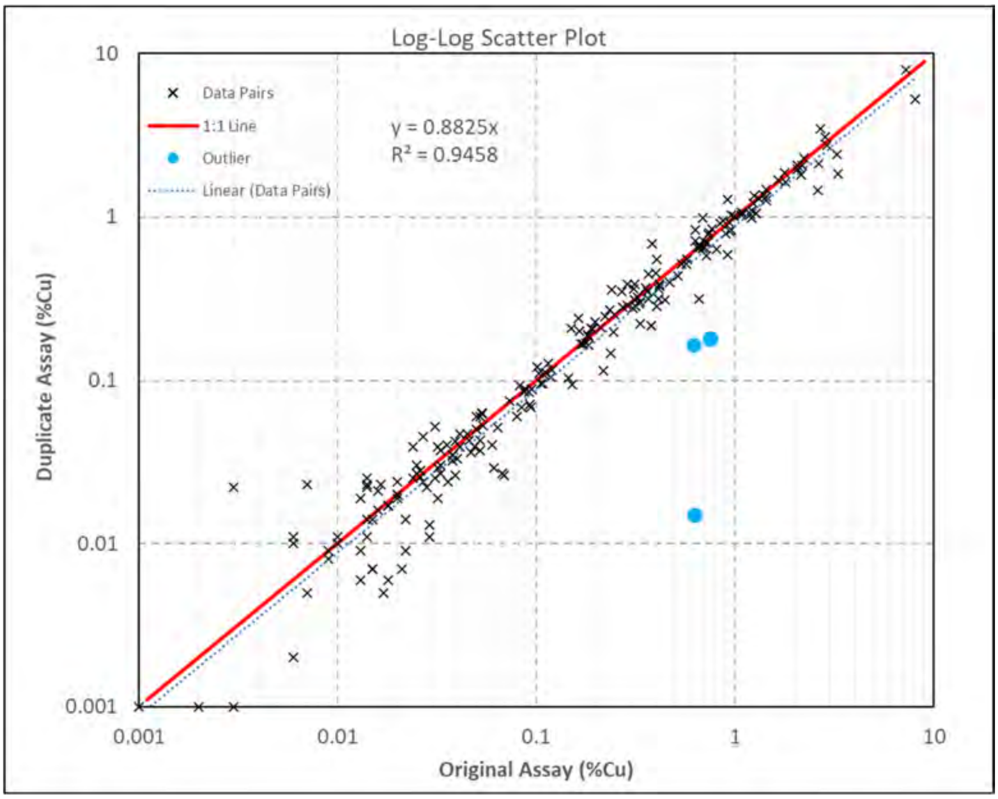


Figure 12-3: Internal duplicate assays (Noble & Barrero, 2022)

12.1.6 Results of Certified Reference Materials (CRMs) and blanks

Five CRMs prepared by Geostats Pty Ltd, of O'Connor, WA, Australia were used by the Exploration Department of Atalaya to routinely monitor assay quality control of the in-house laboratory. The results of the 2018–2021 reference assays, as summarized in Table 12-5, suggest that the Atalaya laboratory copper grades average slightly lower than the reference assays. Although the differences are statistically significant for three of the five standards, the relative differences are small and do not have practical significance for resource estimation.

Although reference assays are not available for the blanks, all assays are very low grade, with an average of 0.011% Cu in 419 assays.

Table 12-5: Summary of Certified Reference Sample Results from the Atalaya Riotinto Laboratory (Noble & Barrero, 2022).

Certified Control Values (Geostats Pty) (Cu ppm)				Atalaya In-House Assay			Difference Statistics (Control-Atalaya)			
Geostats Number	Number Assays	Grade Cu ppm	Std. Dev.	Number Assays	Grade Cu ppm	Std. Dev.	Diff.	Std Dev of Diff.	t-test	% Rel Diff
GBM316-10	78	0.4554	0.0146	343	0.445	0.014	-0.011	0.002	0.00%	-2.4%
GBM906-10	66	0.1916	0.0081	157	0.191	0.010	-0.001	0.001	62.32%	-0.3%
GBM910-5	89	0.7952	0.0089	137	0.767	0.023	-0.028	0.002	0.00%	-3.5%
GBM910-6	87	1.0084	0.0309	103	0.970	0.025	-0.038	0.004	0.00%	-3.8%
GBM914-5	148	1.292	0.0501	45	1.307	0.048	0.015	0.008	7.52%	1.2%
			Total	785						
Welsh's t-Test is used, assuming unequal variances. The difference is significant with t-test values less than 5%.										

12.1.7 Results of External Duplicate Samples

Starting in December 2016, duplicate samples are submitted periodically to ALS (Omac) laboratory in Ireland. AGQ laboratory in Sevilla, Spain, and the Alex Stewart International laboratory in Bilbao were used as umpire laboratories in the past. Since 2018, ALS is the main external umpire laboratory.

Since August 2018, a total record of 800 duplicate samples are available in 8 lots. Paired statistics for the samples are summarized in Table 12-6. The results are shown graphically in Figure 12-4. These statistics show that all lots are within acceptable tolerances for resource estimation.

Table 12-6: Summary of External Sample Results by lot and by grade range (Noble & Barrero, 2022)

Lot	Number	External Lab %Cu		Riotinto %Cu		Difference			Relative
	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	Difference
ALS Aug 2018	100	0.346	0.498	0.344	0.488	0.003	0.044	56.6%	0.7%
ALS Dec 2018	100	0.354	0.535	0.370	0.562	-0.016	0.047	0.1%	-4.5%
ALS Octb 2019	100	0.416	0.527	0.399	0.509	0.016	0.041	0.0%	3.9%
ALS Feb 2020	101	0.268	0.424	0.269	0.410	-0.001	0.022	70.7%	-0.3%
ALS June 2020	100	0.332	0.399	0.335	0.406	-0.003	0.021	10.5%	-1.0%
ALS Sept 2020	100	0.312	0.517	0.311	0.526	0.001	0.050	79.7%	0.4%
ALS Dec 2020	99	0.258	0.385	0.244	0.368	0.014	0.022	0.0%	5.4%
ALS April 2021	100	0.217	0.387	0.212	0.377	0.004	0.015	0.5%	2.0%
All Lots	800	0.313	0.463	0.311	0.463	0.002	0.036	8.7%	0.7%

Grade Range		Number	External %Cu		Riotinto %Cu		Difference			Relative
Minimum	Maximum	Pairs	Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	Difference
0	0.1	332	0.036	0.028	0.039	0.030	-0.002	0.015	0.3%	-6.9%
0.1	0.2	123	0.142	0.029	0.143	0.030	-0.001	0.015	38.0%	-0.8%
0.2	0.5	196	0.320	0.088	0.315	0.087	0.005	0.026	1.2%	1.5%
0.5	100	149	1.061	0.627	1.049	0.636	0.012	0.074	4.4%	1.2%
0	100	800	0.313	0.465	0.311	0.463	0.002	0.036	8.7%	0.7%
0.1	100	468	0.509	0.525	0.503	0.525	0.006	0.046	0.9%	1.1%

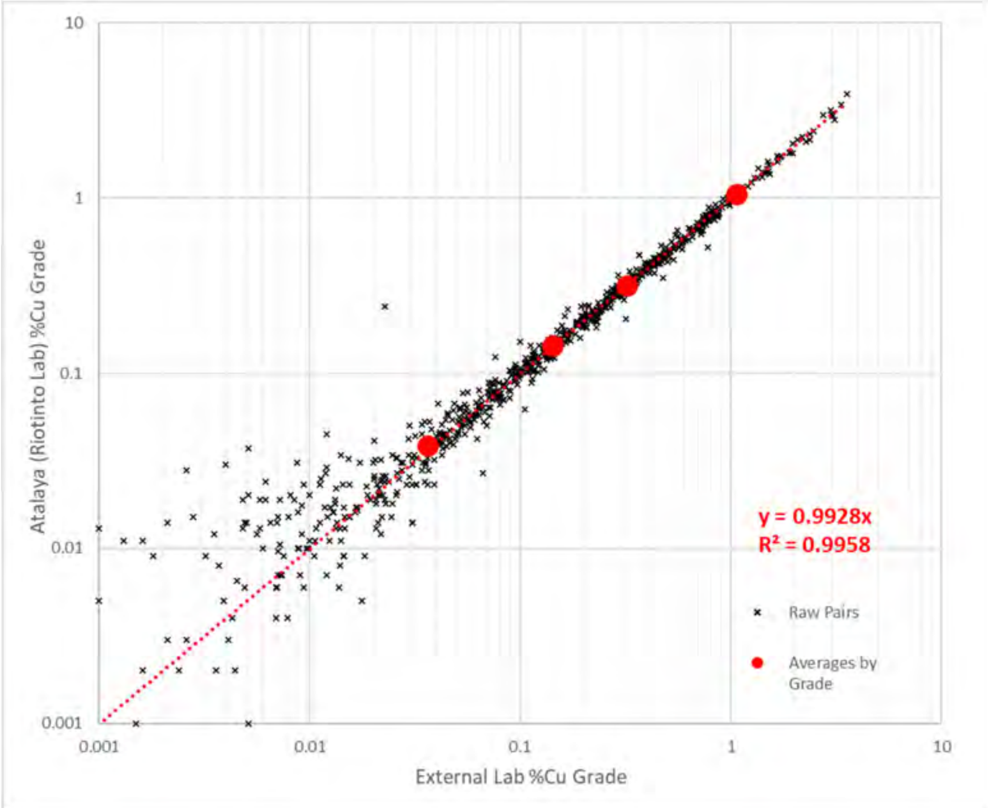


Figure 12-4: Duplicate Assays at External Labs: August 2018 to April 2021 (Noble & Barrero, 2022)

12.2 Geological Data

The geological data and interpretation were updated by project geologists in conjunction with Dr. Daniel Arias Prieto. The geologic model was reviewed and was determined to be reliable for resource and reserve estimation.

12.3 Drill Hole Database

The drill-hole database started with historical electronic data files from historical mining. The historical data were extensively checked in conjunction with AMC mining consultants. During this review process, drill-hole location, downhole surveys, geologic logging, and assays were checked against the original paper documents. A number of minor errors were corrected in the electronic data, which is currently maintained in the RecMin/Datamine resource estimation system.

Additionally, in 2021 historical drilling data from San Dionisio and San Antonio was verified by Monica Barrero Bouza and Alan Noble against an extensive record of historical documentation that remains from previous mining operations and exploration.

Data from newer drilling by Atalaya are added using well-established procedures that minimize data entry errors. The drill hole database is regarded as reliable for resource estimation.

12.4 Density Data

Density for Cerro Colorado is estimated from sulfur data using a formula established by Riotinto.

San Dionisio density formula has been derived by Alan Noble from sulfur assays of density samples performed on core pieces from current drilling.

Regarding San Antonio, there is no density data available from current drilling. The density formula for San Antonio was derived by Alan Noble based on historical density data from combined sulfur and zinc data.

More details on density estimation are discussed in Section 14. The use of sulfur grades to estimate density is regarded as reliable for resource estimation.

12.5 Topographic Data

The pre-mining topography of Cerro Colorado was provided by Atalaya as an AutoCAD drawing that contained topographic contours and other elevation data. The initial topographic interpretation was based on aerial photogrammetry with a flight date of April 2010, and was prepared by INVAR, S.L. of Sevilla, Spain.

As mining has progressed, the mine survey department has conducted in-pit surveys and has modified the topographic drawing to reflect the mining progress at the end of each month. The end-of-year topographies are based on aerial photogrammetry with a flight. The end-of-year topographic data were provided for 2015, 2016, 2017, 2018, 2019, and 2020 for use in this report.

The pre-mining topography of San Dionisio is not available. Atalaya provided current Atalaya pit topography as elevation data and break lines. It is important to note that pumping in the pit ceased in 2005, and since then, water levels have fluctuated above the ultimate pit bottom at around 139.1 m elevation. The 2005 topography before the cessation of pumping is not available. In 2021 the average in-pit water level was around 241.7 m elevation. The topography below the water table hasn't been updated.

The pre-mining topography of San Antonio is only available for the west part of Planes. Current topography has been extracted from Digital Elevation Model data of the Spanish National Geographic Institute[19] dated in 2015.

12.6 San Dionisio Water Volume

Atalaya in-pit water volume and water inside the underground development of Alfredo Mine below the water table has been calculated assuming the current water level at 241.7 m elevation.

In-pit water volume was calculated as the volume enclosed by the current Atalaya pit topography below the 241.7 m elevation. The water inside the underground workings below the mentioned elevation was computed using the mined-out block model (Table 12-7).

[19] Instituto Geográfico Nacional (IGN): http://centrodedescargas.cnig.es/CentroDescargas/index.jsp

Table 12-7: Calculated water Volumes (Noble & Barrero, 2022).

	Volume (m^3)
In-pit water	5,925,346
Water in UG workings	431,241
Total Water Volume below 241.7m elevation	6,356,587

13. MINERAL PROCESSING AND METALLURGICAL TESTING

This section was compiled by Atalaya Mining technical staff and reviewed by Jaye Pickarts, P.E. who is a Qualified Person for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

13.1 Summary

From 1995 to 2001 the Riotinto concentrator processed ore with similar characteristics to what is processed today. In that period a total of 23.9 Mt of ore at an average 0.54% Cu were processed, which generated information that was used to develop the design criteria and startup plan for the current operation. The old concentrator initially processed 4.5 Mt/y of ore, and an expansion increased the concentrator processing capacity to 7.3 Mt/y in 1997; a peak annual throughput of 9 Mt/y was achieved in 1998.

Metallurgical testwork results and current plant performance indicate that Riotinto ore is amenable to conventional crushing, grinding, froth flotation, dewatering, and filtering processes. The ore for the current operation is mined from 5 different zones (CCW, Isla, Salomon, Lago, and QUEB), with different but acceptable metallurgical performance variability when processing it with conventional flotation machines and Isopropyl Ethyl thiocarbamate (IPETC)-based chemistry at basic pH of over 10.5. The optimum target P_{80} in the flotation feed has been set to 175-200 microns as a compromise between copper recovery and throughput.

Recently, additional testwork has been commissioned to reduce key areas of technical risk when expanding the capacity of the plant. This includes:

1. Additional comminution design testwork to estimate specific energy consumption and aid the design of expanded crushing and comminution circuits;
2. Bulk solids flow testwork to support the design of ore storage and transport systems;
3. Flotation testwork to be used in conjunction with operating plant flotation performance to support flotation circuit design;
4. Concentrate rheology testwork be used in conjunction with operating plant thickening performance to support the design of concentrate thickening facilities; and
5. Concentrate filtration testwork to be used in conjunction with operating filtration performance to support the design of additional filtration capacity.

The following sections discuss the testwork in more detail.

13.2 Comminution Energy Consumption

Specific energy consumption for different ores was gathered during the previous Riotinto mine's operation, and it was expected that the new ore to be milled would have similar energy requirements – an assumption that was confirmed after the current operation started.

The overall plant energy consumption in the past, including crushing, grinding, flotation, filtering, water system, and tailings, was at around 21 to 23 kWh/t. Historical data shows that about 78% of the unit energy consumption was drawn by the crushing and grinding stages, about 16.7 to 18.2 kWh/t.

The design criteria and equipment specifications for the rehabilitated plant and for the expansion to 9.5 Mt/y were based on historical performance, laboratory and pilot plant test-work, and computer simulations.

The 9.5 Mt/y expansion was based upon a ball mill and rod mill work index between 14 and 16 kWh/t, a crushing work index of 12.5 to 13 kWh/t, and JK Simmet Axb values between 45 to 60. In general, the Riotinto project has a unit energy consumption that can be qualified as average in the copper ores industry, with some maximum and minimum values of 11.3 and 19.8 kWh/t, which have been found to be present about 10% of the total time. The ore types that exhibit high energy consumption are handled using ore blending techniques at the mine and, hence, its impact on processing rate is minimized.

Additional comminution breakage characterization testwork was conducted on samples sourced and selected to estimate the power required and subsequent comminution circuit selection for expansion to 15 Mt/y.

Samples for comminution testwork were selected by Atalaya to represent the expected life of mine (LOM) range of ore hardness. Samples were designated SAG01, SAG02, and SAG03 and were selected from within the mining area as shown in Figure 13-1.

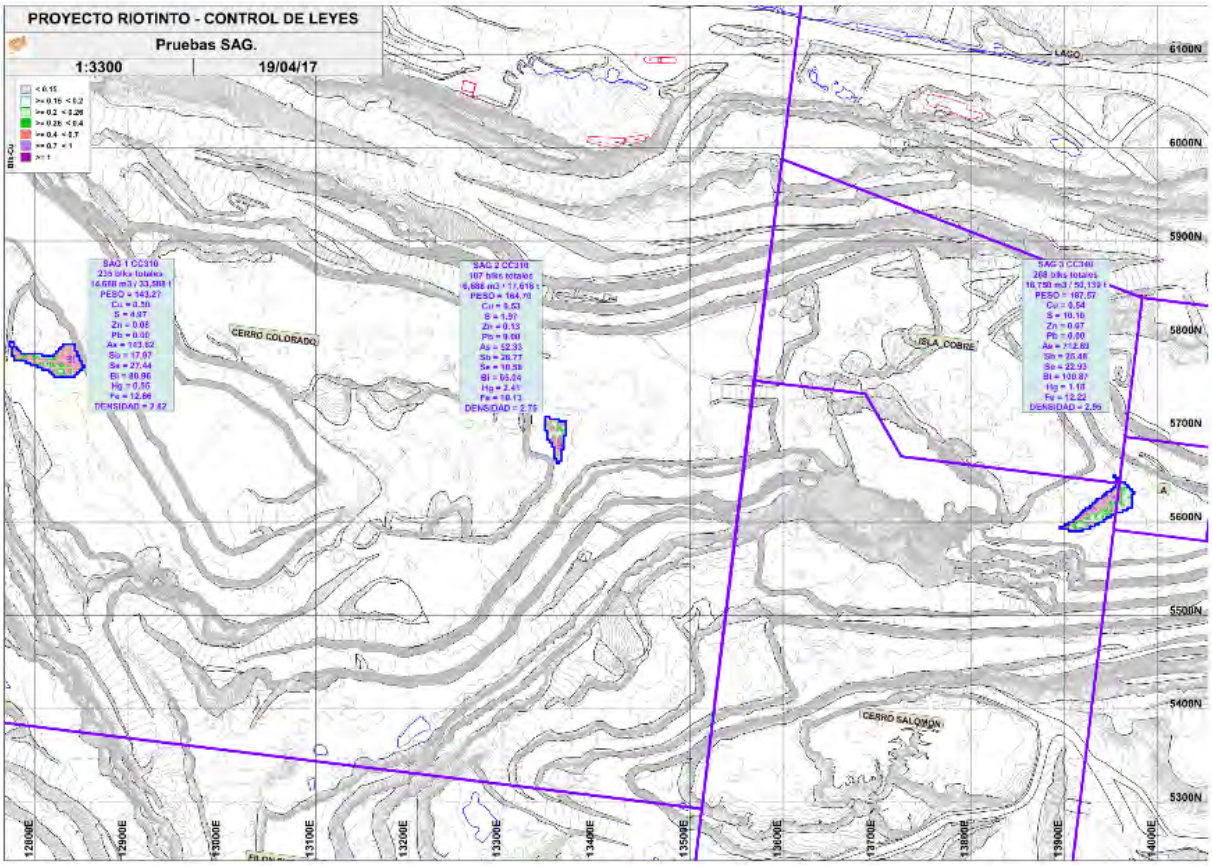


Figure 13-1: SAG Comminution Sample Selection

Atalaya indicated that the typical LOM blend would comprise one-third of each sample type and this was used as the design basis for the comminution circuit design.

The testwork suite was undertaken at SGS, Bureau Veritas (JKTech, SMC Test® Report on Two Samples from Proyecto Riotinto Project. JKTech Job No: 17003/P11, June 2017) and ALS (JKTech, SMC Test® Report on Two Samples from Proyecto Riotinto Project. JKTech Job No: 17003/P38, June 2017) in Perth and included:

- Abrasion Index.
- Bond Rod Mill Work Index.
- Bond Ball Mill Work Index.
- SMC Testing (Duplicate tests for SAG01 and SAG02).

Results of the testwork are summarized in Table 13-1.

Table 13-1: SAG Comminution Results

Item	Unit	Sample					Design
		SAG01		SAG02		SAG03	
Ai		0.18		0.11		0.189	0.18
BWi	kWh/t	19.8		20.8		12.86	17.8
RWi	kWh/t	21.4		21.8		12.98	18.7
DWi	kWh/m³	7.98	8.02	8.13	8.54	5.33	7.22
M_{ia}	kWh/t	21.4	21.4	22.1	22.3	14.6	
M_{ih}	kWh/t	16.4	16.4	17	17.3	10.3	
M_{ic}	kWh/t	8.5	8.5	8.8	9.0	5.3	
A		62.9	59.5	57.1	67.8	63.5	
b		0.56	0.59	0.6	0.49	0.88	
Axb		35.2	35.1	34.3	33.2	55.9	39.9
SG		2.82	2.83	2.78	2.86	2.99	
T_a		0.32	0.32	0.32	0.3	0.48	
SCSE	kWh/t	10.8	10.8	10.8	11.2	8.99	

The results indicate that the SAG01 and SAG02 samples are of moderate to high hardness, while the SAG03 sample is relatively soft.

Abrasion indices for all three samples were moderate.

13.3 Bulk Solids Flow Testwork

A dried sample of copper ore was provided to Greentechnical for bulk solids flow testing. The particle size distribution of the sample is presented in Table 13-2.

Table 13-2: Particle Size Distribution of Copper Ore Sample

Screen Size (mm)	Cumulative Passing (%)
6.300	99.74
4.000	92.76
2.000	49.45
1.000	31.49
0.850	28.71
0.500	21.16
0.250	13.76
0.180	10.90
0.106	7.44
0.063	3.09
Base	0.00

The report by Greentechnical (Greentechnical, October 2017) presented detailed results and summaries of mass flowability in funnel storage facilities (Table 13-3) and transfer chutes (Table 13-4).

Table 13-3: Storage Flowability of Samples – Tested Moisture Contents

	Tested Moistures	Flowability	Mass Flow	Funnel Flow
Copper Ore Sample	3%	Fair Flowing	Preferred	Acceptable
Copper Ore Sample	5%	Fair Flowing	Preferred	Acceptable
Copper Ore Sample	7%	Fair Flowing	Preferred	Acceptable

The sample's bulk strength increased as its tested moisture content values increased. The copper ore can be stored in mass flow and funnel flow storage facilities, if designed correctly.

The most suitable feeder selection for a bulk stream containing a high percentage of fines would be vibrating or belt feeders (note, only for maximum lump sizes < 75 mm). Vibrating feeders can be used, and their selections are dependent on the -4 mm size fraction and the operating moisture. The flow functions have inclination angles less than 15° which indicates that the material is not sensitive to vibration and, therefore, vibrating feeders would work efficiently. The recommended liner for bins or hoppers is VRN-500 or ceramics.

Table 13-4: Chute Flowability of Samples – Tested Moisture Contents

	Tested Moistures	Flowability	Dead Boxes
Copper Ore Sample	3%	Fair Flowing	Acceptable
Copper Ore Sample	5%	Cohesive	Acceptable
Copper Ore Sample	7%	Cohesive	Acceptable

Transfer chutes can be designed with dead boxes, but careful consideration should be given in terms of build-up angles, material velocities, and bulk stream particle size distributions. For bulk streams with a high percentage of fines (-4 mm and lower), sliding or diverter-type chutes are the better option.

It was concluded that VRN-500, CB8000, and ceramic liners produced similar chute friction characteristics. The polyurethane liner produced the lowest chute friction values and can be used for sliding applications, although direct impact onto polyurethane liners should be avoided. For a bulk stream impacting directly onto a chute surface, the first choice is material on material, otherwise VRN-500, Hardox-450 or CB8000. For sliding wear, VRN-500, Hardox-450, or ceramic liners should be considered.

Liner ledges should be minimized and round corners should be installed for transfer chutes. As a general rule, for a bulk stream containing larger lumps and fines, the bulk stream's impact angle relative to the impact surface should not be greater than 35˚ unless proved otherwise with chute velocity calculations. For fines and duff chutes, Rio Carb (Ultra Smooth), Tivar-88, or polyurethane liners should be considered, and the bulk stream's impact angle relative to the impact surface should not be greater than 20˚, unless proved otherwise with chute velocity calculations. A duff or fines chute should also have rounded corners and should be set at 70–90 degrees with the horizontal.

13.4 Flotation Testwork

Extensive flotation optimization testwork was carried out on ore samples from the Riotinto mine during 2015. Five ore samples were tested (CCW, Isla, Salomon, Lago, and QUEB). Portions of Isla, Salomon, Lago, and QUEB were combined to form Composite 2, while ore from CCW formed Composite 1. Most of the flotation optimization testwork was done on Composite 2, and the best condition was used as a basis for the optimization testwork on Composite 1.

Tests were performed on the individual samples to develop particle size distributions, mineralogical analyses, grindability indices, and locked cycle flotation tests. The main objective of the flotation testwork was to optimize the flotation conditions for maximum copper recovery at concentrate grades greater than 20% Cu. Locked cycle testing of Composites 1 and 2 resulted in a Cu recovery between 85% to 90% at a concentrate grade between 22% and 26% Cu.

In addition to these external tests, Atalaya Mining undertook a comprehensive series of metallurgical tests at its laboratories from October 2014 to August 2015. These tests confirmed the results obtained by the external laboratory and confirmed historical data and metallurgical parameters used at the former processing plant. Additional flotation testwork is ongoing to maintain optimal conditions in the plant.

Analysis of historical metallurgical performance and its comparison to current plant performance and current metallurgical testing confirms that the samples selected for metallurgical testing represent the ore body well.

The current phase 1 has been producing copper concentrates since early August 2015 and has been operating on steady state at an equivalent processing rate of 4.8 Mt/y since November 2015. Metallurgical performance has been in line with the production indicated by historical records and with the testwork results. These results and the metallurgical testing have confirmed the decision of Atalaya Mining to process the Riotinto ore using froth flotation.

Current knowledge of the open-pit zones allows the processing of selected ore zones to maintain deleterious elements in concentrates as per agreements with clients. Metallurgical testing specifically designed to depress Fe and As has shown positive results.

13.5 Concentrate Rheology Testing

In February 2015, slurry flow behavior and concentrate characterization tests for two composites were performed by specialized laboratories. Table 13-5 summarizes the results obtained.

Table 13-5: Concentrate Properties for two Atalaya mining Samples

Property Tested	Composite 1 U/F	Composite 2 U/F
Solids density (gas pycnometer)	2851 kg/m3	3435 kg/m3
d90 particle size	28.0 µm	28.5 µm
d50 particle size	4.7 µm	3.5 µm
% + 75 µm	2.2	3.7
Average slurry pH at 25°C	9.2	9.1
Average slurry temperature	21.5°C	21.6°C
Conductivity	0.4 mS/cm	0.7 mS/cm
Freely settled bed packing concentration, Cbfree	32.3%v or 57.7%m	22.6%v or 50.1%m

Table 13-6 shows the correlations used to calculate the plastic viscosity and the yield stress for the two slurries tested.

Table 13-6: Plastic Viscosity and Yield Stress

Slurry Name	Bingham Plastic Model	
	Plastic Viscosity	Bingham Yield Stress
Composite 1 U/F	Applicable mass solids concentration range: 48% m < C < 63% m	
	$K_{BP} = \mu_w + 81.89\ C^{13.12}$	$t_y = 225.1 \times 10^3\ C^{15.64}$
Composite 2 U/F	Applicable mass solids concentration range: 46% m < C < 59% m	
	$K_{BP} = \mu_w + 18.37\ C^{9.38}$	$t_y = 103.68 \times 10^3\ C^{12.68}$

Data from the previous operation were used to develop the project´s design criteria. The concentrate thickener was designed to meet the following process parameters shown in Table 13-7.

Table 13-7: Concentrate Thickener Parameters

Description	Value
Design Feed Rate ($t/h/m^2$)	0.25
Feed Rate (t/h)	31 (total for 2 thickeners)
Feed Percent Solids (%)	16%
Underflow Percent Solids (%)	58%
Number of Thickeners	2

13.6 Concentrate Filtration

Concentrate filtration tests are summarized in Table 13-8 and Table 13-9.

Table 13-8: Campaign 1 Filtration Tests

Filtration Tests	Composite 1		Composite 2	
Pressure Filter	40 mm cake	55 mm cake	40 mm cake	55 mm cake
Form time @ 3 bar (minutes)	8	12	11	25
Cake moisture @ 3 bar (%m)	26.4	26.2	26.5	25.9
Form time @ 6 bar (minutes)	8	7	11	25
Cake moisture @ 6 bar (%m)	25.5	25.4	24.5	24
Dry cake bulk density (t/m3)	1.5	1.5	1.6	1.6
Number of presses	3	3	3	3
Number of plates per press	110	110	110	115

Table 13-9: Campaign 2 Filtration Tests

Description	Value	Value
Initial Slurry Concentration (g/l)	773	515.6
Filtration Time (min)	6.6	15.6
Drainage Aspect	Clean	Semi clear
Blowing time (min)	1.25	3
Working Pressure (bar)	2	16
Specific Gravity (g/cm3)	2.82	2.82
Moisture (%)	16.0	14.5

Both campaigns found high cake moisture, but Atalaya believes this was due to poor laboratory filter performance. The filter presses at the plant are delivering consistent moisture content, within specifications, at around 9 to 10%.

13.7 Tailings Testing

Tailings settling tests were performed by laboratories in Spain. Laboratory results show that the solids compacted after 2 weeks reach about 67% solids, when settling slurries at 30 to 40%, as per Figure 13-2 below (Golder, July 31, 2015)

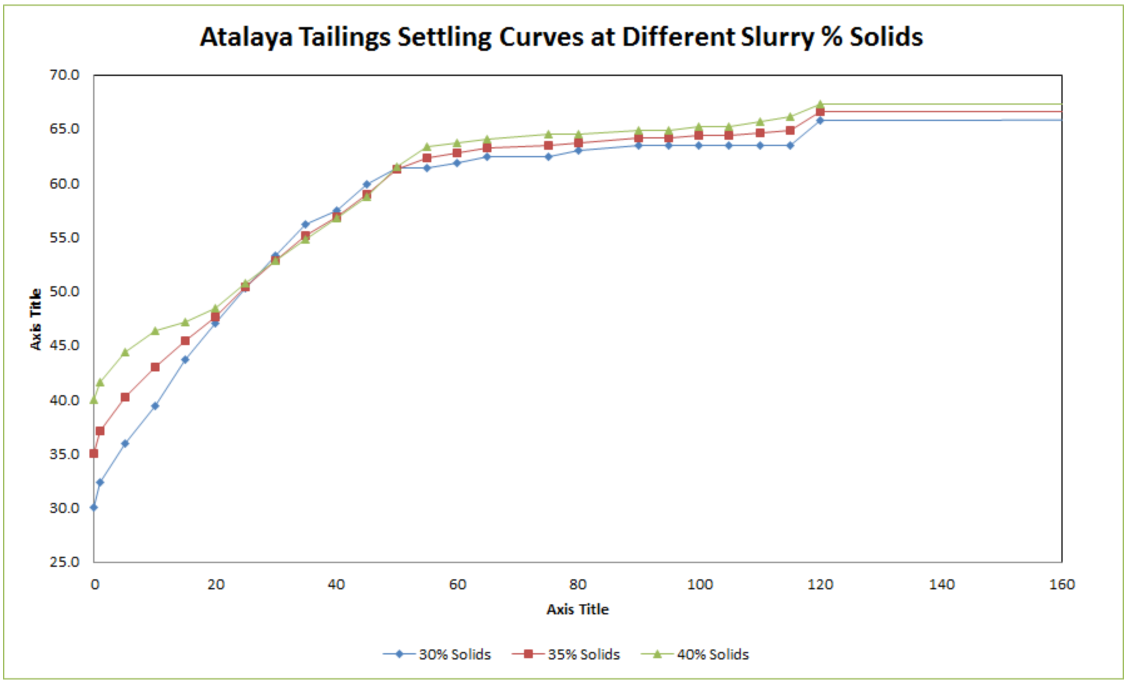


Figure 13-2: Settling curves and final compacted solids for Atalaya Tailings (Golder 2015)

Table 13-10 shows the size distribution for tailings as per February 2015 tests. (Golder, July 31, 2015, Technical Memo).

Table 13-10: Atalaya Tailings Particle size distribution

Tamaño de Malla	Retenido en Tamiz (gr)	% en Peso de la Fracción Retenida	% Rechazo Acumulado	% Paso Acumulado
+ 16	1.60	1.60	1.60%	98.40
+ 20	0.90	0.90	2.50%	97.50
+ 30	0.60	0.60	3.10%	96.90
+ 40	1.20	1.20	4.30%	95.70
+ 50	1.50	1.50	5.80%	94.20
+ 70	9.20	9.20	15.00%	85.00
+ 100	5.40	5.40	20.40%	79.60
+ 140	15.60	15.60	36.00%	64.00
+ 200	11.60	11.60	47.60%	52.40
+ 270	7.30	7.30	54.90%	45.10
+ 325	6.60	6.60	61.50%	38.50
+ 400	2.50	2.50	64.00%	36.00
- 400	36.00	36.00	< 37	
	TOTAL:	100.00	Gramos.	

Golder, Applus, Eptisa and Atalaya have developed geotechnical tests and reviewed geotechnical conditions of the current tailings facility. Table 13-11 (Applus, August 2015) present a summary of the geotechnical parameters determined during 2014 and 2015, where γ is the tailings density, Kvsat is the vertical hydraulic conductivity, Cv is the consolidation coefficient, ϕ is the internal friction angle and C is the cohesion.

Table 13-11: Geotechnical Parameters

	γ (kN/m^3)	K_{vsat} (m/s)	C_v (cm^2/dia)	E_m (MPa)	ϕ' (º)	c' (kPa)
Arenas Cobre	21,00	10^{-7}	$1,2*10^{5}$	$30*\sigma'$	32	0
Arenas Gossan	21,00	10^{-7}	$1,2*10^{5}$	$40*\sigma'$	33	0
Lamas Cobre	20,00	$2,5\text{-}3,5*10^{-8}$	$1,5*10^{4}$	$50*\sigma'$	33	0
Lamas Gossan (Aguzadera)	20,00	$2,5\text{-}3,5*10^{-8}$	$1,5*10^{4}$	$50*\sigma'$	33	0
Escollera	24,00	---	---	134	33	0
Núcleo	20,70	$3*10^{-8}$	$1,94*10^{2}$	75	35	20
Gossan	19,90	$3*10^{-8}$	$1,3*10^{7}$	50	35	12
Pizarras	26,00	10^{-11}	---	5890	40	200

MATERIAL	DENSIDAD (kN/m^3)	CONDUCTIVIDAD HIDRÁULICA VERTICAL (Kvsat)(m/s)	ÁNGULO DE FRICCIÓN INTERNO (º)	COHESIÓN (kPa)
Arenas Cobre	21 *(21,00)*	$1*10^{-7}$ *($1*10^{-7}$)*	32 *(32)*	0 *(0)*
Lamas Cobre	20 *(20,00)*	$3*10^{-8}$ *($2,5\text{-}3,5*10^{-8}$)*	33 *(33)*	0 *(0)*
Escollera	24 *(24,00)*	Muy permeable($>1*10^{-3}$)	33 *(33)*	0 *(0)*
Material de núcleo y Gossan	20,3 *(Núcleo: 20,70)* *(Gossan: 19,90)*	$3*10^{-8}$ *(Núcleo: $3*10^{-8}$)* *(Gossan: $3*10^{-8}$)*	35 *(Núcleo: 35)* *(Gossan: 35)*	16 *(Núcleo: 20)* *(Gossan: 12)*
Pizarras (cimentación)	26 *(26,00)*	$1*10^{-11}$ *($1*10^{-11}$)*	40 *(40)*	200 *(200)*
Lodos alta densidad (proyectados)	20 *(20,00)*	$3*10^{-8}$ *($2,5\text{-}3,5*10^{-8}$)*	33 *(33)*	0 *(0)*

13.8 Polymetallic Testwork

A preliminary metallurgical investigation of the polymetallic resources from the San Antonio and San Dionisio was started in 2020. As described in Chapters 7 and 14, these deposits contain potentially economically recoverable base metals, lead, and zinc, in addition to copper, silver, and gold. The primary ore minerals are chalcopyrite, galena, sphalerite with minor amounts of tetrahedrite, covellite, and other copper complex minerals. Many of which are associated or encapsulated in pyrite.

Historical metallurgical testwork evaluated bulk sulfide and differential flotation. The presence of pyrite encapsulation required a fine grind in the range of d80 20–30 microns, in order to liberate the ore minerals. While bulk sulfide flotation produced recoveries in the 70–90% range, concentrate grades remained very low due to the inability to selectively recover only the ore minerals.

13.9 Historical Polymetallic Testwork

The previous testwork focused on the liberation of the copper, lead, and zinc values from the ore. A mineralogical investigation shows that the chalcopyrite, galena, sphalerite, and pyrite are closely intermingled and that a fine grind of d80 20/30 microns will be required before the individual values can be recovered. These initial results were poor but did provide data for future testwork.

The first laboratory studies of the massive polymetallic sulfides of Masa San Dionisio and San Antonio, were made by ESPINDESA, which reached the following conclusions:

- By employing differential flotation, it is impossible to produce a lead concentrate because the lead is evenly distributed between the concentrations of copper and zinc.
- Bulk flotation using a sulfite oxidant to control the activation of pyrite achieved the following results:

Grade, %			Recovery, %		
Cu	Pb	Zn	Cu	Pb	Zn
11.5	5.5	23.5	85.0	69.0	90.0

Subsequently, when differential flotation was employed using SO_2, the grade had improved but achieved lower recoveries:

		Grade, %			Recovery, %		
		Cu	Pb	Zn	Cu	Pb	Zn
San Dionisio:	Cu Conc	22.0	0.82	1.93	65.0	3.4	2.8
	Pb Conc	10.5	20.0	10.5	13.0	35.0	6.3
	Zn Conc	0.70	2.30	49.0	2.2	10.4	76.0
San Antonio:	Cu Conc	23.5	1.12	2.80	76.0	5.0	5.9
	Pb Conc	1.82	38.0	12.0	1.4	40.6	0.1
	Zn Conc	0.66	2.30	58.0	1.4	6.5	78.0

An additional investigation was completed to evaluate differential flotation, bulk flotation, and bulk-differential flotation on a combined sample. Both the selective differential flotation and the bulk flotation achieved poor results. However, in the bulk differential flotation testwork, bulk flotation was used in the roughers, followed by differential flotation of the rougher concentrate as achieved the following results:

	Grade, %			Recovery, %		
	Cu	Pb	Zn	Cu	Pb	Zn
Cu Conc	24.0	2.5	3.0	60.0	7.1	4.8
Pb Conc	16.0	30.0	8.5	16.2	34.5	12.0
Zn Conc	2.5	3.0	49.0	5.6	7.6	70.0

13.10 Current Testwork

A 2022 metallurgical test program was conducted by Base Met Labs (Base Met labs, March, 2022) to assess the performance of the polymetallic samples using various floatation methods to determine the preliminary metallurgical performance of the ore minerals.

Ore from the San Dionisio deposit were used for this test program, Head assays from the sample are shown in Table 13-12.

Table 13-12: Head Assays (Atalaya 2022)

San Dionisio	Assay, percent or g/t										Cu, Dist. %	
	Cu	Pb	Zn	Fe	S	Au	Ag	As	CuOx	CuCN	CuOx	CuCN
Head 1	1.16	0.83	3.60	36.1	50.7	0.57	32	3784	0.07	0.15	6.3	13.1
Head 2	1.16	0.81	3.60	36.1	48.6	0.64	33	3890	0.08	0.13	6.7	11.6
Average	1.16	0.82	3.60	36.1	49.7	0.61	33	3837	0.08	0.14	6.5	12.3

Copper measured 1.16%, with a small portion present as oxide and secondary copper minerals, as indicated by the CuOX and CuCN sequential assays respectively. The presence of secondary copper in a polymetallic flotation process can cause challenges in selective metal recovery, due to the activation of sphalerite from dissolved copper. Lead and zinc measured 0.8% and 3.6% respectively. Gold and silver measured 0.6 and 33 g/tonne, respectively.

The Bond work index of the sample was moderately soft at 11.5 kWh/tonne. After crushing the samples to minus 3.35 mm, the feed material was ground to a p_{80} of 75 microns and split into four sub-samples. A QEMSCAN analysis showed that the pyrite (87%) was the main mineral with minor amounts of arsenopyrite. The ore minerals included Chalcopyrite (3.07%), Sphalerite (4.94%), Galena (0.88%), as well as other minor coper minerals (chalcocite, covellite, enargite, bornite, and tetrahedrite). The copper sulfides, galena, and sphalerite were locked with the pyrite. Many of the ore minerals were very finely grained and would be difficult to recover into a high-grade concentrate.

A series of rougher flotation tests were completed to determine the general flotation characteristics. As expected, the best results were achieved at a finer grind. The tests were set up sequentially; throughout all rougher flotation testing, the copper selectivity over zinc did not change significantly based on the conditions. The reason for this is thought to be related to the presence of secondary copper mineral and acid-producing potential of the sample, causing sphalerite activation form copper ions in solution. While further optimization in the rougher may provide some difference in selectivity, a bulk rougher showed good selectivity over pyrite and was a suitable first step to reducing mass prior to further processing. The metal losses to bulk rougher tailings would likely be very challenging to recover in subsequent cleaner flotation.

Following the initial rougher tests, additional tests were conducted with a bulk Cu, Pb, Zn rougher, followed by regrinding and selective rougher flotation of a bulk Cu/Pb concentrate, and zinc concentrate. SMBS was used in the regrind and selective rougher stages. Significant improvements to the copper selectivity over zinc were measured, indicating SMBS and fine regrind is a suitable means for rejecting zinc.

Cleaner tests were conducted using the bulk rougher, regrind, and selective rougher tests. The Cu/Pb rougher was cleaned, followed by a copper lead separation with cyanide. Two tests were conducted, at various regrind sizes with the P_{80}, 10µm resulted in improved performance with a final copper concentrate, after Cu/Pb separation, of 23% copper at 48% copper recovery. About 37% of the lead was recovered to the bulk Cu/Pb concentrate. The zinc performance measured 67% zinc recovery at a grade of 49% zinc (Table 13-13).

Table 13-13: Cleaner Test Results (Atalaya 2022)

Product	Test	Mass	Assay – percent or g/t				Distribution - percent			
		%	Cu	Pb	Zn	S	Cu	Pb	Zn	S
Cu/Pb Ro	T07	12.2	7.04	3.44	18.7	41.7	72.1	52.0	65.1	10.7
	T08	10.5	8.0	4.44	13.0	42.1	72.4	57.7	41.7	8.9
Zn Ro	T07	4.5	0.98	0.58	15.4	48.0	3.7	3.2	19.7	4.5
	T08	9.9	1.10	0.66	15.8	47.6	9.4	9.4	47.6	9.5

Lock cycle testing provided the better results, which included a combination of bulk rougher flotation, fine regrinding, and then selective flotation of a combined copper-lead concentrate and a zinc concentrate.

As shown in Table 13-14, the locked cycle test recovered 58 percent of the copper into the final copper concentrate, grading 19% copper. The lead concentrate graded 32% lead at a recovery of 37%. Zinc recovery measured 75% at a concentrate grade of 50% zinc. Silver recovery trended with lead recovery, and silver credits may be payable, particularly in the lead concentrate. Gold recovery was very low, and trended with sulfur recovery, indicating an association with pyrite, possibly in solid solution that would be unrecoverable in flotation. While these data are improved, additional testwork should focus on a sub-10 micron regrind, reagent optimization, and more efficient bulk rougher flotation. An economic trade-off study should also be conducted to determine the financial impacts of these optimizations.

Table 13-14: Locked Cycle Test Results (Atalaya 2022)

Product	Weight	Assay – percent or g/t						Distribution - percent					
	%	Cu	Pb	Zn	S	Ag	Au	Cu	Pb	Zn	S	Ag	Au
Feed	100	1.07	0.79	3.25	51	37.2	0.6	100	100	100	100	100	100
Pb Con	0.9	8.5	31.9	6.0	35	654	0.4	7.4	37	1.7	0.6	16.3	0.7
Cu Con	3.3	18.9	3.1	6.2	41	118	0.3	58.2	12.7	6.3	2.7	10.5	1.5
Zn Conc	4.9	1.4	0.5	49.9	37	75	0.5	6.3	2.9	74.7	3.5	9.9	4.2
Zn 1st Clnr Tls	3.0	0.7	0.6	1.7	52	65	0.7	2.0	2.5	1.5	3.1	5.3	3.4
Zn Ro Tail	25.6	0.22	0.33	0.4	52	17.8	0.64	5.3	10.7	2.9	26.3	12.3	26.5
Bulk Ro Tail	63.2	0.35	0.42	0.66	51.6	26.9	0.63	20.9	33.9	12.8	63.8	45.7	63.8

13.11 E- LIX™ Technology Summary

E-LIX™ is a process for the leaching of refractory minerals such as the primary sulfides of copper, lead, zinc and millerite, in particular chalcopyrite, galena, sphalerite, and millerite. Previous methods for leaching of primary sulfides have been met with extremely slow leaching rates and poor recoveries caused by development of a "passivation layer" on the mineral surface that inhibits further dissolution of the mineral. The E-LIX™ technology incorporates systems to solve both the problem of the passivation layer as well as the slow kinetics, resulting in fast reaction rates with high recoveries and the possibility of selective metal deposition during the leaching of complex, polymetallic sulfides.

The process is primarily focused on the leaching of the primary sulfide minerals mentioned above for copper, zinc, lead, and nickel, but the invention is relevant for primary sulfide minerals of all metals. While many hydrometallurgical processes have been devised for leaching of chalcopyrite, none of the methods for atmospheric temperature/pressure leaching have reached an industrial scale due to feasibility issues at laboratory or pilot stages. Currently, the only industrially viable hydrometallurgical system for processing chalcopyrite is to autoclave at 220ºC and 700 kPa, where water reacts with chalcopyrite to form copper sulfate and sulfuric acid. Because of the high temperatures and pressures, autoclave plants are very costly to build, maintain, and operate; therefore, the industrial use of hydrometallurgy in primary copper mineral processing is currently restricted to secondary copper minerals such as copper oxide.

E-LIX™ is a newly developed electrochemical extraction process developed and patented by Lain Technologies with the financial support of Atalaya. The E-LIX™ process:

- Uses electrochemical methods to dissolve sulfide mineral with use of singular catalysts and physicochemical conditions.
- Allows for the dissolution of chalcopyrite and other primary sulfides while avoiding the passivation of particles.
- Generates zero emissions and does not consume water or acid and runs under mild operating conditions (atmospheric pressure and room temperature).
- Can treat concentrates with high concentrations of penalty elements such as antimony and arsenic.

- Can treat a bulk sulfide concentrate containing a mix of minerals such as copper, zinc, and lead. Compared to differential flotation and smelting, recovery may be increased by 20% to 30%.
- After copper or other metals are brought into solution, they can be recovered by conventional precipitation or solvent extraction followed by electrowinning ("SX-EW").
- Atalaya has an exclusive license to use E-LIX™ in the Iberian Pyrite Belt.

The idea was developed initially for laboratory bench tests and was refined over the years, going through several stages until reaching industrial practicality. The scale was sequentially increased from large laboratory tests to small pilot tests up to, finally, a larger, semi-industrial pilot plant that has been successfully run continuously.

The development was staged as follows:

- Laboratory Stage (Batch discontinuous testing, confirmed the high metals recovery potential and mild operating conditions and set the potential design for a discontinuous operation).
- Small Pilot Plant (Confirmed high recoveries and set key operating cost expectations, proved continuous automatic operation in a single leach tank, copper electroplating was achieved at small scale from solution, pregnant solution was produced for Solvent Extraction (SX) design and basic design parameters for a larger continuous pilot campaign were provided).
- Larger Pilot plant (Designed to prove the industrial concept including production of Cu cathodes (and potentially zinc): achieved continuous operation successfully leaching Copper and Zinc concentrates; it included the leaching steps as well as a small SXEW installation for both Copper and Zinc; it produced high purity Copper and Zinc soluble precipitates and high purity Copper cathodes; it confirmed detailed estimates of future Operating Costs; it provided the basis for a full plant design and a Final Feasibility Study; and it included the flexibility to treat other concentrates, including low grade and complex sulfide materials.

In summary, the E-LIX™ Process is a novel hydrometallurgical method that has shown promising results at a semi-industrial scale for the treatment of copper and polymetallic primary sulfide concentrates. It has achieved high recoveries at fast rates under mild, economically competitive operating conditions. It makes it possible to treat combined polymetallic concentrates, thus increasing overall recoveries considerably versus traditional selective flotation, where recoveries are severely compromised to produce concentrates with sufficiently high grades for smelting. It therefore has potential for significant added value in the case of polymetallic deposits, even possibly making the difference between a deposit being economically feasible or not.

14. MINERAL RESOURCE ESTIMATION

This resource estimate was prepared by Alan C. Noble, P.E. of Ore Reserves Engineering, Lakewood, Colorado USA, and by Monica Barrero Bouza, EurGeol.

- Mr. Noble is a qualified person for resource estimation based on having received a B.S. Degree in Mining Engineering from the Colorado School of Mines, registration as a Professional Engineer in the State of Colorado USA, and over 50 years of experience with resource estimation on over 156 mineral deposits throughout the world. Mr. Noble is independent of Atalaya Mining and Proyecto Riotinto, using all the tests of NI 43-101.
- Ms. Barrero Bouza is a qualified person based on having received a BS Degree in Geology from the University of Oviedo (Spain), registered member of the Official Association of Professional Geologist of Spain (ICOG), registered Eurogeologist, and 25 years of diverse experience in the geology of precious and base metal projects. Ms. Barrero Bouza is independent of Atalaya Mining and Proyecto Riotinto, using all the tests of NI 43-101.

14.1 Cerro Colorado

14.1.1 Mineral Resource Block Model

The mineral resource model for the main mineralized zone of Cerro Colorado was created as a 3-dimensional block model using Datamine Studio RM software. The model block size is 10x10x10 meters, which is consistent with the mining bench height and the estimated selective mining unit. The horizontal extent of the model is defined to cover the Cerro Colorado mineral deposit, plus sufficient space outside the deposit to cover the ultimate pit. Resource model size and location parameters are shown in Table 14-1.

Table 14-1: Cerro Colorado Resource Model Size and Location Parameters (Noble & Barrero, 2021).

	Minimum (ETRS89 meters)	Maximum (ETRS89 meters)	Cell Size (meters)	Number Cells	Model Size (meters)
Easting (X)	711,900	714,750	10	285	2850
Northing (Y)	4,174,900	4,176,500	10	160	1600
Elevation(Z)	0	550	10	55	550

At Filón Sur, the model block size is 5x5x5 meters, which is consistent with the narrow shape of the domains. For estimation purposes, empty models were created for cloritas and massive sulfide domains, initial model size, and location parameters are shown in Table 14-2.

Table 14-2: Filón Sur Resource Model Size and Location Parameters (Noble & Barrero, 2021).

	Minimum (ETRS meters)	Maximum (ETRS meters)	Cell Size (meters)	Number Cells	Model Size (meters)
Easting (X)	711,900	714,750	5	570	2850
Northing (Y)	4,174,900	4,176,500	5	320	1600
Elevation(Z)	0	550	5	110	550

Key items included in the block models are the geologic model zones, flattened XYZ coordinates from Datamine unfolding, copper-grade zone, Mineral Zone code, and resource classification codes. Grades were estimated using inverse-distance-power estimation for copper, sulfur, lead, zinc, antimony, and arsenic. Density was estimated from sulfur grade using the mine's sulfur grade estimation formula.

In addition to the inverse distance (IDP) estimates, values were estimated for all the elements using Nearest-Neighbor-Assignment (NN) for additional validation of the IDP estimates; in the case of copper and sulfur, Nearest-Neighbor-Assignment (NN) and Ordinary Kriging (OK). Other variables include a mined code to identify previously mined blocks, the Datamine search volume code, the number of samples used for estimation, the composite grid-spacing parameter, and the resource classification code.

Initially, "empty" models were created with the dimensions and location parameters that are shown previously in Table 14-1 and Table 14-2.

For resource modeling purposes, three domains were identified: The Mineralized Zone at Cerro Colorado, the Filón Sur massive sulfides, and the Filón Sur cloritas. Geological modeling, data selection, unfolding procedures, and estimations have been done separately within each domain.

A 3D wireframe of the Mineralized Zone Domain (MinZ) was modeled based on digitized NE vertical sections with an approximate spacing of 50m (Figure 14-1). The Filón Sur massive sulfides (MS) and the Filón Sur cloritas were modeled in 3D based on the digitized legacy NE vertical sections and plans with an approximate spacing of 30 m (Figure 14-2). The NW fault, which splits the Mineralized Zone (MinZ) into East and West zones, was modeled based on drill hole data and mapped surveyed points on pit slopes (Figure 14-3). This structure is considered to be an important control on the mineralization.

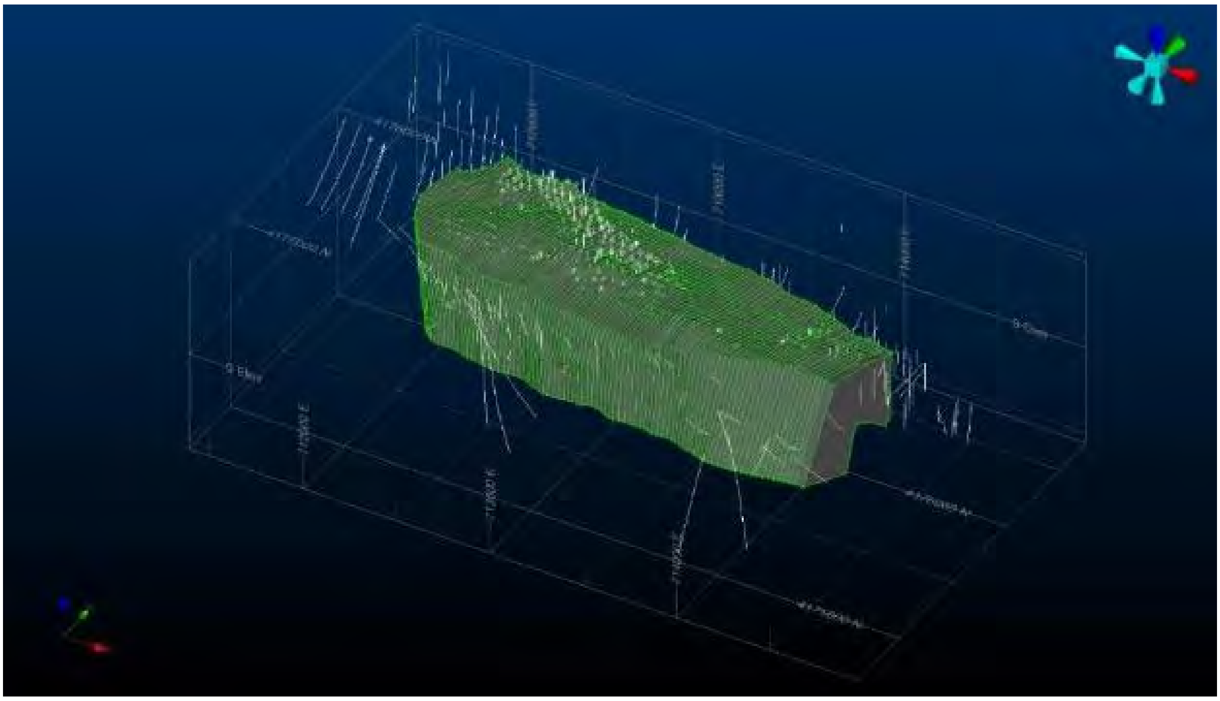


Figure 14-1: 3D view of the modeled Mineralized Zone (MinZ), (Noble& Barrero, 2020)

Experimental variograms of the different elements within the grade zones were created and modeled to define the anisotropy parameters for each grade zone. Inverse-distance power (IDP) interpolation was conducted on each interpolation zone applying the anisotropy parameters. Variogram modelling was performed with SAGE 2001 software[20]. It should be noted that Sage normalizes all variogram sills to a value of 1.00; traditional sills and nugget effect values may be obtained by multiplying the individual structure sill times the overall relative variance

The Datamine UNFOLD process was used to address the folded nature of the deposit. MinZ and Filón Sur (massive sulfide and cloritas) were unfolded and estimated separately. Estimation has been performed in flat or unfolded coordinates and transformed back to the current folded state.

[20] SAGE 2001 Version 1.08, Issacs & Co.

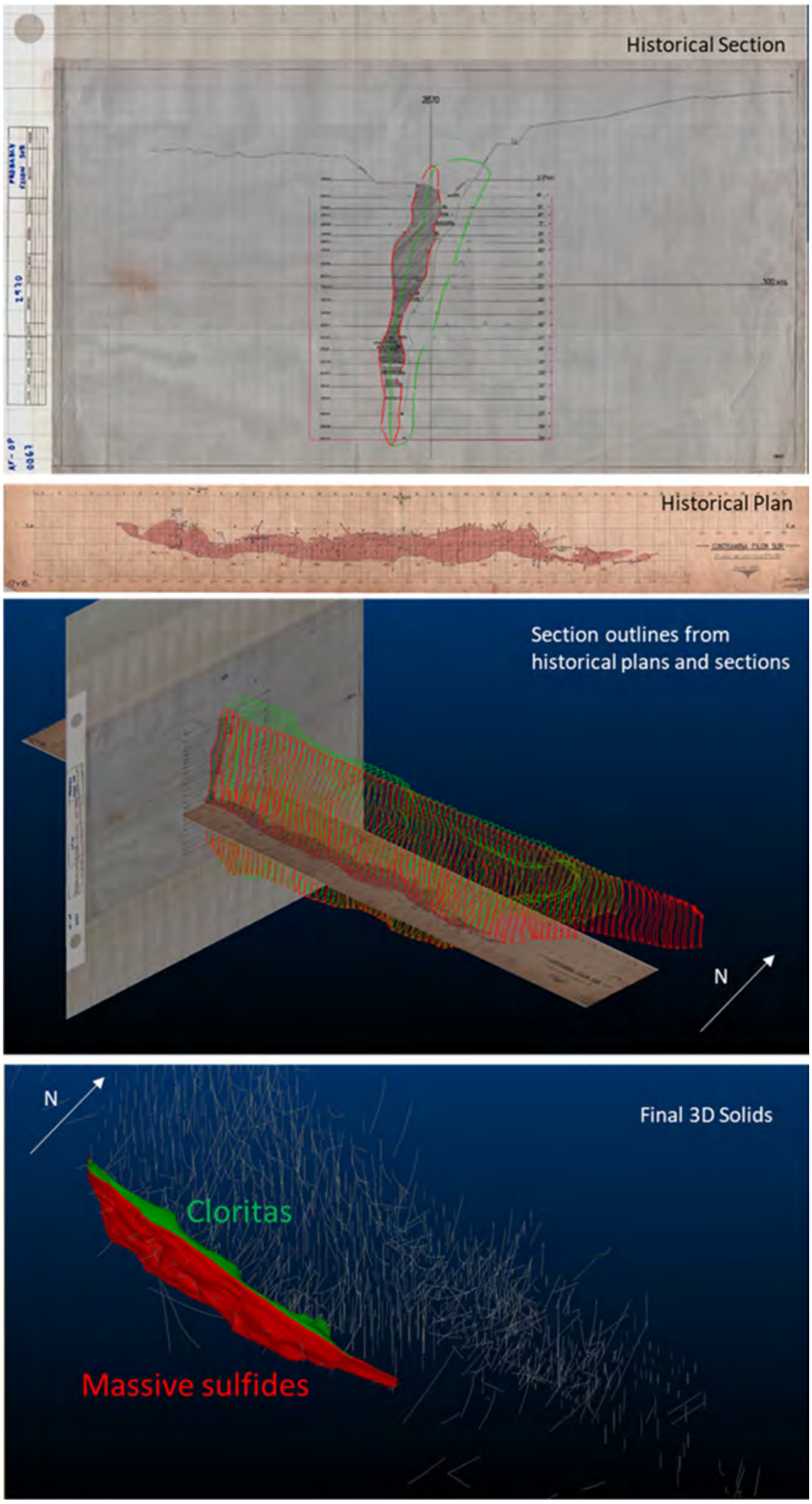


Figure 14-2: 3D views of the modeled MS and Cloritas (Noble & Barrero, 2020).

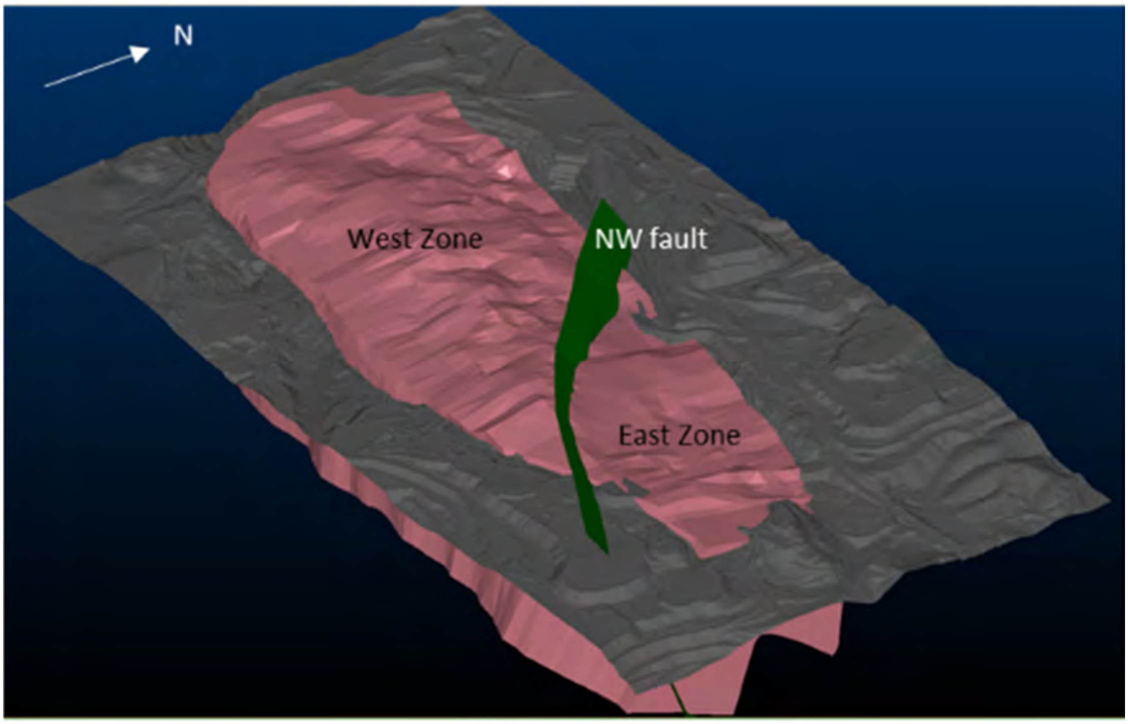


Figure 14-3: 3D view of the location of the NW structure (Noble & Barrero, 2020).

For estimation, the Datamine search expansion feature was used to expand an initial search ellipse until the desired number of composites were located inside the search ellipse. The primary objective of the search ellipse expansion was to keep the search as localized as possible, subject to finding sufficient samples for reliable estimation. The final search ellipse expansion was set to provide estimates in areas with widely spaced drilling.

14.1.2 Drill Hole Sample Database

Drill-hole data were provided by Atalaya geology personnel as ASCII files containing assays, collar locations, down-hole surveys, and geologic logging for all drilling in the resource area. Only those core holes and reverse-circulation holes drilled from the surface were used for the MinZ estimate. The resource estimate includes 318 additional drill holes that were drilled between 2018 and 2021, as summarized in Table 14-3. These new holes were reviewed and validated during 2021.

The new drilling provides additional definition of the Filón Sur area and those areas enriched in deleterious elements (particularly antimony). In addition, the new drilling provides further detail throughout the deposit. A group of historical underground drill-hole data and the historical underground channel samples were available but were not used for resource estimation because of concerns regarding the quality of those data.

Because of the scarcity of sample data for the deleterious elements, the short (about 12 m), close-spaced (investigatory) holes and a 20 m-grid of blastholes were used for estimation of Arsenic, Lead, Zinc, and Antimony. The investigatory holes were drilled during previous open-pit operations for grade-control purposes.

Table 14-3: Summary of Drilling used for Resource Estimation at Cerro Colorado

Drill Series	Type	Year	Number Holes	Number Assays	Drilled Length	Average Hole Length	Average Interval Length
RTM (Numbered)	Core	Historical	682	68,050	142,355.30	208.70	2.09
CCR	RC	2014	12	1,444	1,480.00	123.30	1.02
ETR & RT	RC	2015	361	18,058	28,659.20	79.40	1.59
RTD 2017	RC	2017	28	2,682	5,436.50	194.20	2.03
FS (Filon Sur)	RC	2017	43	2,759	10,255.10	238.50	3.72
GT (Geotech)	Core	2017	6	847	1,170.00	195.00	1.38
ARD		2017	3	759	768.90	256.30	1.01
Total previous drilling programs			1135	94,599	190,125.00	167.50	2.01
Geotech 2018	Core	2018	11	419	1,061.05	96.46	2.19
Special (PZ&SA)		2020	5	82	166.95	33.39	1.91
RT 2018	RC/Core	2018	41	4,236	8,557.40	208.72	2.02
RT Penalty 2019	RC/Core	2019	54	4,972	11,179.50	207.03	2.15
RT Penalty 2020	RC	2020	164	9,346	18,880.00	115.12	2.00
RT 2021	RC/Core	2021	43	3,017	6,800.20	158.14	2.07
Total NEW 2022			318	22,072	46,645.10	146.68	2.05
Total			**1,453**	**116,671**	**236,770.10**	**163.86**	**2.07**

14.1.3 Assay Corrections

Prior to estimation and within the MinZ, legacy holes with default lead assay of 0.05% were flagged with a “Pb Bad” Flag in the collar file. A Pb-Zn power-law regression was used to estimate the default lead assays of the flagged holes, and to correct those assays less than 0.01% Pb:

Pb_pct = 0.4786*Zn_pct^1.286

This correction was not applied to the Filón Sur assay intervals.

14.1.4 Bulk Density

Bulk density is estimated using a formula correlating density and sulfur grade. Data for the correlation were sulfur assays and specific gravity measurements that were done on blasthole cuttings. The samples were taken from the Cerro Colorado (low sulfur) and Salomon (high sulfur) areas of the mine, primarily during 2000. These measurements, shown in Figure 14-4, demonstrate increasing density with increasing sulfur. While this correlation is significant, the correlation coefficient is only 0.629, so there is still considerable variability around the trend.

A second investigation of the correlation between specific gravity and sulfur grade was conducted in 2010 as part of a comparison between ALS check assays and historical Rio Tinto Mining assays. The results of this study, shown in Figure 14-5, show an excellent correlation between the ALS sulfur assays and the ALS measured specific gravity. These data also show an increasing relationship between S.G. and sulfur grade, but with much less scatter around the regression line and a much higher correlation coefficient of 0.845. The correlation is improved because the S.G. is measured on larger pieces of core compared to small pieces of blast hole cuttings in the 2000 study. Outliers shown as orange points on the chart were reported to be porous, weathered rock that is not representative of the copper resource.

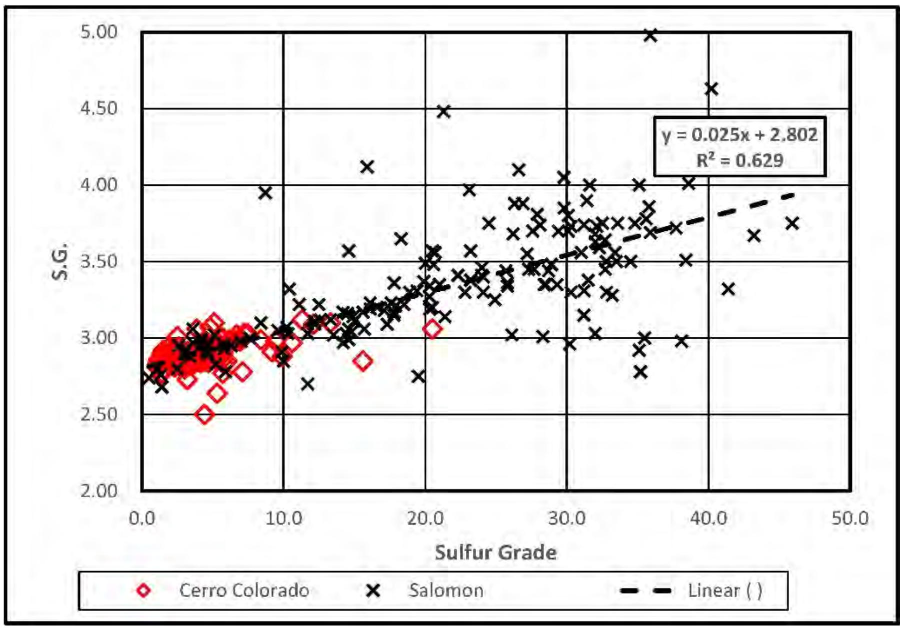


Figure 14-4: Correlation between Specific Gravity and Sulfur Grade – 2000 Data (Noble 2016).

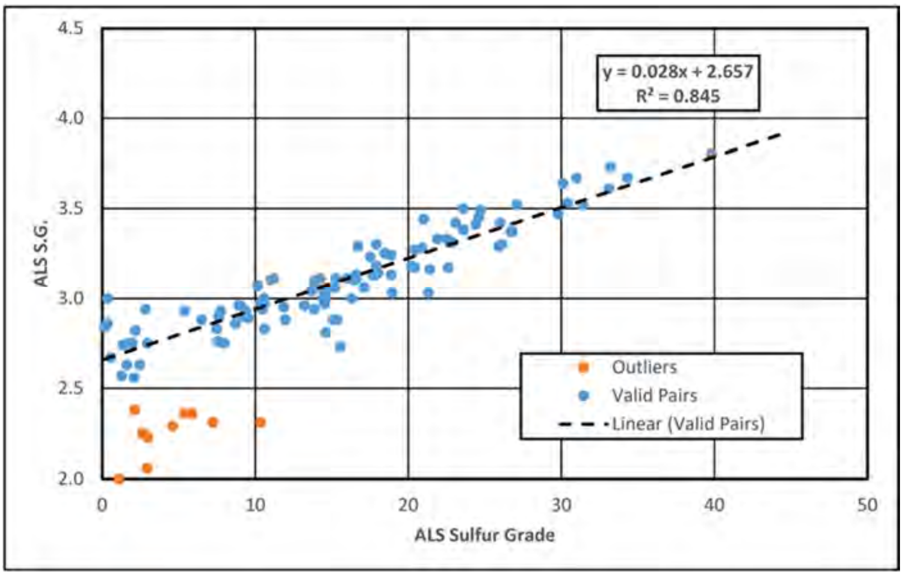


Figure 14-5: Correlation between Specific Gravity and Sulfur Grade – 2010 Data (Noble 2016).

The Cerro Colorado density formula is based on the year 2000 data with a slight discount on the constant from 2.8 to 2.7 to account for void space and fracturing in the in-situ rock.

Density = 2.7 + (0.025 x %S)

The 2010 work suggests that the constant may be lower than indicated by the resource formula but the slope of the line may be steeper than the slope of the resource formula. Thus, low-sulfur rock may be lighter than suggested by the Riotinto formula, and high-sulfur rock may be heavier. These differences are minor, however, and the effect on resources is negligible.

14.1.5 Resource Model Density

The Cerro Colorado density formula and IDP sulfur estimates are used for estimation of block model density. A default sulfur grade of zero (0.0) is used for density estimation where there is insufficient sulfur data for an estimated sulfur grade. The default density in waste rock is thus set to 2.7 t/m^3. Density in fill material, particularly the backfilled Filón Sur open pit, is assigned a default density of 2.00 t/m^3. Volumes mined-out with underground stopes and other workings were assigned a density of 2.00 t/m^3, which is equivalent to assuming that the underground openings have either caved, were backfilled during underground operations, or will be backfilled for safety during current open-pit operations.

14.1.6 Topographic Model

Topographic contour data were provided by Riotinto as AutoCAD drawing files containing topographic elevation contours, break lines, and various cultural features and buildings. These data are as follows:

1. Original Topo – contains the pre-mining topographic surface as of 26 April 2010.
2. December 31, 2020 – contains the modified topography including mining through the end of December 2020. This is the basis for the resource and reserve estimates.
3. End-of-year estimates for 2015, 2016, 2017, 2018, and 2019.
4. Topography showing the extent of historical open-pit mining when it finished in approximately 1934.

Triangulated digital terrain models (DTMs) were prepared from the original data as follows:

1. Local mine coordinates were translated to ETRS 89, if required.
2. Buildings, conveyor belts, and other features not related to the topographic surface were removed from the data.
3. Intermediate contour intervals on 1-m intervals were removed so that only the 5-m contours remained.
4. The topographic data were triangulated using the Datamine DTM creation tool.
5. The resulting DTM was cropped to the area 50 m outside the resource model limits.

14.1.7 Mined-out Model

Mined-out portions of the block model were defined as follows:

1. **Underground Workings and open stopes**: 3D wireframe models were provided by Atalaya that define the volumes mined as underground workings and open stopes of Filón Sur and Filón Norte by previous operators. These wireframes were used to create a block model of the mined-out volume using 1x1x1-m sub-blocks in the 10x10x10-m resource model prototype. The vertical extent of the 1x1x1-m sub-blocks was set to the exact height of the wireframe volumes to maintain maximum precision on the mined-out block model.
2. **Filón Sur pit Backfill**: Contours of the mined-out and backfilled surface of the Filón Sur open pit were provided by Atalaya to describe that volume. Additionally, during 2019, topography pit contours of 31 historical N-S vertical sections were digitized to improve the pit topography (Figure 14-6). The sections were converted to a DTM surface. A block model was created in the

10x10x10-m prototype that defined the volume between the April 2010 topography and the bottom of the Filón Sur pit. All these blocks are defined as backfill.

3. **Filón Sur massive sulfide and cloritas mined out volumes**: The model of the massive sulfide and part of the cloritas mined-out portion was constructed based on geo-referenced historical sections and recent Atalaya drilling on Filón Sur. 29 vertical sections and 49 horizontal plans showing the mined and backfilled portion of the massive sulfide orebody were digitized during 2019 (Figure 14-7). The contours of the mined-out portion were used to construct a 3D wireframe representing the underground backfilled area. The wireframes were used to create a block model of the mined-out volume using 5x5x5-m sub-blocks in the 10x10x10-m resource model prototype. For estimation purposes, the massive sulfide orebody at Filón Sur is considered completely mined-out from the East coordinate 712,235 to the east, all of these blocks are defined as backfill (see Section 14.1.11).
4. **Filón Norte/Lago Backfill:** Contours from the 1934 map were used to define the mined-out volume and backfill in these pits.
5. **1996 to 2001 Mining:** Strings defining the outlines of material mined for the period from 1996 to 2001 were available from work previously done by AMC Mining Consultants. These outlines were used to define blocks within the mined-out perimeters by the year in which they were mined. Since the previous open-pit mining was on 10- and 12-m benches and the current model is on 10-m benches, most of these mined blocks were defined as partial blocks on multiple 10-m benches.
6. **2015-2020 Mining:** Current mining from July 2015 through the end of Dec 2020 was defined using end-year topographic models for 2015, 2016, 2017, 2018, 2019, and 2020.
7. **End Dec 2020:** Final resources and reserves are computed using the end of Dec 2020 mine topography as the reporting basis.

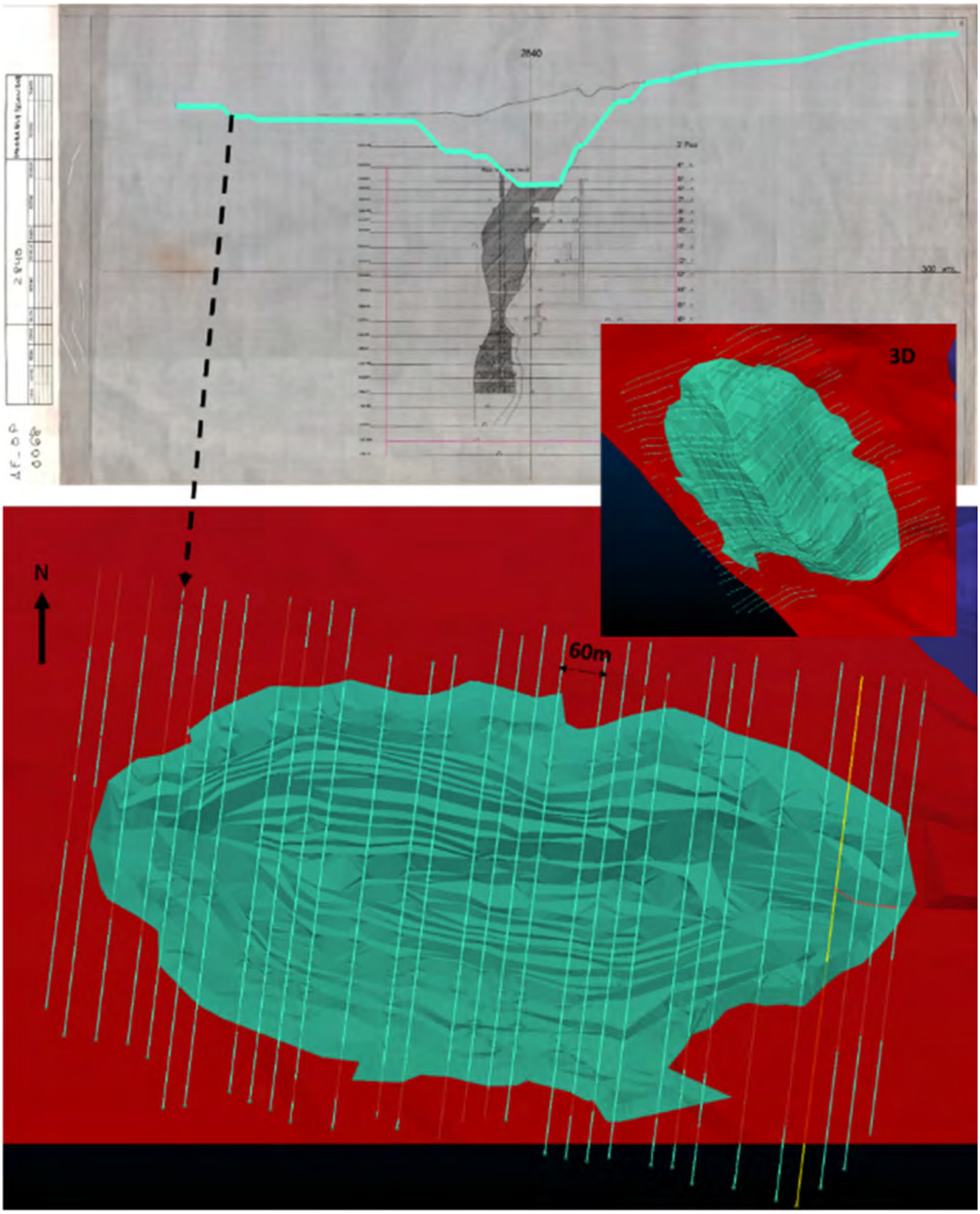
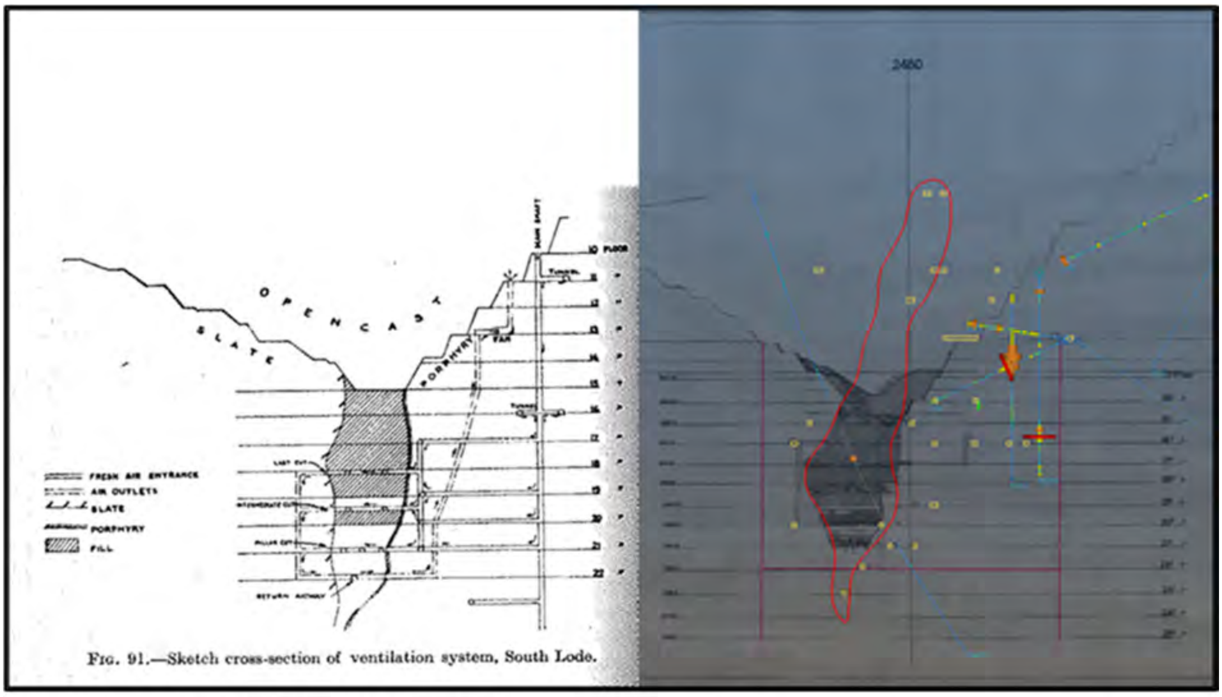


Figure 14-6: Updated DTM of Filón historical pit from digitized sections (Noble, 2019).



Sketch cross section of Filón Sur showing the ventilation system and the filled areas (Julian, 1940)

Digitized legacy section across the filled area with recent drilling and massive sulfide orebody contour

Figure 14-7: Filón Sur Cross Sections (Noble& Barrero, 2020).

14.1.8 Geological Model

The geologic model was constructed to provide geologic control for grade estimation and to provide parameters for mine planning in the non-ore-bearing geologic units.

14.1.8.1 Mineralized Zones

Wireframes corresponding to the main mineralized zone at Cerro Colorado anticline ("MinZ"), Filón Sur massive sulfides ("MS"), and cloritas ("CLO") were constructed and used as the basis for the combined mineralized zone model, with adjustments to incorporate the drilling completed to April 2021 and the historical sections information.

14.1.8.2 Unfolding

The Datamine unfolding tool was used to flatten the anticlinal fold of Cerro Colorado (Figure 14-8) and the Filón Sur massive sulfide and cloritas into a geometry that is as close as possible to the original geologic shape of the deposit.

Unfolding was applied separately to the main mineralized zone at Cerro Colorado, and to the Filón Sur massive sulfides, and the cloritas.

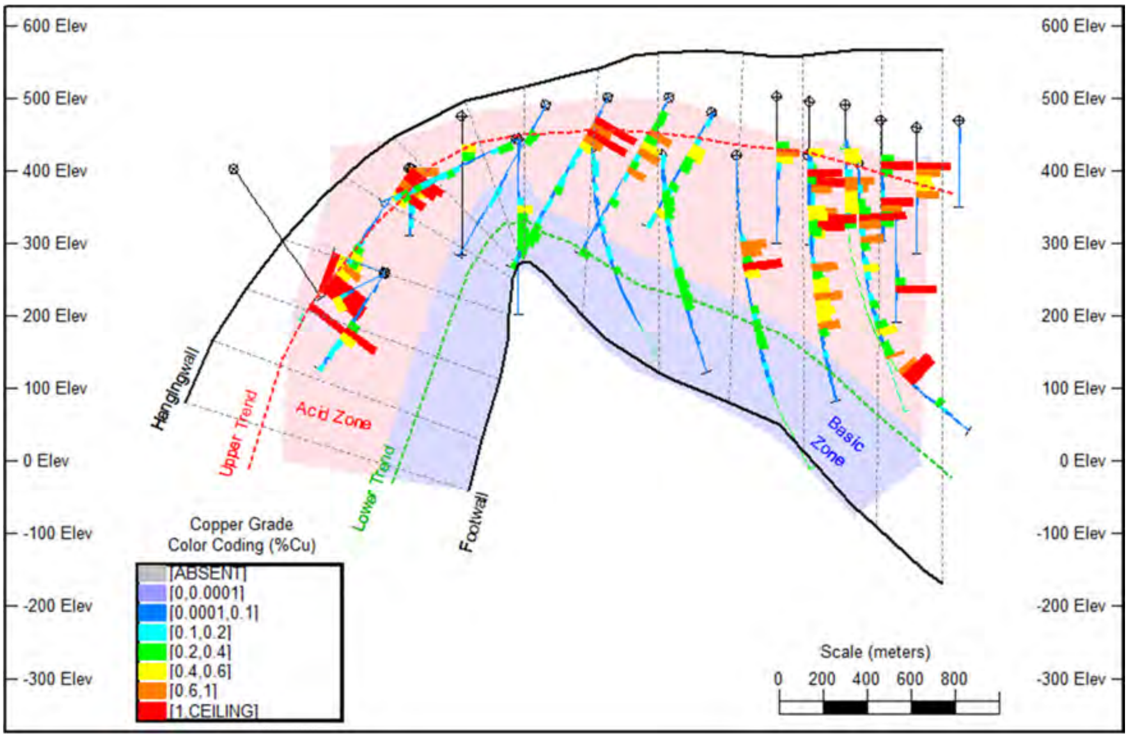


Figure 14-8: Typical Cross-Section of Cerro Colorado looking N83W, showing Drill Holes, Trends, and Unfolding Strings (Noble, 2018)

The procedure for unfolding of the main mineralized zone at Cerro Colorado is as follows:

1. Trend strings were drawn through the two strongest mineralized horizons, as shown in Figure 14-8. The lower trend generally follows a well-defined band of mineralization just below the bottom of the Acid Zone (top of the Basic Zone) and is maintained subparallel to the bottom of the Acid Zone in areas of weak mineralization. The upper trend follows stronger mineralization near the hanging wall of the Acid Zone.
2. Between-trend strings were drawn that connect between the lower trend and the upper trend. North of the anticline apex, the between-trend strings were drawn vertically. South of the anticline apex, the between-trend strings were drawn approximately perpendicular to the trend strings.
3. The between-trend strings were extended up and down 50% of the length of the between-trend strings. The extended between-trend strings were used as guidelines for drawing the hanging wall and footwall strings and for the footwall-to-hanging wall tag strings.
4. The resulting footwall-to-hanging wall tag strings define the Z’ axis in the unfolded coordinate system. The Z’ unfolded axis is scaled proportional to the average “thickness” of the zone, which is approximately 440 m. The Z’ values were adjusted so that the unfolded Z’ value is approximately 58 at the footwall and 500 at the hanging wall.
5. The unfolded Y’ axis is oriented parallel to the N7E direction and is approximately perpendicular to the strike of the deposit. The origin of the unfolded Y’ coordinates is at the crest of the anticline and Y’ is negative to the south and positive to the north. The Y’ coordinates are scaled relative to the average unfolded width of the deposit in the Y’ direction.

6. A final tag string was drawn to connect horizontally between the section strings. This string generally follows the crest of the anticline. The X' unfolded axis follows parallel to this axis and is in unscaled units.

The same procedure was performed at Filón Sur where the hanging wall and foot wall of the massive sulfide and the cloritas zones were defined individually and unfolded separately for each domain.

14.1.9 Compositing

Drill hole assays were composited to 10-m composites using the standard Datamine downhole compositing routine, COMPDH. Before compositing, drill holes were assigned DOMAIN codes based on the mineralized zone wireframe. Intervals inside the mineralized zone wireframe were assigned a code "MinZ", intervals outside of the wireframe were assigned the code "NOZN". For Filón Sur massive sulfides and cloritas a code "MS" and "CLO" was assigned for the intervals inside the corresponding wireframes, and a code "NOMS" and "NOCLO" outside the mentioned wireframes.

Composites were then computed with the compositing routine set to compute nominal 10-m composites that started and ended on DOMAIN boundaries. The resulting composites are as close to 10-m long as possible, while using all assays within the defined zone intervals.

Assays were composited using length-weighted averages for this study. Density-weighted averaging should be evaluated for future studies.

14.1.10 Mineralized Zone (MinZ)

14.1.10.1 Copper, Sulfur and Zinc Models

14.1.10.1.1 Copper Grade Distribution

The distribution of composited copper grade, shown in Figure 14-9 as lognormal cumulative probability and lognormal histogram plots, indicates that copper grade is composed of several lognormal populations.

1. A set of four grade sub-populations were fitted to the raw data using least square fitting on both the cumulative probability plot and on the histogram plot. The resulting distribution fit included the following component populations:
2. A low-grade population that is essentially unmineralized, averaging 0.017% Cu and containing about 18% of the total samples. There are spikes at 0.01% Cu, 0.02% Cu and 0.05% Cu that are attributable to rounding to the nearest 0.01% Cu and 0.05%.
3. A mid-grade population averaging 0.06% Cu and containing about 24% of the total samples. This population may be ore at grades near the breakeven cutoff.
4. A high-grade distribution averaging 0.38% Cu and containing about 55% of the total samples. This distribution contains the bulk of the ore-grade mineralization.
5. A very-high-grade distribution that averages 1.46% Cu and is composed of high-grade outliers (3% of the total samples).

The large overlap between low-grade and high-grade is problematic for resource estimation, since there is no easy way to differentiate the populations. In addition, the distributions are not strictly preserved when larger volumes than drill holes are considered, and distributions are much more transitional at the scale of selective mining units. Accordingly, a simple strategy was developed to provide grade-zoning control as follows:

- A simple nearest-neighbor (NN) model was created for copper grade, and preliminary grade zones (CuGZones) were assigned using the grade-range parameters in Table 14-4. Search parameters for the NN model are documented in Table 14-5.
- A very-high-grade zone was defined using nearest-neighbor assignment and a more restricted search pattern. The blocks in the very high-grade zone were overprinted onto the initial grade zone model to form the complete model.

Interpolation was done using composites with overlapping grade ranges. The overlapping grade ranges are required to prevent polygonal edge effects on the boundaries of the grade zones and to account for smearing at grade-zone boundaries. Composite grade zone parameters are shown in Table 14-4 along with the block model grade-zone parameters. Composite grade-range parameters were optimized during grade interpolation to provide an unbiased overall estimate and to approximate the distribution of grades observed in blasthole blocks. Probability plots and histograms for the resulting grade-zones copper grades (used for interpolation) are shown in Figure 14-10.

Table 14-4: Grade-Zone Parameters for Block Model and Composites (Noble & Barrero, 2020).

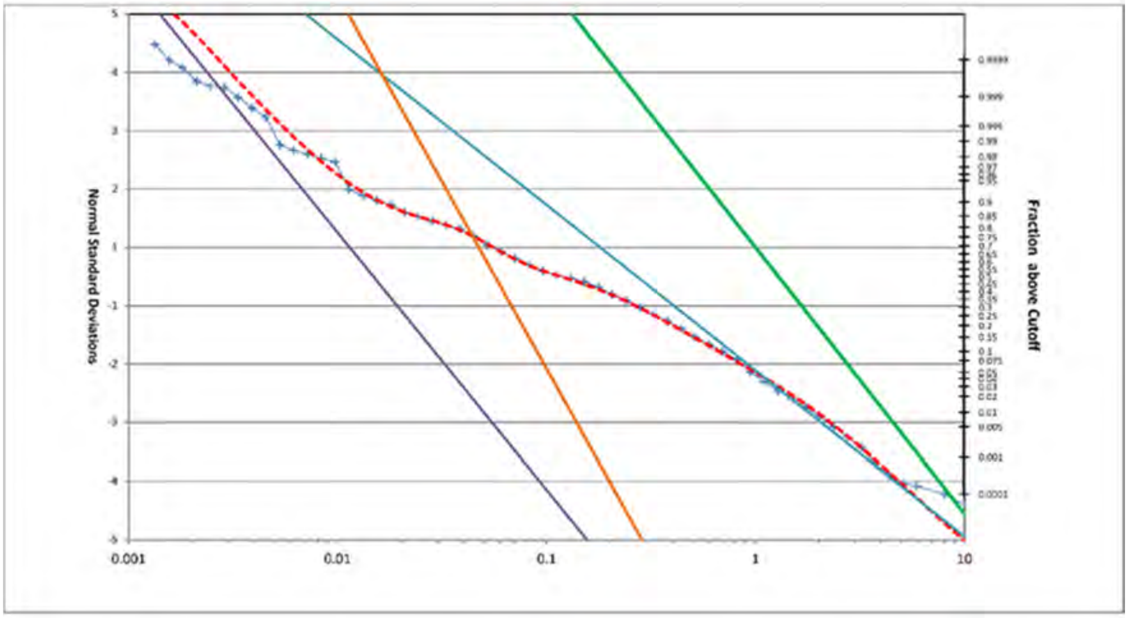
Zone Code	Description	Block Model Grade Ranges		Composite Grade Ranges	
		Lower	Upper	Lower	Upper
11	Low-Grade	0.00	0.06	0.00	0.10
12	Low/High Overlap	0.06	0.25	0.04	1.00
13	High Grade	0.25	4.00	0.16	4.00
99	Very High Grade	4.00	100	0.80	100

Table 14-5: Grade-Zone NN Search Ellipses (Noble & Barrero, 2020).

Zone	X’	Y’	Z’
Low-Grade Through High-Grade (CuGZones 11,12, and 13)	300	175	70
Very High Grade (CuGZone 99)	35	10	15

Riotinto Probability Fit for Mineralized Zone Copper

	Population	Low Grade	Mid Grade	High Grade	Very HG	Total
Fraction		17.95%	24.30%	54.8%	2.98%	100.0%
Mean	0.2675	0.0170	0.0604	0.3766	1.4623	0.26753
Beta		0.5229	0.3595	0.8118	0.5057	
Median		0.0148	0.0566	0.2709	1.2867	
Log Mean		-4.2118	-2.8709	-1.3062	0.2521	
Sum of Errors		SSQ	Weight			
%CFREQ		0.0015993	0			
%HISTO		0.0016581	1			
Z-Fit		4.0828887	0.001		Hist/Z-fit	0.000406098
FIT		0.0057409				



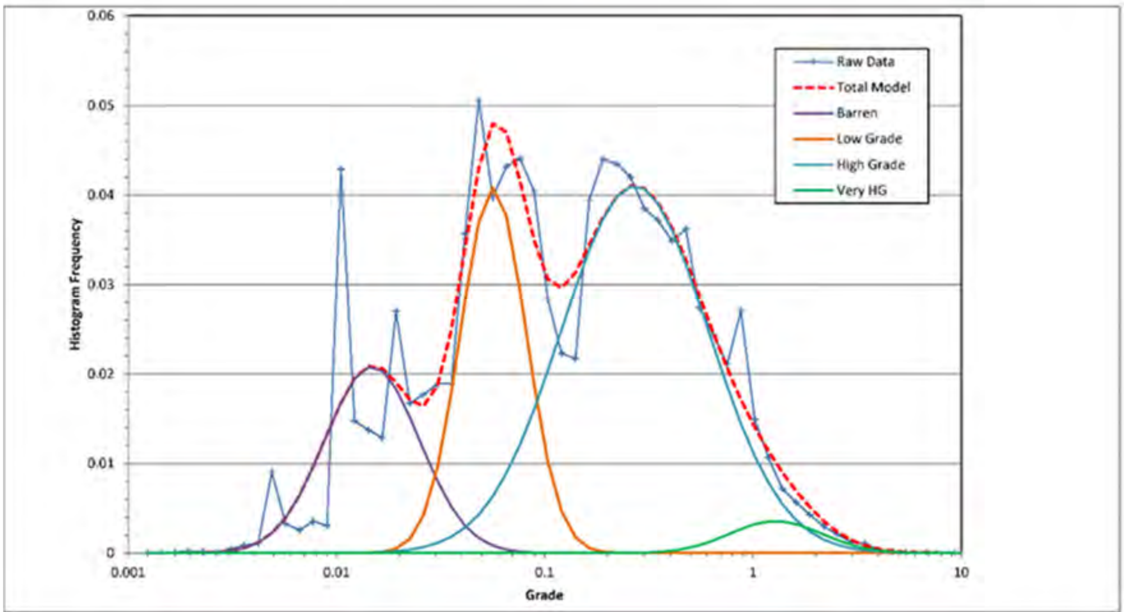


Figure 14-9: Probability distributions fitted to copper data in the mineralized zone (Noble 2020).

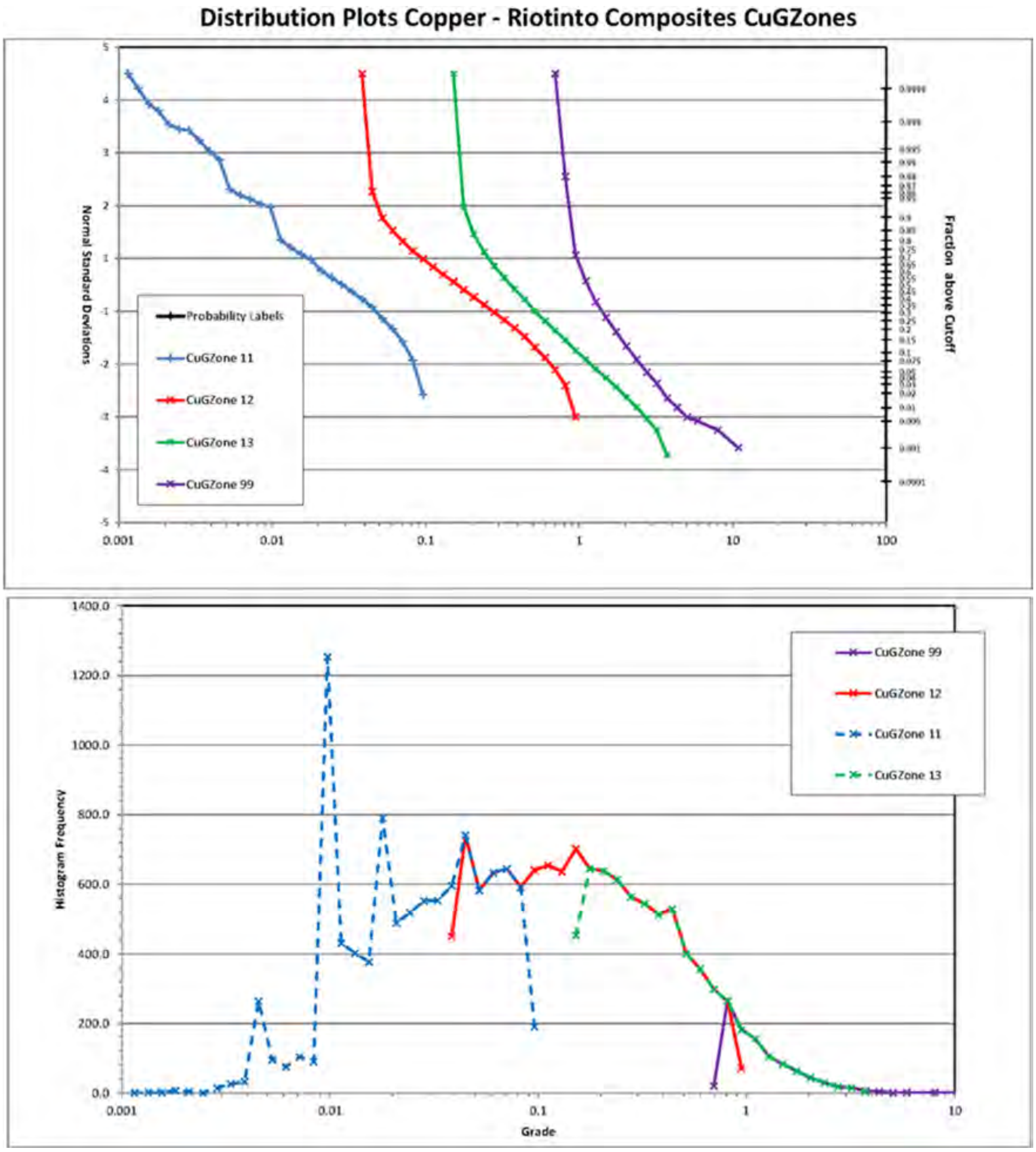


Figure 14-10: Lognormal probability and histogram plots of CuGZones in the MinZ (Noble & Barrero, 2020).

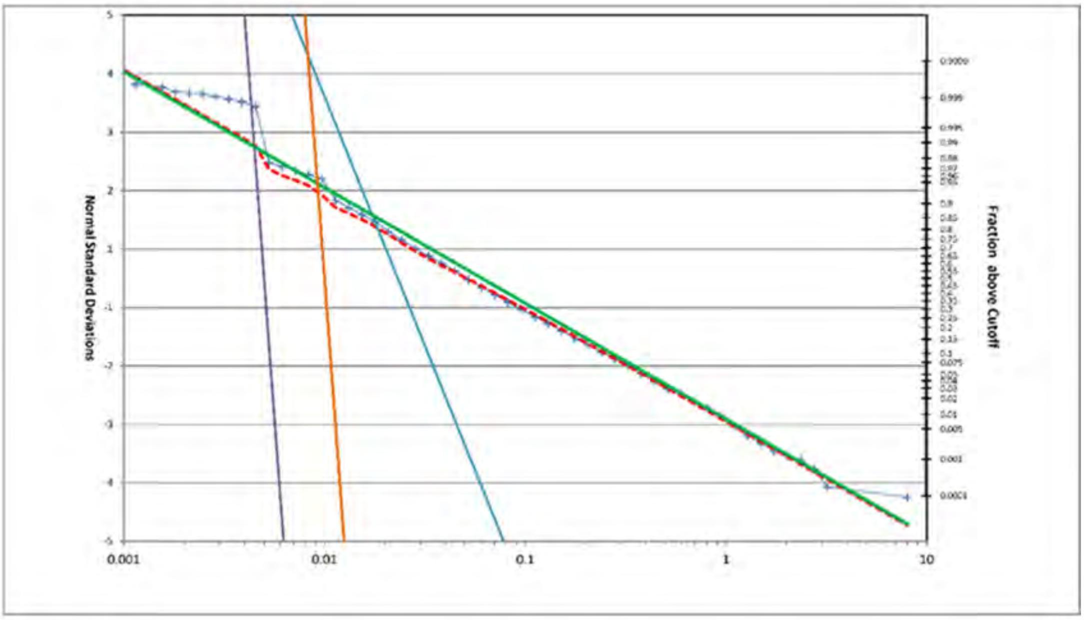
14.1.10.1.2 Zinc Grade Distribution

The distribution of zinc grades initially appears to be a simple single modal distribution with spikes at 0.005, 0.01, 0.025, and possibly 0.05 that are artifacts of assaying precision and rounding of assays. The lognormal cumulative probability plots and histograms of zinc grades in the mineralized zone are shown in Figure 14-11.

Initially, it was hoped that zinc grade could be estimated as a single grade zone, but closer inspection of zinc-grade zoning shows several pods of high-grade, +0.5% zinc mineralization.

Riotinto Probability Fit Zinc: Mineralized Zone All Data

	Population	Spike 0.005	Spike 0.01	Spike 0.025	Mineralized	Total
Fraction		1.75%	3.00%	6.0%	89.3%	100.0%
Mean	0.1084	0.0050	0.0100	0.0240	0.1194	0.1084
Beta		0.0500	0.0500	0.2700	1.1616	
Median		0.0050	0.0100	0.0231	0.0608	
Log Mean		-5.2996	-4.6064	-3.7662	-2.8000	
Sum of Errors	SSQ	Weight				
%CFREQ	0.0063735	0				
%HISTO	0.0008331	1				
Z-Fit	2.051414	0		Hist/Z-fit		0.000406127
FIT	0.0008331					



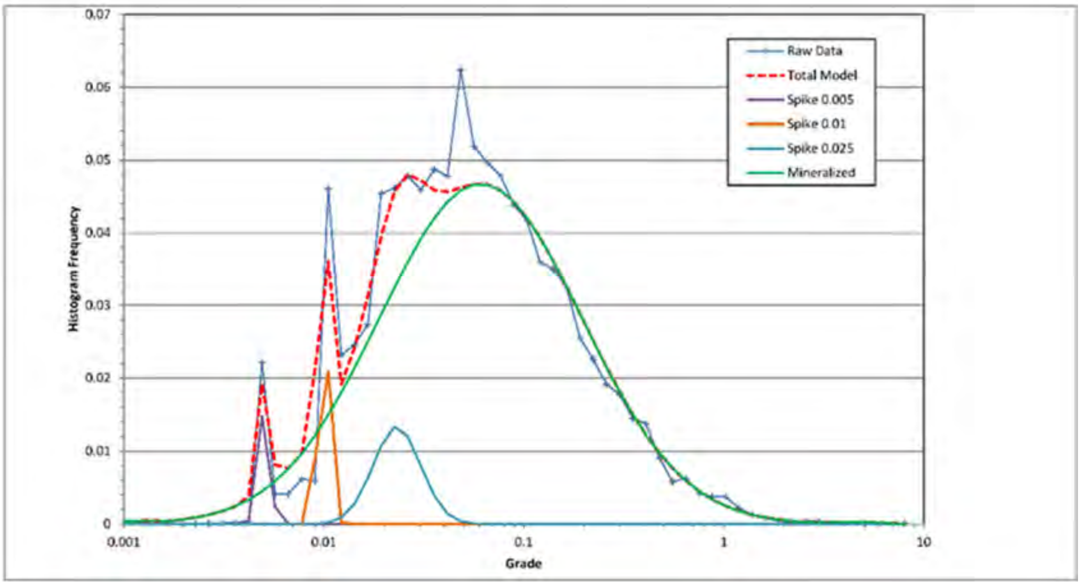


Figure 14-11: Probability distributions fitted to zinc data in the mineralized zone (Noble & Barrero, 2020).

The most significant of these high-grade zinc zones are located in the southern part of the mineralized zone. Initial attempts were made to manually define the high zinc zones, but the shape of the zones proved too complex for manual interpretation. Nearest-neighbor assignment of zinc grade zones was equally unsuccessful. After several trials, it was observed that there is a very slight correlation between copper and zinc when zinc grades are categorized by copper grade zones, as shown in Figure 14-12. The resulting distributions used for zinc grade estimation are as follows:

1. CuGZone 11: Low-grade population averaging 0.066% Zn containing about 18% of the total samples.
2. CuGZone 12: Mid-grade population averaging 0.114% Zn and containing about 24% of the total samples.
3. CuGZone 13: Higher grade distribution averaging 0.155% Cu and containing about 55% of the total samples.
4. CuGZone 99: A High-grade distribution that averages over 0.24% Zn and is containing about 3% of the total samples.

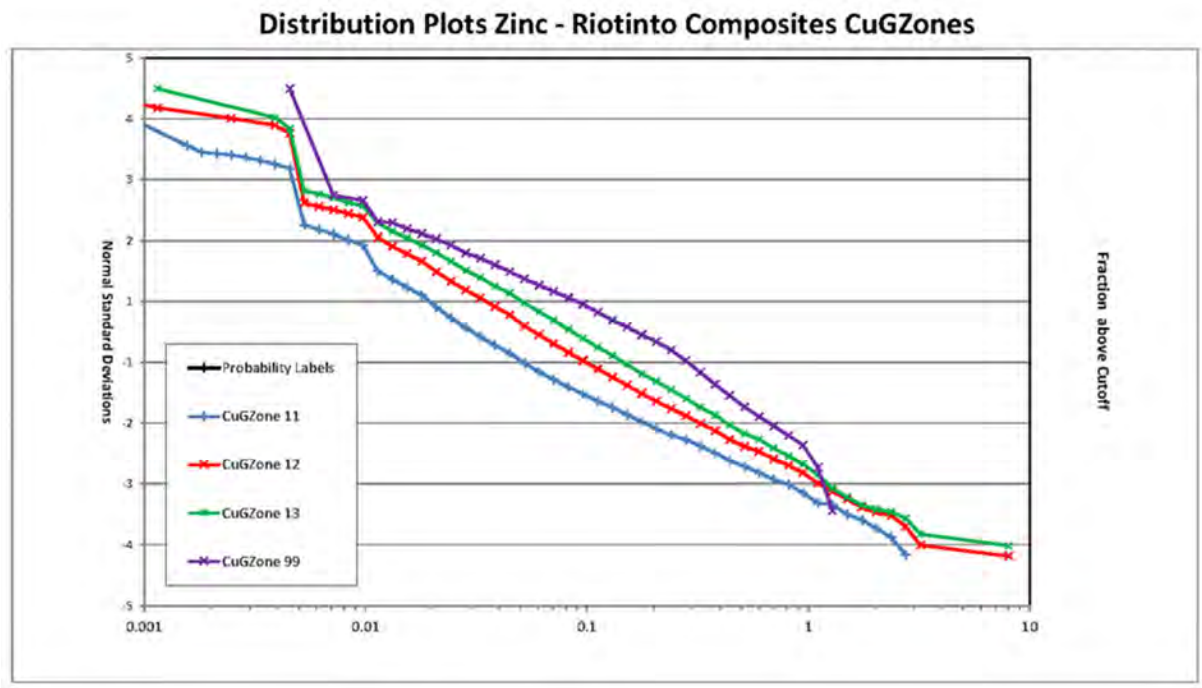


Figure 14-12: Zinc Grade Distribution in the CuGZones (Noble & Barrero, 2020).

14.1.10.1.3 Sulfur Grade Distribution

The sulfur grade distribution, as shown in Figure 14-13, is dominated by a population of moderate sulfur grade that has an average sulfur grade of 4.23% sulfur and contains 80% of the total data. This population represents stockwork sulfide mineralization that is pervasive in the mineralized zone. Approximately 7.5% of the samples are massive sulfide mineralization averaging over 22% sulfur. A smaller 10% of the samples is represented by a low-sulfur population that averages less than 1% sulfur. This population is difficult to model on the cumulative probability and histogram plots because of assaying artifacts at the low-sulfur end of the population.

Based on the above analysis of the sulfur grade distribution, a determination was made that sulfur grade zones were not required for the resource model. Sulfur grade-zoning should be reviewed for the next model update, particularly with respect to massive sulfides.

Riotinto Probability Fit Sulfur MinZ

	Population	Default	Low Sulfur	Mineralized Sulfur	Massive Sulfur	Total
Fraction		1.73%	10.44%	80.3%	7.56%	100.0%
Mean	5.1331	0.1035	0.6499	4.2363	22.0016	5.1331
Beta		0.0500	0.9501	0.9000	0.3500	
Median		0.1034	0.4139	2.8256	20.6944	
Log Mean		-2.2695	-0.8822	1.0387	3.0299	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0186582	0		
%HISTO	0.0005162	1		
Z-Fit	4.7159414	0.01	Hist/Z-fit	0.00010946
FIT	0.0476756			

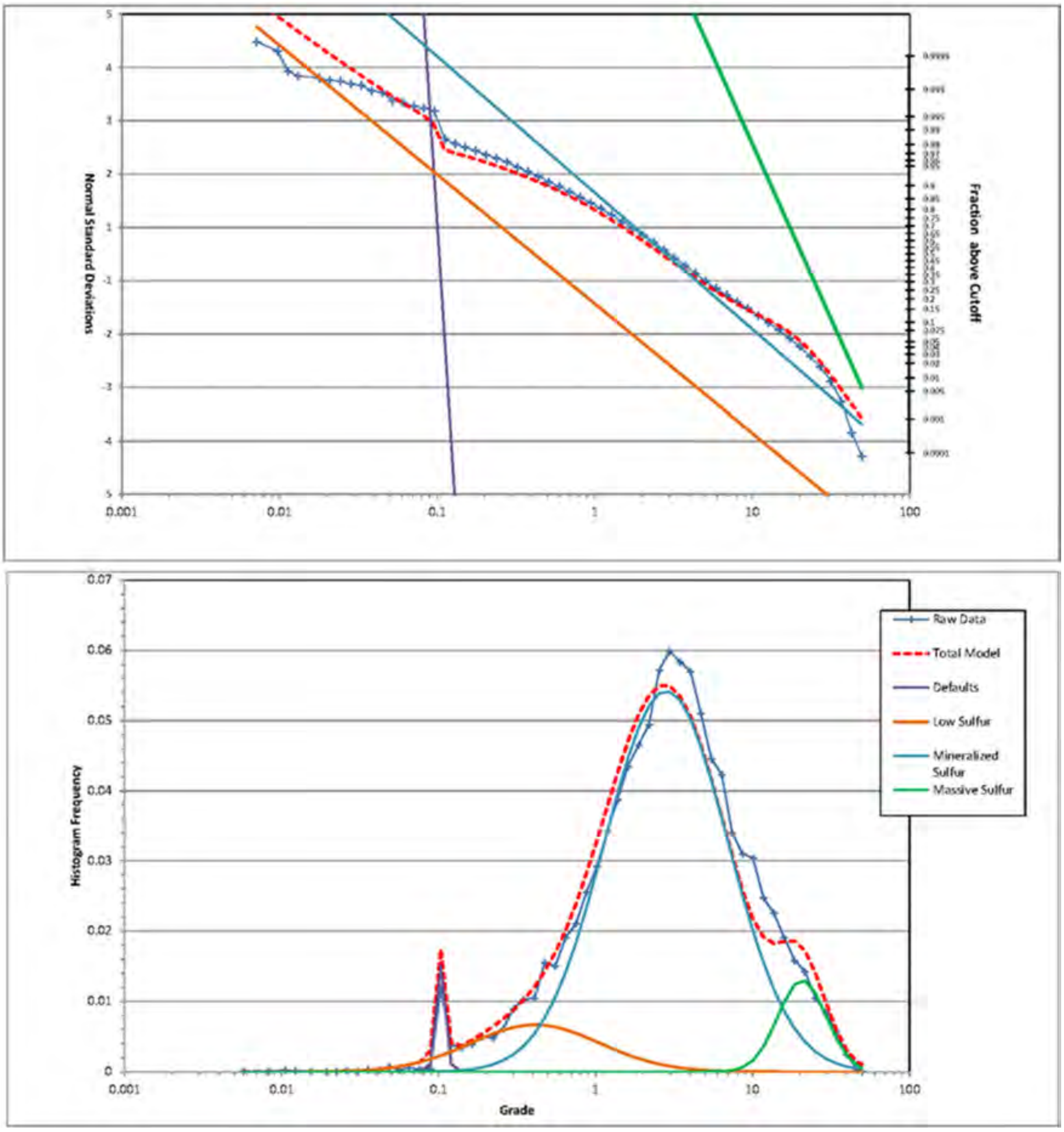


Figure 14-13: Sulfur Grade Distribution in the MinZ, (Noble & Barrero, 2020).

14.1.10.1.4 Copper and Sulfur Variograms

Variograms were computed for copper in both the ETRS 89 coordinate system and in the Unfolded coordinate system (Figure 14-14 and Figure 14-15). Sulfur variograms were only computed in the Unfolded coordinate system. The results of variogram modeling are summarized in Table 14-6. All variograms were modeled using two nested exponential variogram structures except for sulfur, which was modeled with a single exponential variogram.

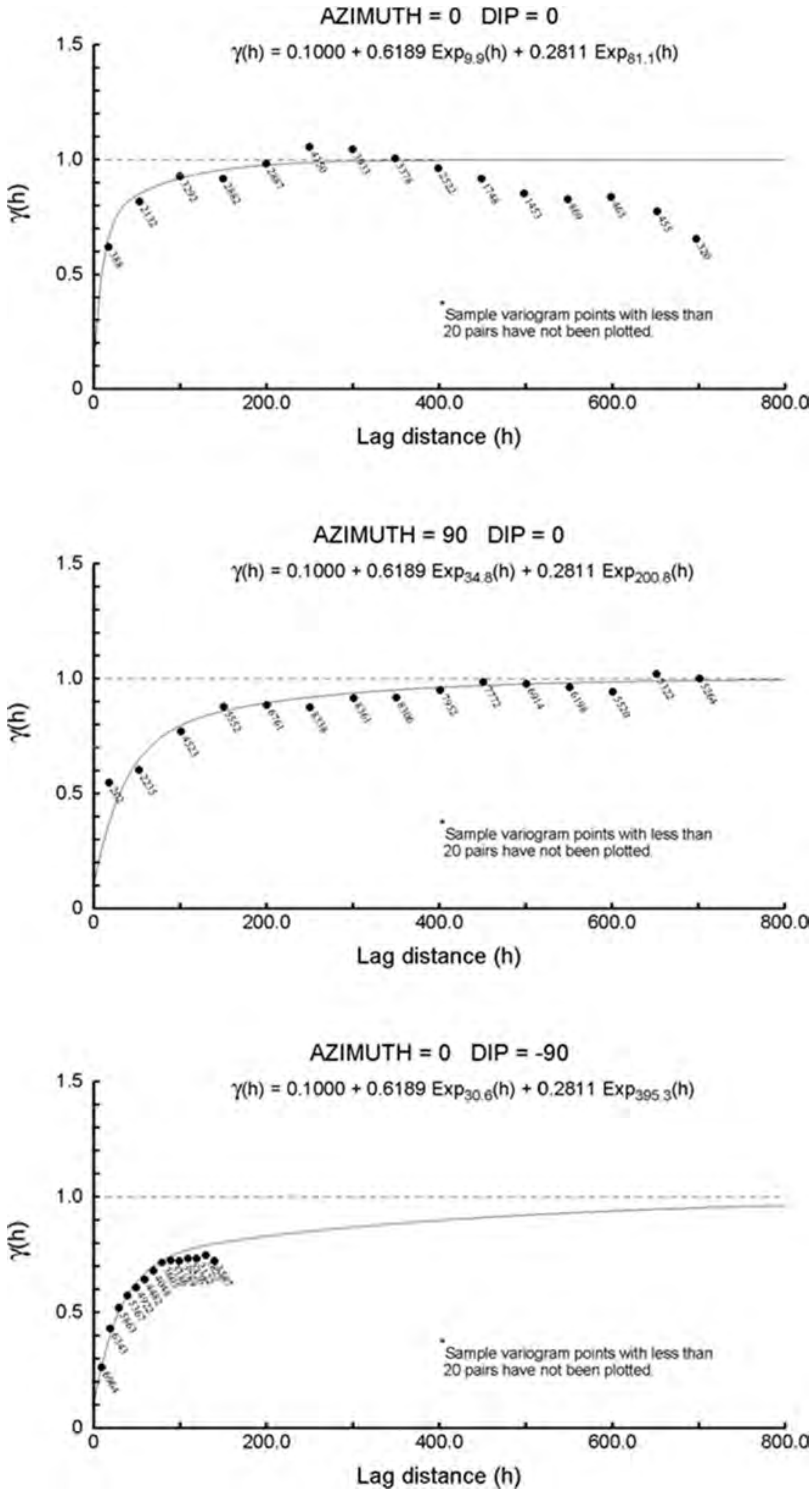


Figure 14-14: MinZ Variograms Copper ETRS Coordinates (Noble, 2016).

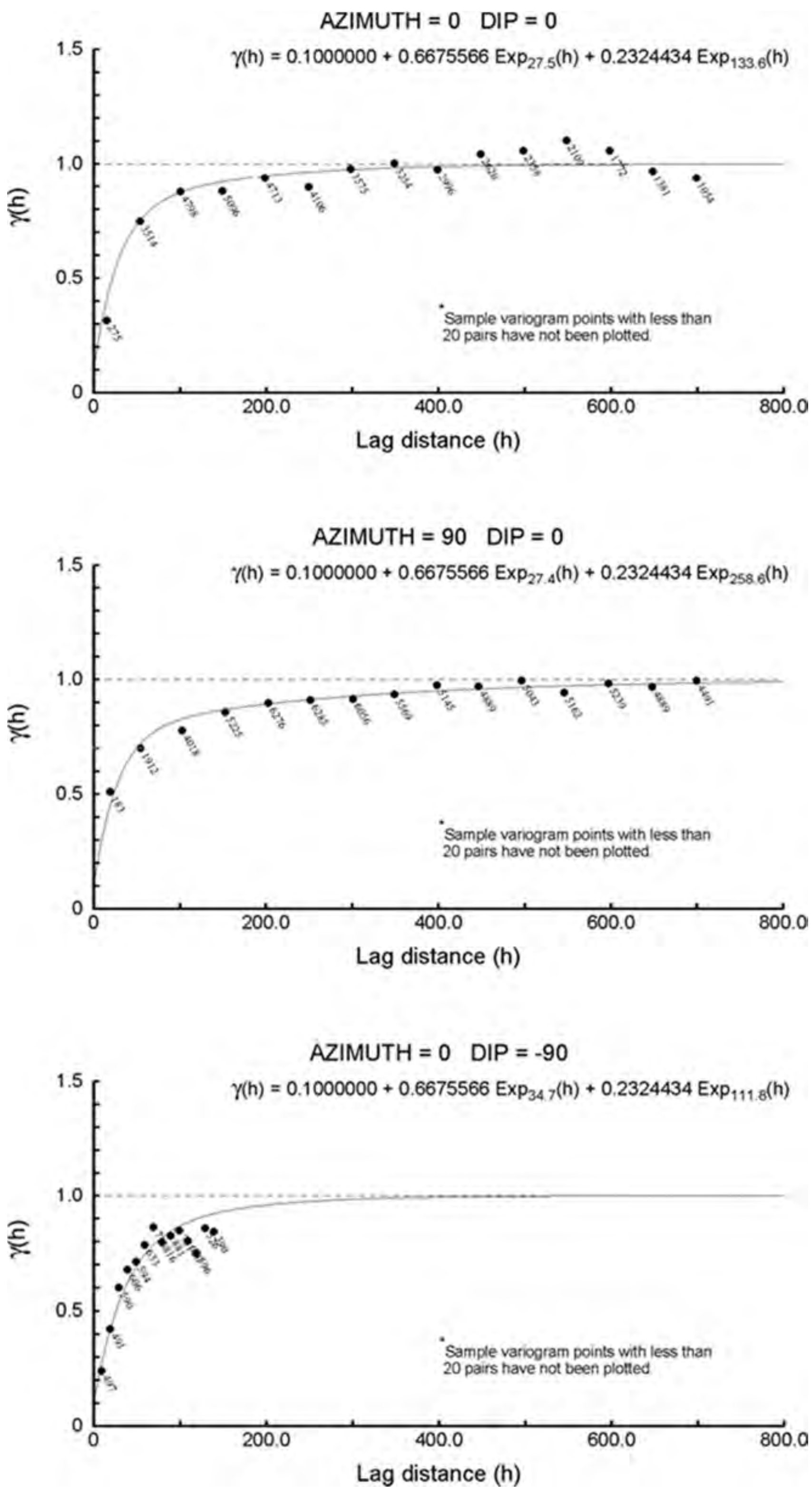


Figure 14-15: MinZ Variograms Copper Unfolded Coordinates (Noble, 2016).

Comparison of the overall (No Grade Zoning) copper variogram in ETRS 89 coordinates with the variogram in the unfolded coordinates shows that continuity in the East-West direction, along strike, is only slightly different. This is not unexpected, since the Cerro Colorado anticline plunges almost due west at only about 8 degrees. In the North-South direction, however, the unfolded variogram has a significantly longer range than the ETRS 89 variogram, confirming that copper mineralization is following parallel to the fold. In the vertical direction, however, the ETRS 89 variogram has better continuity than the unfolded variogram, which suggests that additional improvement could be achieved in the unfolding process by making the hanging wall-footwall links more vertical.

When the variograms are computed with grade-zoned data (Table 14-6), the immediate effect is that overall variability is reduced by removing the effect of grade-zone crossing from the variogram. The grade-zone effect, also known as a zonal effect, is caused by the squaring of large grade differences when data from different grade zones are added to the general variation within the zones. The relative variance in all the grade-zoned variograms is much lower than the relative variance of the variogram without grade zones. The relative nugget effect for the grade-zoned variograms is also lower, even though the Sage-scaled nugget effect is higher. Variogram ranges are shorter in the mid-grade and high-grade zones than for the overall variogram, while variability in the low-grade zone is much more continuous, confirming that the grade zones represent different types of mineralization.

The sulfur variogram, has much greater continuity than the copper variograms and is easily modeled with a single exponential variogram component. Sulfur-grade continuity is best along the strike of the anticline and is slightly better in the vertical axis than in the north-south axis, crossing the anticlinal fold.

Table 14-6: Summary of Variogram Models for Copper (Noble, 2020)

XYZ	Variogram	Copper Grade Range		Rotation	Sage Variograms Scaled to Sill = 1.00								
						Exponential Structure 1				Exponential Structure 2			
		Cu Min	Cu Max		Nugget	Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Cu - No Zones	0.001	100	0	0.1	27.4	27.5	34.7	0.67	259	133	112	0.1
	Cu - Low	0.001	0.14	-10	0.2	10	22	20	0.45	132	75	125	0.4
	Cu - Mid	0.04	0.3	15	0.27	10	10	12	0.58	109	61	80	0.2
	Cu - High	0.25	4	0	0.35	10	10	23	0.38	110	61	32	0.3
	Sulfur	0.01	100	0	0	303	143	185	0.9	-	-	-	-

14.1.10.1.5 Copper, Sulfur, and Zinc Search Ellipse Parameters

Search ellipse parameters were developed for each zone based on the variograms and a general assessment of the continuity of grades. All search ellipses are relative to the unfolded coordinate system and are not rotated, except for sulfur, which is rotated 11 degrees clockwise around the +Z axis. Search ellipse parameters are summarized in Table 14-7.

Table 14-7: Copper, Sulfur, and Zinc Search Ellipse Parameters (Noble, 2020)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
NN Sulfur	11	150	70	10	5	10	1.5	5	10	2	1	10
IDP/OK Sulfur	11	150	70	70	8	10	1.5	8	10	2	5	10
GRID Flag	0	160	65	10	5	10	1.5	5	10	2	1	10
NN Cu, GZONES	0	300	175	70	8	10	1.5	8	10	2	5	10
NN VHG Cu, GZONE	0	35	10	15	1	1	0	1	20	0	1	20
IDP/OK Cu-Zn by GZONE	0	150	80	50	8	10	1.5	8	10	2	5	10
IDP/OK Cu-Zn in VHG GZONE	0	60	15	30	5	10	2	5	10	3	1	10

14.1.10.1.6 Copper, Sulfur, and Zinc Grade Estimation

Grade models were estimated for copper and sulfur grades using the unfolded coordinate space and nearest-neighbor (NN), inverse-distance-power (IDP), and ordinary kriging. Zinc was estimated using the unfolded coordinate space and inverse-distance-power (IDP) with the copper grade zones. Sulfur was estimated as a single zone and copper was estimated both with and without grade zones.

Copper grade estimation was done using nearest-neighbor (NN), inverse-distance-power (IDP), and ordinary kriging with grade zone control.

Zinc grade estimation was done using inverse-distance-power (IDP) with copper grade zone control.

Sulfur grade estimation was done using nearest-neighbor (NN), inverse-distance-power (IDP), and ordinary kriging with no zone control. An IDP power of 3 was used for estimation.

IDP anisotropies are the same as the search ellipse radii. The optimized IDP powers are shown in Table 14-8.

Table 14-8: IDP Copper and Zinc Estimation Powers by Grade Zone (Noble, 2020)

	Cu	Zn
Cu Grade Zone	POWER	POWER
Low-Grade	2	3
Mid-Grade	1.5	3
High-Grade	2	3
Very High-Grade	1	3

14.1.10.2 Lead Model

14.1.10.2.1 Lead Grade Distribution

Lead grade distributions were defined separately in the East and West Zones of the MinZ, which are separated by the NW fault. Both grade distributions are presented as lognormal cumulative probability and lognormal histogram plots in Figure 14-16 and Figure 14-17. Lead grade zones are not required for the resource model within the East and West Zones. It is noted that many lead assays are very low grade and close to the detection limit, resulting in very spikey histograms. Lead grade-zoning is not required within East and West zones

Lead distribution in both zones is represented by a single population averaging 0.035% Pb in the East Zone and 0.022% Pb in the West Zone, with spikes representing populations of default values.

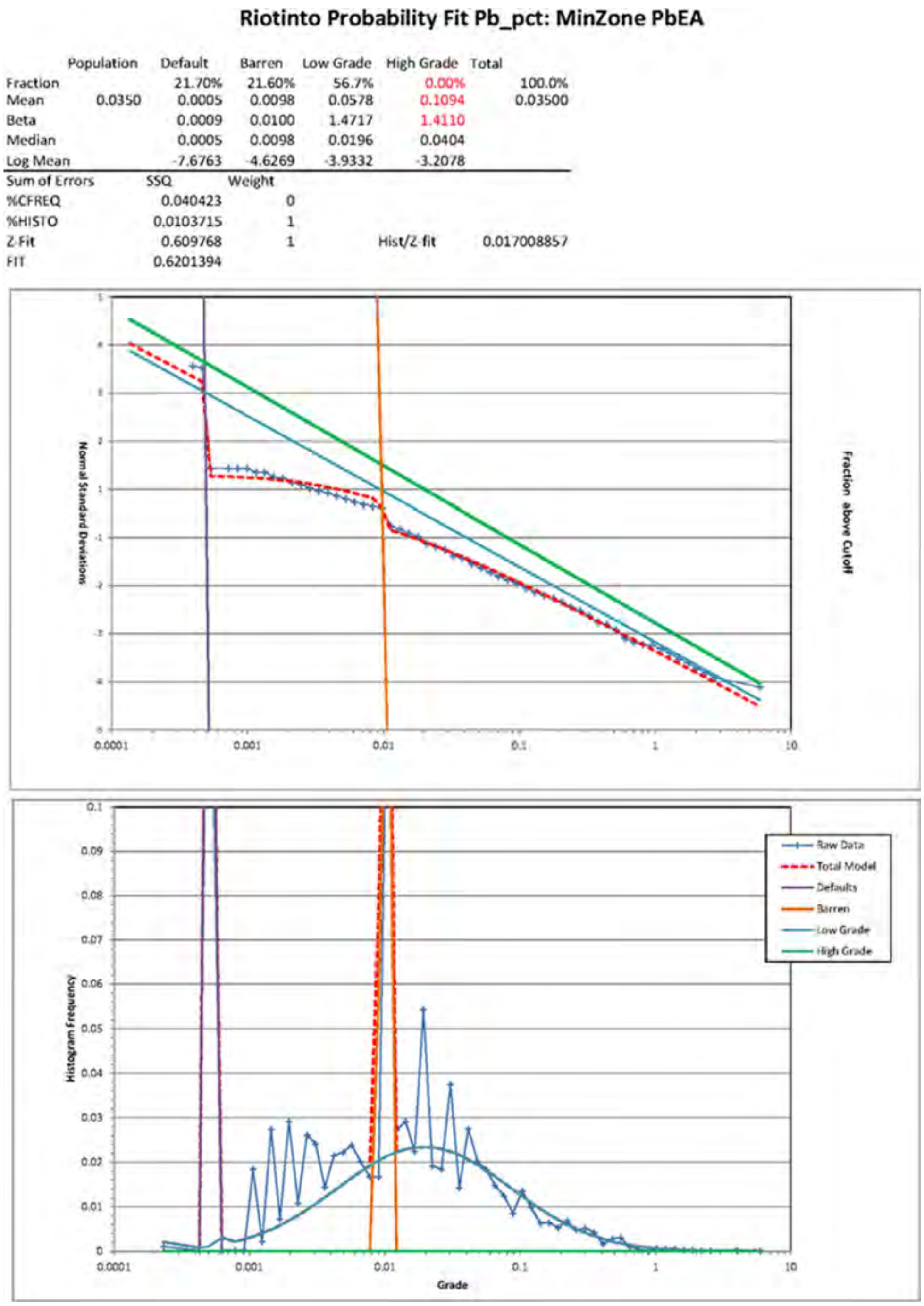


Figure 14-16: Lead Grade Distribution in the East Zone - MinZ (Noble & Barrero, 2020).

Riotinto Probability Fit Pb_pct: MinZone PbWE

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		23.99%	6.02%	70.0%	0.00%	100.0%
Mean	0.022	0.000	0.010	0.031	0.120	0.02244
Beta		0.001	0.005	1.457	1.200	
Median		0.000	0.010	0.011	0.058	
Log Mean		-7.680	-4.625	-4.534	-2.840	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0093298	0		
%HISTO	0.0022378	1		
Z-Fit	0.1871699	0.01	Hist/Z-fit	0.011955733
FIT	0.0041095			

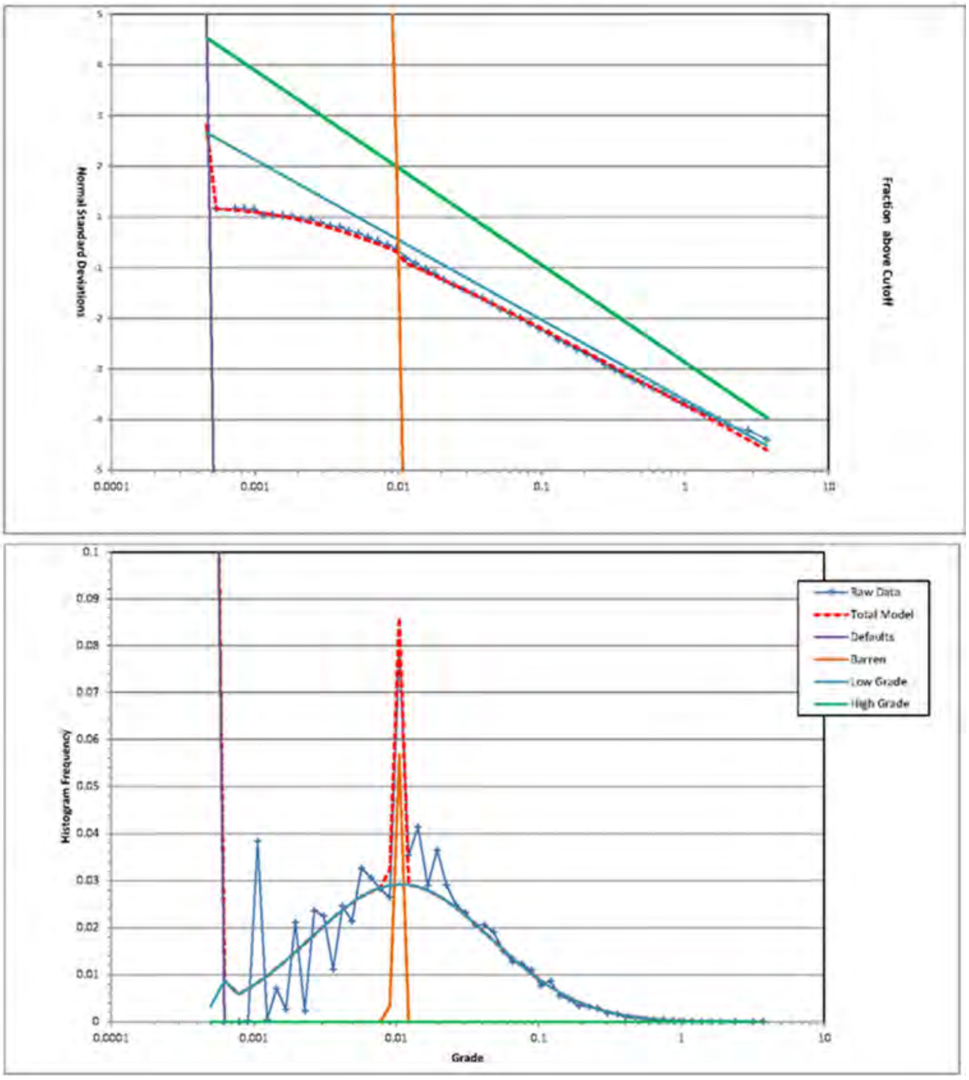


Figure 14-17: Lead Grade Distribution in the West Zone - MinZ (Noble & Barrero, 2020)

14.1.10.2.2 Lead Variograms

Variograms were computed for Lead in the unfolded coordinate system. A summary of the results of variogram modeling are summarized in Table 14-9.

In the N-S direction, the unfolded variograms has a significantly shorter range than the E-W orientation confirming that lead mineralization is following parallel to the fold. In detail, lead in the West Zone has better continuity along the E-W axis than the East Zone.

Table 14-9: Summary of Variogram Models for Lead (Noble & Barrero, 2020)

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
				Exponential Structure 1				Exponential Structure 2			
			Nugget	Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Pb West	15	0.1	10	20	36	0.348	520	170	90	0.552
	Pb East	13	0.1	10	15	25	0.376	200	40	25	0.524

14.1.10.2.3 Lead Search Ellipse Parameters

Search ellipse parameters were developed for each zone based on the variograms and a general assessment of the continuity of grades. The search ellipses are relative to the unfolded coordinate system and are rotated around the +Z axis. Lead search ellipse parameters are summarized in Table 14-10.

Table 14-10: Lead Search Ellipse Parameters (Noble& Barrero, 2020)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
NN Pb West	15	150	100	10	6	10	1.5	6	10	3	1	10
NN Pb East	13	100	50	10	6	10	1.5	6	10	3	1	10
IDP Pb West	15	100	50	10	6	10	1.5	6	10	3	1	10
IDP Pb East	13	50	25	10	6	10	1.5	6	10	3	1	10

14.1.10.2.4 Lead Grade Estimation

The lead grade model was estimated using the unfolded coordinate space nearest-neighbor (NN), and inverse-distance-power (IDP) separately in the East and West zones. The optimized IDP powers are 3.9 for the West and 3 for the East. IDP anisotropies are the same as the search ellipse radii.

The average estimated lead grade was assigned as default value when the NN and IDP estimates were missing.

14.1.10.3 Arsenic Model

14.1.10.3.1 Arsenic Grade Distribution

The distribution of arsenic grade is different on both sides of the NW discontinuity which splits the MinZ into East and West zones. Arsenic grade-zoning is not required within these zones.

The East Zone grade distribution, presented in Figure 14-18 as lognormal cumulative probability and lognormal histogram plots, indicates that the arsenic grade distribution is composed of a main population making up the 90% of the data with an average grade of 394 ppm As, and small low-grade and high-grade populations representing the 10% of the data.

The West Zone is much lower grade than the East Zone, with a grade distribution dominated by a population averaging 162 ppm As that represents 97% of the data and a long tail into lower grades (Figure 14-19).

Riotinto Probability Fit As_ppm: MinZone AsEA

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		4.14%	89.62%	6.2%	0.00%	100.0%
Mean	466.66	57.21	393.99	1781.59	3186.83	466.66098
Beta		1.00	0.85	0.95	1.19	
Median		34.55	275.40	1136.22	1573.84	
Log Mean		3.54	5.62	7.04	7.36	

Sum of Errors	SSQ	Weight		
%CFREQ	0.001142	0		
%HISTO	0.0003274	1		
Z-Fit	0.0639264	1	Hist/Z-fit	0.005121359
FIT	0.0642538			

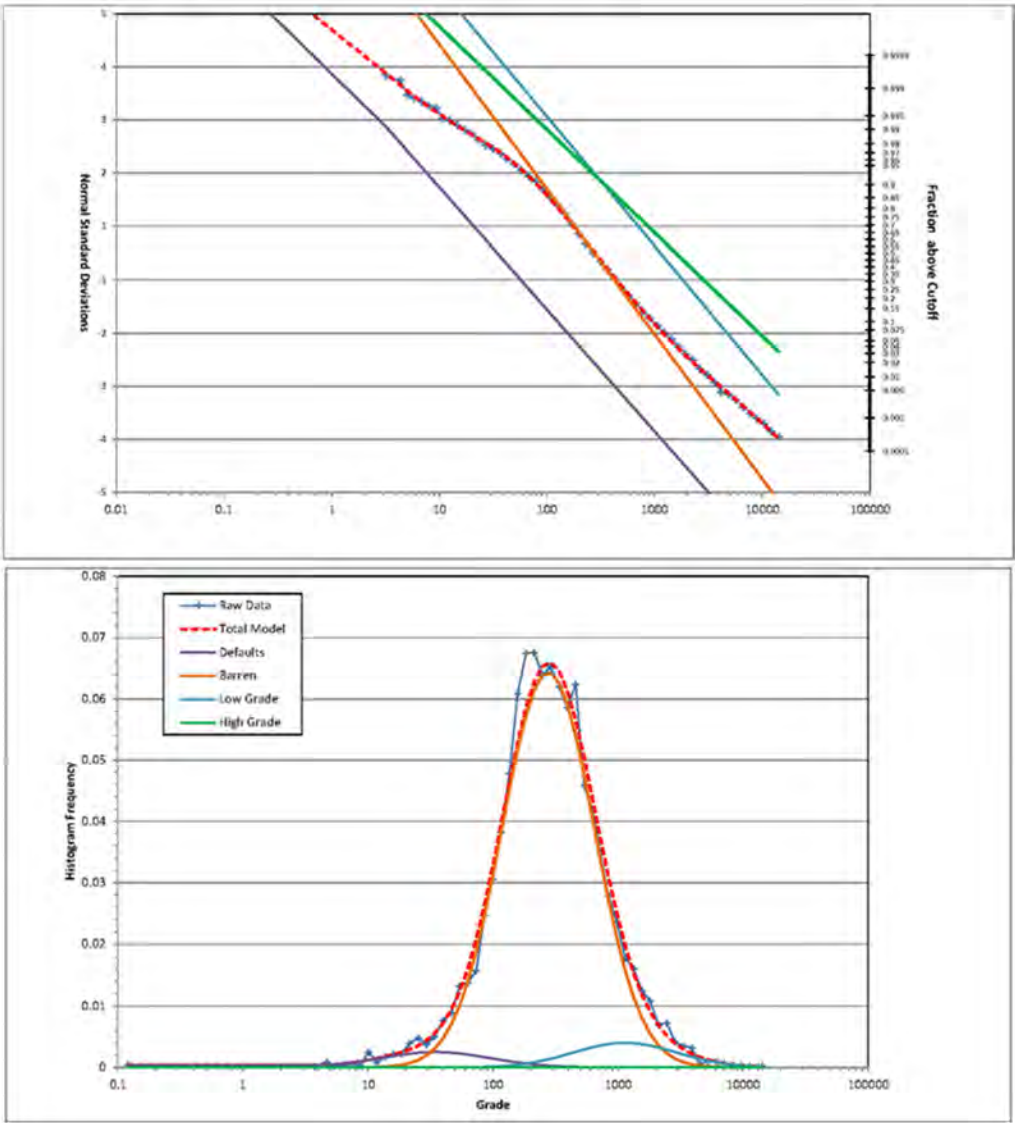


Figure 14-18: Arsenic Grade Distribution in the East Zone - MinZ (Noble & Barrero, 2020).

Riotinto Probability Fit As_ppm: MinZone AsWE

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		1.24%	2.03%	96.7%	0.00%	100.0%
Mean	156.80	0.01	10.02	161.88	214.17	156.79781
Beta		0.47	1.13	1.04	1.38	
Median		0.01	5.26	94.45	82.23	
Log Mean		-4.86	1.66	4.55	4.41	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0027261	0		
%HISTO	0.0003773	1		
Z-Fit	0.0669461	1	Hist/Z-fit	0.005636312
FIT	0.0673234			

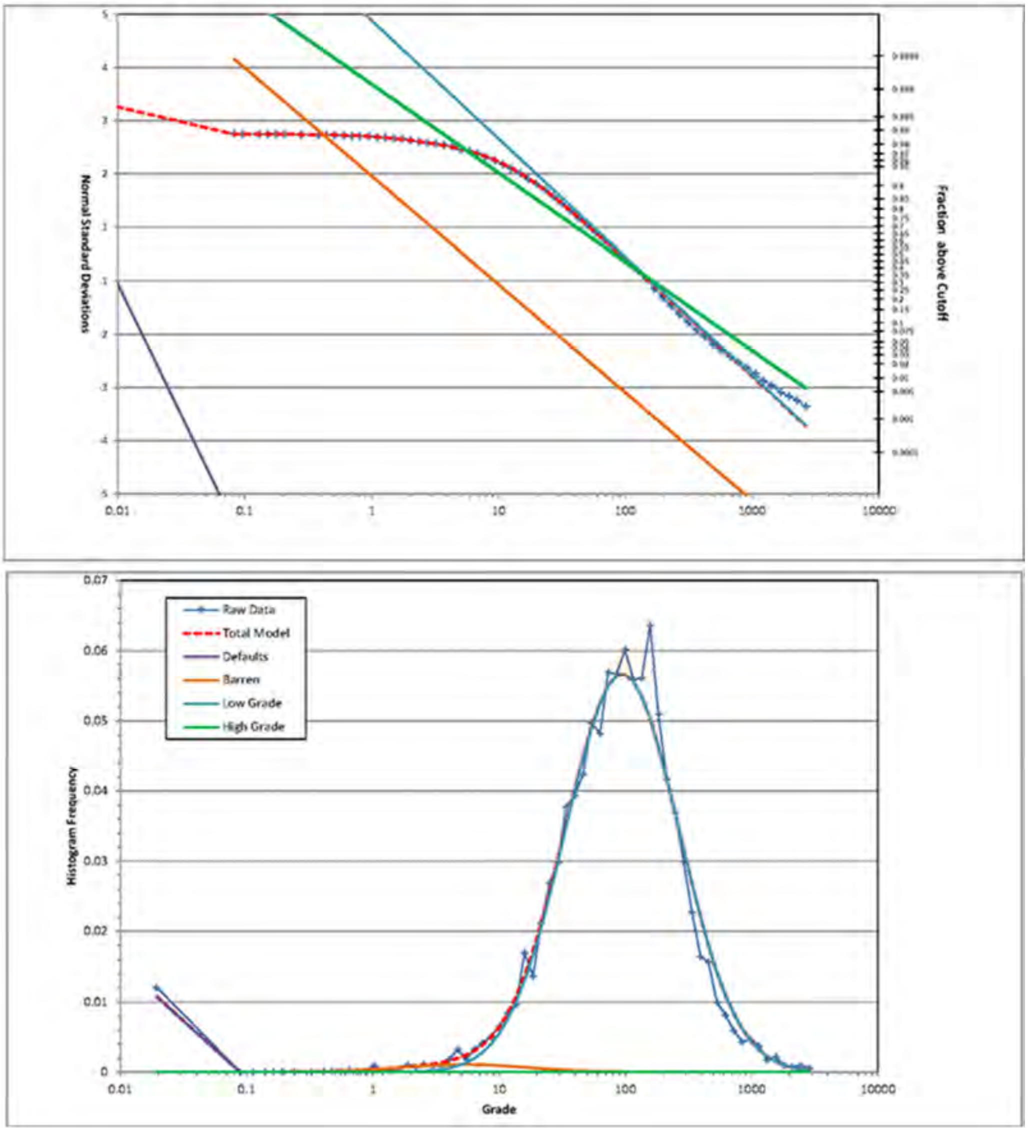


Figure 14-19: Arsenic Grade Distribution in the West Zone- MinZ (Noble & Barrero, 2020).

14.1.10.3.2 Arsenic Variograms

Variograms were computed for arsenic in the unfolded coordinate system within the East and West Zones, individually. The results of variogram modeling are summarized in Table 14-11. Within the East and West Zones arsenic variograms show geometric anisotropy with longer ranges parallel to the X axis and shorter ranges in the Y axis, with a marked zonal effect along the Z axis in the East Zone.

Table 14-11: Summary of Variogram Models for Arsenic (Noble & Barrero, 2020)

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
				Exponential Structure 1				Exponential Structure 2			
			Nugget	Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	As West	14	0.35	25	20	20	0.4	300	110	80	0.25
	As East	18	0.1	30	15	20	0.5	310	35	275	0.4

14.1.10.3.3 Arsenic Search Ellipse Parameters

Search ellipse parameters were developed for each zone based on the variograms and a general assessment of the continuity of grades. The search ellipses are relative to the unfolded coordinate system and are rotated around the +Z axis. Search ellipse parameters are summarized in Table 14-12.

Table 14-12: Arsenic Search Ellipse Parameters (Noble& Barrero, 2020)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
NN As West	14	200	100	40	1	1	2	1	1	0	1	1
NN As East	18	100	40	40	1	1	2	1	1	0	1	1
IDP As West	14	100	50	20	6	10	2	6	10	4	1	10
IDP As East	18	50	20	20	6	10	2	6	10	4	1	10

14.1.10.3.4 Arsenic Grade Estimation

The arsenic grade model was estimated using the unfolded coordinate space with nearest-neighbor (NN) and inverse-distance-power (IDP) separately in the East and West zones.

An IDP power of 3.9 was used for estimation in both East and West zones. IDP anisotropies are the same as the search ellipse radii. The average estimated arsenic grade was assigned as default value when the NN and IDP estimates were missing.

14.1.10.4 Antimony Model

14.1.10.4.1 Antimony Grade Distribution

The antimony grade distribution was found to be extremely complex, with very-high-grade zones having sharp limits and irregular shapes that are exceedingly difficult to model based on grade only. The high antimony zones (Sb zones) have been defined in detail using outlines in each level, every 10 m, and labeled North, East, West, Central, and South zones as shown in Figure 14-20.

Antimony estimation was performed separately inside and outside the high-grade antimony zones. Inside the Sb Zones, the defined zone perimeters were used to select the assay data used for estimation. Outside the Sb zones, antimony was estimated using the copper CuGZones which were found to be appropriate grade zones for antimony.

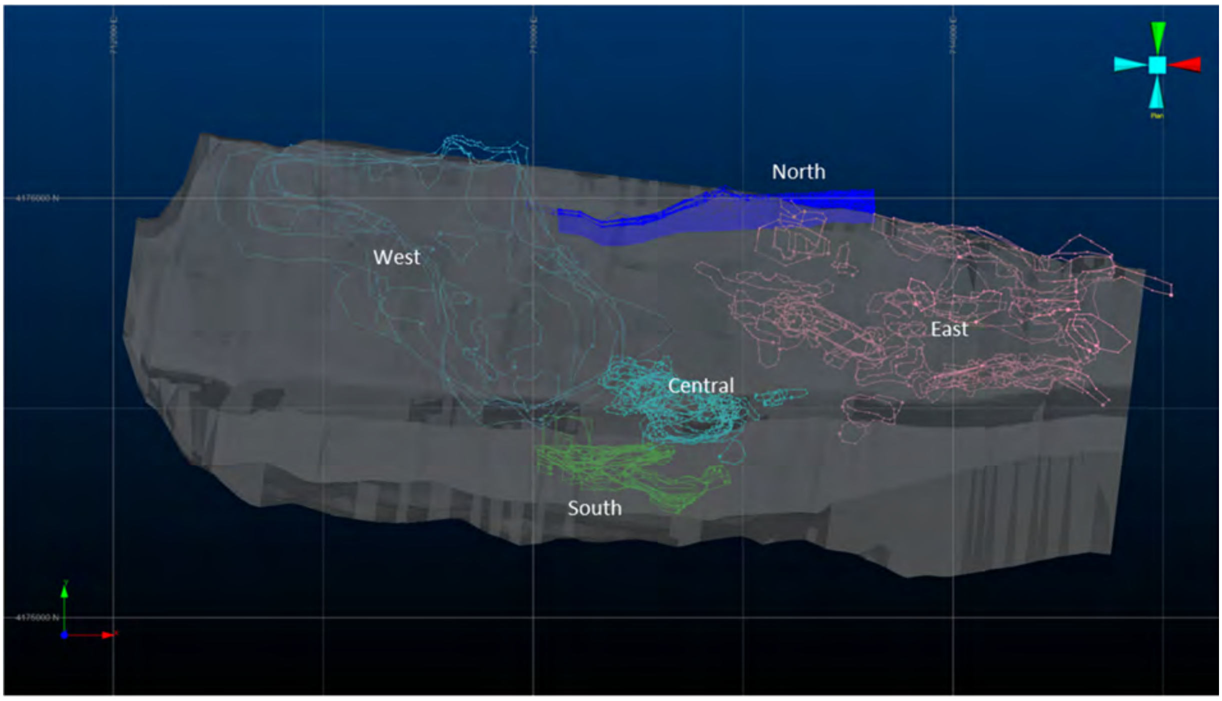


Figure 14-20: Plan 3D View of the location of the high-Sb zones (Noble & Barrero, 2020).

Within the defined Sb Zones, antimony grade distribution is dominated by a high-grade population representing the 72% of the data with an average grade of 282 ppm Sb (Figure 14-21), with long tails into the very-low and very-high grades.

Outside the high-grade Sb-Zones, the grade distribution of the antimony in the CuGZones is dominated by a population making up the 74% of the data, with an average antimony grade of 14.5 ppm and a medium grade population representing 13% of the data with an average grade of 74 ppm Sb (Figure 14-22).

A comparison of the antimony grade distribution in the Sb Zones and in the CuGZones is shown in Figure 14-23 as lognormal probability and histogram plots. The data within the copper grade zones represent the 90% of the data.

Riotinto Probability Fit Antimony: SbZones

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		1.19%	0.00%	26.4%	72.38%	100.0%
Mean	223.2317	0.0089	0.3833	71.8160	282.1865	223.23167
Beta		0.0299	0.0617	0.3420	1.4201	
Median		0.0089	0.3826	67.7366	102.9439	
Log Mean		-4.7209	-0.9607	4.2156	4.6342	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0026028	0		
%HISTO	0.0017756	1		
Z-Fit	0.0924842	0.01	Hist/Z-fit	0.019198715
FIT	0.0027004			

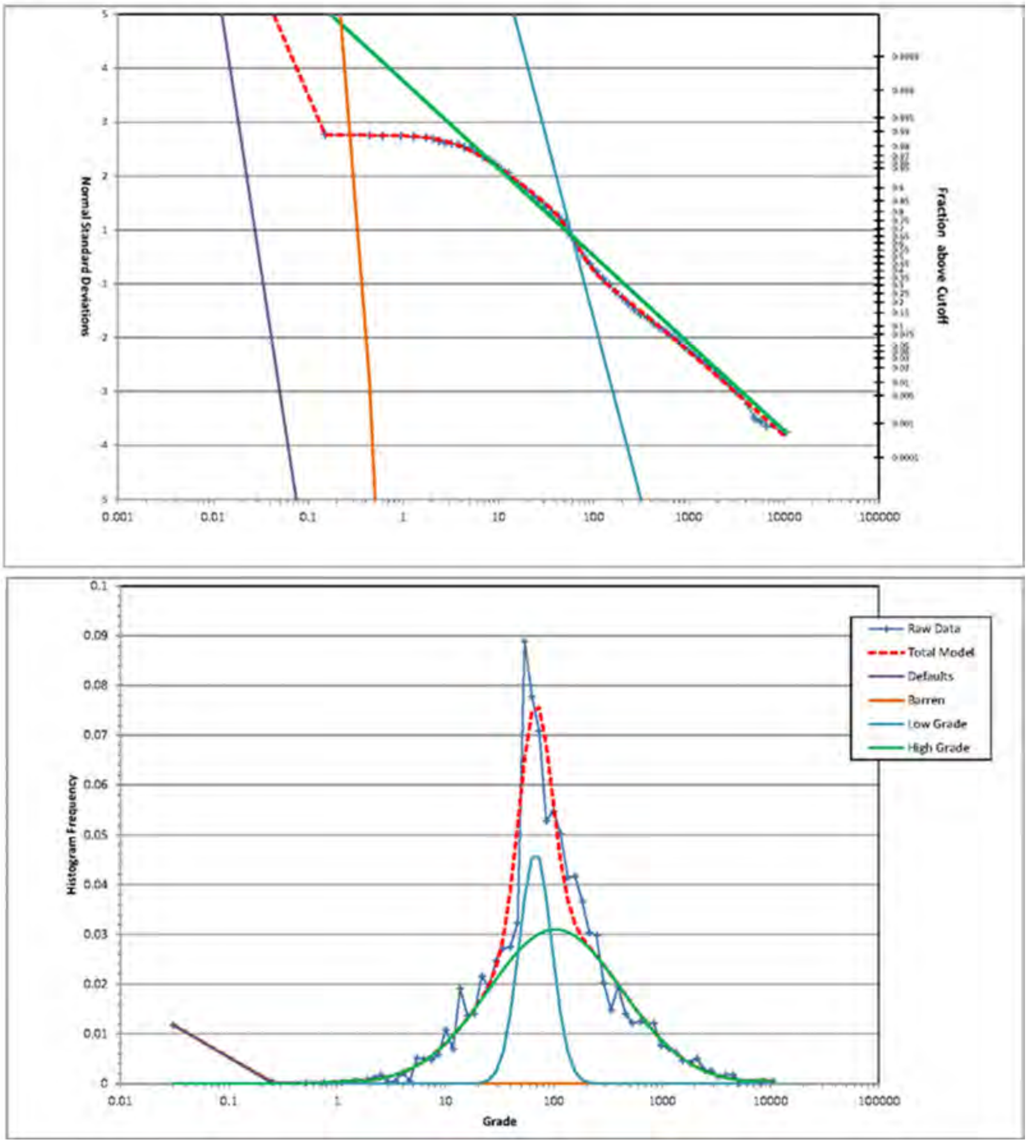


Figure 14-21: Lognormal probability and histogram plots of Sb grade in the High-grade Sb Zones (Noble & Barrero, 2020).

Riotinto Probability Fit Antimony: CuGZones

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		9.45%	3.90%	74.0%	12.67%	100.0%
Mean	20.2448	0.0089	0.4799	14.5304	74.7710	20.24479
Beta		0.0299	0.0565	0.8899	1.5501	
Median		0.0089	0.4792	9.7791	22.4874	
Log Mean		-4.7211	-0.7357	2.2802	3.1130	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0047591	0		
%HISTO	0.0032465	1		
Z-Fit	0.0556156	0.01	Hist/Z-fit	0.058373799
FIT	0.0038026			

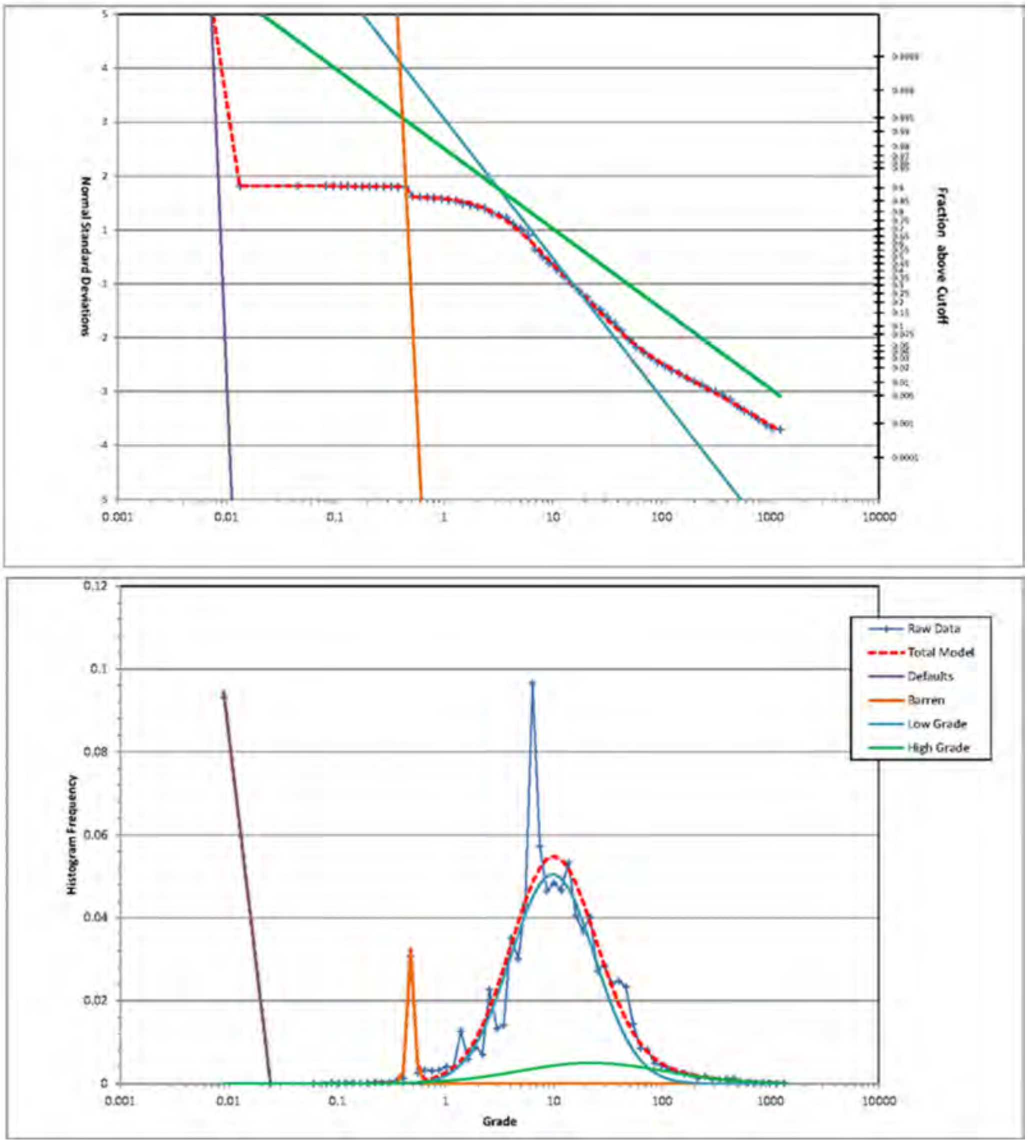


Figure 14-22: Lognormal probability and histogram plots of Sb grade in the CuGZones (Noble & Barrero, 2020)

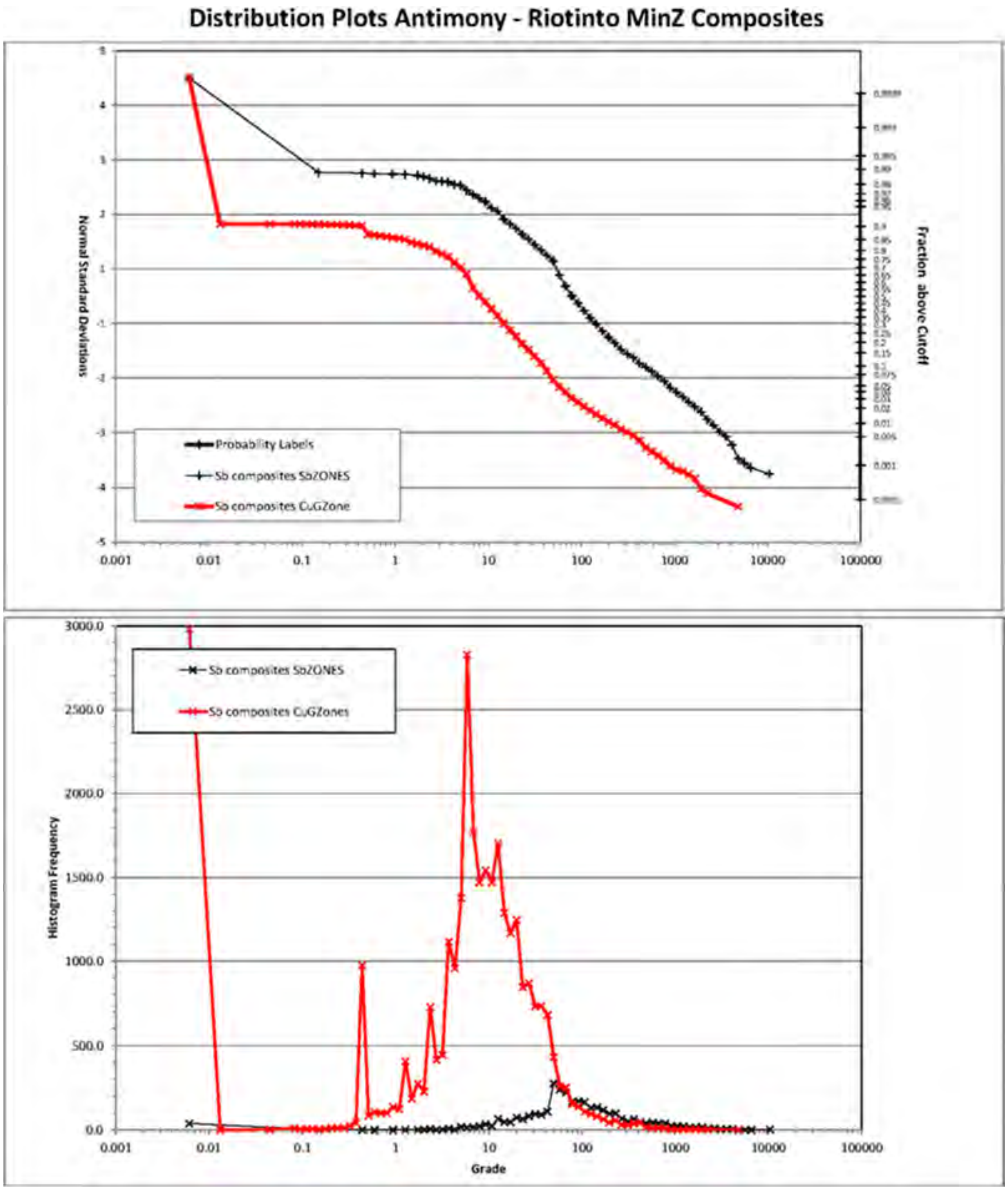


Figure 14-23: Comparison of the antimony distributions within the zones (Noble & Barrero, 2020).

14.1.10.4.2 Antimony Variograms

Variograms were computed for antimony in the ETRS 89 coordinate system within each of the zones, except the North zone where there are not enough samples for variogram modeling. The results of variogram modeling are summarized in Table 14-13. Outside the Sb Zones, antimony variograms are isotropic in the short range and show a strong geometric anisotropy in the E-W to SE-NW orientation with longer ranges along this orientation.

Inside the Sb Zones zonal anisotropy is present. The best continuity is found in the East and West zones along the X axis with longer ranges.

Table 14-13: Summary of Variogram Models for Antimony (Noble, 2020)

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
			Nugget	Exponential Structure 1				Exponential Structure 2			
				Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
ETRS	Sb No Zone	19	0.4	11.2	10.9	10	0.39	663	179	34.7	0.21
	Sb Central	43	0.4	9.1	26.4	1.7	0.488	29.5	96.4	70.4	0.112
	Sb South	6	0.34	48	5.8	12.3	0.41	24.6	39.9	48.9	0.25
	Sb East	14	0.34	15	15	10	0.6	1000	200	15	0.06
	Sb West	0	0.4	5.3	25.3	15	0.43	208.7	96.7	15	0.17

14.1.10.4.3 Antimony Search Ellipse Parameters

Search ellipse parameters were developed for each Sb Zone based on the variograms and a general assessment of the continuity of grades. The search ellipses are relative to the unfolded coordinate system and are rotated around the +Z axis except in the high-grade west zone. Search ellipse parameters are summarized in Table 14-14.

Table 14-14: Antimony Search Ellipse Parameters (Noble, 2020)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
No Zone	19	100	65	25	5	10	1.5	5	10	5	1	10
Central	43	30	100	15	5	10	1.5	5	10	5	1	10
South	6	100	40	60	5	10	1.5	5	10	5	1	10
East	14	50	50	40	5	10	1.5	5	10	5	1	10
West	0	50	100	40	5	10	1.5	5	10	5	1	10

14.1.10.4.4 Antimony Grade Estimation

Antimony grade model was estimated using the unfolded coordinate space with nearest-neighbor (NN), and inverse-distance-power (IDP) separately within the Sb Zones and outside the Sb Zones using the CuGZones control. The North Zone does not have enough data for estimation within the zone; for this reason, the average Sb grade of 145ppm Sb has been assigned as a default value to estimates of this zone.

An IDP power of 3 was used for estimation in all cases. IDP anisotropies are the same as the search ellipse radii. Average estimated antimony grade was assigned as default value when the NN and IDP estimates were missing.

14.1.10.5 Model Optimization

The IDP model was optimized relative to the NN model and through reconciliation, as follows:

1. The average copper grade of the IDP model should be as close as possible to the average grade of the NN model to ensure that the overall estimates are unbiased.
2. Estimated IDP copper grade and tonnage should be as close as possible to the blasthole model grade and tonnage over the most important range of cutoff grades from 0.15% Cu to 0.25% Cu.
3. Estimated IDP grade of sulfur, lead, zinc, arsenic, and antimony at different copper cutoff grades should be as close as possible to the blasthole model grade.

The copper tonnage-grade distribution of the resource model is compared to the blasthole model in Table 14-15. This comparison shows that the resource model slightly overestimates tonnage compared to blasthole model, this is within 4% to 8% in the most important range of cutoff grades from 0.15% Cu to 0.24% Cu. Copper grade is slightly underestimated in the resource model and is 2% to 4.7% lower than blasthole grades. The tonnage and copper grade differences offset, and the tonnage of copper metal is between 2–3.4% different through the 0.15% Cu to 0.24% Cu grade range. There are larger differences at higher cutoff grades, which may be important for short-range scheduling but do not affect resources or reserves.

Estimation and reconciliation of grades for sulfur and the penalty elements antimony, arsenic, lead, and zinc are more difficult than copper. In the case of these elements, the models must not only estimate the grades of the elements as standalone models, but the estimates must preserve any correlation with copper grade. Considering that none of the penalty elements have correlation coefficients (R-squared) greater than 10% this is an extremely difficult task.

As shown in Table 14-15, sulfur grade tends to be estimated about 0.65% sulfur low, but otherwise tracks blasthole model sulfur. This difference may lead to a slightly conservative estimation of density and tonnage but is not important.

Resource model zinc grade is about 0.007% Zn lower than blasthole model zinc grade, which is small considering the quality of the zinc assays.

Resource model lead grade is about 0.002% Pb lower than blasthole model lead grade; this difference is insignificant considering the quality of the lead assays.

Resource model arsenic grade is about 34 ppm As lower than blasthole model arsenic grade, this difference is significant, but the authors were unable to reduce the bias for this estimate. It would be appropriate to add 34 ppm arsenic to the model arsenic grades during mine planning, but this is only a quick-and-dirty fix, and arsenic estimation deserves more study.

Resource model antimony grade generally tracks blasthole model antimony grade for typical cutoff grades. Considering the importance of antimony as a penalty element, additional work to improve the correlation at higher cutoff grades could be useful.

Table 14-15: Tonnage-Grade Distribution the Resource Model (April 2021) vs the Blasthole Model (October 2020), (Noble, 2021).

%Cu	Resource Model								BlastHole Model							
Cutoff	Ktonnes	%Cu	Ktonnes Cu	%S	%Zn	%Pb	ppm As	ppm Sb	Ktonnes	%Cu	Ktonnes Cu	%S	%Zn	%Pb	ppm As	ppm Sb
0.00	123,024	0.265	326	4.670	0.093	0.026	213	45	123,647	0.266	329	5.298	0.100	0.030	214	43
0.05	84,947	0.369	314	4.798	0.109	0.018	223	56	98,448	0.327	322	5.409	0.111	0.019	233	52
0.10	77,813	0.397	309	4.844	0.114	0.018	226	59	80,034	0.386	309	5.497	0.119	0.017	247	61
0.15	69,436	0.430	298	4.845	0.119	0.017	229	63	66,647	0.439	292	5.516	0.127	0.016	261	70
0.16	67,391	0.438	295	4.850	0.120	0.017	231	64	64,431	0.448	289	5.517	0.128	0.016	263	72
0.17	65,366	0.446	292	4.836	0.121	0.017	233	64	62,277	0.458	285	5.508	0.129	0.016	265	73
0.18	63,423	0.455	288	4.849	0.123	0.017	234	65	60,116	0.468	281	5.505	0.130	0.016	268	75
0.19	61,378	0.464	285	4.845	0.124	0.017	237	67	58,167	0.478	278	5.487	0.131	0.016	270	77
0.20	59,355	0.473	281	4.843	0.125	0.017	238	68	56,146	0.488	274	5.482	0.132	0.016	273	79
0.21	57,459	0.482	277	4.852	0.126	0.018	240	68	54,190	0.498	270	5.478	0.133	0.016	275	80
0.22	55,750	0.490	273	4.843	0.128	0.017	241	69	52,364	0.508	266	5.473	0.134	0.016	276	82
0.24	52,773	0.504	266	4.857	0.130	0.017	244	71	48,644	0.529	257	5.479	0.136	0.016	281	86
0.26	50,084	0.518	259	4.872	0.131	0.017	246	73	45,523	0.548	250	5.478	0.138	0.016	284	90
0.28	47,129	0.534	252	4.915	0.131	0.017	247	75	42,415	0.569	241	5.478	0.140	0.015	286	94
0.30	44,113	0.550	243	4.971	0.132	0.017	249	76	39,327	0.591	232	5.488	0.143	0.015	290	98
0.40	30,084	0.644	194	5.176	0.140	0.017	274	80	27,252	0.699	190	5.567	0.154	0.016	319	119
0.50	19,428	0.753	146	5.426	0.152	0.019	301	82	18,725	0.813	152	5.719	0.166	0.017	348	140
0.60	12,465	0.869	108	5.982	0.166	0.022	329	89	13,132	0.926	122	5.962	0.180	0.018	375	158
0.70	7,953	0.995	79	6.656	0.181	0.026	373	105	9,187	1.045	96	6.201	0.195	0.020	409	176
%Cu	Difference Resource Model-BlasHole Model								% Differences (Resource Model-BlastHole Model)/Blasthole Model							
Cutoff	Ktonnes	%Cu	Ktonnes Cu	%S	%Zn	%Pb	ppm As	ppm Sb	Ktonnes	%Cu	Ktonnes Cu	%S	%Zn	%Pb	ppm As	ppm Sb
0.00	(623)	(0.00)	(3.18)	(0.63)	(0.007)	(0.004)	(1)	2	-0.5%	-0.5%	-1.0%	-12%	-7%	-14%	0%	4%
0.05	(13,501)	0.04	(8.75)	(0.61)	(0.002)	(0.001)	(10)	4	-13.7%	12.7%	-2.7%	-11%	-1%	-4%	-4%	7%
0.10	(2,221)	0.01	0.11	(0.65)	(0.005)	0.001	(22)	(2)	-2.8%	2.9%	0.0%	-12%	-4%	7%	-9%	-3%
0.15	2,789	(0.01)	6.00	(0.67)	(0.008)	0.002	(32)	(7)	4.2%	-2.0%	2.1%	-12%	-6%	10%	-12%	-10%
0.16	2,960	(0.01)	6.26	(0.67)	(0.008)	0.002	(32)	(8)	4.6%	-2.3%	2.2%	-12%	-6%	10%	-12%	-11%
0.17	3,089	(0.01)	6.47	(0.67)	(0.008)	0.002	(33)	(9)	5.0%	-2.6%	2.3%	-12%	-6%	10%	-12%	-12%
0.18	3,307	(0.01)	6.85	(0.66)	(0.007)	0.002	(33)	(10)	5.5%	-2.9%	2.4%	-12%	-6%	10%	-12%	-13%
0.19	3,210	(0.01)	6.67	(0.64)	(0.007)	0.002	(33)	(10)	5.5%	-3.0%	2.4%	-12%	-6%	10%	-12%	-13%
0.20	3,209	(0.02)	6.67	(0.64)	(0.007)	0.002	(34)	(11)	5.7%	-3.1%	2.4%	-12%	-5%	10%	-13%	-14%
0.21	3,269	(0.02)	6.79	(0.63)	(0.007)	0.002	(35)	(12)	6.0%	-3.3%	2.5%	-11%	-5%	11%	-13%	-15%
0.22	3,387	(0.02)	7.04	(0.63)	(0.006)	0.002	(35)	(13)	6.5%	-3.6%	2.6%	-12%	-5%	11%	-13%	-16%
0.24	4,128	(0.02)	8.73	(0.62)	(0.007)	0.002	(36)	(15)	8.5%	-4.7%	3.4%	-11%	-5%	10%	-13%	-18%
0.26	4,561	(0.03)	9.83	(0.61)	(0.007)	0.002	(38)	(17)	10.0%	-5.5%	3.9%	-11%	-5%	11%	-13%	-19%
0.28	4,714	(0.04)	10.24	(0.56)	(0.009)	0.001	(40)	(19)	11.1%	-6.2%	4.2%	-10%	-6%	9%	-14%	-21%
0.30	4,786	(0.04)	10.45	(0.52)	(0.011)	0.001	(41)	(22)	12.2%	-6.8%	4.5%	-9%	-8%	7%	-14%	-22%
0.40	2,832	(0.05)	3.44	(0.39)	(0.014)	0.001	(46)	(38)	10.4%	-7.8%	1.8%	-7%	-9%	5%	-14%	-32%
0.50	703	(0.06)	(5.99)	(0.29)	(0.014)	0.002	(47)	(58)	3.8%	-7.4%	-3.9%	-5%	-9%	14%	-13%	-42%
0.60	(667)	(0.06)	(13.39)	0.02	(0.014)	0.004	(46)	(68)	-5.1%	-6.2%	-11.0%	0%	-8%	22%	-12%	-43%
0.70	(1,233)	(0.05)	(16.90)	0.45	(0.014)	0.005	(37)	(71)	-13.4%	-4.8%	-17.6%	7%	-7%	26%	-9%	-40%

14.1.11 Filón Sur Massive Sulfides and Cloritas

14.1.11.1 Filón Sur Grade Distributions

The correlation between elements via regression were done for copper, sulfur, lead, zinc, arsenic, antimony, and iron. The main findings of the regression analysis of the composite assays are summarized below:

1. Within the massive sulfides copper correlates with sulfur, arsenic, and antimony. The best correlation is found between the sulfur and iron, and between the arsenic and the sulfur and lead.
2. Within the cloritas, the correlation between elements is poor. The best correlations are found between lead and zinc, and sulfur and with iron.

Within both domains and after compositing, when copper assay is present, missing values of arsenic and antimony have been replaced by the average value of the domain; the missing iron values have been estimated using the iron-sulfur power regression:

Cloritas: Fe_pct=4.993+S_pct*0.7611

Massive Sulfides: Fe_pct=5.8211+S_pct*0.7545

The grade distributions of the composited data for the massive sulfides and cloritas domains have been reviewed for each of the elements. Lognormal cumulative probability plots and elemental lognormal histogram plots in each domain were analyzed, those for copper are presented in Figure 14-24 and Figure 14-25.

The main findings of the grade distributions of the composited data are:

- Copper: Grades of composited data average 0.77% Cu for the massive sulfides and 0.66% Cu for the cloritas domain. The copper grade distribution is composed at least of a high- and a low-grade populations.
- Sulfur: Average sulfur grade within the massive sulfides is 17.3% S while the cloritas is averaging 12.5% S. Several subpopulations can be fitted to the sulfur distribution data.
- Lead: The composited data of the massive sulfides and cloritas can be fitted to a single population averaging 0.14% Pb within the cloritas and 0.53% Pb within the massive sulfides, although the massive sulfide distribution is very spiky.
- Zinc: The zinc distribution is bimodal in the two domains with a low-grade and a high-grade distribution. Zinc is averaging 0.4% in the cloritas and 0.93% in the massive sulfides.
- Arsenic: Arsenic grades average 1105 ppm in the cloritas and 3030 ppm in the massive sulfides. The spike at 1107 ppm As in the arsenic distribution of the cloritas domain, corresponds to the default value used when the assay is missing.
- Antimony: At least two populations (low and high grade) can be fitted to the antimony distributions. Antimony averages 64 ppm in the cloritas domain and 144 ppm in the massive sulfides.
- Iron: Although the populations are quite spiky a predominant high-grade population is clear, averaging 14% Fe in the cloritas and 19% Fe in the massive sulfides.

Probability Fit Copper: Massive Sulfides Composites

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		14.6%	3.64%	60.1%	21.6%	100.0%
Mean	0.769	0.072	0.017	1.188	0.198	0.769
Beta		0.147	0.043	0.784	1.264	
Median		0.072	0.017	0.874	0.089	
Log Mean		-2.636	-4.081	-0.135	-2.420	
Sum of Errors	SSQ		Weight			
%CFREQ		0.0067	0			
%HISTO		0.0092	0			
Z-Fit		0.1150	1		Hist/Z-fit	0.079988
FIT		0.1150				

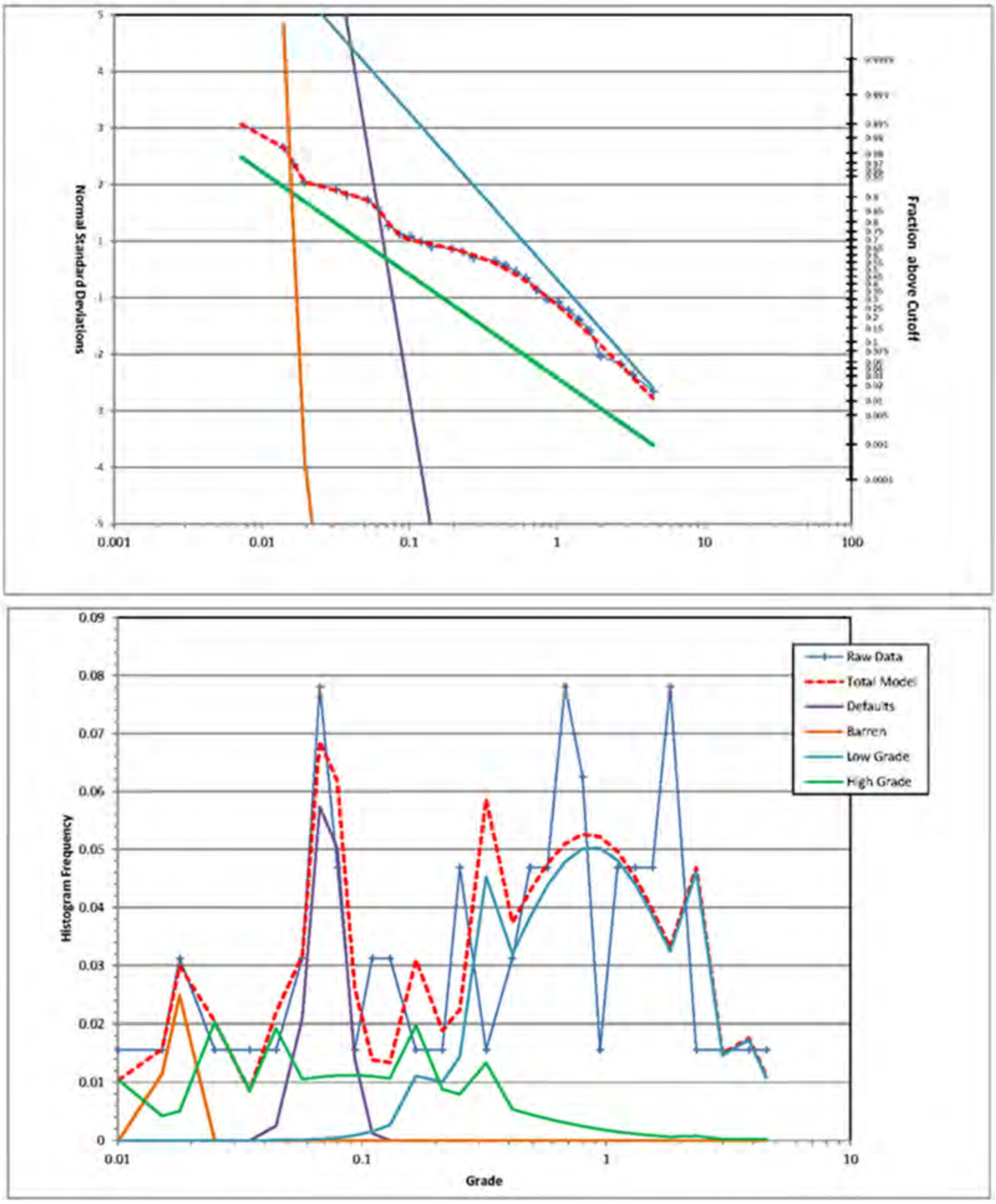


Figure 14-24: Probability Fit (Copper)-Filón Sur massive sulfides, (Noble & Barrero, 2020).

Probability Fit Copper: Cloritas Composites

	Population	Default	Barren	Low Grade	High Grade	Total
Fraction		7.5%	72.67%	19.3%	0.5%	100.0%
Mean	0.656	0.046	0.429	1.646	4.537	0.656
Beta		0.680	0.959	0.340	0.033	
Median		0.036	0.271	1.553	4.535	
Log Mean		-3.313	-1.307	0.440	1.512	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0011	0		
%HISTO	0.0022	0		
Z-Fit	0.0296	1	Hist/Z-fit	0.073219
FIT	0.0296			

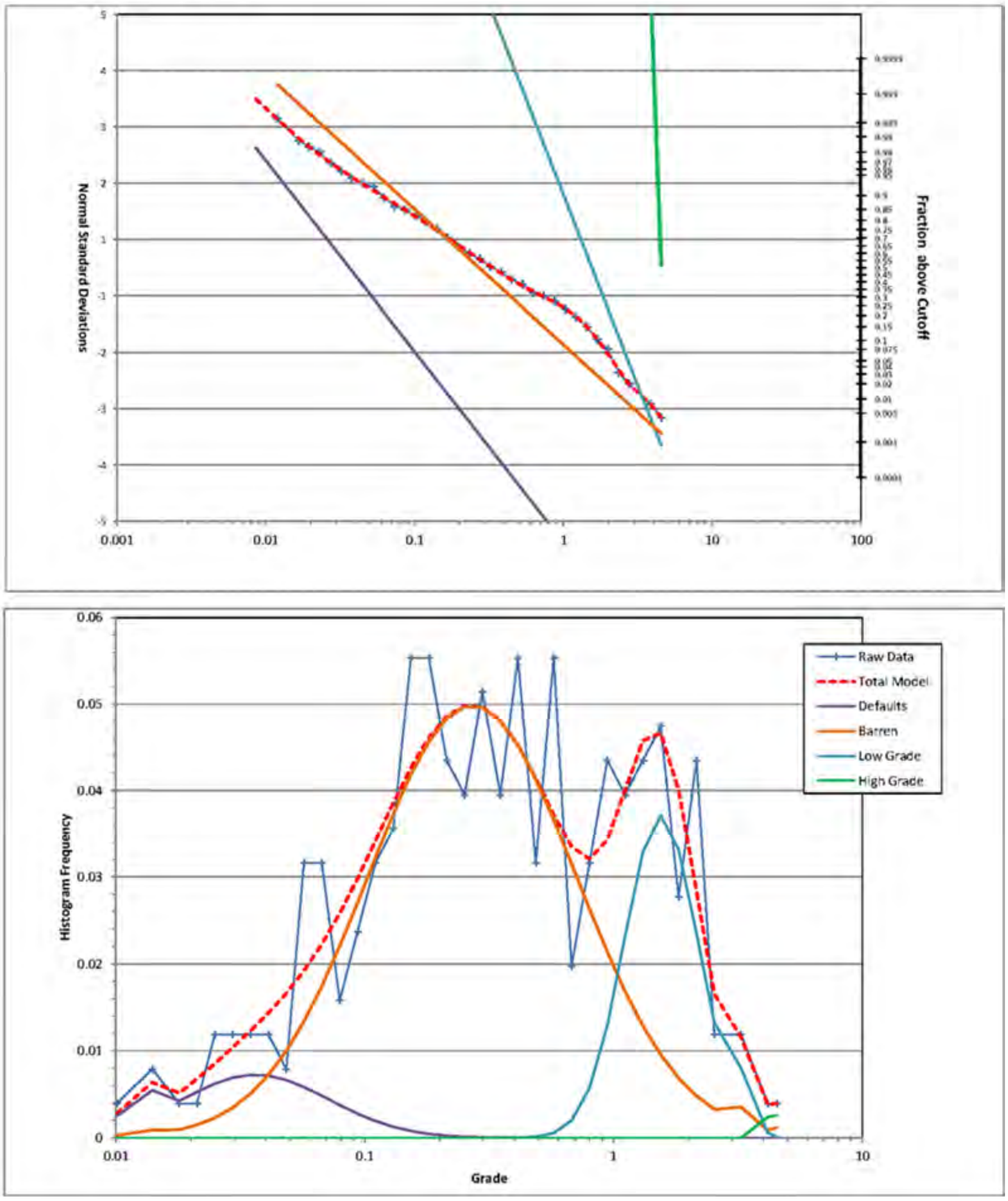


Figure 14-25: Probability Fit (Copper)-Filón Sur Cloritas, (Noble & Barrero, 2020).

14.1.11.2 Filón Sur Variograms

Variogram modeling has not been performed due to the scarcity of assay data in both cloritas and massive sulfide domains.

14.1.11.3 Filón Sur Search Ellipse Parameters

Search ellipse parameters were defined according to the shape of the domains as well as the scarcity of data, and a general assessment of the continuity of grades.

The search ellipses are relative to the unfolded coordinate system and are not rotated around the +Z axis. Filón Sur search ellipse parameters are summarized in Table 14-16.

Table 14-16: Search ellipse parameters used in the cloritas and massive sulfide estimation (Noble & Barrero, 2020)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
NN	0	75	75	20	4	20	1.5	4	20	2	1	20
IDP	0	75	75	70	4	20	1.5	4	20	2	5	20

14.1.11.4 Filón Sur Estimation

Element grade estimation was done using nearest-neighbor (NN), inverse-distance-power (IDP) constrained within the cloritas, and massive sulfide wireframe domains. The estimated elements in Filón Sur are copper, sulfur, lead, zinc, arsenic, antimony, and iron.

The IDP model was optimized relative to the NN model by matching the average grade of the IDP model to the average grade of the NN model to ensure that the overall estimates are unbiased. The IDP powers are 2 for the cloritas and 3.5 for the massive sulfides. IDP anisotropies are the same as the search ellipse radii.

After estimation, the massive sulfides and cloritas models were combined using the Datamine process ADDMOD, and reblocked to full 10x10x10 m blocks.

Underground mining at Filón Sur started during Roman times, but it was more intensely active between 1874 and 1973. Initially the mining method used was "pillar and stall", but it was changed afterwards to "bottom slicing and filling with roof settlement" mining method to increase ore recovery (Julian, 1939-1940). Based on the reviewed historical information (Gil Varon, 1984), from 1874 to 1967 a total of 18 Mt was mined at the Filón Sur underground mine and 24 Mt in open pit operations.

For the purposes of resource estimation and after the review of legacy sections and plans from the Filón Sur mining period and the new drilling performed by Atalaya in 2017–2018, it is assumed that massive sulfides were almost entirely mined out from the East Coordinate 712,235 to the East. The mining method with roof settlement could disrupt any portions of the ore that were not mined. Any portion of massive sulfide ore intersected by the more recent drill holes may correspond to an in situ pillar or any disrupted block of ore. Since it is impossible to predict the size, shape, or location of any remnant pillars, the entire volume of historical mining is assumed to be backfill.

14.1.12 Construction of the Combined Model

The MinZ copper and the models of the deleterious elements and sulfur were combined using the Datamine process ADDMOD, then the Filón Sur model subset was added to the combined model. Fill, and mined-out models were added afterward on top of the grade model. Corresponding fractions of fill and rock are calculated for each block. Horizontal and vertical sections of the final copper block model are shown in Figure 14-26 and Figure 14-27.

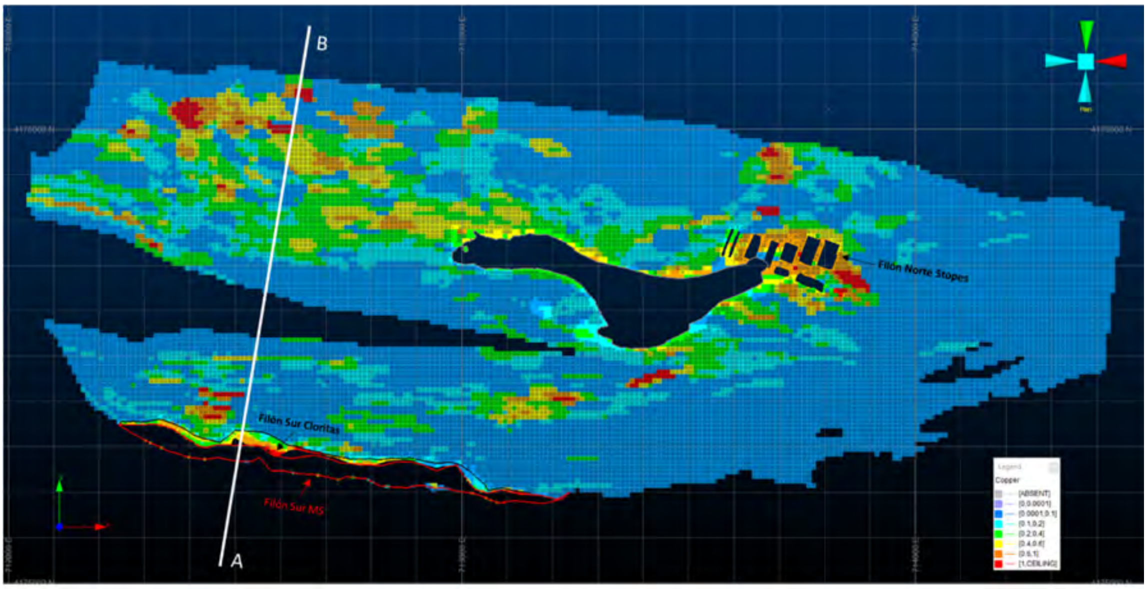


Figure 14-26: Horizontal section at 235m elevation of the copper model (Cu_IDP>0) (Noble & Barrero, 2021).

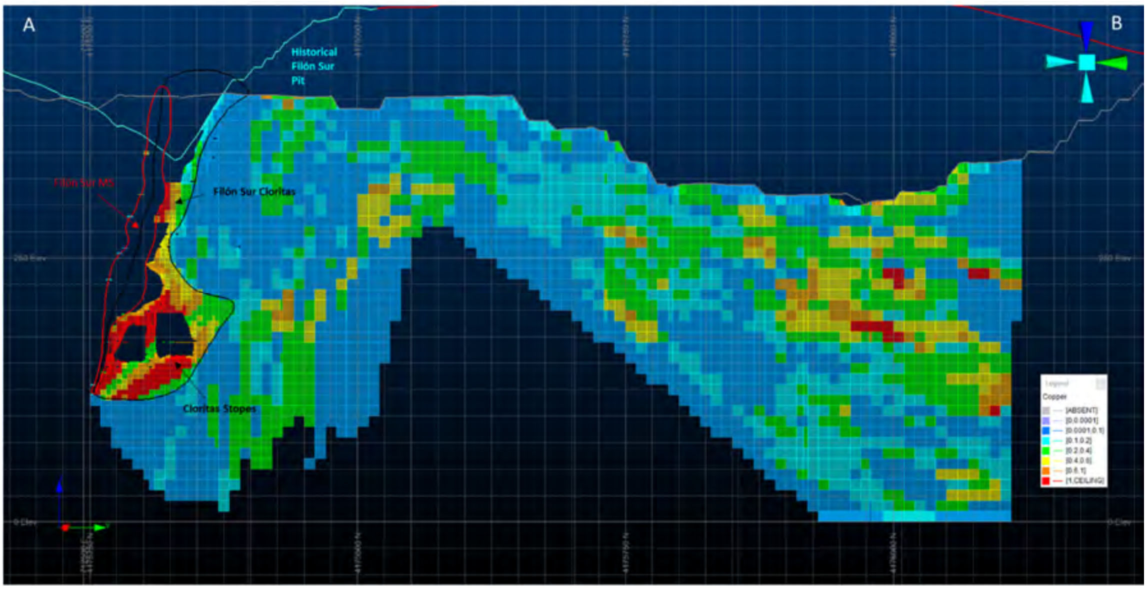


Figure 14-27: Vertical Section A-B on Figure 14-26 showing the copper model (Cu_IDP>0) (Noble & Barrero, 2021).

14.1.13 Mineral Resource Classification

Classification of mineral resources into measured, indicated, and inferred resource classes is based on drill-hole spacing and the number of drill holes selected for estimation. Drill-hole spacing is measured based on the kriging variance from a point-kriging estimate using a “FLAG” variable that is set to 1.0 for composites with copper values and “absent” for composites with insufficient sampling to make a composite. A linear, zero-nugget variogram with a slope of 0.5 is used for this kriging run. The kriging variance for block at the center of a 4-point, square drill-hole pattern is approximately equal to 28% of the drill-hole spacing. If the block is outside the drilling pattern (extrapolated), the kriging variance is equal to the distance to the nearest drill hole. The resource classification parameters are summarized in Table 14-17.

Table 14-17: Mineral Resource Classification Parameters (Noble & Barrero, 2021).

Resource Class	Drill Hole Spacing (m)	Search Volume
Measured	<=60 m	SVOL<=1
Indicated	>60 m to <=100 m	SVOL<=2
Inferred	>100 m to <= 134 m	
Unclassified	>134 m or no estimate	

14.1.14 Mineral Resource Summary

The copper resource was summarized using a Lerchs-Grossmann (LG) pit shell that was run using a copper price of US$3.50/lb Cu and all mineral resources, including inferred resources. All other slope and economic parameters are the same as those used for the design of the open pit for mineral reserve estimation (Chapter 15). The resulting pit shell is considered to have reasonable prospects for economic extraction, assuming that the inferred resource is converted to measured and indicated by drilling and that the copper price is above US$3.50/lb. Mineral resources are estimated from the end of December 2020 topography. The base case cutoff for mineral resources at a copper price of US$3.50/lb is 0.14% Cu. The mineral resource estimate, using multiple cutoffs, is summarized in Table 14-18.

Table 14-18: Mineral Resource Summary – April 2021 estimate, using multiple cutoffs, constrained by the US$3.50/lb Cu pit and the 31 December 2020 topography (Noble & Barrero, 2021).

Riotinto Project
Cerro Colorado Mineral Resources
April 2021 Model (21D) - 31 Dec 2020 Topo - $3.50/lb Cu Pit

% Cu Cutoff	Class	TONNES (1000's)	%Cu	%Zn	%Pb	%S	ppm Sb	ppm As
	Measured	151,621	0.36	0.15	0.03	5.51	23	209
0.14	Indicated	49,094	0.38	0.14	0.03	5.95	28	249
(Base Case)	**M+I**	**200,715**	**0.37**	**0.15**	**0.03**	**5.62**	**24**	**219**
	Inferred	4,428	0.40	0.15	0.04	7.85	32	344
	Measured	146,107	0.37	0.15	0.03	5.51	23	210
0.15	Indicated	47,612	0.38	0.14	0.03	5.92	29	250
	M+I	193,719	0.37	0.15	0.03	5.61	24	220
	Inferred	4,229	0.41	0.15	0.04	7.64	33	347
	Measured	140,257	0.38	0.15	0.03	5.52	23	212
0.16	Indicated	46,264	0.39	0.14	0.03	5.94	29	252
	M+I	186,521	0.38	0.15	0.03	5.63	25	222
	Inferred	4,036	0.42	0.16	0.04	7.60	34	351

14.1.15 Discussion of Factors Affecting Resource Grade Models

There are no known environmental, permitting, legal, title, taxation, socio-economic, marketing, political, or other relevant factors that would materially affect the mineral resource estimate.

14.2 San Dionisio

14.2.1 Mineral Resource Block Model

The mineral resource model was created as a 3-dimensional block model using Datamine Studio RM software. The model block size is 10x10x10 m, which is consistent with the mining bench height and the estimated selective mining unit. The horizontal extent of the model is defined to cover the San Dionisio mineral deposit, plus sufficient space outside the deposit to cover the ultimate pit. Resource model size and location parameters are shown in Table 14-19.

Key items included in the block models are the geologic model zones, flattened XYZ coordinates from Datamine unfolding, copper-grade zone, Mineral Zone code, and resource classification codes. Grades were estimated using inverse-distance-power estimation for copper, sulfur, lead, and zinc. Density was estimated from sulfur grade using a sulfur grade estimation formula (Section 14.2.3).

In addition to the inverse distance (IDP) estimates, values were estimated for copper and sulfur using Nearest-Neighbor-Assignment (NN). Other variables include a mined code to identify previously mined blocks, the Datamine search volume code, the number of samples used for estimation, the composite grid-spacing parameter, and the resource classification code.

Table 14-19: San Dionisio Resource Model Size and Location Parameters (Noble & Barrero, 2021).

	Minimum (ETRS89 meters)	Maximum (ETRS89 meters)	Cell Size (meters)	Number Cells	Model Size (meters)
Easting (X)	710,450	712,400	10	195	1950
Northing (Y)	4,174,830	4,176,530	10	170	1700
Elevation(Z)	-350	550	10	90	900

For resource modeling purposes, three domains were identified: Massive Sulfides (MS), Cloritas or mineralized zone (MinZ) representing the copper stockwork, and Zone 2a which is a deeper stockwork zone of lower sulfur content. Geological modeling, data selection, unfolding procedures, and estimations have been done separately within each domain.

Each domain was modeled in 3D based on legacy sections and plans and the geology of historical and current Atalaya drilling. A total of 195 horizontal plans and 133 sections were georeferenced from local coordinates to ETRS 89 system coordinates and digitized to define each domain and the mined-out portions of the deposit (Figure 14-28).

Experimental variograms of the different elements within the grade zones were created and modeled to define the anisotropy parameters for each grade zone. Inverse-distance power (IDP) interpolation was conducted on each interpolation zone applying the anisotropy parameters.

Variogram modelling has been performed with SAGE 2001 software[21]. It should be noted that Sage normalizes all variogram sills to a value of 1.00; traditional sills and nugget effect values may be obtained by multiplying the individual structure sill times the overall relative variance. Variograms were modeled using one or two nested exponential variogram structures, except for sulfur in Zone 2a where two nested spherical variogram structures were used.

The Datamine UNFOLD process was used to address the folded nature of the deposit. MinZ and MS were unfolded together but estimated separately. Both variogram modeling and estimation have been performed in flat or unfolded coordinates and transformed back to the current folded state.

Variogram modelling and estimation of Zone 2a was performed in the ETRS 89 coordinate system.

[21] SAGE 2001 Version 1.08, Isaaks & Co.

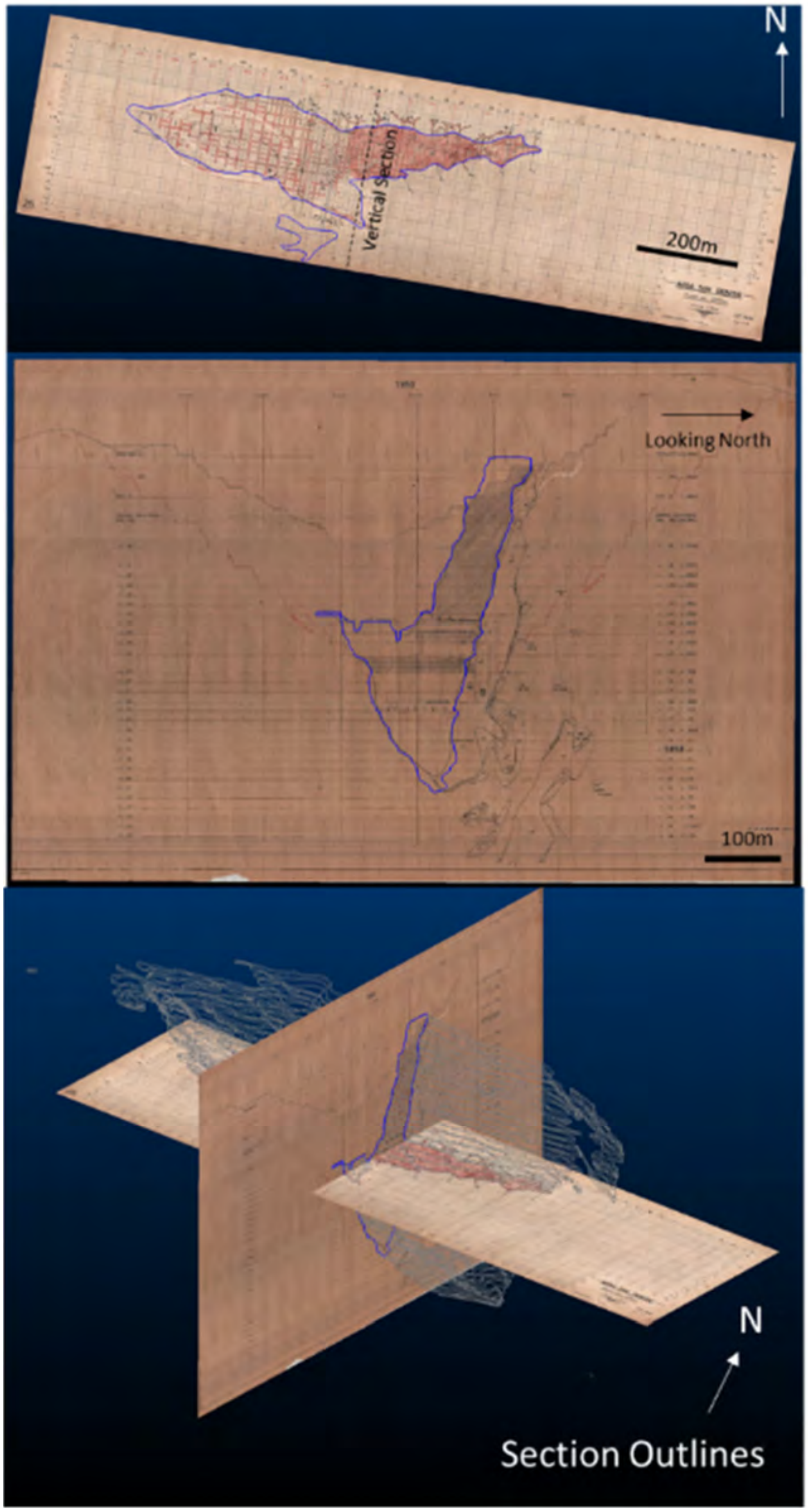


Figure 14-28: Different views of the modeling process of San Dionisio massive sulfides (Noble & Barrero, 2021).

14.2.2 Drill Hole Sample Database

Drill-hole data were provided by Atalaya geology personnel as ASCII files containing assays, collar locations, and down-hole surveys for all drilling in the resource area. The drilling used for resource estimation at San Dionisio is summarized in Table 14-20.

Atalaya drilling comprises only drillholes drilled from surface, most of them core drill holes. Drilling used for the resource estimate includes 45 drill holes that were drilled between 2015 and 2021 to define the San Dionisio Resource, and 5 holes from Cerro Colorado which are located in the south-east area of the San Dionisio model limits.

Table 14-20: Summary of Drilling used for Resource Estimation at San Dionisio.

Drill Series	Type	Year	Number Holes	Number Assays	Drilled Length (m)	Average Hole Length (m)	Average Interval Length (m)
RTM (Numbered)	Core	Historical	949	29,473	65,610.70	69.13	2.06
7000 series	Core	1996	9	520	1,032.55	114.72	1.99
Atalaya	RC/Core	2015-2021	45	8,085	16,911.00	375.80	2.00
Total			**1,003**	**38,078**	**83,554.25**	**83.30**	**2.05**

14.2.3 Bulk Density

Bulk density is estimated using a formula correlating density and sulfur grade. Data used for the correlation were sulfur assays and specific gravity measurements that were done on 20 drill core samples of Atalaya drill holes. The samples were taken from the San Dionisio low sulfur stockwork, cloritas and massive sulfides cores during 2021. Density determination was performed on site using the water immersion method. The results of this study demonstrate an excellent correlation between sulfur grades and measured density, as shown in Figure 14-29. The estimated density formula agrees with historical density data for high sulfur zones above 45% S.

The San Dionisio density formula when estimated sulfur is above 17% is:

$$\textbf{Density} = 2.39 + (0.0431 \times \%S)$$

The regression line shows a crossover with Cerro Colorado density regression at 17.1% S. Below this sulfur content, density estimated by the San Dionisio formula is lower than the density estimated using Cerro Colorado formula, for this reason, below 17% the Cerro Colorado formula is used.

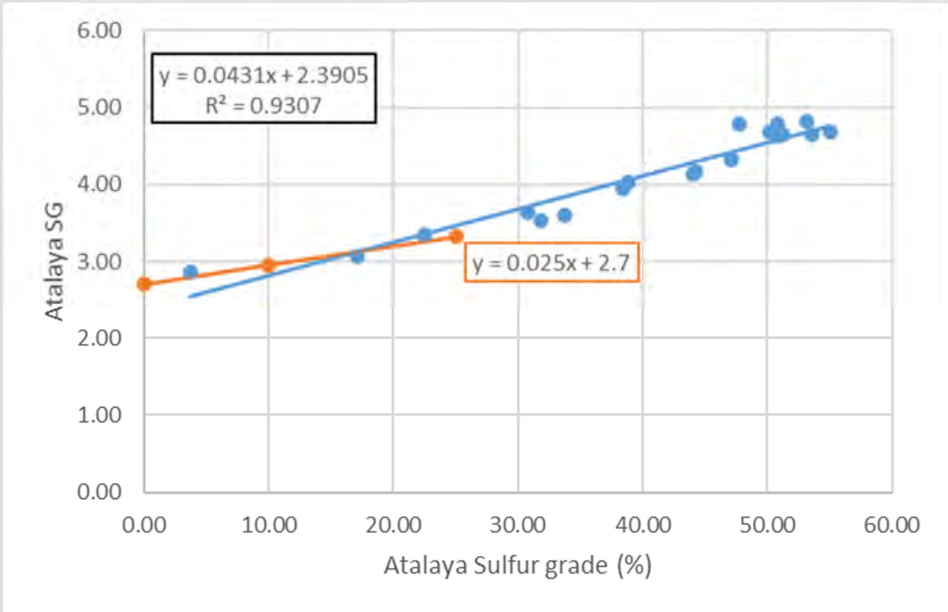


Figure 14-29: Correlation between Specific Gravity and Sulfur Grade – San Dionisio 2021 Data (blue) and Cerro Colorado 210 Data (orange), (Noble, 2022).

14.2.4 Resource Model Density

The San Dionisio density formula defined in the previous sections (14.1.4 and 14.2.3) and IDP sulfur estimates are used for the calculation of block model density.

Default values for sulfur are assigned based on the estimated sulfur zones. Density in high-sulfur areas has been capped to 4.54, which corresponds to an estimated 50% Sulfur. When estimated sulfur is above 17%, the San Dionisio density formula is used, if estimated sulfur is below 17%, the Cerro Colorado density formula is used instead.

Density in fill material is assigned a default value of 2.00 t/m^3. Volumes of mined-out with underground stopes and other workings were assigned a density of 2.00 t/m^3, which is equivalent to assuming that the underground openings have either caved, were backfilled during underground operations, or will be backfilled for safety during current open-pit operations.

14.2.5 Topographic Model

Current topographic data of Atalaya pit were provided by Riotinto as AutoCAD drawing files containing topographic elevation contours and break lines. Triangulated digital terrain models (DTMs) were prepared from the original data where data had been triangulated using the Datamine DTM creation tool. The resulting DTM was cropped to the resource model limits.

14.2.6 Mined Out Model

Mined-out portions of the block model were defined as follows:

1. **Underground Workings:** 3D wireframe models were provided by Atalaya that define the volumes mined as underground workings. The wireframes were used to create a block model of the mined-out volume using 1x1x1-m sub-blocks in a 5x5x5-m resource model prototype. The underground workings have many minor errors, but correcting those errors is out of the scope of this report. Additionally, it has been noticed that the underground workings and access ramps below level (floor) 33 are missing from the information provided by Atalaya; this information should be added in future studies of San Dionisio
2. **Massive sulfide and cloritas mined out volumes (Alfredo mine):** Historical mined-out areas at San Dionisio are the outcome of more than 100 years of open pit and underground mining through several types of mining methods. A 3D view of the different mined portions of San Dionisio is shown in Figure 14-30. A brief description of the different mined areas is provided below:
    a. Massive sulfides mined-out and backfilled volumes because of the historical underground pillar and stall mining method up to the 26th floor were constructed based on geo-referenced historical sections and recent Atalaya drilling. The contours of the mined-out portion were used to construct a 3D wireframe representing the underground backfilled area
    b. Modern pillar and stall mined-out volumes between 31st and 33rd floors have been provided by Atalaya as 3D wireframes. Theses wireframes contain minor errors and should be corrected for further studies.
    c. Cloritas – stockwork mined-out volumes consist of one stope between the 17th and the 23rd floors, cut & fill volumes between levels 32nd and 30th, and large stopes that resulted from blast hole stoping with hydraulic backfill between the 33rd and the 45th floors. The 3D volumes were constructed based on digitized contours of historical sections and plans.

3. **Current topography:** Final resources are computed using the current topography provided by Atalaya which includes the historical open pit mined out portion.

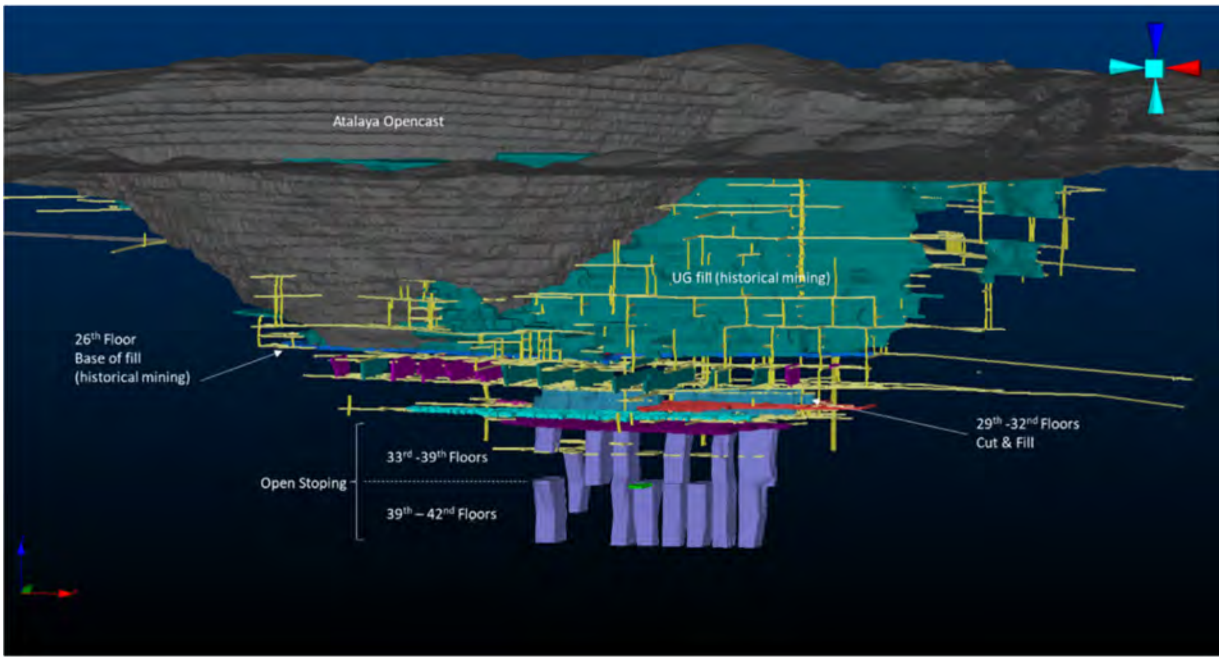


Figure 14-30: 3D view of the mined-out volumes of San Dionisio (Noble & Barrero, 2021).

14.2.7 Geological Model

The geologic model was constructed to provide geologic control for grade estimation and to provide parameters for pit optimization in the non-ore-bearing geologic units (Figure 14-31).

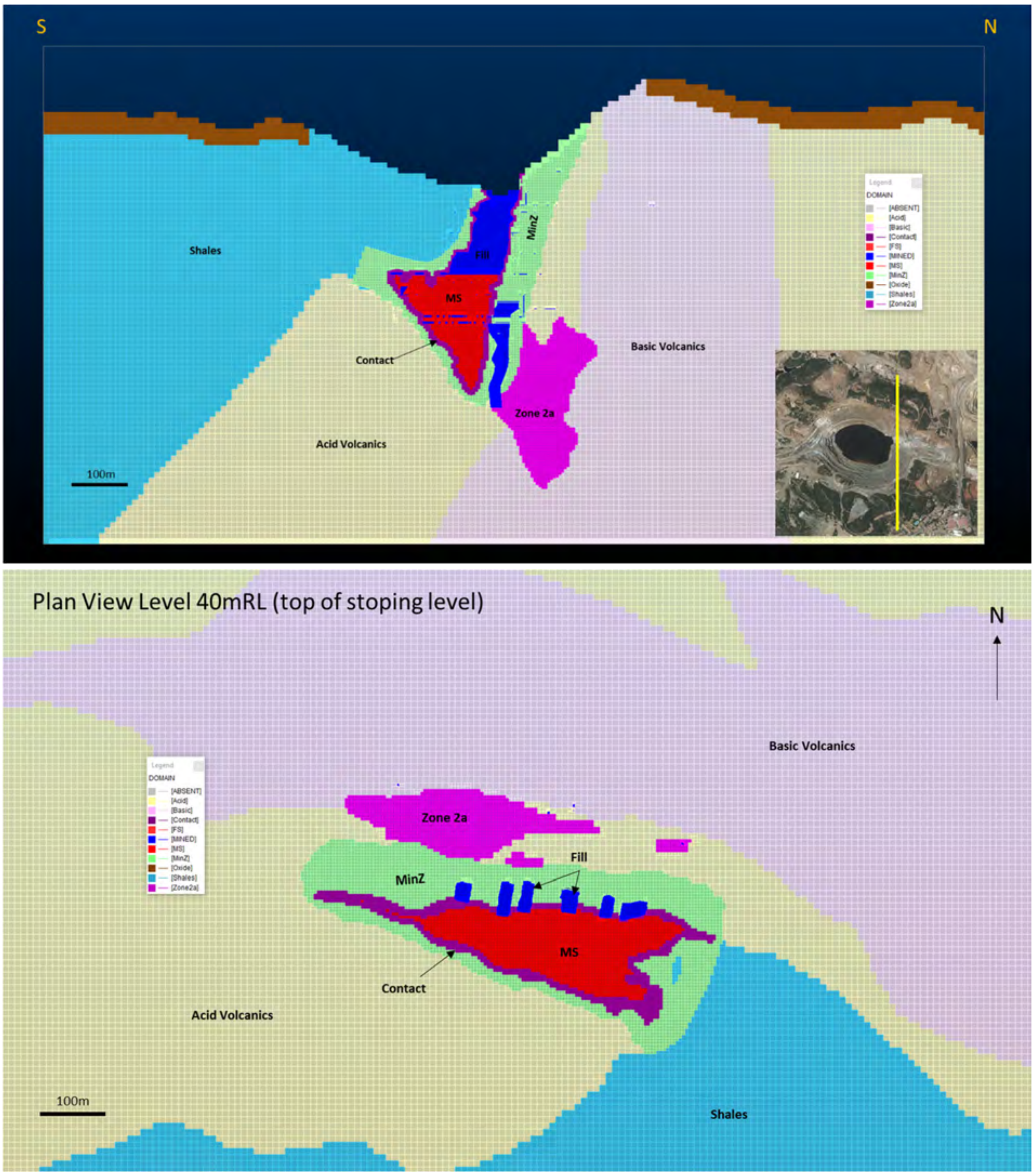


Figure 14-31: Vertical section (above) and plan section (below) of the San Dionisio geological model (Noble & Barrero, 2021).

14.2.7.1 Mineralized Zones

Wireframes corresponding to the main mineralized cloritas zone (“MinZ”), massive sulfides (“MS”), and Zone 2a were constructed and used as the basis for the combined mineralized zone models.

Empty block models in a 5x5x5-m resource model prototype were created for the MinZ, MS and Contact, and then added together to create one model. The Contact zone was created as the contact between the MS and the cloritas, 5 m inside and 5 m outside of the MS wireframe. The same procedure was followed to create the Zone 2a mineralized zone model, which was created as a block model in a 5x5x5-m resource model prototype.

14.2.7.2 Unfolding

The Datamine unfolding tool was used to flatten the synclinal fold of San Dionisio composed of the massive sulfides, contact and MinZ-cloritas into a geometry that is as close as possible to the original shape of the geologic units.

The procedure for unfolding of at San Dionisio syncline is very similar to the procedure applied to Cerro Colorado which has been described in a previous section:

- Upper and lower trend strings in 25 m spacing N9.8°E trending vertical sections were drawn representing hanging wall and footwall of the mineralized zone. Between-trend tag strings were drawn that connect between hanging wall and footwall strings (Figure 14-32).
- The resulting footwall-to-hanging wall tag strings define the Z’ axis in the unfolded coordinate system. The Z’ unfolded axis is scaled proportional to the average “thickness” of the mineralized zone.
- The unfolded Y’ axis is oriented parallel to the N9.8E direction and is approximately perpendicular to the strike of the deposit. The origin of the unfolded Y’ coordinates is at the highest point of the north flank of the hanging wall. The Y’ coordinates are scaled relative to the average unfolded width of the deposit in the Y’ direction.
- A final tag string was drawn to connect horizontally between the section strings. This string generally follows the axial plane of the syncline. The X’ unfolded axis follows parallel to this plane and parallel to the strike of the deposit and is in unscaled units.

Unfolding was not applied to the Zone 2a.

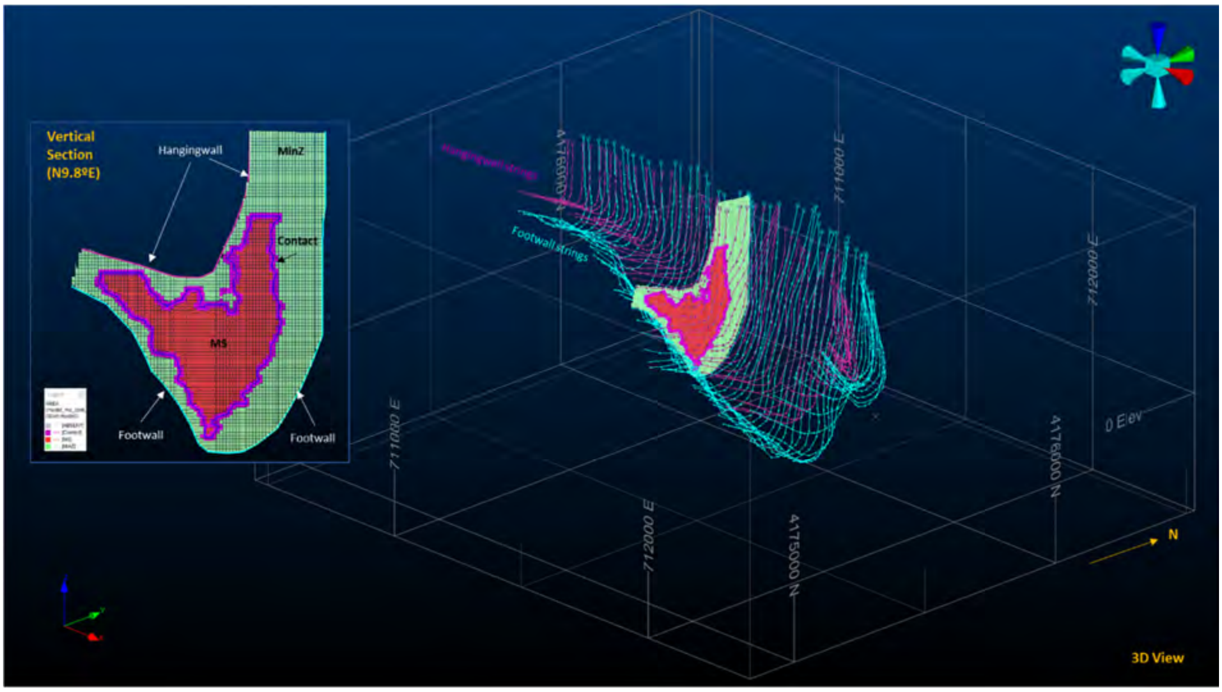


Figure 14-32: 3D view and vertical section showing the unfolding strings of the MinZ and massive Sulfides; Zone 2a is not shown (Noble & Barrero, 2021).

14.2.8 Compositing

Drill hole assays were composited to 5-m composites using the standard Datamine downhole compositing routine, COMPDH. After compositing, drill holes were assigned DOMAIN codes based on the mineralized zone wireframes. Intervals inside the mineralized zones wireframes were assigned a code “MinZ” for cloritas, and “MS” and “Contact” for the massive sulfides and contact.

Composites were computed with the compositing routine set to compute nominal 5-m composites that started and ended on DOMAIN boundaries. The resulting composites are as close to 5-m long as possible, while using all assays within the defined zone intervals. Assays were composited using length-weighted averages.

14.2.9 MinZ, Massive Sulfides, and Contact

14.2.9.1 Copper Grade distribution

Copper distributions were studied separately for MinZ, Contact, and MS areas, these are shown as lognormal cumulative probability and lognormal histogram plots in Figure 14-33. The distribution fits are explained below:

Copper grade in the MinZ averages 0.63% Cu and is composed of two overlapping lognormal populations:

1. A low-grade population, representing 61% of the total samples with an average grade of 0.34% Cu.
2. A high-grade distribution averaging 1.57% Cu representing 26% of the samples.

Contact area has the highest copper grade averaging 1.24% Cu. Copper grade distribution in this area is composed of two overlapping lognormal populations:

1. A low-grade population, representing 48% of the total samples with an average grade of 0.59% Cu.
2. A high-grade distribution averaging 2.02% Cu representing 47% of the samples.

Copper grade in the MS, exhibits a single lognormal population of high grade with a small proportion of low-grade representing dilution. The massive sulfide zone contains most of the high-grade copper mineralization.

In the case of the MS, a hard boundary between the MS and the Contact was used to estimate the MS separate from the Contact.

The boundary between the Contact and MinZ areas was considered a soft boundary and were estimated together. The large overlap between low-grade and high-grade in MinZ and Contact is problematic for resource estimation, since there is no easy way to differentiate the populations. In addition, the distributions are not strictly preserved when larger volumes than drill holes are considered, and distributions are much more transitional at the scale of selective mining units.

A simple strategy was developed to provide grade-zoning control for the estimation. The estimation strategy is as follows:

1. A simple nearest-neighbor (NN) model was created for copper grade, and preliminary grade zones (CuGZones) were assigned using the grade-range parameters in Table 14-21. Search parameters for the NN model are documented in Table 14-22.
2. Interpolation was done using composites with overlapping grade ranges. The overlapping grade ranges are required to prevent polygonal edge effects on the boundaries of the grade zones and to account for smearing at grade-zone boundaries.

Table 14-21: CuGZones: Grade-Zone Parameters for Block Model and Composites (Noble & Barrero, 2021)

Zone Code	Description	Block Model Grade Ranges		Composite Grade Ranges	
		Lower	Upper	Lower	Upper
11	Low-Grade	0	0.5	0	0.5
12	Low/High Overlap	0.5	0.7	0.4	0.8
13	High Grade	0.7	100	0.5	100

Table 14-22: Grade-Zone NN Search Ellipses (Noble & Barrero, 2021).

Zone	X’	Y’	Z’
CuGZones 11,12, and 13	100	35	5

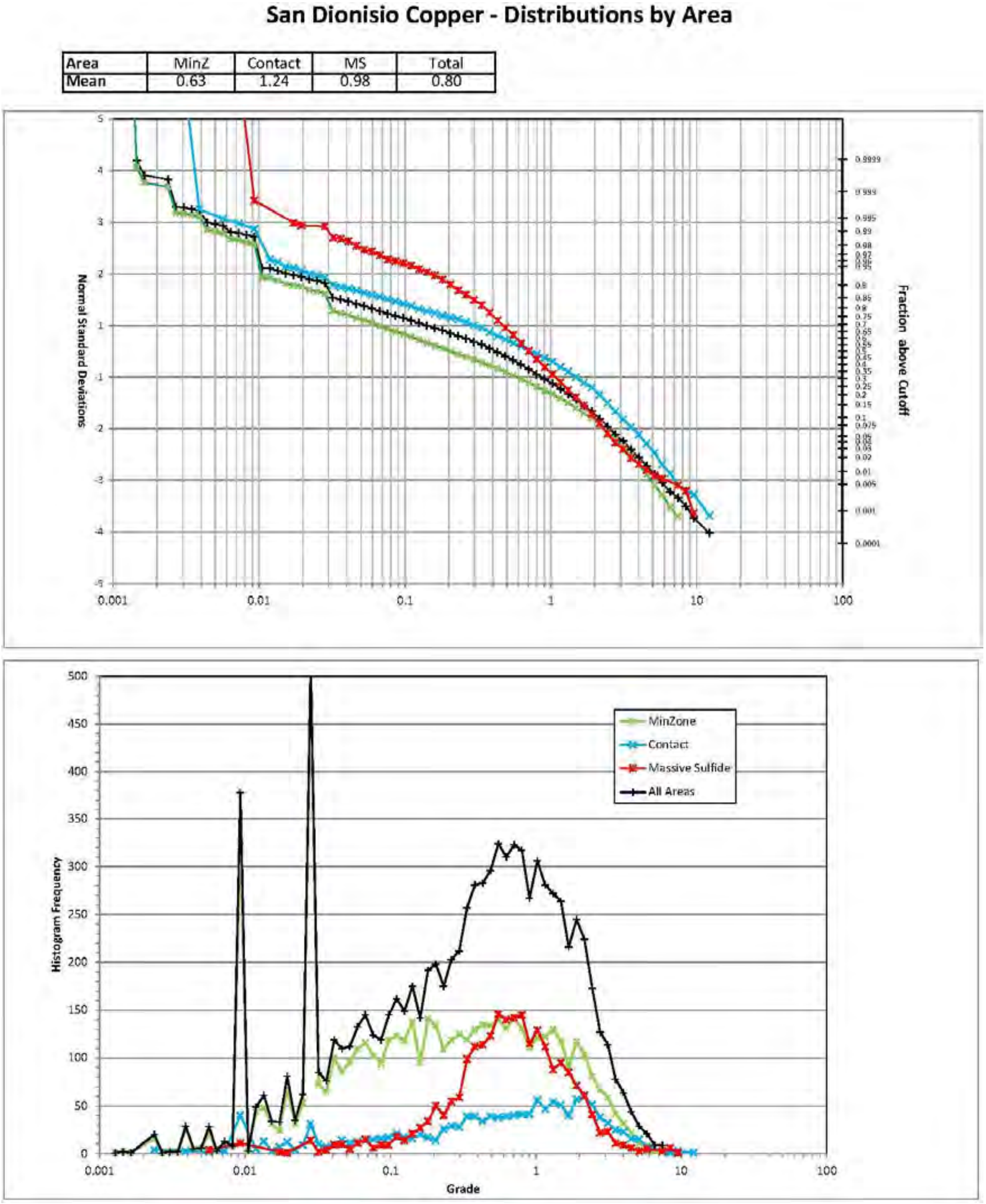


Figure 14-33: Probability distributions and lognormal histogram plots fitted to composite copper data of the MinZ, Contact, and MS (Noble & Barrero, 2021).

14.2.9.2 Sulfur Grade Distribution

The sulfur grades distributions were studied by area (Figure 14-34):

1. The massive sulfides (MS) exhibit a single lognormal population of high grade with a small proportion of low-grade. It is the area with highest sulfur grade, averaging 46.5% S, and highest proportion of high-grade sulfur.
2. The Contact sulfur distribution, averaging 28.2% S, is composed of a dominant mid-grade population with 33% S average grade and overlapping high and low-grade populations.
3. The MinZ distribution is mainly low-grade but with proportions of high-grade and mid-grade populations.

The problem of the large overlap between low-grade, mid-grade, and high-grade between areas was resolved using composites with overlapping grade ranges between areas for the interpolation. The composite grade zone parameters used are shown in Table 14-23.

Table 14-23: Grade-Zone Parameters for Composites (Noble & Barrero, 2021).

Sulfur Grade Zone	Description	Composite Grade Ranges by Area and Sulfur grade
1	Low-Grade	No MS
		MInZ
		Contact<40%S
2	Mid-Grade	Contact
		MInZ>30%S
		MS<45%
3	High Grade	No MInZ
		Contact>40%S
		MS

Model sulfur grade zones (S_Zones) were defined before estimation based on the areas to provide grade-zoning control for nearest-neighbor and IDP estimations:

S_Zone 1: MinZ
S_Zone 2: Contact
S_Zone 3: MS

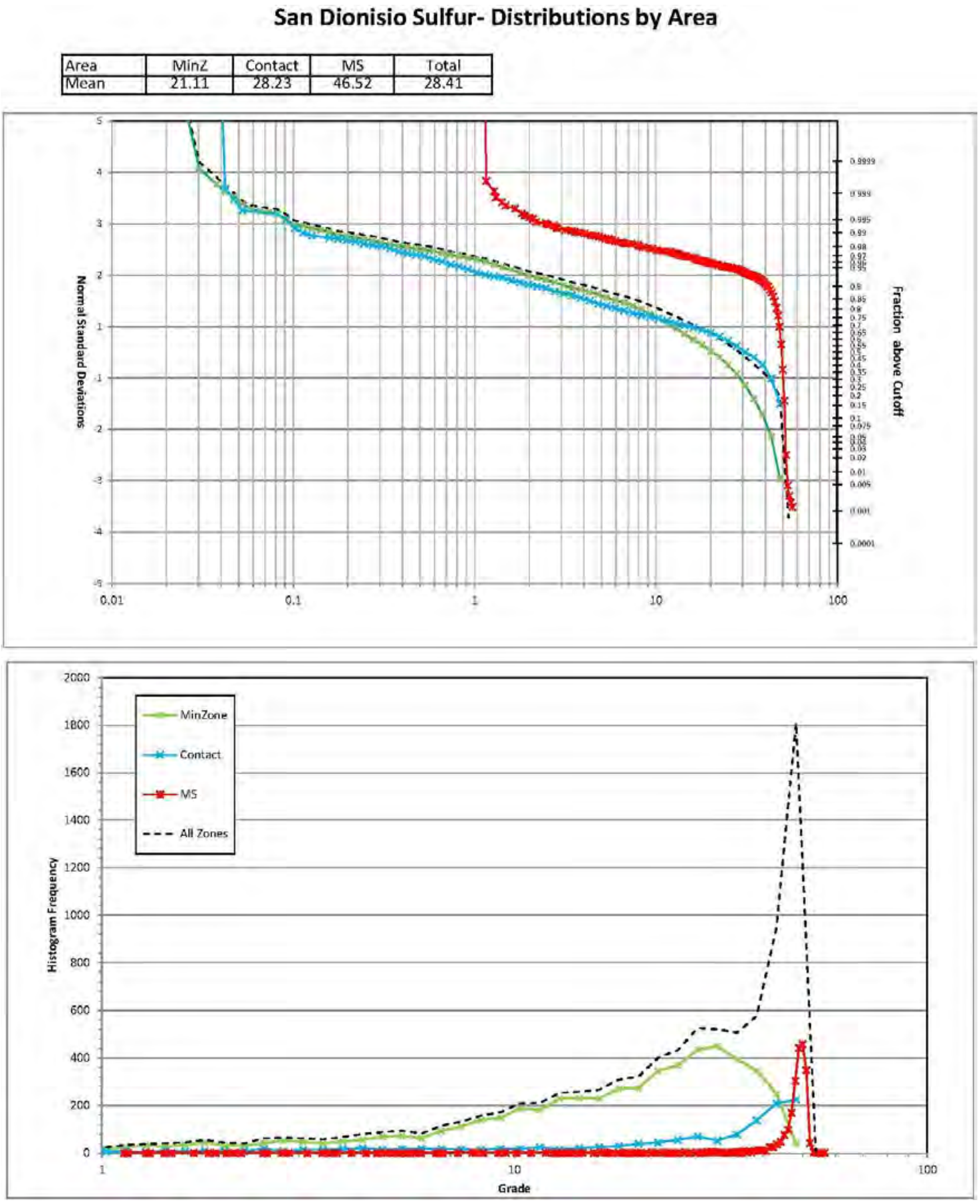


Figure 14-34: Probability distributions and lognormal histogram plots fitted to composite sulfur data of the MinZ, Contact, and MS (Noble & Barrero, 2021).

14.2.9.3 Zinc and Lead Distributions

The zinc grades distributions were first studied by area, finding a great overlap of zinc grades within each area (Figure 14-35):

1. The Massive sulfide area has the highest Zn grade with an average of 2.32% Zn and contains smaller low- and mid-grade populations.
2. The Contact Zone has lower grade than the MS with an average grade of 1.65% Zn, but also extends to lower grades.
3. The MinZ has lower zinc grades, averaging 0.62% Zn, with a small population of high-grade.

When the data was plotted in plan-view in the unfolded space it was evident that for the MS and Contact areas the high-grade zinc zone presented a very sharp contact with the surrounding lower-grade samples. The high-grade zinc zone was digitized as contours on plan sections every 5 m. The contours were used to construct a 3D wireframe to define the high-grade zone.

The composite zinc grade zones were defined as follows:

1. ZnZone 1 (Zn MinZ): This corresponds to the MinZ area.
2. ZnZone 2 (Zn LG): These are the low-grade samples in the Contact and MS areas outside the high-grade wireframe.
3. ZnZone 3 (Zn HG): Corresponds to the samples which lie within the defined high-grade zinc wireframe in flat coordinates.

The sample zinc grades were capped before estimation to 3% Zn in the MinZ and 8% Zn in the low-grade zinc. No capping of grades was applied to the samples in the high-grade zinc zone.

Model zinc grade zones (ZnZones) were defined before estimation based on the same logic described above to provide grade-zoning control for nearest-neighbor and IDP estimations.

The lead grade distributions were first studied by area, finding a significant overlap of lead grades within each area (*Figure 14-36*):

1. The massive sulfide area has the highest Pb grade with an average of 0.53% Pb with a long tail representing the low- and mid-grade populations.
2. The Contact Zone has slightly lower grade of 0.43% Pb but is also extends to lower grades.
3. The MinZ is the area with lowest lead grades averaging 0.09% Pb with a small population of high-grade.

When the data was plotted in plan view in the unfolded space, it was evident that for the MS and Contact areas the high-grade lead zone presented a very sharp contact with the surrounding lower-grade samples following the general pattern of the high-grade zinc zone but with a small offset. The high-grade lead zone was digitized as contours in plan sections every 5m. The contours were used to select the high-grade composites.

The composite lead grade zones were defined in a similar way as the zinc samples:

1. PbZone 1(Pb MinZ): This zone corresponds the MinZ area.
2. PbZone 2 (Pb LG): These are the low-grade samples in the Contact and MS areas outside the high-grade lead contours.
3. PbZone 3 (Pb HG): Corresponds to the samples which lie within the defined high-grade lead contour strings in flat coordinates.

The sample lead grades were capped before estimation to 1% Pb in the MinZ and to 1.5% Pb in the low-grade zones. No capping of grades was applied to the high-grade lead zone samples.

Model lead grade zones (PbZones) were defined before estimation based on the same logic described above to provide grade-zoning control for nearest-neighbor and IDP estimations.

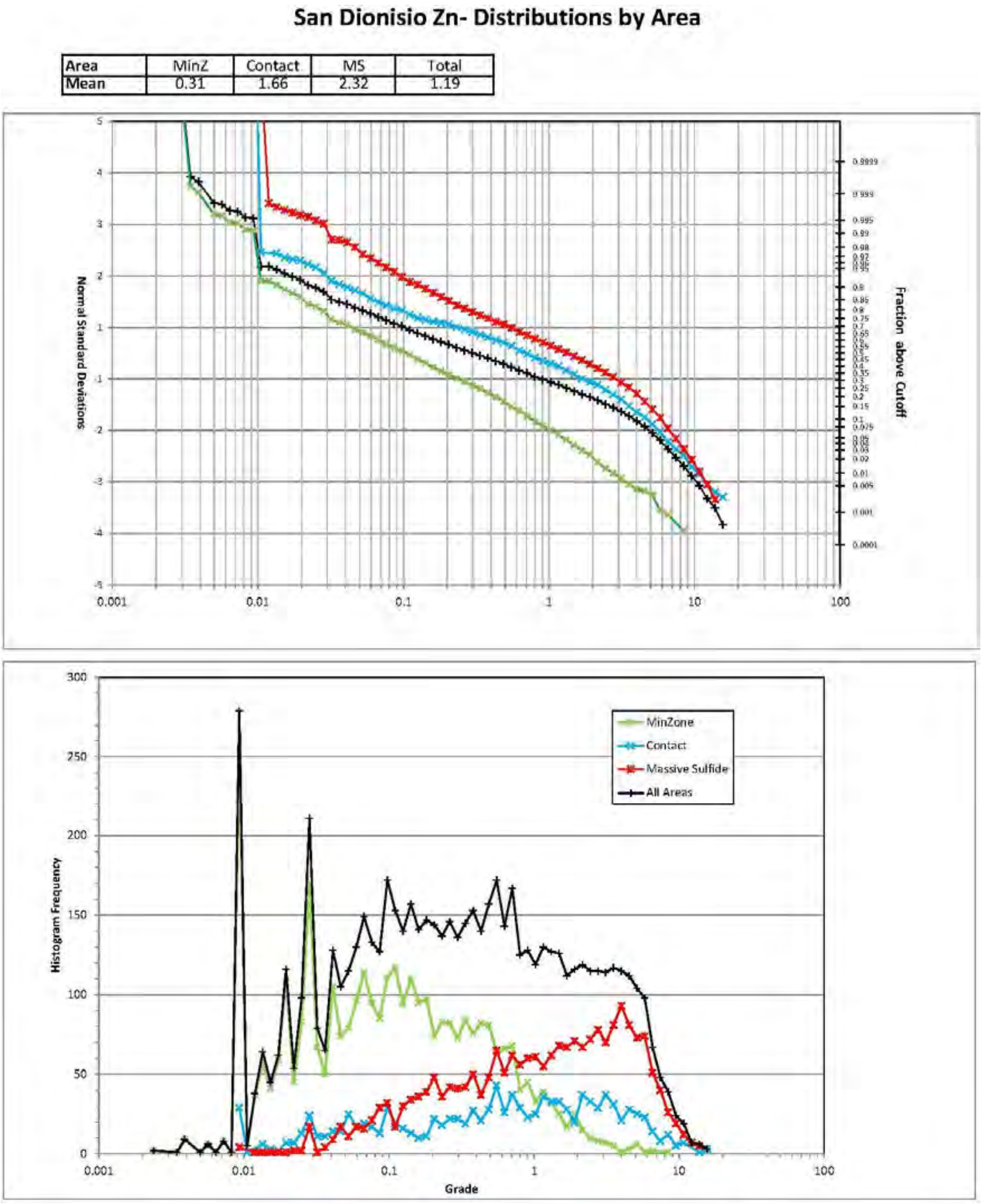


Figure 14-35: Probability distributions and lognormal histogram plots fitted to composite zinc data of the MinZ, Contact, and MS (Noble & Barrero, 2021).

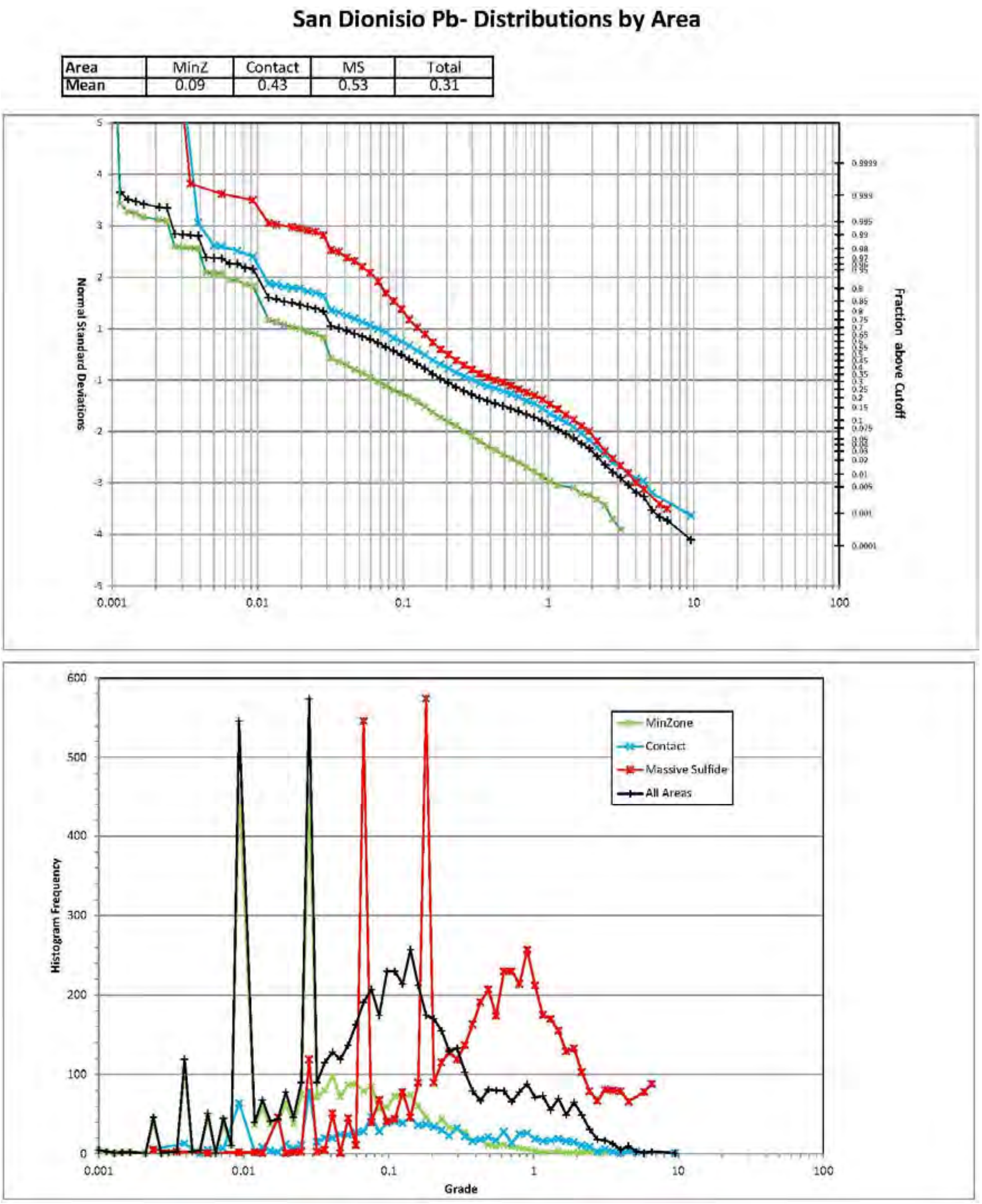


Figure 14-36: Probability distributions and lognormal histogram plots fitted to composite lead data of the MinZ, Contact, and MS (Noble & Barrero, 2021).

14.2.9.4 Variograms

14.2.9.4.1 Copper Variograms

Variograms were computed for copper in the Unfolded coordinate system for MinZ and MS (Figure 14-37 and Figure 14-38), the Contact area did not have enough samples to get reliable variograms.

The results of variogram modeling are summarized in Table 14-24 and Table 14-25. All variograms were modeled using two nested exponential variogram structures.

Table 14-24: Summary of Variogram MinZ Models for Copper Unfolded Coordinates (Noble & Barrero, 2021).

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
			Nugget	Exponential Structure 1				Exponential Structure 2			
				Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Low-Grade	-28	0.35	17.2	7.6	6.8	0.54	1674	37.7	33	0.11
	Mid-Grade	0	0.5	5	5	5	0.5	63.1	67.5	58.1	0
	High-Grade	-10	0.2	18	10	10	0.64	350	350	15.5	0.16

Table 14-25: Summary of Variogram MS Models for Copper Unfolded Coordinates (Noble & Barrero, 2021).

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
			Nugget	Exponential Structure 1				Exponential Structure 2			
				Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	MS	-14	0.2	10	10	7.2	0.41	681.5	27.6	14.7	0.39

For the MinZ the variograms were computed for the copper grade zones. When the variograms are computed with grade-zoned data, the immediate effect is that overall variability is reduced by removing the effect of grade-zone crossing from the variogram. The grade-zone effect, also known as a zonal effect, is caused by the squaring of large grade differences when data from different grade zones are added to the general variation within the zones. The relative variance in all the grade-zoned variograms is much lower than the relative variance of the variogram without grade zones.

For the MinZ low-grade zone, copper continuity in the unfolded coordinates is slightly better in the East-West direction, along strike, than in the Y and Z direction which show similar ranges. Mid-grade zone copper variogram has low number of samples and exhibits the lowest continuity, it is almost isotropic in all directions. MinZ high-grade copper variograms in the unfolded coordinates are isotropic in the X and Y directions with the longest ranges, and a very short range in the vertical Z axis indicating strong zonal anisotropy.

MS copper grades show geometrical and zonal anisotropy and much greater continuity than in the MinZ. Grade continuity is best along strike of the orebody than across strike, with the shortest ranges in the Z direction.

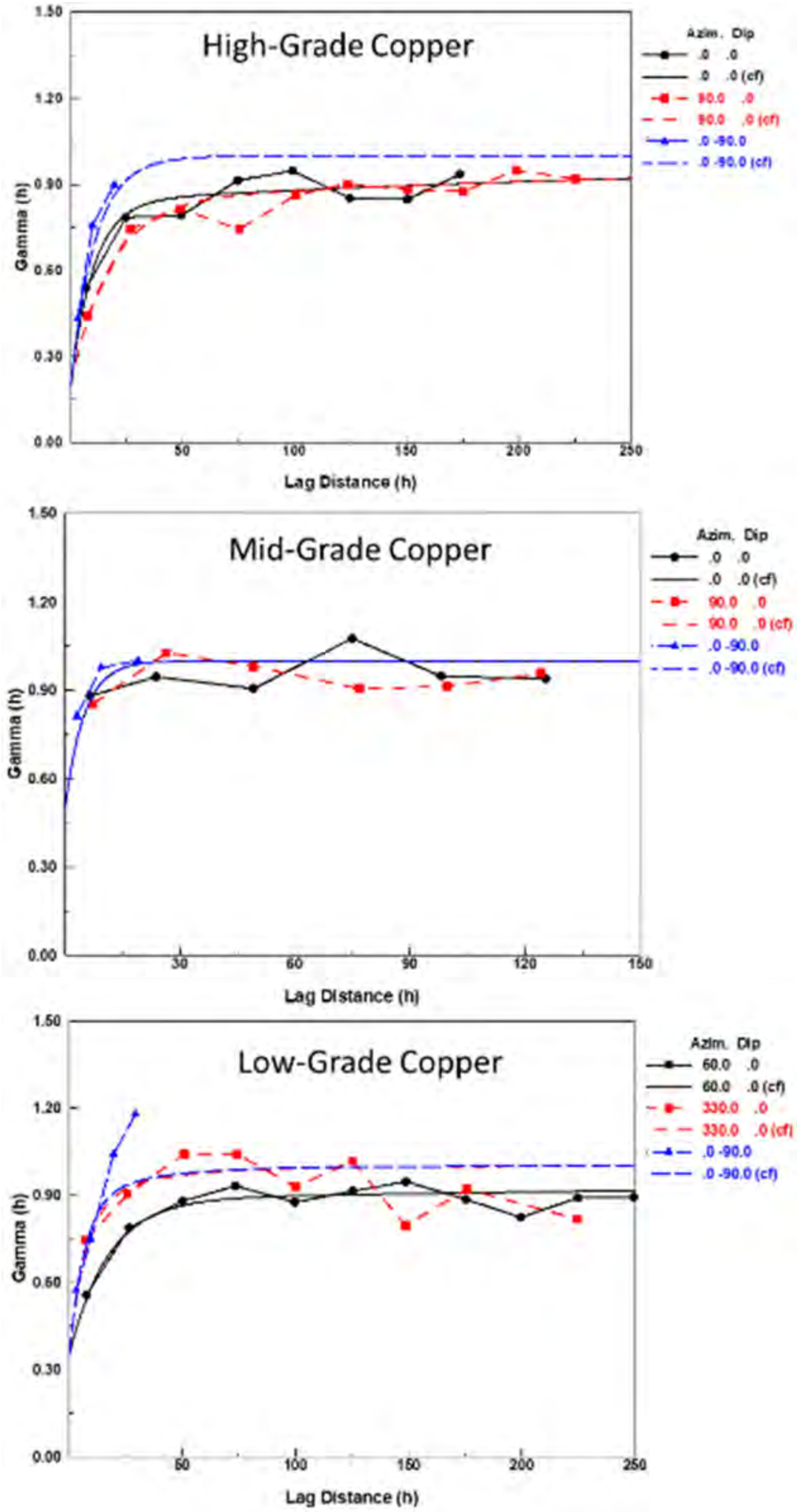


Figure 14-37: MinZ Variograms Copper Unfolded Coordinates (Noble & Barrero, 2021).

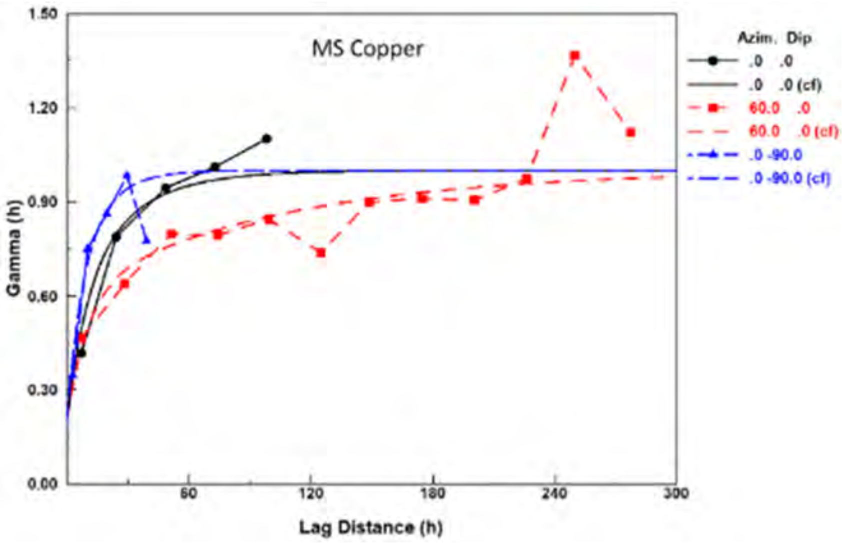


Figure 14-38: MS Variograms Copper Unfolded Coordinates (Noble & Barrero, 2021)

14.2.9.4.2 Sulfur Variograms

Variograms were computed for copper in the Unfolded coordinate system for MinZ, Contact, and MS (Figure 14-39). The results of variogram modeling are summarized in Table 14-26. All variograms were modeled using two nested exponential variogram structures.

Table 14-26: Summary of Variogram Models for Sulfur Unfolded Coordinates (Noble & Barrero, 2021).

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
			Nugget	Exponential Structure 1				Exponential Structure 2			
				Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	MinZ	-15	0.1	83.7	40	40	0.61	200	75	75	0.29
	Contact	0	0.1	10	40	25	0.65	185	55	25	0.25
	MS	0	0.2	10	15	15	0.68	100	15	15	0.12

The variograms exhibit better continuity along strike in the E-W direction in the unfolded space. While the variograms do not show a clear orientation except for the MinZ, when the sample data in flat coordinates was projected in plan-view, it was clear that the greatest continuity of the sulfur grade was associated with the massive sulfides (MS) and followed a NE orientation of 78 degrees azimuth. For this reason, a rotation of -12 degrees clockwise around the +Z axis was used for the search ellipse.

MinZ and Contact areas showed very irregular distributions in plan-view and were estimated with no rotation.

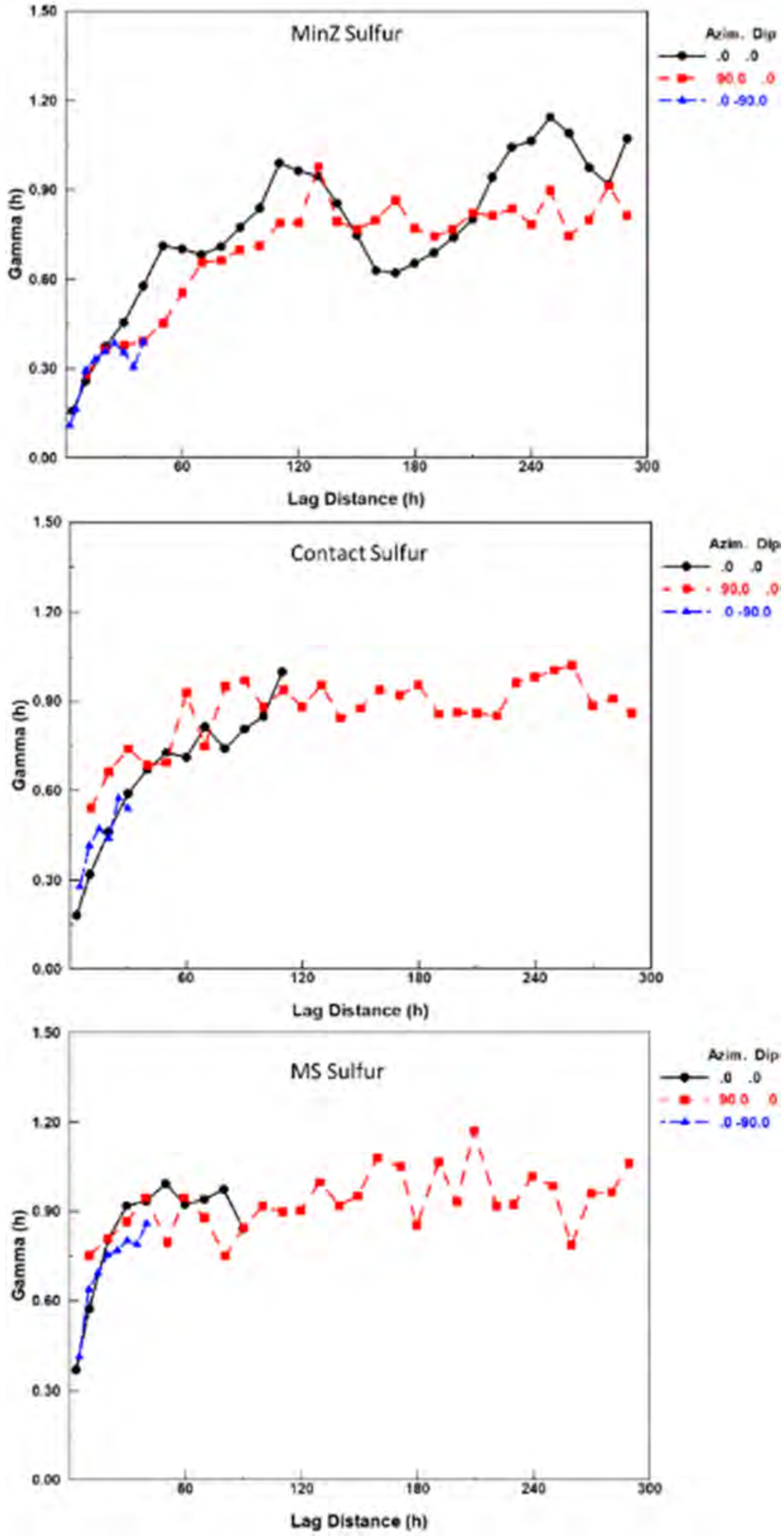


Figure 14-39: Variograms Sulfur Unfolded Coordinates (Noble & Barrero, 2021)

14.2.9.4.3 Zinc and Lead Variograms

Variograms were computed for zinc and lead in the Unfolded coordinate system for the grade zones described in Section 14.2.9.3, and are shown graphically in Figure 14-40 and Figure 14-41.

The results of variogram modeling are summarized in Table 14-27 for zinc and Table 14-28 for lead. All variograms were modeled using two nested exponential variogram structures except for the LG zinc and LG lead zones where only one structure was used.

Zinc continuity in the MinZ, in the unfolded coordinates, shows geometrical and zonal anisotropy with much better continuity along the strike of the deposit than across strike, with the shortest ranges in the vertical Z axis.

Zinc grades in the low-grade zone of the Contact and MS areas have the lowest continuity with a slightly better continuity along the rotated X axis (155 azimuth) and isotropic continuity along the rotated Y axis (65 azimuth) and the vertical Z axis.

Grade continuity in the high-grade zone of the Contact and MS areas is better along strike in the E-W direction, with similar ranges in the Y and Z directions.

Table 14-27: Summary of Variogram Models for Zinc Unfolded Coordinates (Noble & Barrero, 2021).

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
			Nugget	Exponential Structure 1				Exponential Structure 2			
				Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Zn MinZ	0	0.16	10	10	10	0.347	235	75	20	0.493
	Zn LG	65	0.08	18	10	10	0.92	-	-	-	-
	Zn HG	0	0.43	5	5	3	0.34	53	11	15	0.23

Lead continuity in the MinZ, in the unfolded coordinates, shows geometrical and zonal anisotropy with much better continuity along the strike of the deposit than across strike and the shortest ranges in the vertical Z axis.

Lead grades in the low-grade zone of the Contact and MS areas, have the highest continuity along the rotated X axis (162 azimuth) and isotropic continuity along the rotated Y axis (72 azimuth) and the vertical Z axis, with very short ranges along both axes.

Lead grade continuity in the high-grade zone of the Contact and MS areas is better along strike in the E-W direction, with similar ranges in the Y and Z directions.

Table 14-28: Summary of Variogram Models for Lead Unfolded Coordinates (Noble & Barrero, 2021).

XYZ	Variogram	Rotation	Sage Variograms Scaled to Sill = 1.00								
			Nugget	Exponential Structure 1				Exponential Structure 2			
				Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Pb MinZ	0	0.1	20	45	20	0.65	500	500	25	0.25
	Pb LG	72	0.15	143.1	5.5	6.8	0.85	-	-	-	-
	Pb HG	-5	0.2	9	9	6	0.41	80	12.5	6	0.39

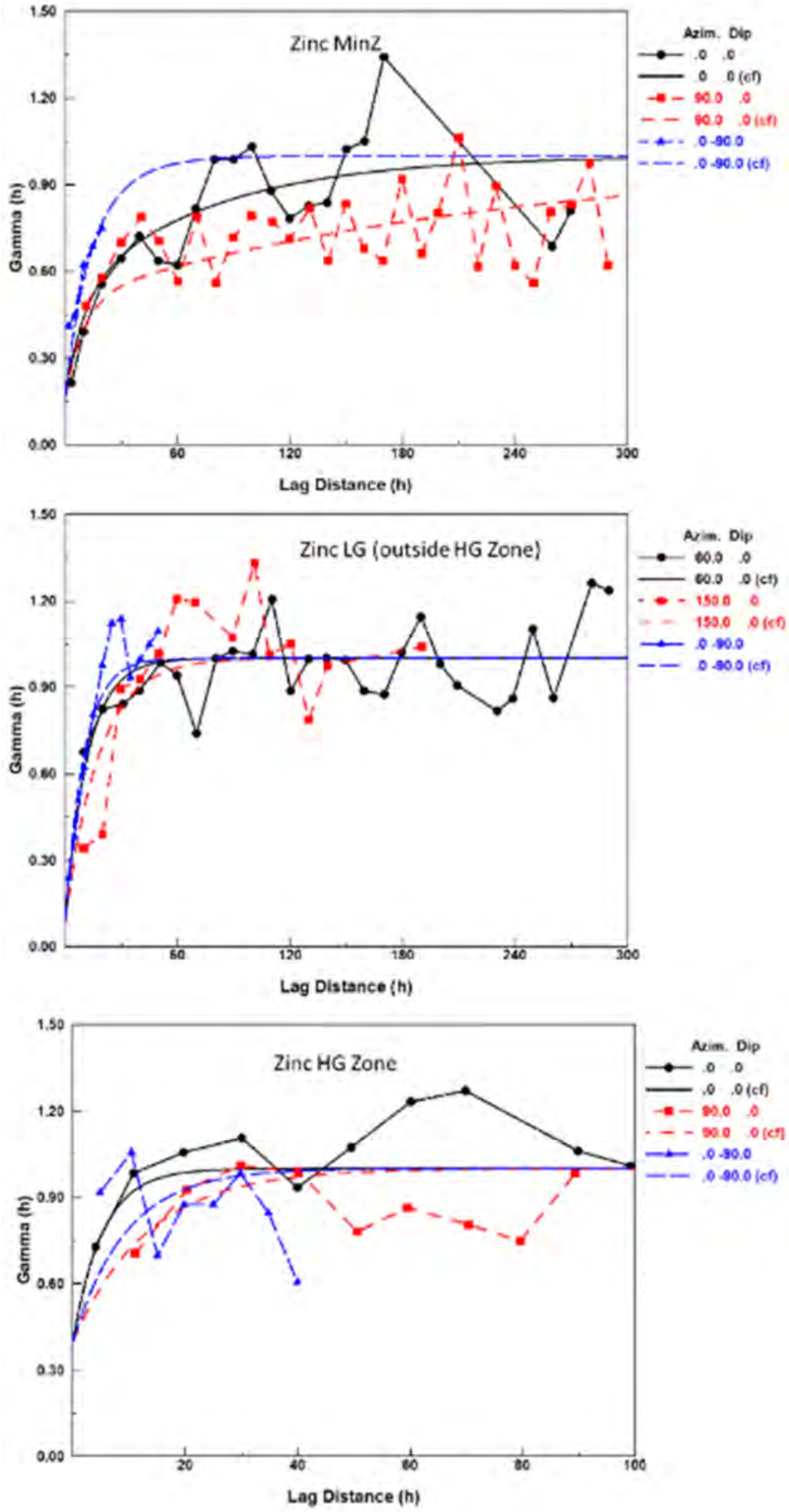


Figure 14-40: Variograms Zinc Unfolded Coordinates (Noble & Barrero, 2021).

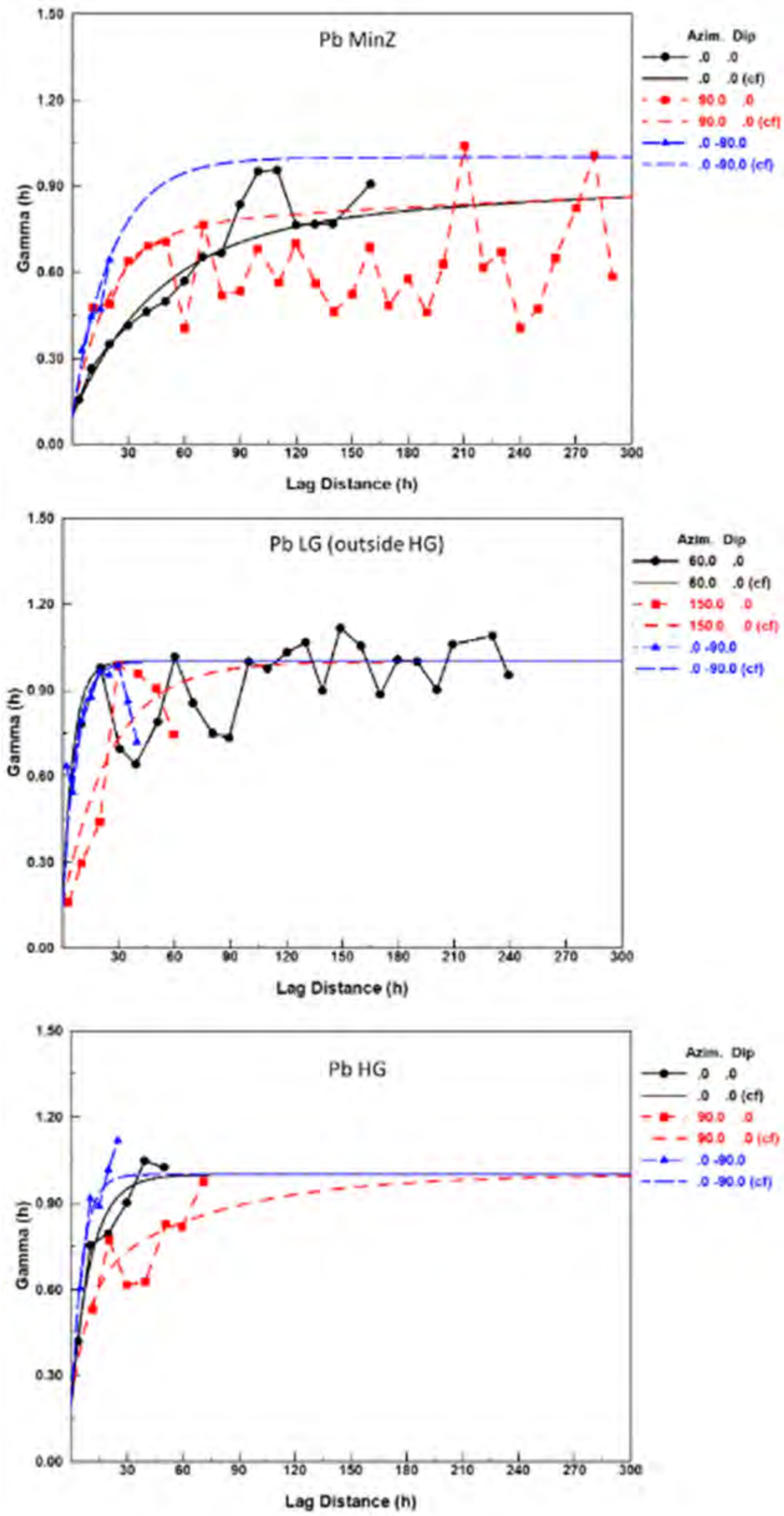


Figure 14-41: Variograms Lead Unfolded Coordinates (Noble & Barrero, 2021).

14.2.9.5 Search Ellipse Parameters

Search ellipse parameters were developed for each element and grade zone based on the variograms and a general assessment of the continuity of grades through inspection of the sample data in plans and sections.

Search ellipse parameters for each element and grade zone, when applied, are summarized in Table 14-29, Table 14-30, and Table 14-31. All search ellipses are relative to the unfolded coordinate system, and the rotation, as indicated in the tables, is clockwise around the +Z axis.

Table 14-29: Copper Search Ellipse Parameters (Noble & Barrero, 2021)

Estimation Case		Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
			Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
			X'	Y'	Z'	Min	Max		Min	Max		Min	Max
MinZ & Contact	NN Cu GZones	0	100	35	5	5	10	1	5	10	1	5	10
	IDP Cu GZone LG	-28	90	90	90	5	10	1.5	5	10	2	1	10
	IDP Cu GZone MG	0	140	40	40	5	10	1.5	5	10	2	1	10
	IDP Cu GZone HG	-10	100	100	5	5	10	1.5	5	10	2	1	10
MS	NN & IDP Cu	-14	160	50	25	5	10	1.5	5	10	2	1	10

Table 14-30: Sulfur Search Ellipse Parameters (Noble & Barrero, 2021)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
IDP-NN MinZ	0	76	20	10	5	10	1	5	10	3	5	10
IDP-NN Contact	0	80	30	30	5	10	1.5	5	10	2	1	10
IDP-NN Massive Sulfide	-12	140	35	12	5	10	1.5	5	10	2	1	10

Table 14-31: Zinc & Lead Search Ellipse Parameters (Noble & Barrero, 2021)

Estimation Case	Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
		X'	Y'	Z'	Min	Max		Min	Max		Min	Max
IDP-NN MinZ	0	50	25	10	5	10	1.5	5	10	3	1	10
IDP-NN Low Grade	0	50	30	10	5	10	1.5	5	10	3	1	10
IDP-NN High Grade	0	50	20	10	5	10	1.5	5	10	3	1	10

14.2.9.6 Grade Estimation

Grade models were estimated for copper, sulfur, lead, and zinc grades using the unfolded coordinate space and nearest-neighbor (NN) and inverse-distance-power (IDP). The estimated grade models were constrained by the defined grade zones and/or by the wireframe domains (MinZ, Contact, MS)

The IDP models were optimized relative to the NN models by matching the average grade of the IDP model to the average grade of the NN model to ensure that the overall estimates are unbiased.

Copper was estimated as a single zone in the MS and with grade zones of low, mid, and high grade in MinZ and Contact area, which were estimated together.

The optimized IDP powers are shown in Table 14-32.

Table 14-32: Copper Estimation Powers by Grade Zone (Noble & Barrero, 2021)

Area	Cu Grade Zone	POWER
MinZ & Contact	Low-Grade	2
	Mid-Grade	1
	High-Grade	2.3
MS	-	3.5

Sulfur was estimated with grade zones of low, mid, and high grade. Average sulfur grade of each grade zone was assigned as default value to the corresponding zone when the IDP estimates were missing: 45% S in the high-grade zone, 25% S in the mid-grade zone, and 15% in the low-grade zone.

IDP anisotropies are the same as the search ellipse radii; the optimized IDP powers are shown in Table 14-33.

Table 14-33: Sulfur Estimation Powers by Grade Zone (Noble & Barrero, 2021)

Grade Zone	POWER
Sulfur LG	3.75
Sulfur MG	3.85
Sulfur HG	1.5

Zinc and lead were estimated for the MinZ and outside the MinZ inside the low-grade and high-grade zones described previously. IDP anisotropies are the same as the search ellipse radii; the optimized IDP powers are shown in Table 14-34.

Table 14-34: Zinc and Lead Estimation Powers by Grade Zone (Noble & Barrero, 2021)

Grade Zone	POWER
Zn MinZ	3.5
Zn LG	3.5
Zn HG	1

Grade Zone	POWER
Pb MinZ	3.8
Pb LG	1.5
Pb HG	2.1

14.2.10 Zone 2a

14.2.10.1 Copper, Sulfur, Zinc, and Lead Grade Distributions

The copper distribution in Zone 2a is composed of a single lognormal population, as shown in Figure 14-42.

This single population represents 94.5% of the sample distribution and averages 0.43% Cu. The copper grades distribution has less than 1% of high-grade copper samples. Spikes at 0.03% Cu and 0.01% Cu correspond to low-grade historical assays rounded off to 0.010 and 0.030. This population shows higher variability than other areas of San Dionisio.

At least three subpopulations can be fitted to the sulfur distribution data, as shown in Figure 14-43: a low-grade and a high-grade population with a mid-grade population overlapping with the other two. Zone 2a has the lowest sulfur grade of San Dionisio, averaging 13.46% S. The low-grade population represents 40% of the total samples and averages 4.14%S. This population represents stockwork sulfide mineralization, comparable to Cerro Colorado mineralization.

The higher-grade population of moderate sulfur grade has an average grade of 29.62% sulfur and contains 24% of the total data; this population represents copper-rich stockwork and would be similar to cloritas stockwork.

The mid-grade sulfur distribution overlaps with the low- and high-grade distributions and averages 13.5% sulfur and represents 34% of the data.

Lead and zinc grades of Zone 2a are very low compared with the other areas of San Dionisio. The zinc sample distribution has an average grade of 0.16% Zn and can be fitted to barren, low, and mid-/high-grade distributions, as shown in Figure 14-44. The low-grade population averages 0.25% Zn and represents 59% of the data. Spikes at 0.03% Zn and 0.01% Cu correspond to low-grade historical assays rounded off to 0.010 and 0.030.

Lead grade sample distribution is very low-grade and averages 0.05% (Figure 14-45). The grades can be fitted to a single low-grade or barren population with an average grade 0.05% lead and representing 38% of the total data. This low-grade population overlaps with a very small medium-grade population averaging 0.25% lead but representing only 4.7% of the total population of samples.

Grade zones are not required for resource modeling within Zone 2a.

Copper, sulfur, zinc, and lead higher grades were capped above a top-cut grade for variogram modeling before estimation. The top-cut grades used are as follows:

Copper: 5%
Sulfur: 30%
Zinc: 1.5%
Lead: 0.5%

San Dionisio Probability Fit Zone 2a (ETRS) Copper

	Population	Spike 1	Spike2	Low Grade	High Grade	Total
Fraction		1.00%	4.00%	94.5%	0.46%	100.0%
Mean	0.4261	0.0100	0.0300	0.4307	3.7944	0.42608
Beta		0.0200	0.0200	1.0525	0.2239	
Median		0.0100	0.0300	0.2475	3.7004	
Log Mean		-4.6054	-3.5068	-1.3963	1.3085	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0023949	0		
%HISTO	0.0004336	1		
Z-Fit	0.2163314	1	Hist/Z-fit	0.002004142
FIT	0.2167649			

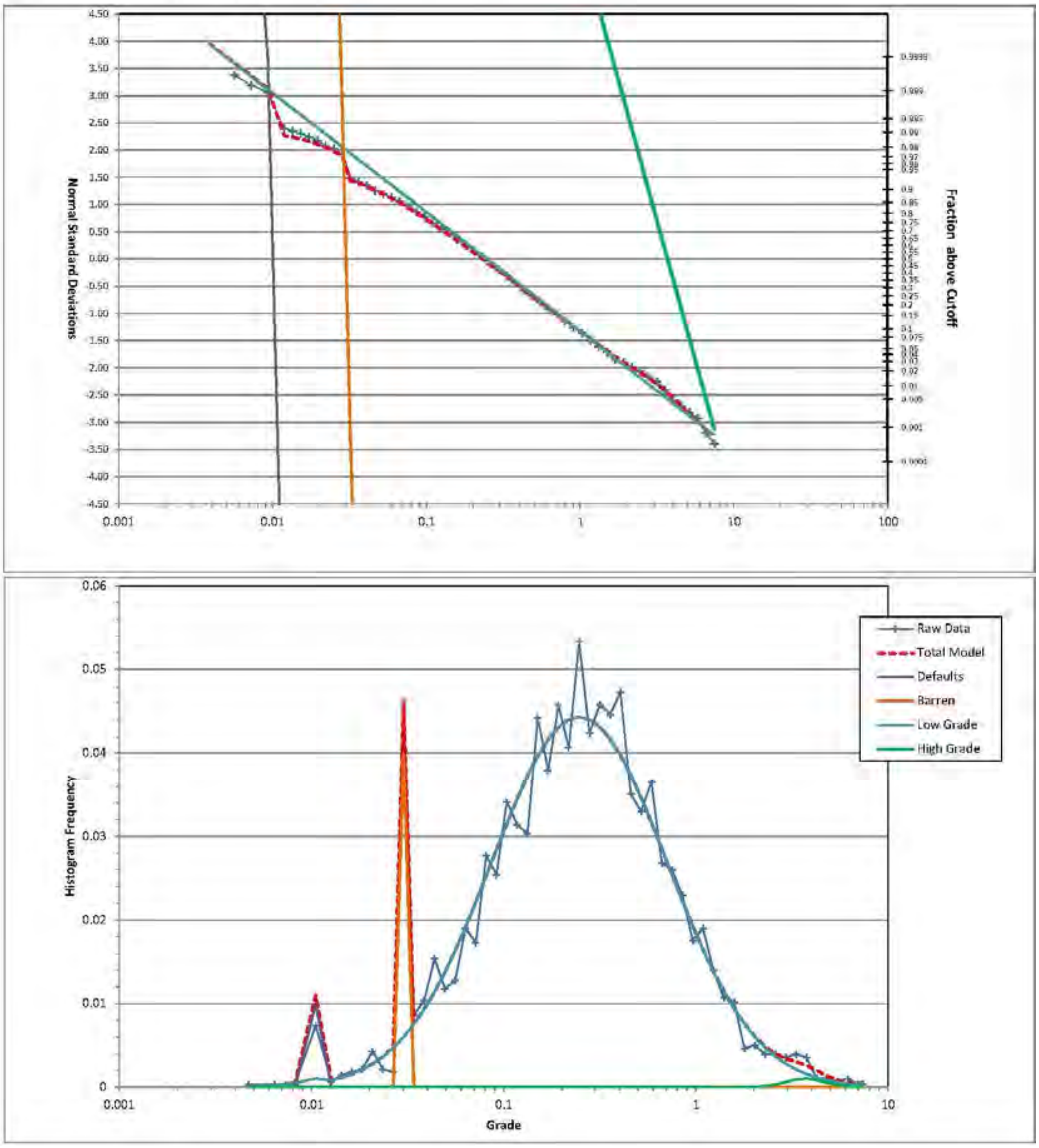


Figure 14-42: Probability distributions and lognormal histogram plots fitted to composite copper data of Zone 2a (Noble & Barrero, 2021).

San Dionisio Probability Fit Zone 2a (ETRS) Sulfur

	Population	Spike 1	Spike2	Low Grade	High Grade	Total				
Fraction		1.72%	40.05%	34.0%	24.27%	100.0%	20.00%	25.00%	20.0%	25.00%
Mean	13.4609	1.6509	4.1442	13.4965	29.6229	13.46089	5.0000	20.0000	35.0000	48.0000
Beta		0.9860	0.8291	0.4011	0.1894		1.0000	0.3000	0.1000	0.0232
Median		1.0154	2.9387	12.4532	29.0966					
Log Mean		0.0152	1.0780	2.5220	3.3706					

Sum of Errors	SSQ	Weight		
%CFREQ	0.0027445	0		
%HISTO	0.0012114	1		
Z-Fit	0.1580772	1	Hist/Z-fit	0.007663578
FIT	0.1592887			

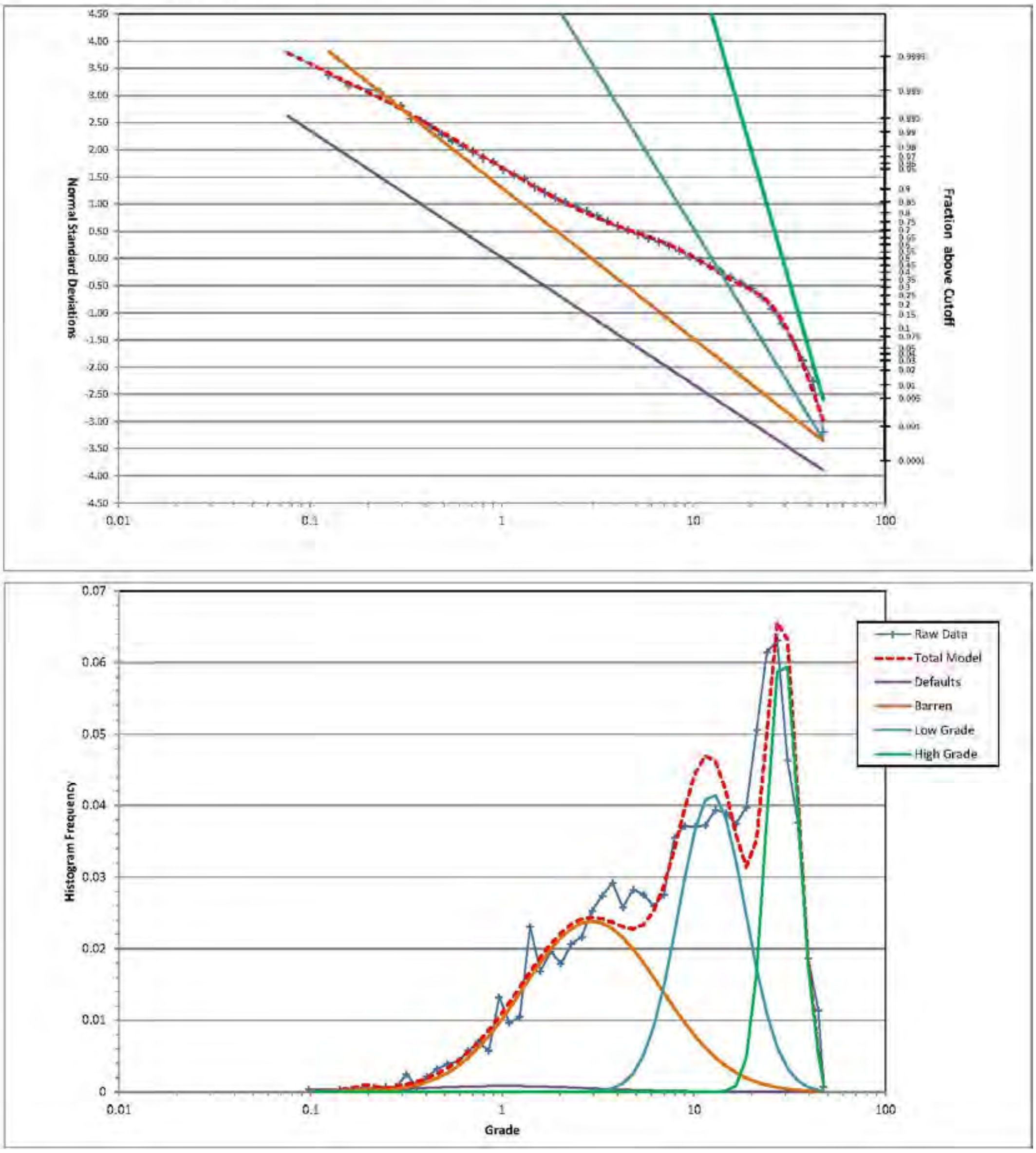


Figure 14-43: Probability distributions and lognormal histogram plots fitted to composite sulfur data of Zone 2a (Noble & Barrero, 2021).

San Dionisio Probability Fit Zone 2a (ETRS) Zinc

	Population	Spike 1	Spike2	Low Grade	High Grade	Total
Fraction		7.88%	16.7%	16.8%	58.63%	100.0%
Mean	0.1576	0.0097	0.0292	0.0348	0.2492	0.15756
Beta		0.0093	0.0177	0.5496	1.0256	
Median		0.0097	0.0292	0.0299	0.1473	
Log Mean		-4.6394	-3.5338	-3.5086	-1.9155	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0007509	0		
%HISTO	0.0007353	1		
Z-Fit	0.0829996	0.002	Hist/Z-fit	0.008858629
FIT	0.0009013			

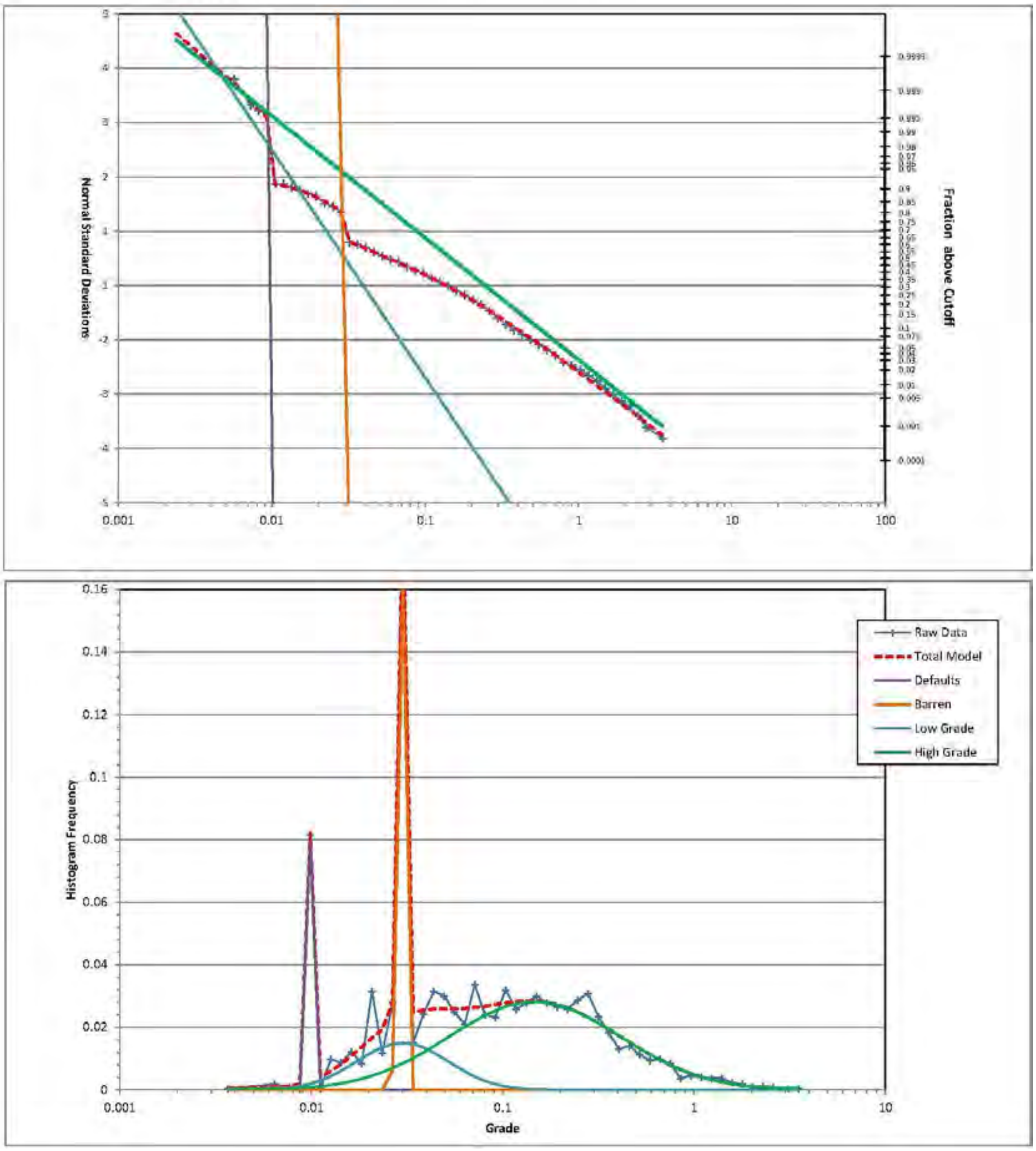


Figure 14-44: Probability distributions and lognormal histogram plots fitted to composite zinc data of Zone 2a (Noble & Barrero, 2021).

San Dionisio Probability Fit Zone 2a (ETRS) Lead

	Population	Spike 1	Spike2	Low Grade	High Grade	Total
Fraction		17.91%	38.6%	37.7%	5.73%	100.0%
Mean	0.0473	0.0095	0.0284	0.0539	0.2495	0.04729
Beta		0.0046	0.0020	0.9748	1.0285	
Median		0.0095	0.0284	0.0335	0.1470	
Log Mean		-4.6582	-3.5616	-3.3962	-1.9172	

Sum of Errors	SSQ	Weight		
%CFREQ	0.0014352	0		
%HISTO	0.0007264	1		
Z-Fit	0.3505187	0.02	Hist/Z-fit	0.002072384
FIT	0.0077368			

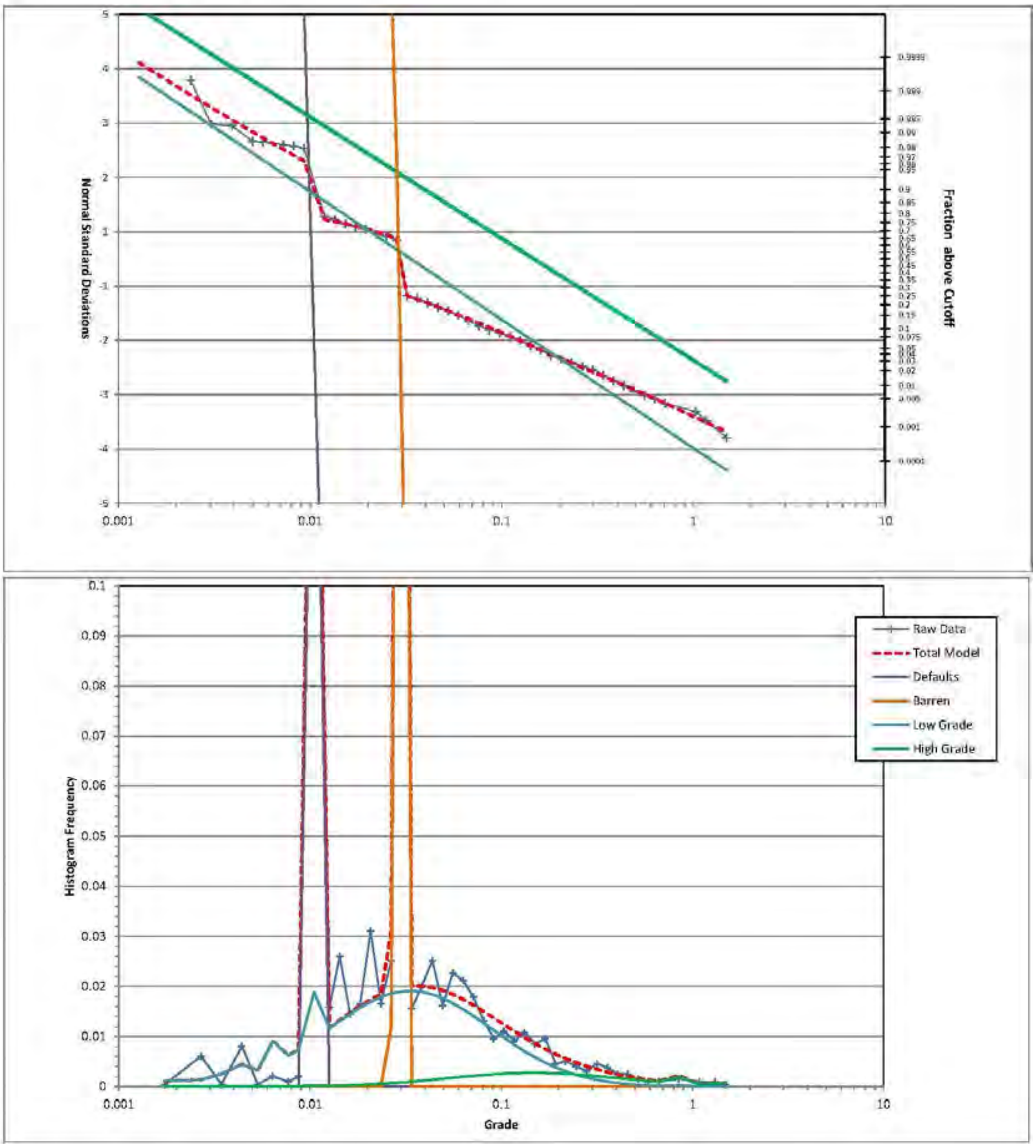


Figure 14-45: Probability distributions and lognormal histogram plots fitted to composite lead data of Zone 2a (Noble & Barrero, 2021).

14.2.10.2 Variograms

Experimental variograms for Zone 2a were computed in ETRS 89 Coordinate system. Because of the low number of sample pairs, reliable experimental variograms and fitted variogram models are only presented for copper, sulfur, and zinc (Figure 14-46).

The results of variogram modeling are summarized in Table 14-35. Variograms were modeled using two nested exponential variogram structures for copper and zinc and two nested spherical structures for sulfur. Axis conventions for the anisotropy rotation angles are ZX'Z' and all left rotations (LLL).

Copper variograms exhibit the best continuity along the X axis, along the strike of the deposit, in the E-W direction, and good continuity along the vertical Z' axis which dips steeply to the south at 75 degrees. The lowest continuity of copper grade is across strike of the deposit in the N-S direction.

Sulfur grade shows the strongest geometric and zonal anisotropy. Sulfur continuity is very good along the rotated Y' axis with a SE-NW orientation (107 azimuth) and plunging 46 degrees to the SE. The smallest ranges are found along the rotated X' axis, approximately in the N-S direction.

Zinc variograms are quite isotropic, mainly in the rotated Y' axis with a NE orientation (065 azimuth) and in the vertical Z direction. The smallest range is found along the rotated X' axis in the NW-SE direction, 155 degrees with the East.

Table 14-35: Summary of Variogram Models for Copper, Sulfur, and Zinc ETRS Coordinates (Noble & Barrero, 2021).

XYZ	Variogram	Rotation			Sage Variograms Scaled to Sill = 1.10								
					Nugget	Exponential Structure 1				Exponential Structure 2			
		Z	X'	Z'		Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
ETRS	Copper	0	15	0	0.1	17.3	15.4	22.3	0.65	183.2	15.6	89.9	0.35

XYZ	Variogram	Rotation			Sage Variograms Scaled to Sill = 1.20								
					Nugget	Spherical Structure 1				Spherical Structure 2			
		Z	X'	Z'		Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
ETRS	Sulfur	107	46	0	0.1	150	350	200	0.30	150	900	300	0.80

XYZ	Variogram	Rotation			Sage Variograms Scaled to Sill = 1.00								
					Nugget	Exponential Structure 1				Exponential Structure 2			
		Z	X'	Z'		Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
ETRS	Zinc	65	0	0	0.2	5	5	5	0.17	46	76.2	80	0.63

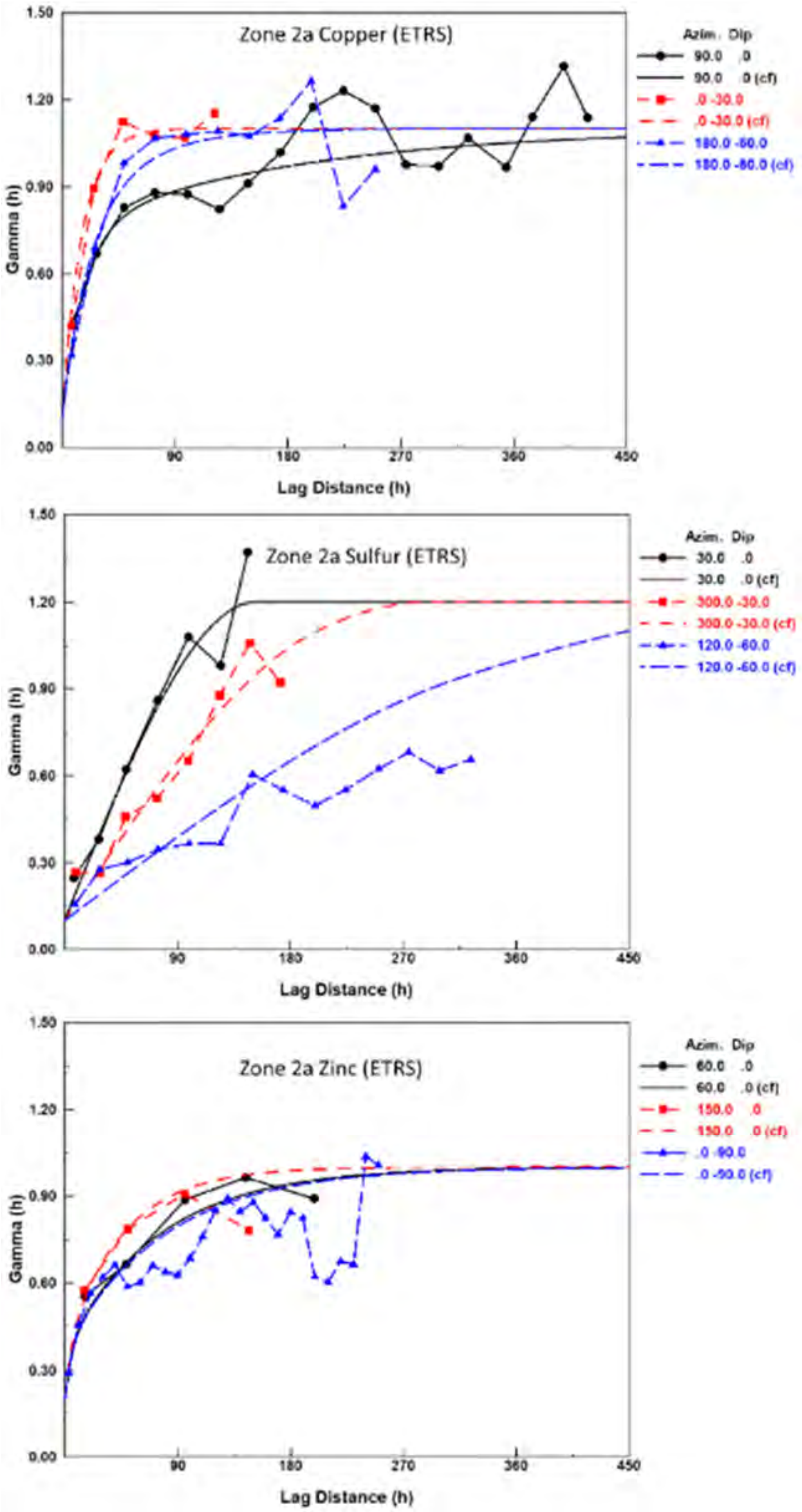


Figure 14-46: Zone 2a Variograms Copper, Sulfur, and Zinc ETRS Coordinates (Noble & Barrero, 2021).

14.2.10.3 Search Ellipse Parameters and Grade Estimation

Search ellipse parameters were developed for each element based on the variograms and a general assessment of the continuity of grades through inspection of the sample data in plans and sections.

Search ellipse parameters for each element are summarized in Table 14-36. All search ellipses are relative to the ETRS 89 coordinate system, and the rotation, as indicated in the tables, is clockwise around the +Z, X', or Z' axis.

Table 14-36: Search Ellipse Parameters IDP & NN Estimation (Noble & Barrero, 2021)

Estimation Case	Rotation			Search Volume 1					Search Volume 2			Search Volume 3		
				Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
	Z	X'	Z'	X'	Y'	Z'	Min	Max		Min	Max		Min	Max
Copper	0	15	0	80	15	50	5	10	1.5	5	10	2	1	10
Sulfur	107	45	0	75	300	150	5	10	1.5	5	10	2	1	10
Zinc & Lead	65	0	0	65	140	140	5	10	1.5	5	10	3	1	10

Copper, sulfur, lead, and zinc grades were estimated using the ETRS 89 coordinate space and nearest-neighbor (NN), and inverse-distance-power (IDP). The estimated grades were estimated as a single zone constrained by the wireframe of Zone 2a.

The IDP models were optimized relative to the NN models by matching the average grade of the IDP model to the average grade of the NN model to ensure that the overall estimates are unbiased.

IDP anisotropies are the same as the search ellipse radii, and the optimized IDP powers are 3.8 for copper and a power of 2 for sulfur, zinc, and lead.

14.2.11 Construction of the Combined Model

The MinZ, Contact, and MS copper, sulfur, zinc, and lead models, were combined using the Datamine process ADDMOD, then the Zone 2a model subset was added to the combined model. Fill, and mined-out models had been added previously on top of the grade model. Corresponding fractions of fill and rock are calculated for each block.

Horizontal and vertical sections of the final block copper model are shown in Figure 14-47 and Figure 14-48.

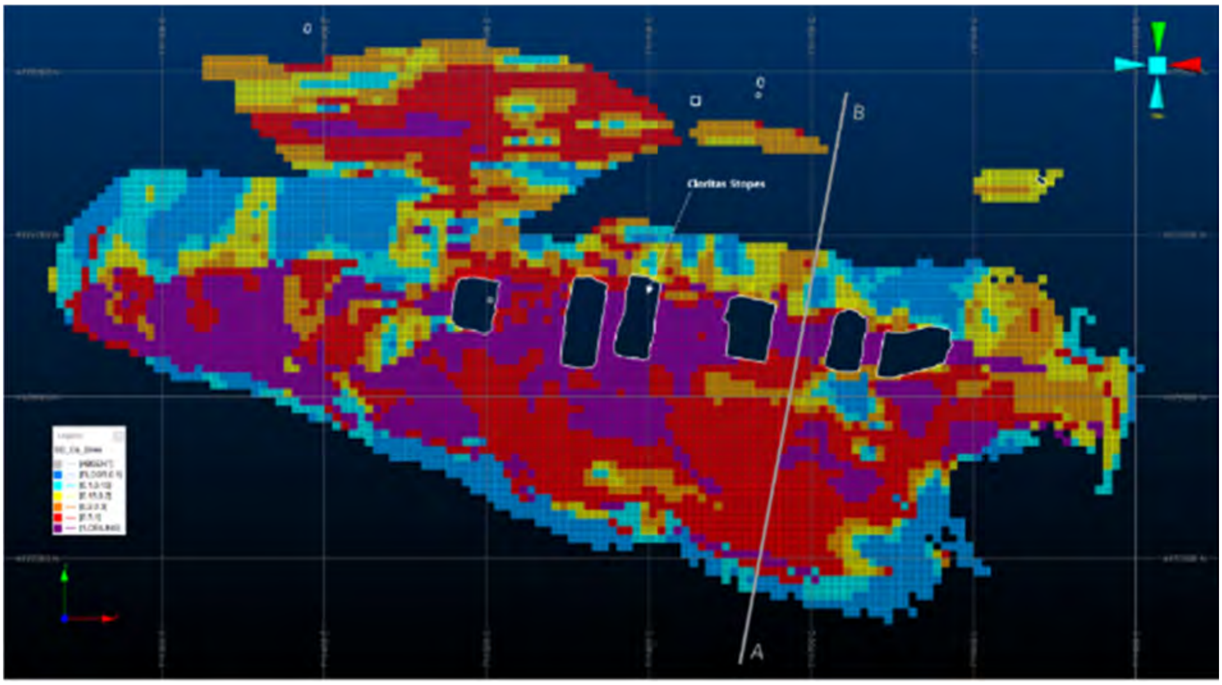


Figure 14-47: Horizontal section at 40m elevation of the copper model (Cu_IDP>0) (Noble & Barrero, 2021).

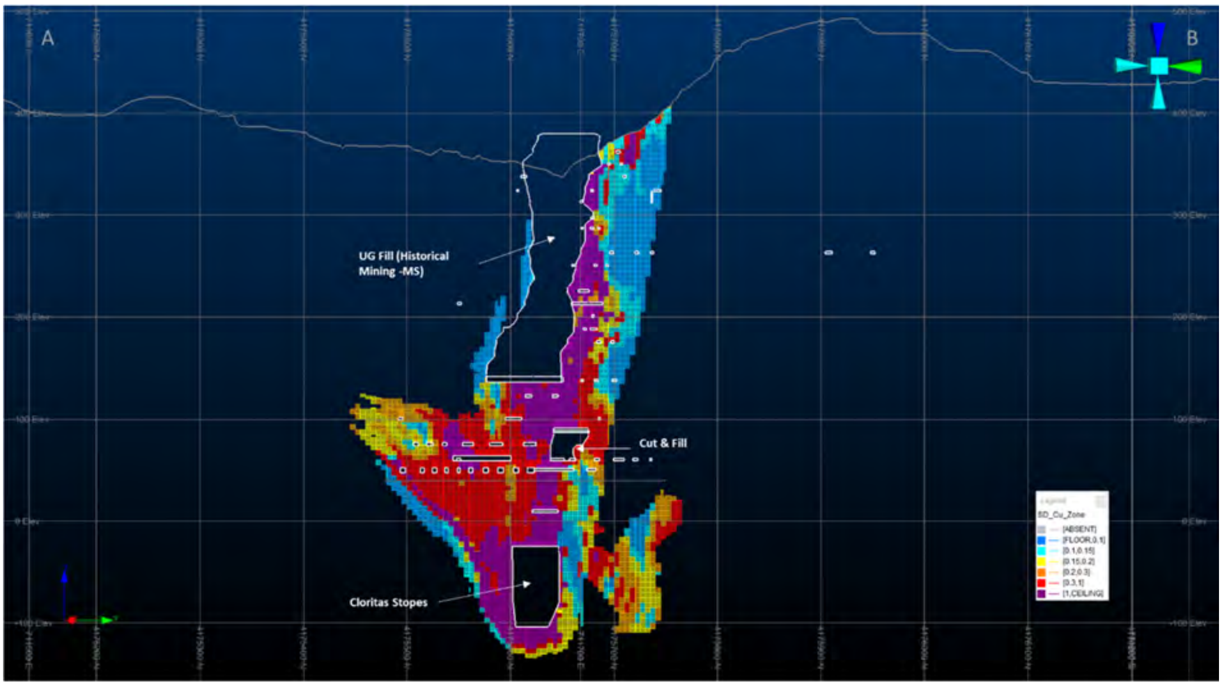


Figure 14-48: Vertical section (section A-B in Figure 14-47) of the copper model (Cu_IDP>0) (Noble & Barrero, 2021).

14.2.12 Mineral Resource Classification

Classification of mineral resources into measured, indicated, and inferred resource classes is based on drill-hole spacing and the number of drill holes selected for estimation. Drill-hole spacing is measured based on the kriging variance from a point-kriging estimate using a “FLAG” variable that is set to 1.0 for composites with copper values and “absent” for composites with insufficient sampling to make a composite. A linear, zero-nugget variogram with a slope of 0.5 is used for this kriging run. The kriging variance for a block at the center of a 4-point, square drill-hole pattern is approximately equal to 28% of the drill-hole spacing. If the block is outside the drilling pattern (extrapolated), the kriging variance is equal to the distance to the nearest drill hole. The resource classification parameters are summarized in Table 14-37.

Table 14-37: Mineral Resource Classification Parameters (Noble & Barrero, 2021).

Resource Class	Drill Hole Spacing (m)	Search Volume
Measured	<=60 m	SVOL<=1
Indicated	>60 m to <=100 m	SVOL<=2
Inferred	>100 m to <= 150 m	
Unclassified	>150 m or no estimate	

14.2.13 Mineral Resource Summary – Open Pit

The copper mineral resource was summarized using a Lerchs-Grossmann pit shell computed using Datamine Maxipit V4 software that was run using a copper price of US$3.60/lb Cu and all resources, including inferred resources. Pit optimization was constrained by the Riotinto Project mining permit limits around the Atalaya pit and by the ultimate pit of Cerro Colorado.

For economic analysis, the Lerchs-Grossmann (LG) algorithm was used to analyze economic pit limits based on metallurgical recoveries and other parameters, which are described below:

1. **Rock types:** A model of the San Dionisio rock types was created as a 3-dimensional block model using Datamine Studio RM software with block size of 10x10x10 m. This rock type block model is necessary to provide slope, mining, and processing cost parameters to the ores and to the non-ore-bearing geologic units.
2. **Density:** Default densities were assigned to the rock type model based on the average density of the different rock types; these densities are summarized in Table 14-38. Next, the combined resource model including the mined-out portion was added on top of the rock type block model. The resource model contains rock and fill tonnages and rock and fill volumes, rock tonnages are based on the interpolated densities, as described in Sections 14.2.3 and 14.2.4.

Table 14-38: Default densities of the rock type block model (Noble & Barrero, 2021)

Rock type	Density (g/cm^3)
Fresh Acid volcanics	2.7
Shales	2.5
Weathered Zone, 30m below current topo	2.3
Fresh Basic Volcanics	2.89
MinZ	4
Contact	4.5
MS-Massive sulfides	4.5
Mined -out (Fill)	2
Zone2a	3
FS-Filón Sur massive sulfides	4.5

3. **The overall slope angles (OSAs):** The OSAs used in the economic pit evaluation were derived from geotechnical historical information and recommendations from Atalaya's geotechnical consultants. The OSAs were used to control the LG shell wall projections and were controlled based on the block model rock types, these are summarized in Table 14-39.

Table 14-39: Overall Slope Angles Used in Pit Optimization (Noble & Barrero, 2021).

Slope Code	Rock type	OSA (degrees)
1	Fresh Acid volcanics	47
2	Shales	38
3	Weathered Zone, 30m below current topo	30
4	Fresh Basic Volcanics	47
5	MinZ	47
6	Contact	47
7	MS-Massive sulfides	47
8	Mined -out (Fill)	33
9	Zone2a	47
10	FS-Filón Sur massive sulfides	47

4. **Metallurgical Recoveries, Payables, Processing, and Operating Costs:** At San Dionisio, two ore types were defined, these are copper-stockwork which corresponds to MinZ ore, and polymetallic represented by the massive sulfide and contact areas ore. The estimation of recoverable copper values for each block was based on the ore type. In the case of the MinZ ore, the recoverable copper was estimated from the interpolated copper values and a formula developed by Mr. Noble in 2019, based on a regression of historical plant recoveries versus crusher head grades:

$$RCu\% = 0.92 * (1 - e\text{^}(-Cu\%0.3/0.19361))$$

The resulting recoveries typically range from about 88% to 91%.

MinZ ore mining costs were derived from Atalaya's updated mining costs estimates for the Cerro Colorado open pit operation.

For the polymetallic ore, benchmarking of plant performance with similar operations like Matsa (Spain), and Aljustrel (Portugal), was used to define a processing cost and an average plant recovery for Cu, Zn, and Pb, as well as mining costs.

Table 14-40 and Table 14-41 list the base economic parameters used in the pit limit analysis for both types of ores. All costs shown are in U.S. dollars. The Copper price is based on moving averages as of December 1, 2021. The assumed price of US$3.60/lb copper is between the 3-year average price of US$3.48/lb and the 15-year average price of US$3.74/lb.

Table 14-40: Base metal prices, recoveries, and payables.

		Item	Unit	Value
Base Prices		Cu	US $/lb	3.6
		Zn	US $/lb	1.25
		Pb	US $/lb	1.08
Plant Recoveries	Massive & Contact	Cu	%	65
		Zn	%	70
		Pb	%	35
	MinZ Stockwork Cu	Cu	%	*
Selling Cost	Massive & Contact	Cu	US $/lb	0.45
		Zn	US $/lb	0.45
		Pb	US $/lb	0.45
	MinZ Stockwork Cu	Cu	US $/lb	0.45
Smelting Payable	Massive & Contact	Cu	%	95.65
		Zn	%	85
		Pb	%	95
	MinZ Stockwork Cu	Cu	%	95.65
Recovery net Smelter	Massive & Contact	Cu	%	62.17
		Zn	%	59.50
		Pb	%	33.25

* $RCu\% = 0.92 * (1 - e$^(-$Cu\%$0.3/0.19361))

Table 14-41: Mining and processing costs for the different ore types and waste.

	Item	Ore Type	Unit	Value
Pit Mining Costs	Ore Mining Cost	Massive-Contact-MinZ	US $/t mined	1.80
	Waste Mining Cost	Waste - Massive or Stockwork	US $/t mined	1.80
		Shales	US $/t mined	1.40
		Mined Areas /Fill	US $/t mined	1.27
	Reclamation Cost	Waste - Massive	US $/t mined	0.06
Plant Costs	Processing Cost	Massive & Contact	US $/t mined	14.00
		MinZ Stockwork	US $/t mined	8.00

5. **Dilution and Ore Loss:** No additional provisions outside of the block model have been made for mining dilution and ore loss.

The resulting pit shell is considered to have reasonable prospects for economic extraction, assuming the inferred mineral resource is converted to measured and indicated by drilling (Figure 14-49). Mineral resources are estimated from the current topography and the ultimate pit of Cerro Colorado. The mineral resource estimate is summarized in Table 14-42.

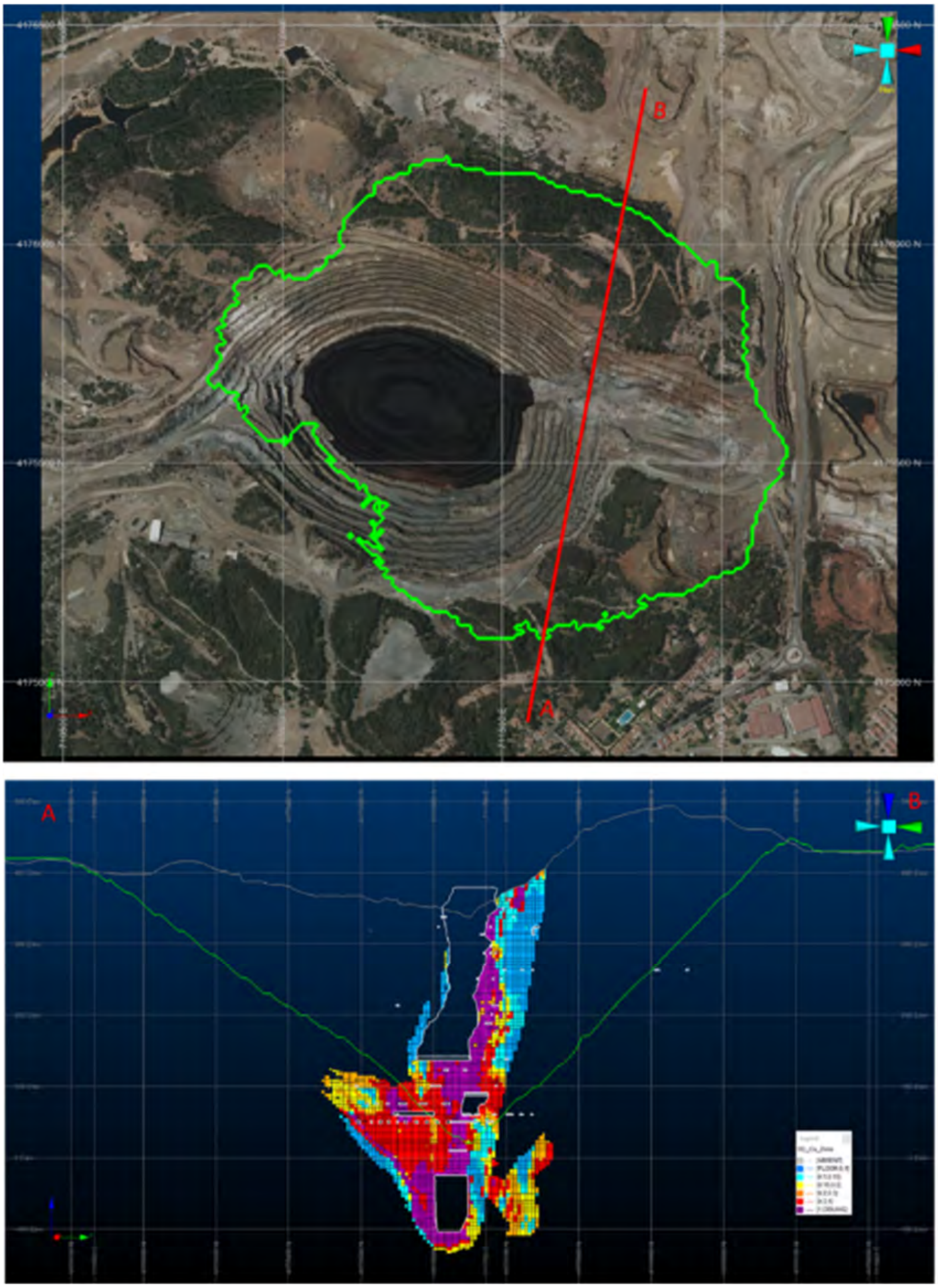


Figure 14-49: Aerial plan view pit rim and vertical section of the economic shell (Noble & Barrero, 2021).

Table 14-42: Mineral Resource Summary - December 2021 estimate, using multiple cutoffs, constrained by the US$3.60/lb Cu pit and the current topography and Cerro Colorado ultimate pit (Noble & Barrero, 2021).

Riotinto Project
San Dionisio Total Mineral Resources
July 2021 Model (21G) - 31 Dec 2020 Topo - $3.60/lb Cu Pit

% Cu Cutoff	Class	Tonnes (1000's)	% Cu	% Zn	% Pb	% S
0.14	Measured	50,817	0.92	1.09	0.21	31.12
	Indicated	6,576	0.70	1.31	0.35	34.05
	M+I	57,393	0.89	1.12	0.23	31.46
	Inferred	872	0.77	0.54	0.23	26.98
0.15 (Base Case)	Measured	49,661	0.94	1.11	0.22	31.46
	Indicated	6,420	0.71	1.33	0.35	34.45
	M+I	**56,082**	**0.91**	**1.14**	**0.23**	**31.80**
	Inferred	850	0.78	0.55	0.23	27.46
0.16	Measured	48,514	0.96	1.13	0.22	31.79
	Indicated	6,284	0.72	1.35	0.36	34.86
	M+I	54,798	0.93	1.16	0.23	32.14
	Inferred	839	0.79	0.56	0.24	27.66

San Dionisio Polymetallic Resource (Contact & MS)

% Cu Cutoff	Class	Tonnes (1000's)	% Cu	% Zn	% Pb	% S
0.14	Measured	22,699	1.12	2.11	0.40	43.70
	Indicated	4,461	0.73	1.85	0.49	43.29
	M+I	27,161	1.05	2.07	0.41	43.63
	Inferred	429	0.62	0.91	0.43	41.61
0.15 (Base Case)	Measured	22,621	1.12	2.11	0.40	43.75
	Indicated	4,428	0.73	1.85	0.49	43.35
	M+I	27,049	1.06	2.07	0.41	43.68
	Inferred	429	0.62	0.91	0.43	41.62
0.16	Measured	22,530	1.12	2.11	0.40	43.80
	Indicated	4,405	0.73	1.85	0.49	43.38
	M+I	26,935	1.06	2.07	0.41	43.73
	Inferred	428	0.62	0.91	0.43	41.63

July 2021 Model (21G) - 31 Dec 2020 Topo - $3.60/lb Cu Pit

San Dionisio Copper Resource (MinZ & Zone2a)

% Cu Cutoff	Class	Tonnes (1000's)	% Cu	% Zn	% Pb	% S
0.14	Measured	28,118	0.76	0.27	0.06	20.97
	Indicated	2,115	0.63	0.18	0.04	14.56
	M+I	30,233	0.75	0.27	0.06	20.52
	Inferred	443	0.91	0.19	0.03	12.81
0.15 (Base Case)	Measured	27,040	0.78	0.28	0.06	21.18
	Indicated	1,993	0.66	0.18	0.04	14.68
	M+I	29,032	0.78	0.27	0.06	20.74
	Inferred	421	0.95	0.19	0.03	13.05
0.16	Measured	25,984	0.81	0.28	0.06	21.38
	Indicated	1,879	0.70	0.18	0.04	14.88
	M+I	27,863	0.80	0.27	0.06	20.94
	Inferred	411	0.97	0.19	0.03	13.09

July 2021 Model (21G) - 31 Dec 2020 Topo - $3.60/lb Cu Pit

14.2.14 Mineral Resource Summary Underground

The underground copper resource was summarized based on the economic block model constructed for pit optimization, which includes the economic parameters described in Section 14.2.13. It was assumed the potential underground economic blocks should have a profit per tonne greater than US$35/t to account for underground mining costs (which add to the open pit costs of the economic model).

The economic block model was re-blocked to 20x20x20 m blocks to simulate mineable shapes and discard isolated potentially profitable blocks with excess dilution. Those blocks with calculated profit per tonne above US$35 were flagged as potential ore to get the total tonnes and profit per tonne of the flagged blocks.

The resulting inferred mineral resource, which might become economically extractable by underground methods assuming that the inferred resource is upgraded to measured and indicated by drilling and by further economic, mining, and technical studies, is summarized in Table 14-43.

Table 14-43: San Dionisio Underground Resource Summary – December 2021 estimate (Noble & Barrero, 2021).

San Dionisio Underground Mineral Resource Summary

	Tonnes (1000's)	Volume (m^3)	% Cu	% Zn	% Pb	% S
TOTAL Inferred Resource	12,388	3,025,419	1.01	2.54	0.62	40.86
July 2021 Model (21G)						

14.2.15 Discussion of Factors Affecting Resource Grade Models

There are no known environmental, permitting, legal, title, taxation, socio-economic, marketing, or political factors that would materially affect the mineral resource estimate.

There are technical relevant factors that would materially affect the resource estimate; these factors are discussed below:

1. A sensitivity analysis conducted on the variation of the south slope OSA confirmed the impact of the variation of the OSA on the size of the economic LG pit shell and in the total mineral resource obtained. Further geotechnical investigations are needed to resolve the current uncertainty on the OSA assumptions for the south slope shales and North wall.
2. Metallurgical test work conducted at the time of writing of this report is considered limited, and further metallurgical test work of the polymetallic ore type is required to confirm the assumptions made on plant performance.
3. The E-LIX™ System, the new processing technology under development and described in Chapter 13, could have a big impact on the estimated total resources by increasing the total resource and the sealable metal tonnes.
4. An expansion of the current tailings storage facilities (TSF) would be needed to store the tailings throughput resulting from San Dionisio ore. TSF expansion studies are currently underway.
5. Additional waste rock storage facilities (WRSF) in the vicinity of the Atalaya pit will be needed as dumping areas for the waste coming from San Dionisio. Different alternatives are currently under study.

6. A complete underground mining study must be undertaken including the selection of an appropriate mining method and an underground mine plan to reduce the current uncertainty associated with the inferred underground resources.
7. The reallocation of the current power line that runs parallel to the National Road A-461 should be considered.
8. Permitting times for issuing the approvals for the project including new WRSFs and TSF expansion, can be long and could have an important impact on the project economics and future project feasibility.

14.3 San Antonio

14.3.1 Mineral Resource Block Model

The mineral resource model for the mineralized zone of San Antonio was created as a three-dimensional block model using Datamine Studio RM software. The model block size is 2x2x2 m, which is used to more accurately define the geometry of the deposit. The horizontal extent of the model is defined to cover the San Antonio and Planes deposits, plus sufficient space outside the deposit for mine planning. Resource model size and location parameters are shown in Table 14-44.

Key items included in the block models are the geologic model zones, flattened XYZ coordinates from Datamine unfolding, and resource classification codes. Grades were estimated using inverse-distance-power estimation for copper, sulfur, lead, and zinc. Density was estimated from sulfur and zinc grades using a density estimation formula (*section* 14.3.3).

Table 14-44: San Antonio Resource Model Size and Location Parameters

	Minimum (ETRS89 meters)	Maximum (ETRS89 meters)	Cell Size (meters)	Number Cells	Model Size (meters)
Easting (X)	714,610	715,978	2	684	1368
Northing (Y)	4,175,270	4,175,970	2	350	700
Elevation(Z)	-180	500	2	340	680

For resource modeling purposes, two domains were identified: the Upper massive sulfide block (SA_UP) and the Lower massive sulfide block (SA_LOW). The two domains are separated by a sub-vertical NW trending fault (Nerva Fault, Figure 14-50). Geological modeling, data selection, unfolding procedures, and estimations have been done separately within each domain.

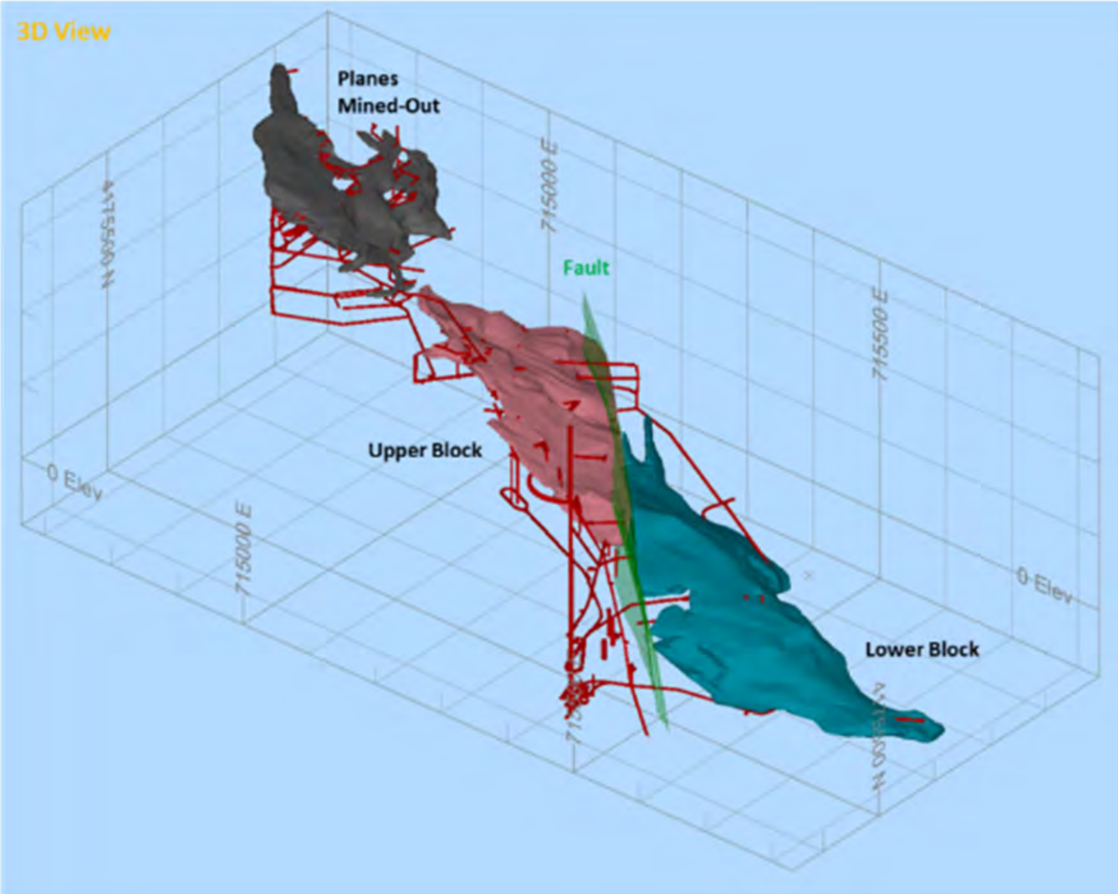


Figure 14-50: 3D view of the San Antonio domains and the Nerva Fault (Noble & Barrero, 2021)

Each domain was modeled in 3D based on legacy sections and plans and the geology of historical and current Atalaya drilling. A total of 30 horizontal plans were georeferenced from local coordinates to ETRS 89 system coordinates and digitized to define each domain, the mined-out portions of the San Antonio and Planes deposits, and the main fault (Figure 14-51). The historical San Antonio plans available include 14 floors, from the 1st floor at 217 elevation and the 14th floor at -28 elevation, with an average height of 19 m between floors.

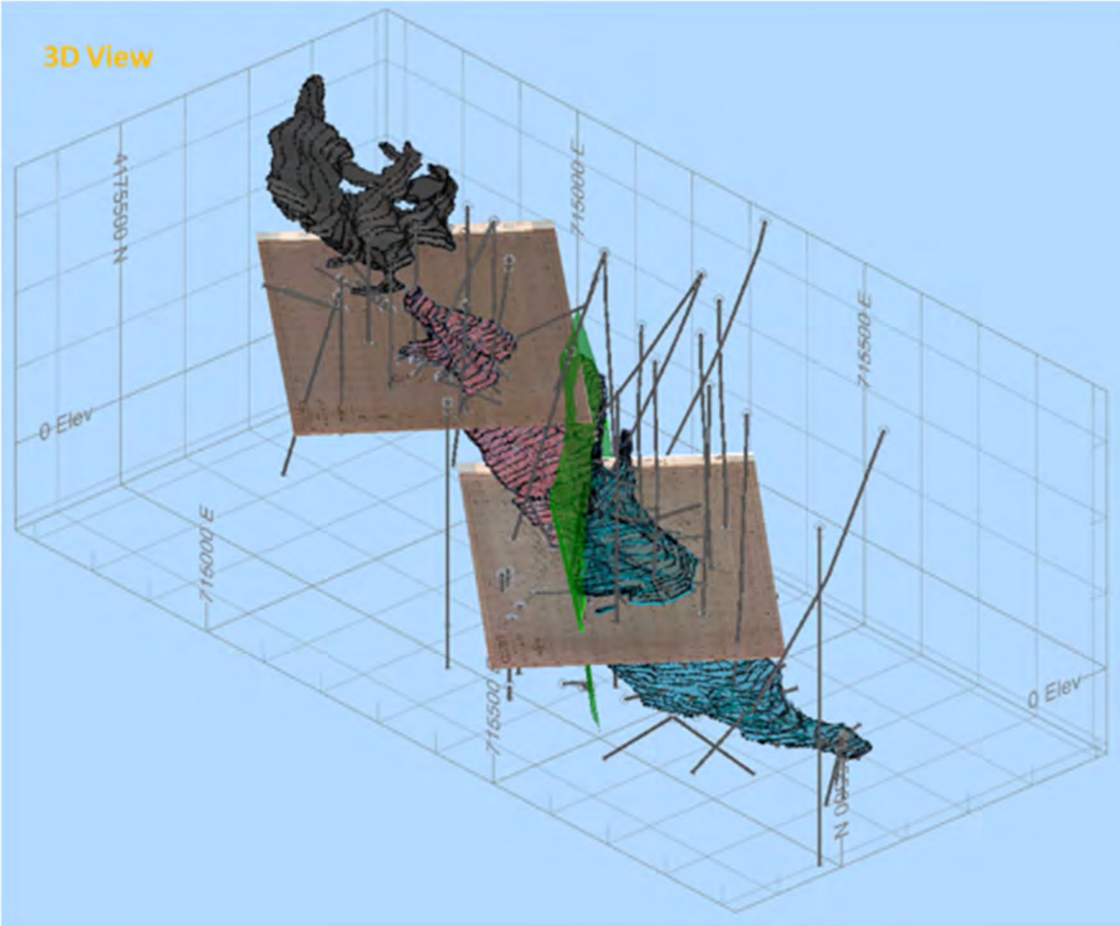


Figure 14-51: 3D view of the modelled San Antonio and Planes massive sulfide orebodies with georeferenced historical sections (Noble & Barrero, 2021).

The present model does not consider any historical or recent drilling at Planes deposit. The only work undertaken for the Planes deposit was a review of the mined-out portion of the orebody, the underground development files, and the historical plans that had been provided by Atalaya.

Experimental variograms of the different elements within the grade zones were created and modeled to define the anisotropy parameters for each grade zone. Inverse-distance power (IDP) interpolation was conducted on each interpolation zone applying the anisotropy parameters.

Variogram modeling was done with SAGE 2001 software[22]. It should be noted that Sage normalizes all variogram sills to a value of 1.00; traditional sills and nugget effect values may be obtained by multiplying the individual structure sill times the overall relative variance. All variograms were modeled using one or two nested exponential variogram structures.

The Datamine UNFOLD process was used to address the folded nature of the deposit. The Upper and Lower massive sulfide blocks were unfolded and estimated separately. Both variogram modeling and

[22] SAGE 2001 Version 1.08, Isaaks & Co.

estimation have been performed in unfolded coordinates and transformed back to the current folded state.

The Datamine search expansion feature was used to expand an initial search ellipse until the desired number of composites were located inside the search ellipse. The primary objective of the search ellipse expansion was to keep the search as localized as possible, subject to finding sufficient samples for reliable estimation. The final search ellipse expansion was set to provide estimates in areas with widely spaced drilling.

14.3.2 Drill Hole Sample Database

Drill-hole data were provided by Atalaya geology personnel as ASCII files containing assays, collar locations, down-hole surveys, for all drilling in the resource area. The drilling used for resource estimation at San Antonio is summarized in Table 14-45, and it is shown in Figure 14-52.

Atalaya drilling only includes core drill holes drilled from surface on the west side of the deposit. Drilling used for the resource estimate includes 8 drill holes that were drilled in 2015. The Atalaya drilling at Planes was not considered, as it lies outside of the San Antonio orebodies.

Table 14-45: Summary of Drilling used for Resource Estimation at San Antonio.

Drill Series	Type	Year	Number Holes	Number Assays	Drilled Length (m)	Average Hole Length (m)	Average Interval Length (m)
Historical Surface	Core	1960s	20	241	6,838	341.91	0.97
Historical Underground	Core	1960s-1970s	157	3,011	9,963	63.46	2.09
Atalaya	Core	2015	8	456	1,504	188.03	1.00
Total			**185**	**3,708**	**18,305.04**	**98.95**	**1.85**

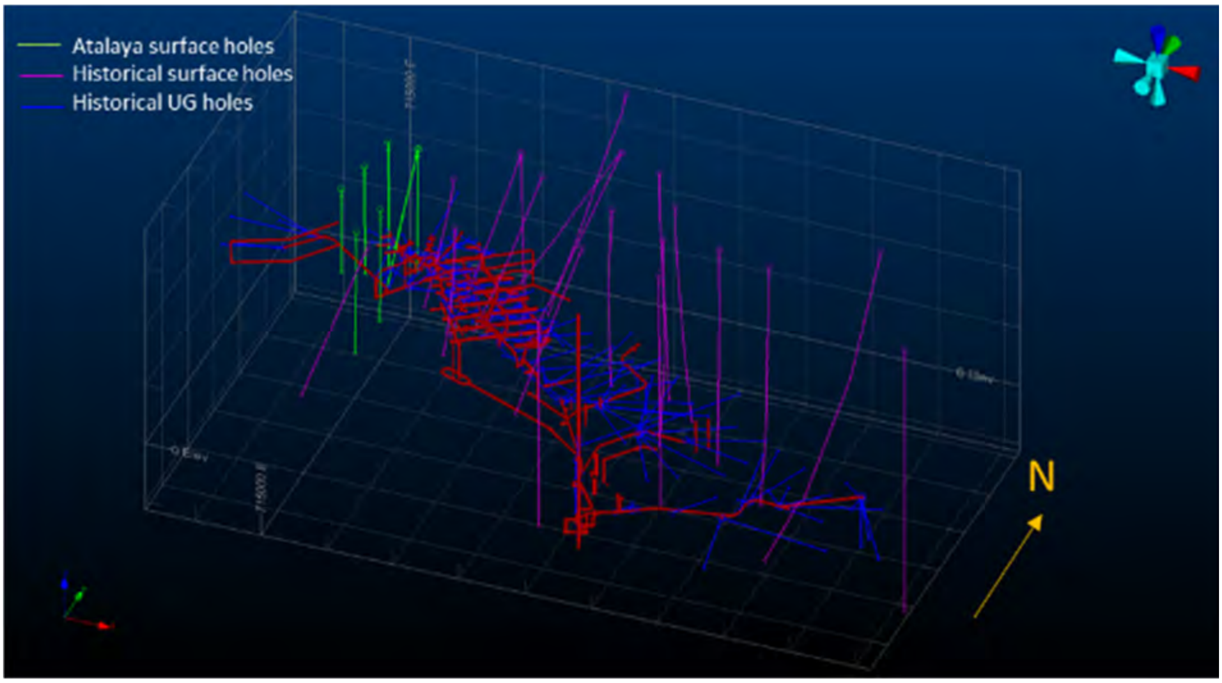


Figure 14-52: 3D view of the San Antonio drill holes (Noble & Barrero, 2021).

14.3.3 Bulk Density

Bulk density is estimated using a formula correlating density with sulfur and zinc grades. Data for the correlation were historical sulfur and zinc assays and specific gravity measurements that were done on drill core samples (RTZ Consultants Limited, 1974). The samples were taken from drill cores of the San Antonio 8, 9, and 11 levels. The density determination method is unknown.

The results of this study demonstrate a good correlation between combined sulfur and zinc grades and measured density (one outlier excluded), as shown in Figure 14-53.

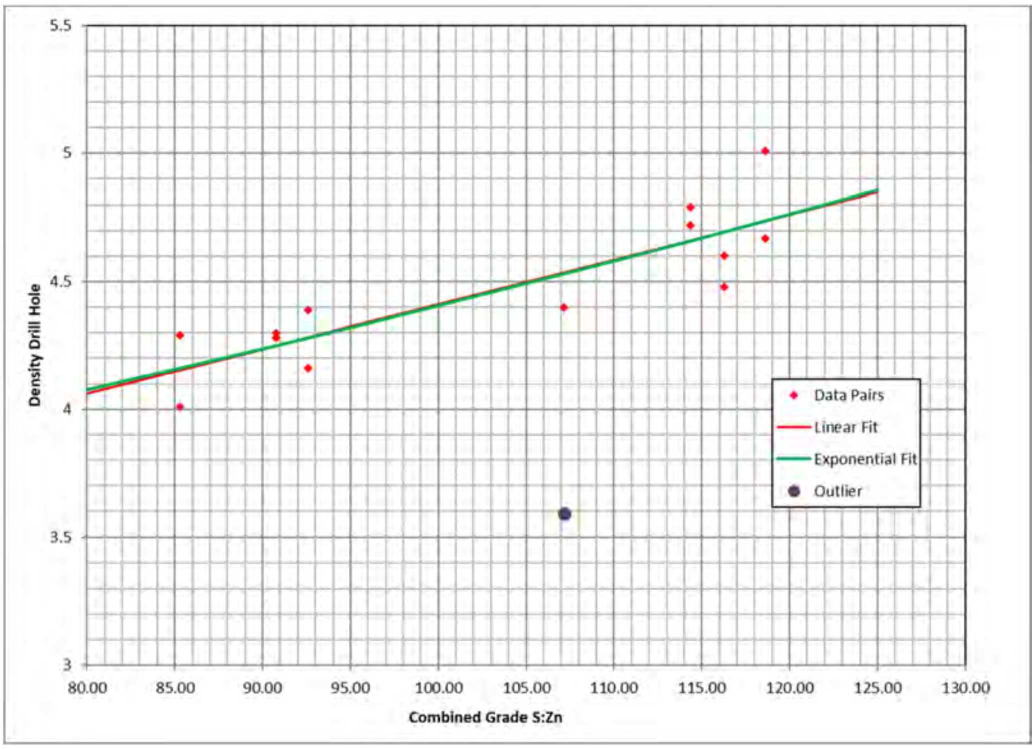


Figure 14-53: Correlation between Specific Gravity and Sulfur& Zinc Grades – San Antonio 1974 Data (Noble, 2022).

The San Antonio density formula is:

$$\text{Density} = 2.6654 + (0.0175 * (2.427*\%\ S\_IDP+1.543*\%\ Zn\_IDP))$$

In those cases where the estimated zinc grade is absent, the density formula used only considers the estimated sulfur grade:

$$\text{Density} = 3.5695 + (0.0241 * \%\ S\_IDP)$$

14.3.4 Resource Model Density

The San Antonio density formula defined in the previous sections (14.3.3) and IDP sulfur and/or zinc estimates are used for estimation of block model density.

Density in fill material is assigned a default density of 2.00 t/m^3. Volumes mined-out with underground stopes and other workings were assigned a density of 2.00 t/m^3, which is equivalent to assuming that the underground openings have either caved, were backfilled during underground operations.

14.3.5 Topographic Model

Triangulated digital terrain models (DTMs) were prepared from the IGN[23] most recent topographic data available, where data had been triangulated using the Datamine DTM creation tool. The resulting DTM was cropped to the resource model limits.

14.3.6 Mined Out Model

Mined-out portions of the block model were defined as follows:

1. **Underground Workings and shafts San Antonio:** 3D wireframe models were provided by Atalaya that define the volumes mined as underground workings. The wireframes were used to create a block model of the mined-out volume using 1x1x1-m sub-blocks in a 2x2x2-m resource model prototype. The underground workings have many minor errors, correcting those errors is out of the scope of this report.
2. **Planes Massive Sulfides:** Massive sulfides mined-out and backfilled volumes due to the historical underground pillar and stall mining method were constructed based on geo-referenced historical sections. The contours of the mined-out portion were used to construct a 3D wireframe representing the underground backfilled area (Figure 14-50 and Figure 14-51). The wireframes were used to create a block model of the mined-out volume using 1x1x1-m sub-blocks in a 2x2x2-m resource model prototype. The fill block model is only a rough estimate of the historical and mined-out and filled volume.

14.3.7 Geological Model

The geologic model was constructed to provide geologic control for grade estimation and as a guide to apply the unfolding procedure.

14.3.7.1 Mineralized Zones

Wireframes corresponding to the main mineralized upper and lower massive sulfide orebodies were constructed and used as the basis for the mineralized zone models. The footwall of the overlying Culm Shales was modeled as a DTM surface using geological sections (Figure 14-54).

Empty block models in the 2x2x2-m resource model prototype were created for the upper and lower blocks which are separated by the Nerva Fault.

[23] Autonomous Body of the National Centre for Geographic Information (Spain): http://centrodedescargas.cnig.es/CentroDescargas/index.jsp

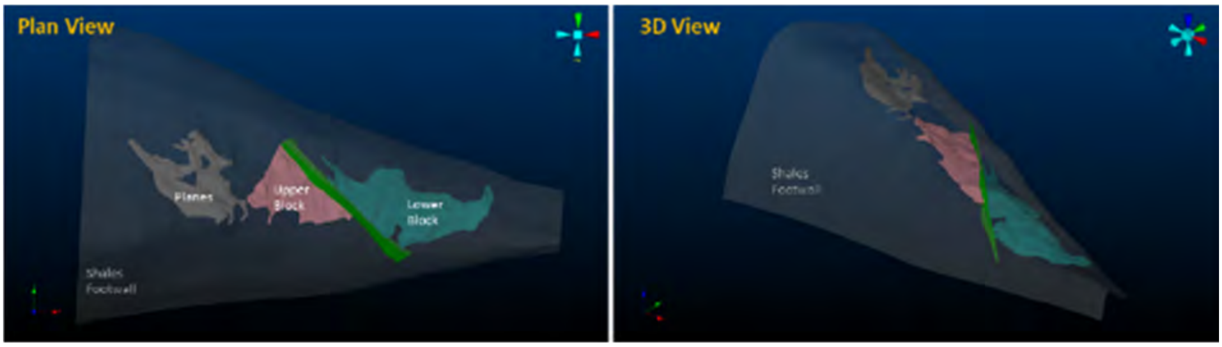


Figure 14-54: Plan and 3D views of the orebodies of San Antonio (Noble & Barrero, 2021).

14.3.7.2 Unfolding

The Datamine unfolding tool was used to flatten the anticlinal fold of San Antonio composed of the two massive orebodies into a geometry that is as close as possible to the original shape of the deposit.

The procedure for the unfolding of at San Antonio is very similar to the method applied to Cerro Colorado or San Dionisio, which has been described in a previous section:

1. Upper and lower trend strings in 4 m spacing N60°E trending vertical sections were drawn, representing the hanging wall and footwall of the mineralized upper and lower zone. Between-trend tag strings were drawn that connect between hanging wall and footwall strings.
2. The unfolded Y’ axis (Y FLAT) is oriented parallel to the N60°E direction (downdip axis) and is approximately perpendicular to the strike of the deposit. The Y’ coordinates are in unscaled units (Figure 14-55).
3. A tag string was drawn to connect horizontally between the section strings in the Y’ axis direction (N150°E).
4. The X’ unfolded axis follows parallel to the N150°E direction or the nominal strike of the deposit, and the X’ coordinates are scaled relative to the average unfolded width of the deposit in the X’ direction (along strike axis).
5. The resulting footwall-to-hanging wall tag strings define the Z’ axis in the unfolded coordinate system. The Z’ unfolded axis is scaled proportionally to the average “thickness” of the mineralized zone (Figure 14-56).

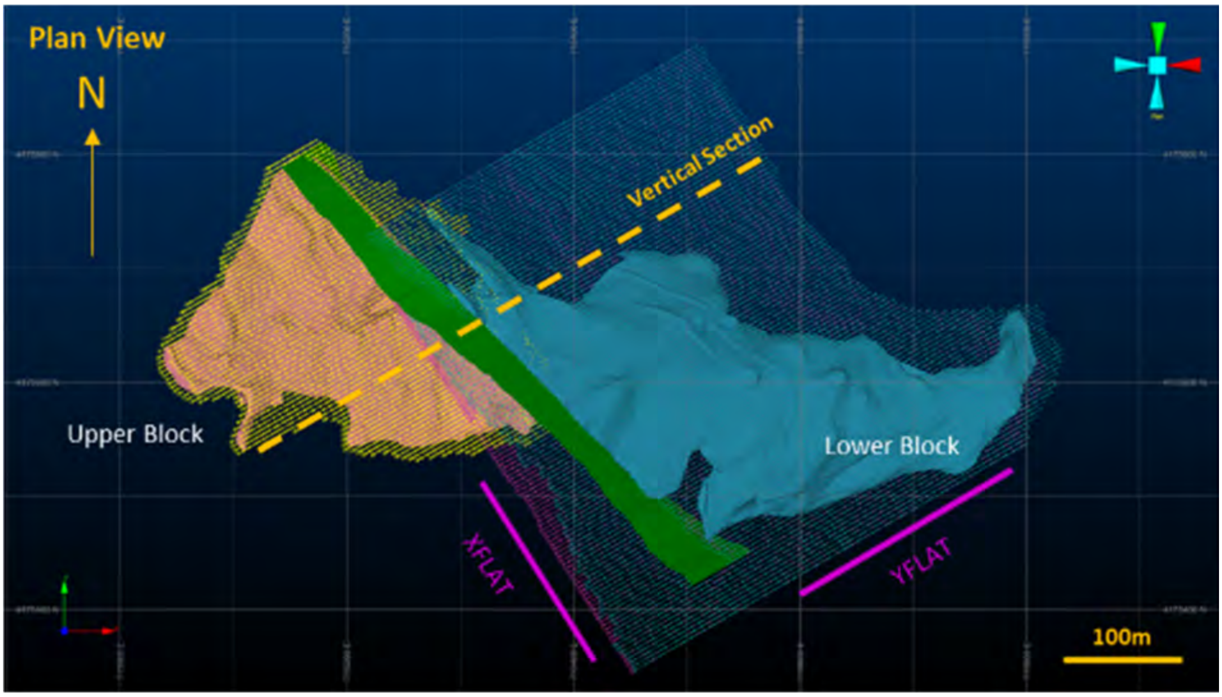


Figure 14-55: Plan view showing the unfolding strings and the unfolding axis (Noble & Barrero, 2021).

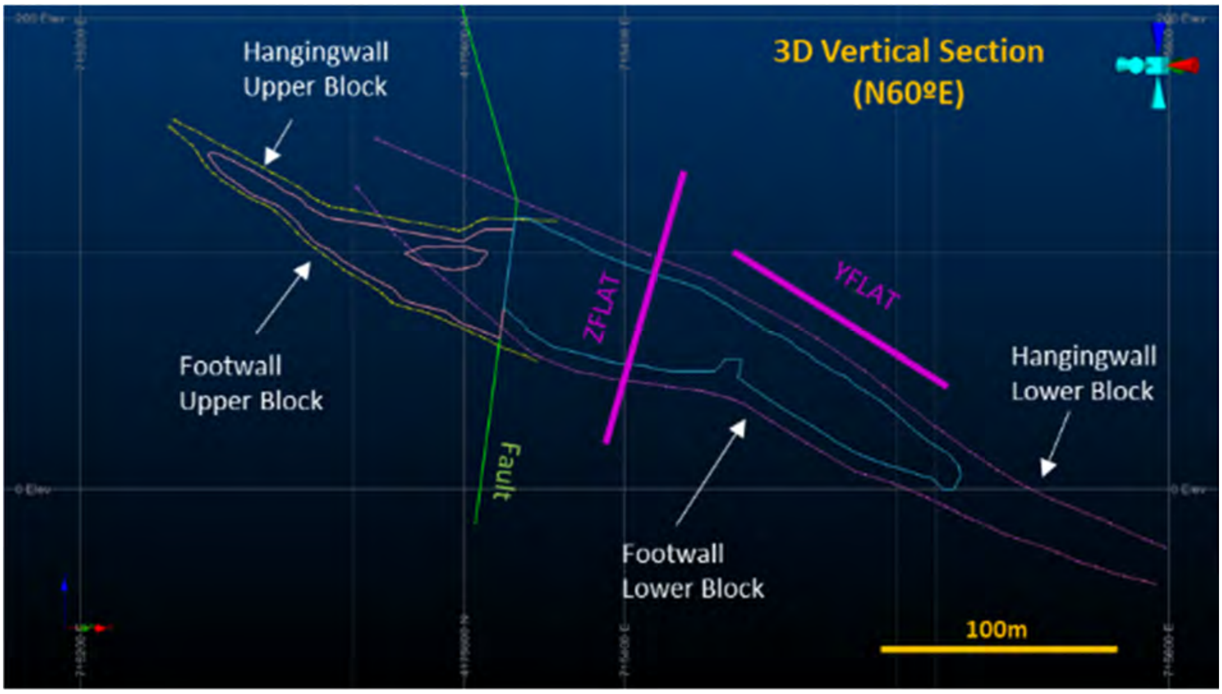


Figure 14-56: Vertical section view showing the unfolding strings and the unfolding axis (Noble & Barrero, 2021).

14.3.8 Compositing

Drill hole assays were composited to 2-m composites using the standard Datamine downhole compositing routine, COMPDH. After compositing, drill holes were assigned DOMAIN codes based on the mineralized zone wireframes. Intervals inside the mineralized zone wireframes were assigned a code SA_UP for the upper block and SA_LOW for the lower block wireframe, and the code NOZN if lying outside the mineralized wireframes.

Composites were computed with the compositing routine set to compute nominal 2-m composites that started and ended on DOMAIN boundaries. All samples are forced to be included in one of the composites by adjusting the composite length, while keeping it as close as possible to 2 m. Assays were composited using length-weighted averages.

14.3.9 Grade Distributions

14.3.9.1 Copper and Sulfur Grade Distributions

Copper distributions were studied separately for the upper and the lower blocks; these are shown as lognormal cumulative probability and lognormal histogram plots in Figure 14-57. The average distribution grade is slightly higher in the lower block. The copper grade distributions are similar with a medium-grade distribution with overlapping low- and high-grade populations.

The copper grade in the upper block is composed mainly by one population representing 89.4% of the total samples and averaging 1.25% Cu with a small fraction of overlapping low- and high-grade distributions, whereas the lower block can be fitted to three distributions: a medium-grade population representing 59% of the total samples averaging 1.28% Cu, overlapping with a high-grade distribution averaging 4.8% Cu and representing 10% of the total samples, and a low-grade distribution with an average grade of 0.76% Cu representing 29% of the data

Grade-zoning control (CuGZones) is used for estimation to resolve the problem of the overlap between low-grade, mid-grade, and high-grade populations. Composites were selected with overlapping grade ranges between CuGZones for the interpolation. A simple nearest-neighbor (NN) model was created to define preliminary medium and high-grade zones with different searches for each grade zone (Table 14-46). The low-grade zone was defined as the default grade zone before NN estimation. Finally, grade zones (CuGZones) were assigned to the model using the grade-range parameters in Table 14-47.

Table 14-46: Grade-Zone NN Search (Noble & Barrero, 2021).

Zone	Copper Zone	Rotation	X’	Y’	Z’
Upper	Medium grade	0	75	100	10
	High grade	0	35	50	5
Lower	Medium grade	-33	40	80	10
	High grade	-33	20	40	5

Table 14-47: Grade-Zone Parameters for Block Model and Composites (Noble & Barrero, 2021)

Zone	CuGZone Code	Description	Block Model Grade Ranges	Composite Grade Ranges	
			Lower	Lower	Upper
Upper Block	11	Low-Grade	<0.3	0	0.3
	12	Medium-Grade	>=0.3	0.3	4
	13	High Grade	>=4	3	100
Lower Block	11	Low-Grade	<0.3	0	0.3
	12	Medium-Grade	>=0.3	0.3	6
	13	High Grade	>=5	3	100

San Antonio Copper Distributions

Area	Upper Block	Lower Block
Mean	1.25	1.44

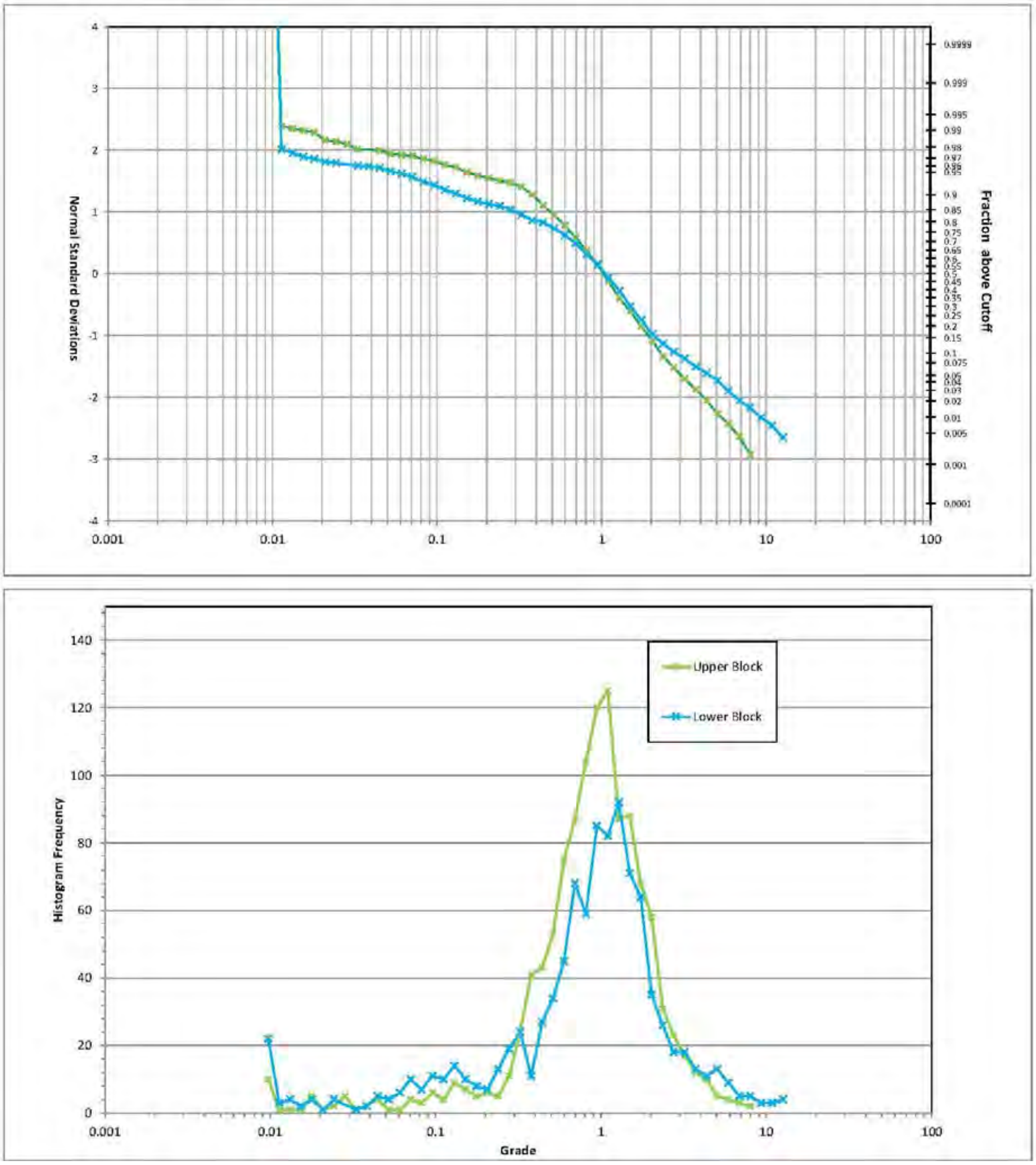


Figure 14-57: Probability distributions and lognormal histogram plots fitted to composite copper data of the upper and lower San Antonio Blocks (Noble & Barrero, 2021).

Sulfur distributions were studied separately for the upper and lower blocks as probability distributions (Figure 14-58), and through a visual assessment of the grades in plans and sections.

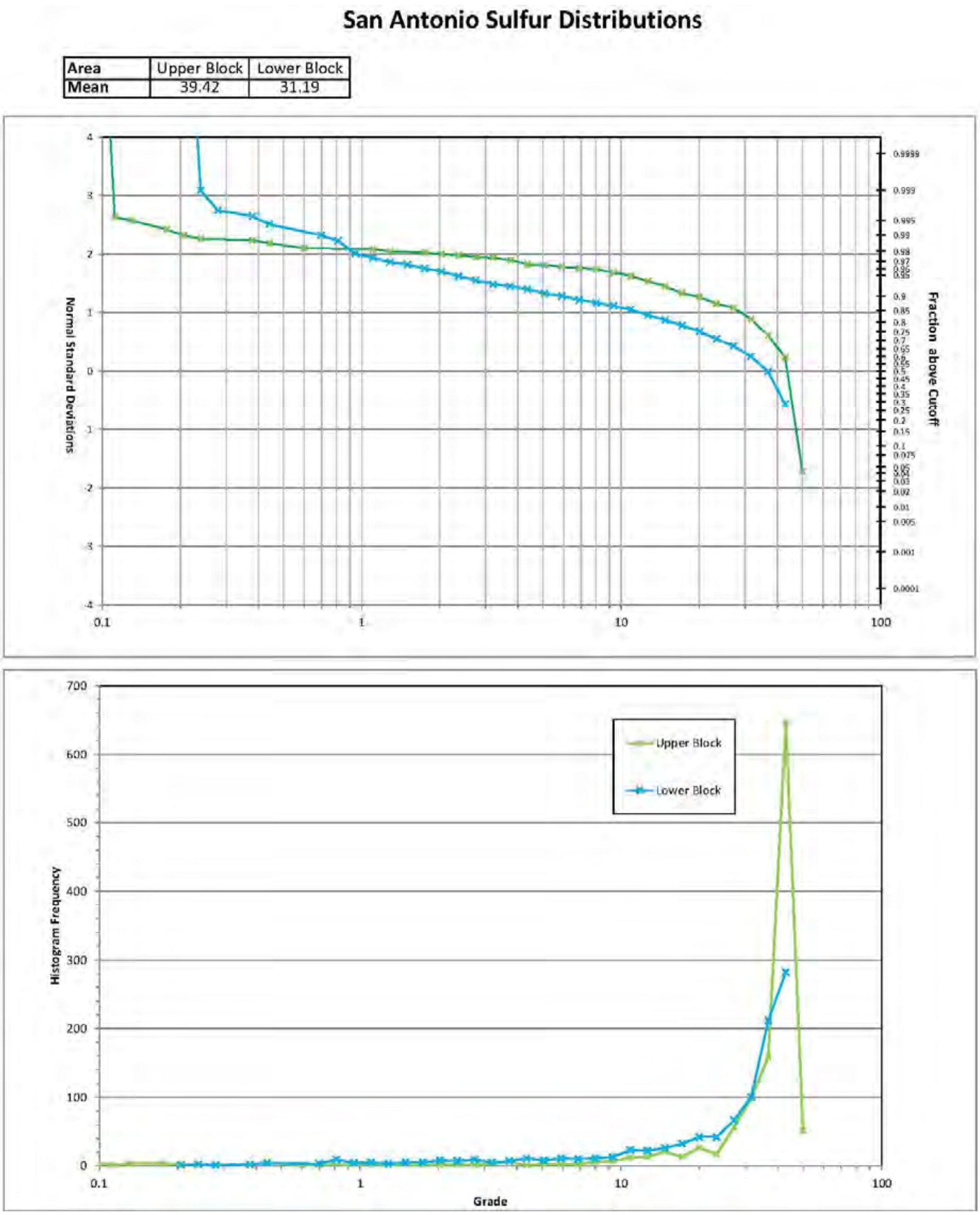


Figure 14-58: Probability distributions and lognormal histogram plots fitted to composite sulfur data of the upper and lower San Antonio Blocks (Noble & Barrero, 2021).

The sulfur grade is higher in the upper block than in the lower block, with average sulfur grades of 39.4% and 31.2%, respectively. The proportion of high-grade is greater in the upper block, with 69% of the total samples averaging 43% sulfur compared with 55% of the samples averaging 42% in the lower block.

In the mid-grade copper zone (CuGZone 12), sulfur and copper correlate and the highest sulfur grade is in this zone, and the lowest sulfur is in the low-grade copper zone (CuGzone 11). The distribution of sulfur grades in plans and sections indicates that the footwall of the orebodies is generally lower grade, with the higher grades found in the middle and tapering to the sides.

Based on the above analysis, a determination was made that sulfur grade zones were not required, and sulfur grades were estimated in the copper grade zones.

14.3.9.2 Zinc Grade Distributions

Zinc grade is slightly higher in the lower block and shows a higher proportion of high grade, averaging 2.2%Zn in the lower block and 1.81% Zn in the upper block. In both blocks, the zinc distribution is strongly bimodal with a crossover of the low-grade and the high-grade around 0.65% Zn (Figure 14-59).

The significant overlap between low and high-grade distributions is problematic for resource estimation since there is no easy way to differentiate the populations. Low-grade and high-grade zinc zones with overlapping ranges were defined in the composites. To provide grade-zoning control to the estimation, a nearest-neighbor model was created to define preliminary high zinc grade zones in the models (Table 14-48), and then, the final zinc grade zones were assigned to the model based on the estimated high-grade zone and the grade crossover at 0.65% Zn (Table 14-49).

Table 14-48: Zinc HG-Zone NN Search (Noble & Barrero, 2021).

Zone	NN Zinc Grade Zone	Rotation	X'	Y'	Z'
Upper	High grade	0	50	40	10
Lower	High grade	49	75	75	10

Table 14-49: Grade-Zone Parameters for Block Model and Composites (Noble & Barrero, 2021)

Zone	CuGZone Code	Description	Block Model Grade Ranges	Composite Grade Ranges	
			Lower	Lower	Upper
Upper Block	11	Low-Grade	<0.65	0	0.8
	12	High Grade	>=0.65	0.4	100
Lower Block	11	Low-Grade	<0.65	0	0.8
	12	High Grade	>=0.65	0.4	100

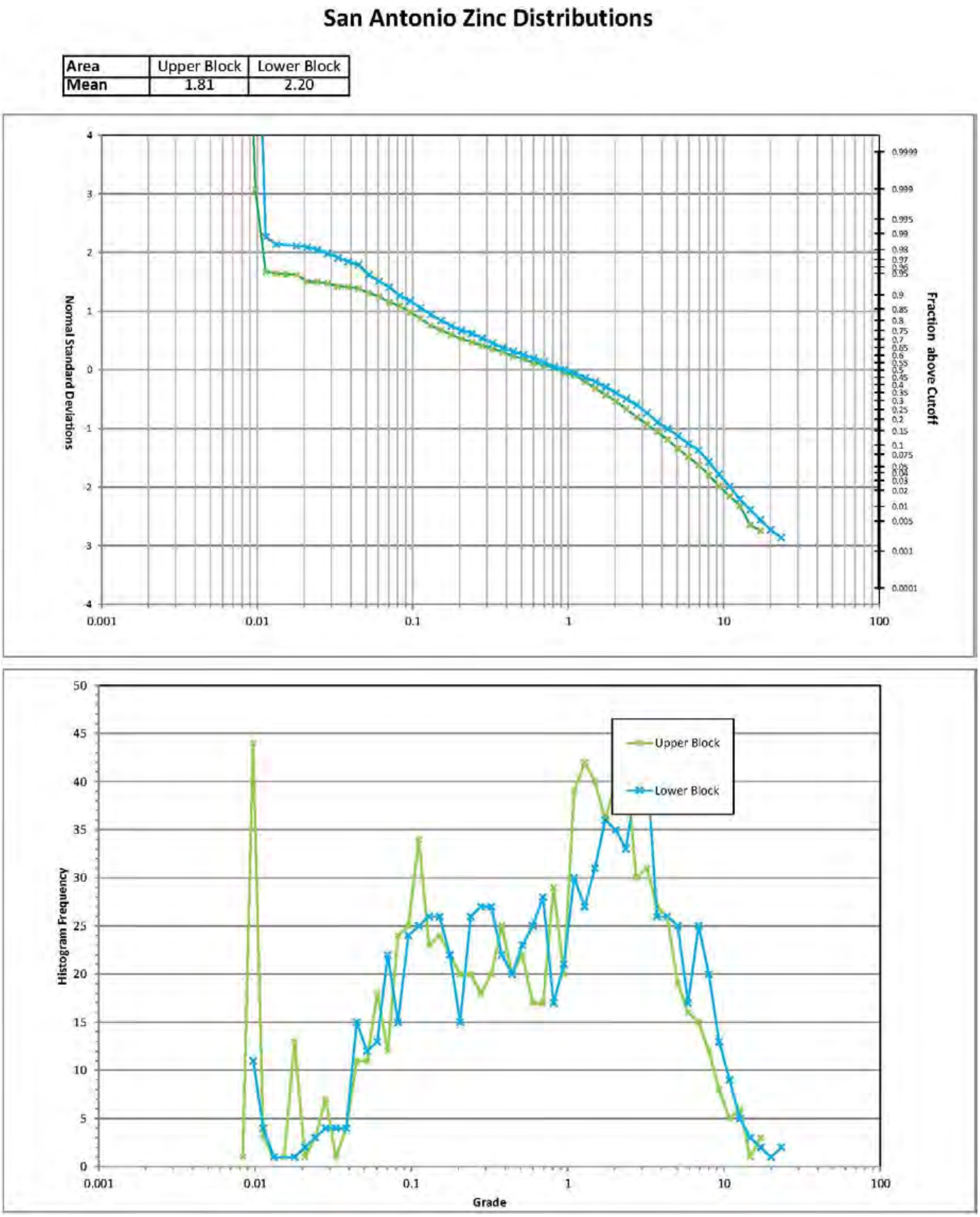


Figure 14-59: Probability distributions and lognormal histogram plots fitted to composite zinc data of the upper and lower San Antonio Blocks (Noble & Barrero, 2021).

14.3.9.3 Lead Grade Distributions

The lead grade is slightly higher in the lower block, averaging 1.1% Pb, while in the upper block, the average grade is 0.99% Pb. In both blocks, the lead distribution can be fitted to several overlapping distributions (Figure 14-60).

For grade zoning, several alternatives were studied, including the use of the lead-zinc correlation. When taking a close look at the lead grade zones, there seem to be four zones: two zones where lead and zinc correlate, one where the lead is higher than it should be, and the last one, where lead is lower than it should be. This could be because the correlation between lead and zinc is good above 0.65% Zn, but below 0.65% Zn the scatter is high. Variogram modeling in the grade zones was not conclusive.

Finally, the lead grade was fitted to two distributions, a high-grade zone above 0.05% Pb and a low-grade zone below 0.05%Pb.

The low-grade and high-grade lead zones with no overlapping ranges were defined in the composites based on the 0.05% Pb "cutoff". To provide grade-zoning control to the estimation, a nearest-neighbor model (NN) was created to define preliminary high lead grade zones in the models and then, the final lead grade zones were assigned to the block model based on the estimated high-grade zone and the 0.05% Pb value.

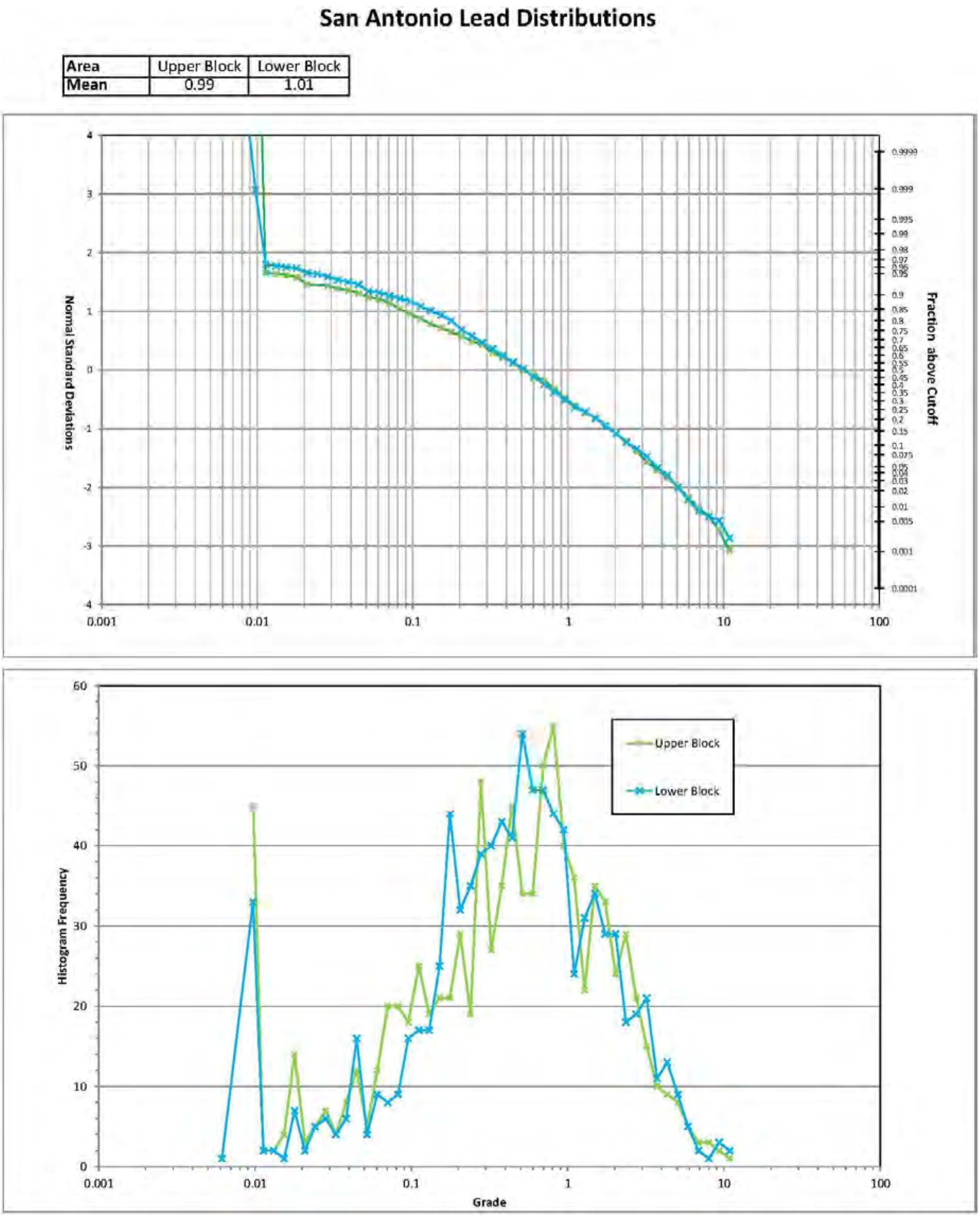


Figure 14-60: Probability distributions and lognormal histogram plots fitted to composite lead data of the upper and lower San Antonio Blocks (Noble & Barrero, 2021).

14.3.10 Variograms

All variograms were computed in the unfolded coordinate system.

14.3.10.1 Copper Variograms

The copper variograms were computed separately for the upper and lower blocks; the results are summarized in Table 14-50 and graphically in Figure 14-61. Experimental variograms were constructed in a sample neighborhood in the range of 0.3 and 4% Cu.

Upper and lower blocks show both zonal and geometric anisotropy with a strong anisotropy in the NS to NW unfolded direction in the X'Y' plane and the shortest ranges along the Z' direction.

Table 14-50: Summary of Variogram Models for Copper (Noble & Barrero, 2021).

XYZ	Variogram	Rotation			Sage Variograms Scaled to Sill = 1.00								
					Nugget	Exponential Structure 1				Exponential Structure 2			
		Z	X'	Z'		Range (X')	Range (Y')	Range (Z')	Sill	Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Copper Upper	0	0	0	0.301	68	40	5	0.30	8.6	65	5	0.40
	Copper Lower	-33	0	0	0.388	6.9	20.2	4.3	0.612	-	-	-	-

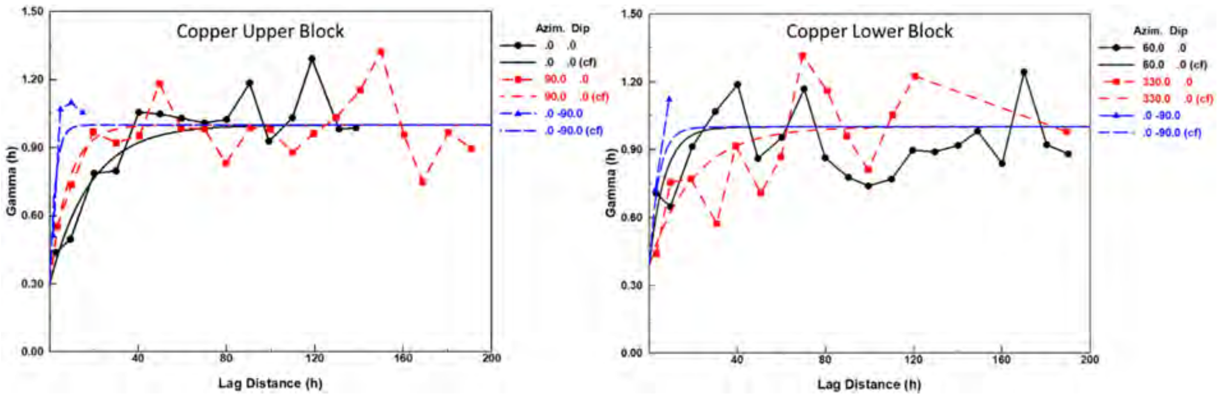


Figure 14-61: Copper variograms for the upper and lower blocks (Noble & Barrero, 2021).

14.3.10.2 Zinc Variograms

The zinc variograms were computed for the defined high-grade zinc grade zones in the upper and lower blocks separately; the results are summarized in Table 14-51 and graphically in Figure 14-62.

Zinc grades in the upper block are almost isotropic in the high-grade zinc zone. In the low-grade zone, there is a geometric anisotropy along the rotated Y' axis in the 41°direction, variograms are isotropic with short ranges in the rotated X' axis along the 131°direction and the Z' direction.

Zinc grades in the lower block exhibit strong geometrical anisotropy along the rotated X' axis in the 140-139° direction in both grade zones, with much better continuity and longer ranges in the high-grade zone in that direction. In both grade zones, the variograms are almost isotropic along the rotated Y' axis and the and Z' directions with the shortest ranges.

Table 14-51: Summary of Variogram Models for Zinc (Noble & Barrero, 2021).

XYZ	Variogram	Rotation			Sage Variograms Scaled to Sill = 1.00				
					Nugget	Exponential Structure 1			
		Z	X'	Z'		Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Zinc Upper LG	41	0	0	0	4.2	17.1	5.5	1.00
	Zinc Upper HG	37	0	0	0.3	9.5	6.2	5.8	0.70
	Zinc Lower LG	49	0	0	0.05	17.4	5.4	4	0.95
	Zinc Lower HG	50	0	0	0.23	35.6	3.4	4.2	0.77

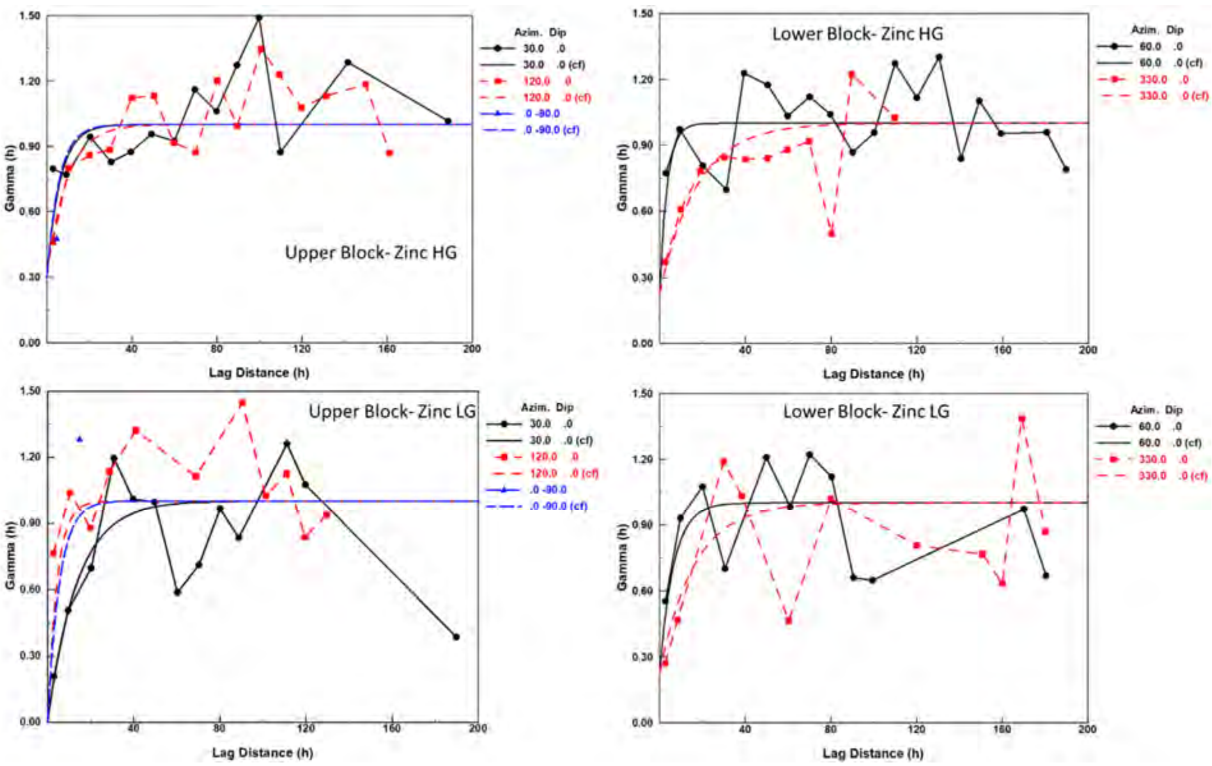


Figure 14-62: Zinc variograms for the upper and lower blocks (Noble & Barrero, 2021).

14.3.10.3 Lead Variograms

The lead variograms were computed for the high-grade lead grade zones in the upper and lower blocks separately. The results are summarized in Table 14-52 and graphically in Figure 14-63.

Lead variograms in the high-grade zone of the upper block show a strong anisotropy along the rotated X' axis in the 75° direction and are isotropic in the rotated Y' and Z' axis. In the lower block, the lead in the high-grade zone is isotropic in the X'Y' plane and presents a very short range in the Z' direction.

Table 14-52: Summary of Variogram Models for Zinc HG Grade Zones (Noble & Barrero, 2021).

XYZ	Variogram	Rotation			Sage Variograms Scaled to Sill = 1.00				
					Nugget	Exponential Structure 1			
		Z	X'	Z'		Range (X')	Range (Y')	Range (Z')	Sill
Unfolded	Zinc Upper HG	-15	0	0	0.35	38.8	7	7.7	0.65
	Zinc Lower HG	-30	0	0	0.00	10	7	3.3	1.00

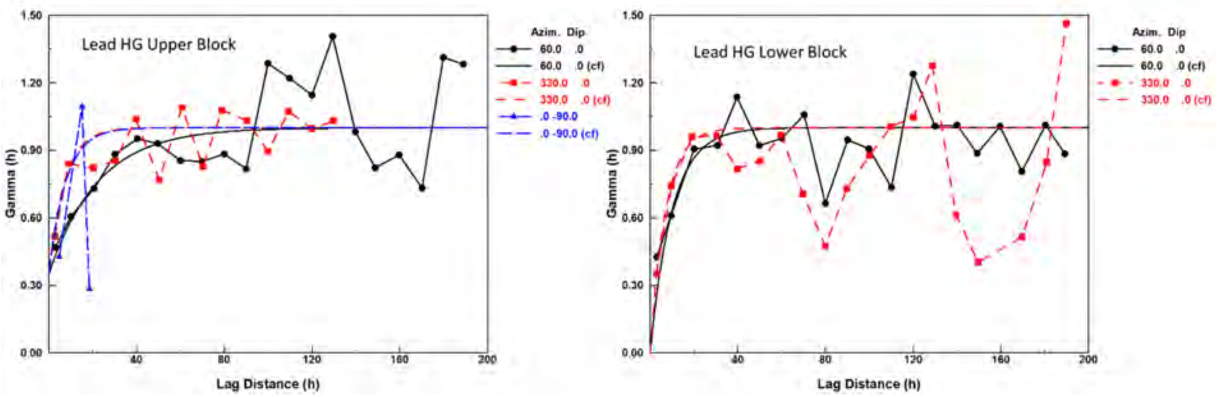


Figure 14-63: Lead variograms for the HG zones of the upper and lower blocks (Noble & Barrero, 2021).

14.3.11 Search Ellipse Parameters

Search ellipse parameters were developed for each element based on the variograms and a general assessment of the continuity of grades through inspection of the sample data in plans and sections.

Search ellipse parameters for each element and grade zone are summarized in Table 14-53, Table 14-54, and Table 14-55. All search ellipses are relative to the Unfolding coordinate system, and the rotation, as indicated in the tables, is clockwise around the +Z axis.

Table 14-53: Copper& Sulfur Search Ellipse Parameters IDP & NN Estimation (Noble & Barrero, 2021)

Estimation Case		Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
			Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
			X'	Y'	Z'	Min	Max		Min	Max		Min	Max
Upper	IDP-NN CuGZone 11 (LG)	0	65	100	10	5	10	1.5	5	10	3	1	10
	IDP-NN CuGZone 12 (MG)	0	65	100	10	5	10	1.5	5	10	3	1	10
	IDP-NN CuGZone 13 (HG)	0	30	50	5	5	10	1.5	5	10	3	1	10
Lower	IDP-NN CuGZone 11 (LG)	-33	40	80	10	5	10	1.5	5	10	3	1	10
	IDP-NN CuGZone 12 (MG)	-33	40	80	10	5	10	1.5	5	10	3	1	10
	IDP-NN CuGZone 13 (HG)	-33	20	40	5	5	10	1.5	5	10	3	1	10

Table 14-54: Zinc Search Ellipse Parameters IDP & NN Estimation (Noble & Barrero, 2021)

Estimation Case		Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
			Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
			X'	Y'	Z'	Min	Max		Min	Max		Min	Max
Upper	IDP-NN ZnGZone 11 (LG)	41	20	80	10	5	10	1.5	5	10	3	1	10
	IDP-NN ZnGZone 12 (HG)	37	40	30	10	5	10	1.5	5	10	3	1	10
Lower	IDP-NN ZnGZone 11 (LG)	49	80	25	5	5	10	1.5	5	10	3	1	10
	IDP-NN ZnGZone 12 (HG)	50	50	10	5	5	10	1.5	5	10	3	1	10

Table 14-55: Lead Search Ellipse Parameters IDP & NN Estimation (Noble & Barrero, 2021).

Estimation Case		Rotation	Search Volume 1					Search Volume 2			Search Volume 3		
			Search Radius			# Composites		Expand Factor	# Composites		Expand Factor	# Composites	
			X'	Y'	Z'	Min	Max		Min	Max		Min	Max
Upper	IDP-NN PbGZone 11 (LG)	0	40	40	10	5	10	1.5	5	10	3	1	10
	IDP-NN PbGZone 12 (HG)	0	40	40	10	5	10	1.5	5	10	3	1	10
Lower	IDP-NN PbGZone 11 (LG)	0	40	40	10	5	10	1.5	5	10	3	1	10
	IDP-NN PbGZone 12 (HG)	0	40	40	10	5	10	1.5	5	10	3	1	10

14.3.12 Grade Models

Grade models were estimated for copper, sulfur, lead, and zinc grades using the unfolded coordinate space and nearest-neighbor (NN), and inverse-distance-power (IDP). The estimated grade models were constrained by the defined grade zones. Estimation was conducted separately in the upper and lower blocks.

The IDP models were optimized relative to the NN models by matching the average grade of the IDP model to the average grade of the NN model to ensure that the overall estimates are unbiased.

The optimized IDP powers are shown in Table 14-56.

Table 14-56: Optimized IDP powers (Noble & Barrero, 2021).

Area	Element	Grade Zone	POWER
Upper Block	Cu and S	CuGZone 11	3.5
		CuGZone 12	3
		CuGZone 13	3.5
	Zn	ZnGZone 11	3.9
		ZnGZone 12	3.5
	Pb	PbGZone 11	3.9
		PbGZone 12	3.9

Area	Element	Grade Zone	POWER
Lower Block	Cu and S	CuGZone 11	2.8
		CuGZone 12	3
		CuGZone 13	2.2
	Zn	ZnGZone 11	3.9
		ZnGZone 12	2.9
	Pb	PbGZone 11	3.9
		PbGZone 12	3.9

14.3.13 Construction of the Combined Model

The upper and lower models for copper, sulfur, zinc, and lead were combined using the Datamine process ADDMOD. Fill and mined-out models were added afterward on top of the grade model. Corresponding fractions of fill and rock are calculated for each block.

After estimation, block model grade values for lead and zinc when one or the other was absent were assigned based on the Pb-Zn power regression.

Horizontal sections of the final copper block model are shown in Figure 14-64 and Figure 14-65.

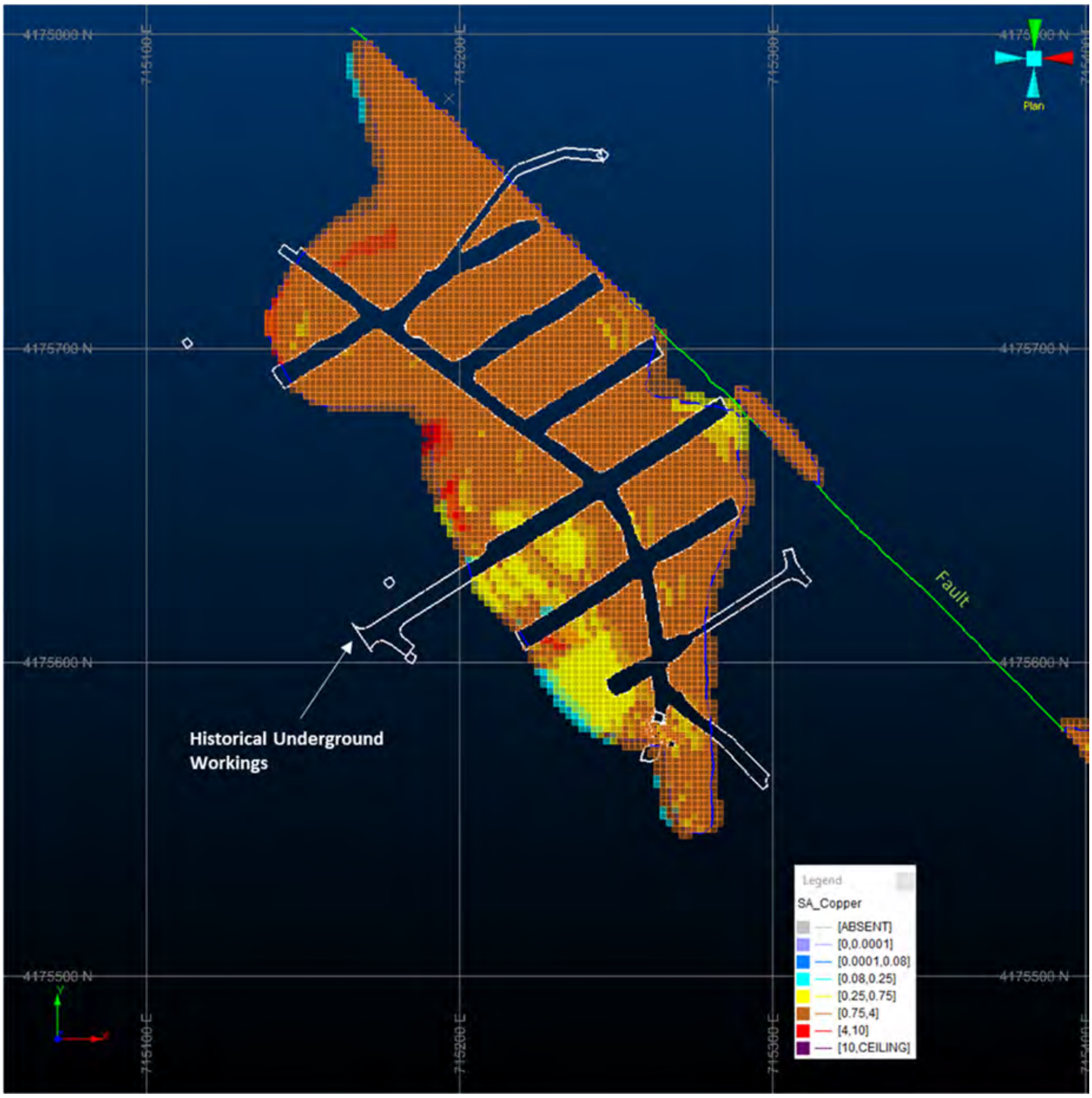


Figure 14-64: Horizontal Section at 123m elevation (6th Floor, upper block) showing the copper block model (Cu_IDP>0) (Noble & Barrero, 2021).

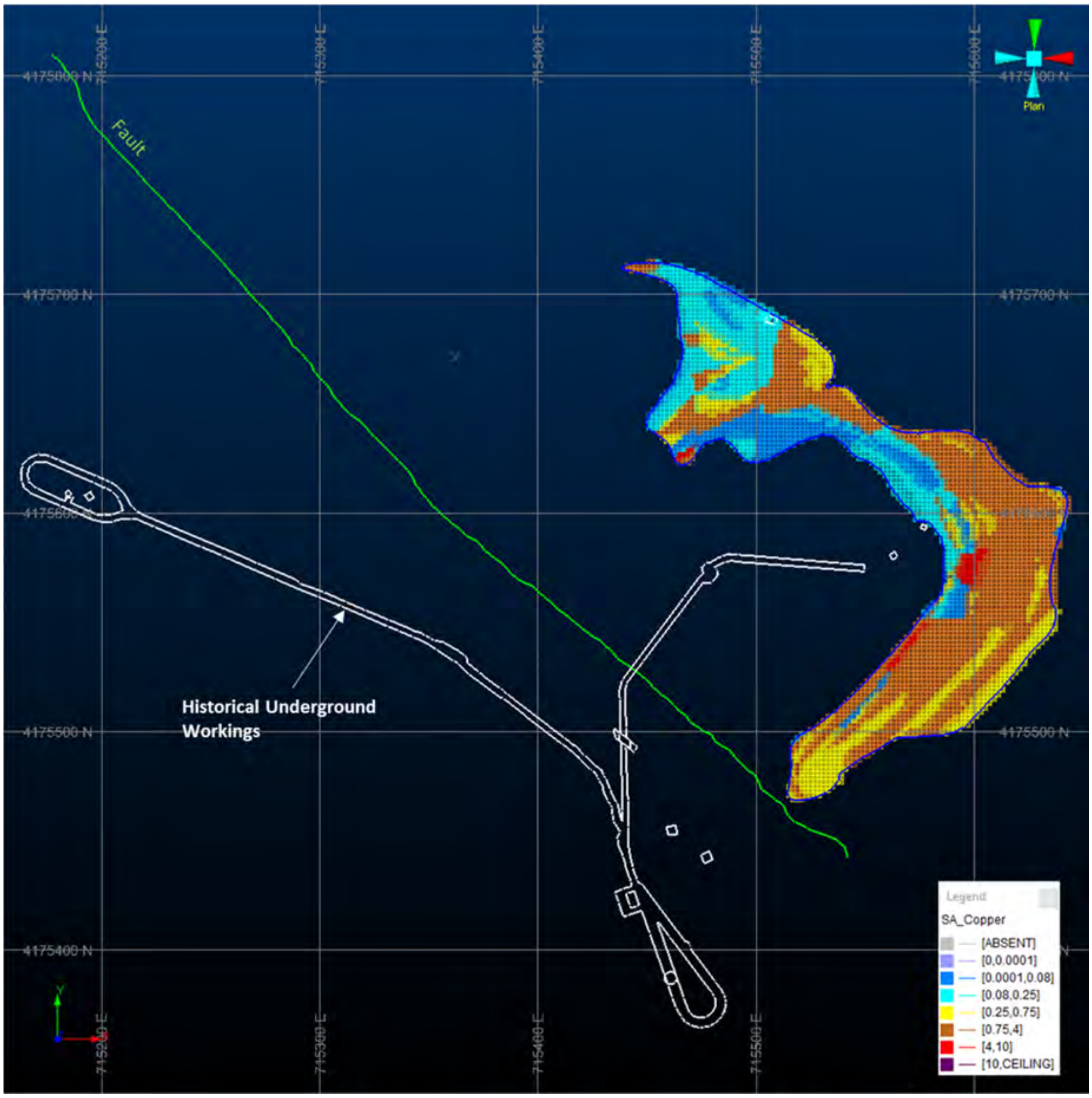


Figure 14-65: Horizontal Section at 48m elevation (11th Floor, lower block) showing the copper block model (Cu_IDP>0) (Noble & Barrero, 2021).

14.3.14 Mineral Resource Classification and Summary

For the San Antonio deposit, the estimated underground mineral resources are classified as inferred because the resource model is based mostly on historical drilling information, and the new drilling data is limited. Historical data had been validated and is considered good quality and reliable but should be confirmed with additional new drilling.

The resulting inferred mineral resource, which might become economically extractable by underground methods assuming that the inferred resource is upgraded to measured and indicated by drilling and by further economic, mining, and technical studies, is summarized in Table 14-57 as total volume and tonnes of ore and fill.

Table 14-57: San Antonio Inferred Underground Mineral Resource – December 2021 estimate, non-diluted (Noble & Barrero, 2021)

San Antonio Underground Mineral Resource Summary

	TONNES (1000's)	VOLUME (m^3)	% Cu	% Zn	% Pb	% S
Total Inferred Resource	11,776	2,832,359	1.32	1.79	0.99	35.67

May 2021 Model (21E)

14.3.15 Discussion of Factors Affecting Resource Grade Models

There are no known environmental, taxation, socio-economic, marketing, or political factors that would materially affect the resource estimate.

A portion of the San Antonio deposit lies within the current mining permit, but part of it is within a set of permits named “Grupo Riotinto” which belongs to the "Grouped Concessions" (Concesiones Agrupadas). The Grouped Concessions were acquired by Atalaya under a contract of sale, transfer of the permit ownership to Atalaya is pending approval of the mining authorities.

There are technical relevant factors that could materially affect the resource estimate; these factors are discussed below:

1. Historical drilling data needs to be confirmed with new drilling and the corresponding QA/QC data to upgrade the current inferred resource to measured and indicated.
2. New density data measurements should be conducted with the new drilling to resolve the uncertainty on the density data as this may impact the estimated tonnes.
3. Sample recovery (drill core) issues and the possible correlation with high lead and zinc values discussed in historical reports should be clarified with new drilling core recovery data. Diamond drill core is recommended for future confirmation and infill drilling programs.
4. No new metallurgical test work has been conducted at the time of writing of this report. The only available data are historical tests performed in the 1970s. Metallurgical test work and mineralogical studies of the San Antonio polymetallic ore type are required as these may affect the feasibility of the project.
5. The E-LIX™ System, the new processing technology under development and mentioned in Chapter 13, could have a big impact on the estimated total resources by increasing the total resource and the sealable metal tonnes.
6. A complete underground mining study must be undertaken, including the selection of an appropriate mining method and an underground mine plan to reduce the current uncertainty associated with the inferred underground resources.
7. The tailings throughput resulting from San Antonio ore should be considered in the current TSF expansion studies, which are currently underway.

15. MINERAL RESERVE ESTIMATES

These mineral reserve estimates, open pit optimizations, and production schedules were prepared by Alan C. Noble, P.E. of Ore Reserves Engineering, Lakewood, CO USA, and by Monica Barrero Bouza, EurGeol, in March 2021.

The open pit optimization and production schedule were prepared in March 2021 based on the Cerro Colorado resource block model dated November 2020 (20K). The current mineral reserve estimates are based on open pit development of the Cerro Colorado deposit and are derived from a block model that was updated in April of 2021 (21D) and the ultimate economic pit analyses described in this section (see Chapter 14). Open pit mining progress through December 31, 2020 was incorporated into this model.

Because there is a minimal difference between the block model dated November 2020 (20K) and the updated block model of April 2021 (21D), updating of the open pit optimization, pit design, and production scheduling based on the 21D block model was not justified.

Updated geotechnical pit design parameters provided by Atalaya Mining, based on revised pit stability analysis (Terratec , 2021), have been used as input for the economic pit analysis and mining phase designs. Economic pit limit analysis has been performed using the Lerchs-Grossmann (LG) algorithm for a copper price of US$3.10/lb and current operating costs and recoveries. The US$3.10/lb LG shell was used as the base of the ultimate pit design.

15.1 Definitions

Canadian National Instrument 43-101 (NI 43-101) references the Canadian Institute of Mining, Metallurgy and Petroleum (CIM) Definition Standards on Mineral Resources and Mineral Reserves. The mineral reserve estimates reported in this section follow the CIM Definition Standards (CIM Standing Committee on Reserve Definitions, 2014). The following definition is from those standards:

> *"A Mineral Reserve is the economically mineable part of a Measured and/or Indicated Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified. A Mineral Reserve includes diluting materials and allowances for losses that may occur when the material is mined".*

Mineral reserve is subdivided to indicate the degree of certainty that can be attached to the estimate. For mineral reserve, the following definitions are from the CIM Definition Standards and are applicable to this report:

- *"Proven Mineral Reserve*" is the economically mineable part of a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction is justified.

- *"Probable Mineral Reserve*" is the economically mineable part of an Indicated and, in some circumstances, a Measured Mineral Resource demonstrated by at least a Preliminary Feasibility Study. This Study must include adequate information on mining, processing, metallurgical, economic, and other relevant factors that demonstrate, at the time of reporting, that economic extraction can be justified.

In this study, mineral reserve is defined as the measured and indicated mineral resource that would be extracted by the mine design, and which can then be processed at a profit. All measured resources meeting that standard are herein classified as proven mineral reserves, while all indicated resources meeting that standard are classified as probable mineral reserves.

15.2 Mineral Reserve Estimation Parameters

15.2.1 Metallurgical Recoveries

The estimation of recoverable copper is based on the interpolated copper values and a formula developed by Mr. Noble in 2019, based on a regression of historical plant recoveries versus crusher head grades. The resulting recoveries typically range from about 88% to 91%:

$$RCu\% = 0.92 * (1 - e\text{^}(-Cu\%^{0.3}/0.19361))$$

All backfilled zones in the deposit model were treated as waste, with no copper recovery.

15.2.2 Royalties, Payables, and Operating Costs

The base economic parameters used in the pit limit analyses and cutoff grades, both internal and breakeven, are listed in Table 15-1. All costs shown are in U.S. dollars. Conversions from Euro currency were based on a factor of US$1.15 per €1.00. Mining costs were derived from Atalaya's experience through December 2020. Atalaya also provided updated ore processing and plant maintenance cost estimates for processing rates of about 15 Mtpa, and an updated general/administration and laboratory cost. The FSR and on-site operating costs were derived from Atalaya Mining's historical figures.

The 3-year moving average method was used to select the commodity price for the economic analysis. The inflation-adjusted Copper price for the 3-year period ending December 31 2020, is US$3.07/lb, which rounds up to the base Copper price assumed of US$3.10/lb.

Table 15-1: Ore Definition Parameters (Noble, 2021).

Item	Unit	Value
Base Copper price	US $/lb Cu payable	3.10
Freight, smelting & refining (FSR) cost	US $/lb Cu payable	0.43
Copper payable	%	95.65
Royalties	%	0
Ore mining cost (contractor historical average)	US $/t mined	1.80
Waste mining cost (contractor historical average)	US $/t mined	1.80
Ore processing & maintenance cost	US $/t ore	6.71
General & Administration and Laboratory cost	US $/t ore	1.23
Internal Cu cutoff	% Cu	0.16
Breakeven Cu cutoff	% Cu	0.196
Internal RCu cutoff	% RCu	0.134
Breakeven RCu cutoff	% RCu	0.166

Considering current copper prices, which are roughly US$4.00/lb, a table of cutoff grades for the previous US$2.90/lb up to US$4.00/lb is shown in Table 15-2. It is noted that the internal cutoff at US$3.10/lb Cu (0.16% Cu) is higher than both the breakeven and internal cutoffs at US$4.00/lb (0.15% Cu and 0.12% Cu, respectively). The internal cutoff grades include differential ore mining (i.e., ore mining less waste mining costs, which can result in a credit in some cases), plus ore processing, plant maintenance, and general/administration costs. The breakeven cutoff grades include the full ore mining cost, plus ore processing, plant maintenance, and general/administration costs. Net revenue is computed by subtracting the FSR cost from the Cu price and then applying the metallurgical recovery and Cu payable factors to the result. There are no royalty or severance obligations.

Table 15-2: Cutoff Grade Sensitivity to Copper Price (Noble, 2021).

Price	Breakeven Cutoff	Internal Cutoff
US $2.90/lb	0.211%Cu	0.172%Cu
US $3.10/lb	0.196%Cu	0.160%Cu
US $3.50/lb	0.173%Cu	0.140%Cu
US $4.00/lb	0.149%Cu	0.121%Cu

15.2.3 Overall Slope Angles (OSAs)

Updated geotechnical pit design parameters were provided by Atalaya Mining based on revised pit stability analysis (Terratec , 2021). Below 320 m elevation in the main mineralized zone (MinZ), an increase of the bench face angle in the North pit wall from 70° to 78° is supported. No constraints to the inter-ramp height were provided; as a result, a catch berm of 20 m has been designed at the 320 m elevation.

Revised pit slope angles by lithology, location, and orientation of pit walls were used for building a slope region model in Studio RM that was incorporated into the main resource model for pit optimization and for ultimate pit and phase design purposes. Detailed wireframes of the MinZ, North and South Shales, and Filón Sur massive sulfides, and cloritas were used to define the slope regions (SR) in the model. A weathered zone was constructed 20 m below the 1934 topography.

The defined slope regions and the detailed pit design parameters are described in Table 15-3. For the MinZ below 320 m elevation, a face angle rosette was defined to account for the change in face angle in the North wall (Figure 15-1).

Table 15-3: Geotechnical Design parameters of the defined Slope Regions (Noble & Barrero, 2021).

SR Code	Region Description	Face Angle (°)	Bench height (m)	Berm width (m)
1	South Shales above 320 mRL	50	20	10
2	MinZone above 320 mRL	70	20	10
3	North Shales above 320 mRL	50	20	10
4	Filón Sur Cloritas	70	20	10
5	Filón Sur Massive Sulfides	45	20	10
6	Weathered Zone	45	20	10
7	Fill	50	20	10
8	MinZone below 320 mRL	Face Angle Rosette	20	10
9	North & South Shales below 320 mRL	70	20	10

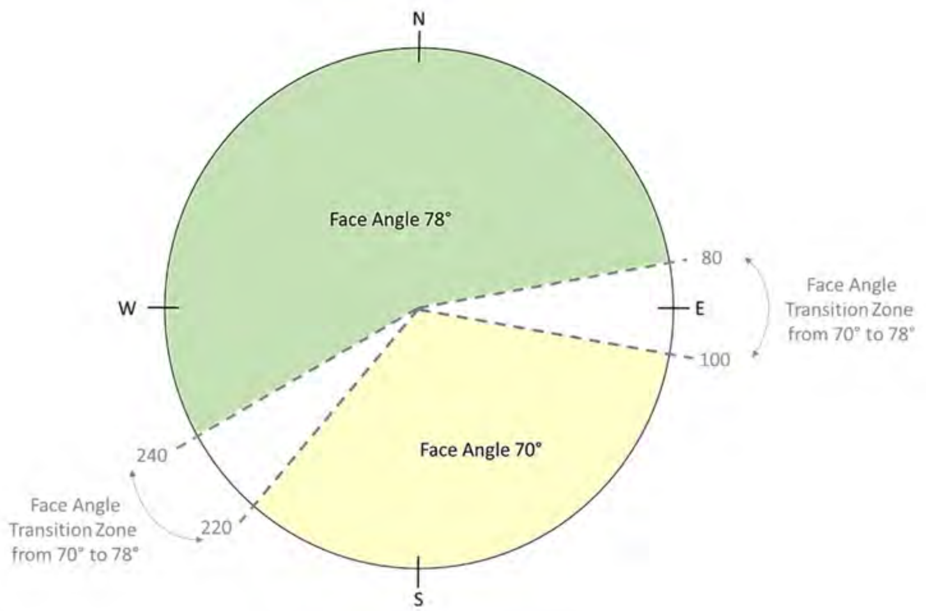


Figure 15-1: Face Angle Rosette for the MinZone slopes below 320m elevation (Noble & Barrero, 2021).

15.2.4 Bulk Densities

In the deposit model, each block contains values for rock tonnage, rock volume, fill tonnage, and fill volume. Most non-air blocks are entirely rock, except for the Filón Sur backfill area and a few isolated blocks intersecting underground workings. The rock tonnages are based on interpolated bulk densities. Fill zones were assigned a bulk density of 2.00 t/m^3.

15.2.5 Dilution and Ore Loss

The deposit model was carefully constructed to reflect the selectivity of anticipated mining equipment and adjusted through numerous trials to best reconcile with past production from the Cerro Colorado pit. Consequently, no additional provisions outside of the block model have been made for mining dilution and ore loss.

15.3 Economic Pit Limit Analyses

The Lerchs-Grossmann (LG) algorithm in Datamine NPVS was used to analyze economic pit limits based on the recoveries and other parameters previously discussed. A discount rate of 0.5% per bench was used and a minimum pit bottom area of 50 m radius. The slope region model and the associated slope parameters defined in the previous section were used to control the LG shell.

In all cases, only mineral resources classified as measured and indicated (M&I) were considered as potential ore; all inferred mineral resources and backfill were treated as waste.

Sensitivity LG cases for different copper prices were run up to US$3.50/lb Cu are shown in Figure 15-2 and Figure 15-3; these figures show that the differences between the LG Shells at US$3.10 and US$3.50 are insignificant.

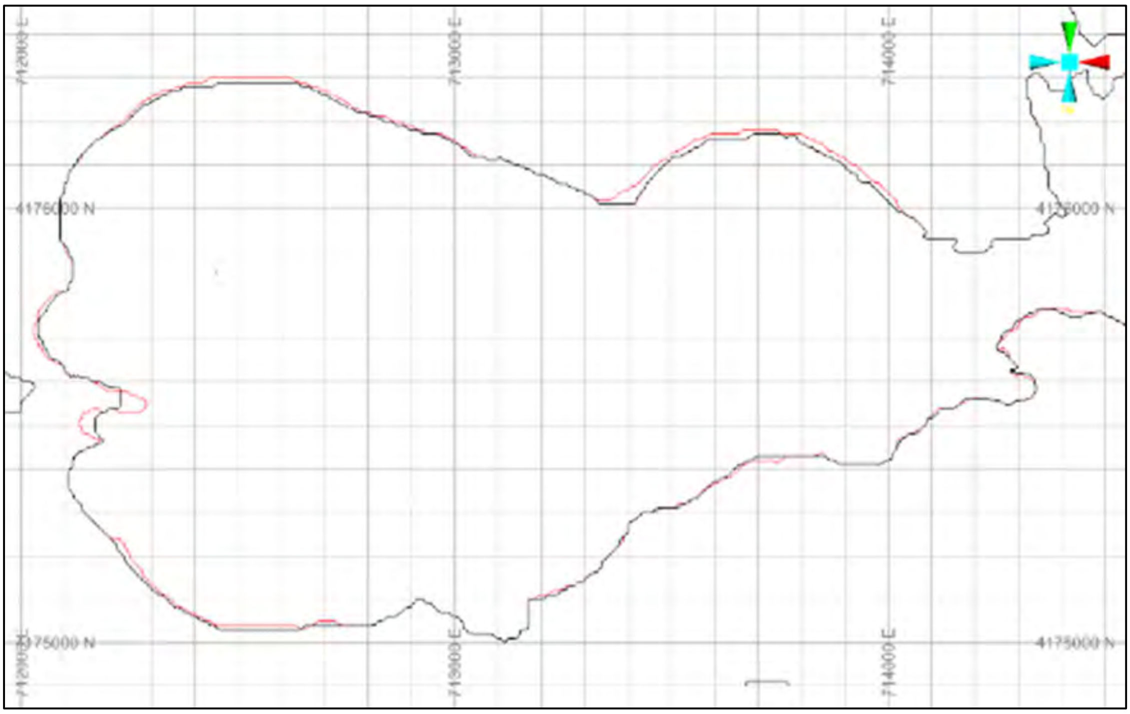


Figure 15-2: LG Shell Contours for US$3.10/lb Cu (Red) and US$3.50 /lb Cu (Black) on the 390m bench (Noble & Barrero, 2021).

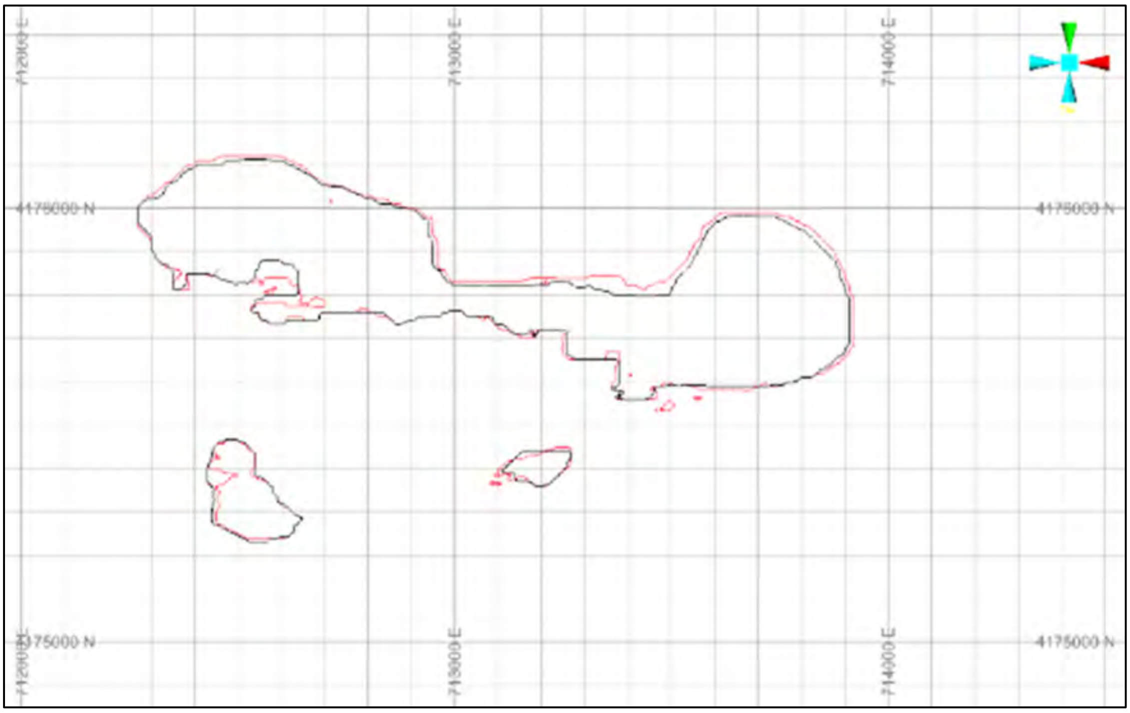


Figure 15-3: LG Shell Contours for US$3.10/lb Cu (Red) and US$3.50 /lb Cu (Black) on the 200m Bench (Noble & Barrero, 2021).

15.4 Open Pit Designs

The ultimate pit and internal phases for the Cerro Colorado pit were designed to accommodate contractors' small- to medium-scale mining equipment operating on 10-m bench intervals. This equipment includes rock drills capable of drilling blastholes of up to 127 mm in diameter, hydraulic excavators with bucket capacities of 6-14 m^3, off-highway trucks with 91-tonnes payload capacity, and appropriately sized support equipment.

15.4.1 Ultimate Pit

Mining phase design started with re-design of the ultimate pit using the resource block model described in the previous section and the US$3.10/lb pit shell obtained after completion of the pit optimization process with NPVS. The mining phase design was done with Datamine Studio OP. The redesigned ultimate pit extends beyond the limits of the previous ultimate pit in the East, and Filón Sur areas (Figure 15-4). The main ramp starts in the Northwest side of the North wall at 440 m elevation and runs along the West wall heading down up to the 340 m level where it turns to the East up to the 220 m elevation.

The Northwest side has two bottom elevations at 130 m and 90 m elevations, whereas the Northeast side is deeper, heading down with a spiral ramp down to the 50 m elevation. The South side of the pit is formed by the Filón Sur pit on the West side with a bottom at 190 m elevation. The Pit slope in the shales is flatter than previously because of poor geotechnical conditions in the shales above 320 m elevation. It is noted that the Filón Sur design pit does not go as deep as the LG pits because the addition of roads made the lower portion uneconomic. The main ramp connects at the 220 m elevation with a shallow circular pit in the center of the South slope which has bottom elevation at 180 m elevation.

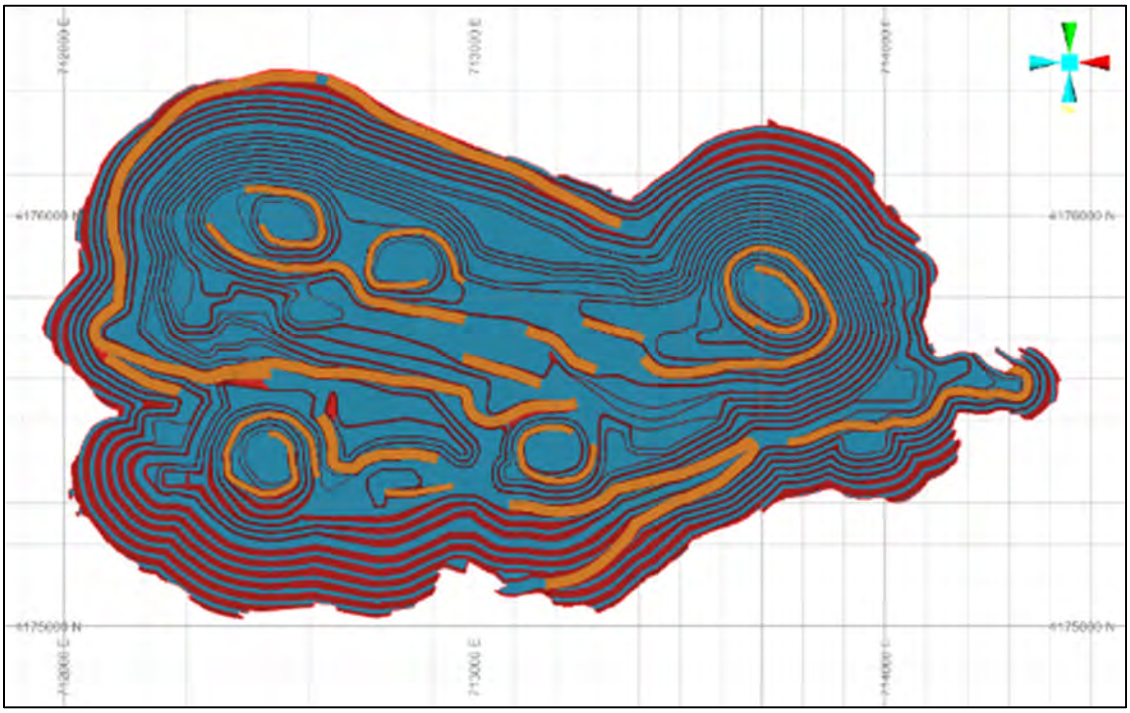


Figure 15-4: Cerro Colorado Ultimate Pit Plan March 2021 (Noble & Barrero, 2021).

15.5 Mineral Reserve Statement

Mineral reserve estimates for the Cerro Colorado pit are based on the designed ultimate pit limits described above and the April 2021 resource model discussed in Chapter 14.

15.5.1 Cutoff-Grade

The estimates of mineral reserves are based on a US$3.10/lb Cu price, and the cost and recovery parameters are presented in Table 15-1.

15.5.2 Mineral Reserve Estimate

Mineral reserve is defined as the measured and indicated mineral resource that would be extracted by the mine design and can then be processed at a profit. All measured resources meeting that standard are classified as proven mineral reserves, while all indicated resources meeting that standard are classified as probable mineral reserves. All inferred resources and unclassified material are treated as waste.

The estimates of proven and probable mineral reserves and the combination of both for the Cerro Colorado open pit are presented in Table 15-4. All Filón Sur backfill material and all material classified as inferred mineral resources were treated as waste.

Table 15-4: Cerro Colorado Mineral Reserve Estimate (Noble, 2021)

Mineral Reserves (0.16 %Cu Cutoff)				**Waste**	**Strip Ratio**
Classification	**TONNES (1000's)**	**%Cu**	**Copper Tonnes**	**TONNES (1000's)**	
Proven	138,929	0.38	523,966		
Probable	46,791	0.38	178,785		
Total	185,720	0.38	702,750	341,847	1.84

April 2021 Block Model (21D) - 31 Dec 2020 Topo - March 2021 $3.1/lb Cu Ultimate Pit

TONNES(1000's): thousands of metric tonnes (Kt)

Total proven and probable mineral reserves are estimated at nearly 185 Mt grading 0.38% Cu. Contained copper is estimated at 702,750 tonnes. Waste rock and backfill are projected at about 342 Mt, resulting in a stripping ratio of 1.84. All the mineral reserves reported in Table 15-4 are contained within the mineral resources reported in Chapter 14.

The mineral reserve estimates in this report are effective as of December 31, 2020.

15.5.3 Sensitivity of Reserves to other Factors

Potential sensitivity of mineral reserves to variations in copper price is indicated in Table 15-5. Other potential risks to mineral reserves include:

1. A requirement for the expansion of the mining permit boundary to fit a larger pit footprint from the current mining permit. Atalaya expects that this can be completed in Q1 2023.
2. Further permitting will be required to cover the full expansion of the pit boundaries to the ultimate pit.
3. Roman settlement archeological site just outside the current northern pit wall: Archeological investigations are underway and should be completed in Q4 2022 according to Atalaya.

4. National Road A-461 must be relocated prior to the beginning of 2024 to prevent disruption of the mine production schedule: The road located along the southwest wall of the ultimate Cerro Colorado pit is moved to the west of the Atalaya open pit. This will enhance public safety and allow the development of pushbacks along the entire western wall.
5. Permitting requirements for expansions to the waste rock storage facilities (WRSF) to support the new mine plan, and for the tailings storage facility (TSF) to accommodate the increase of estimated mineral reserves from the Technical Report of 2018.

Table 15-5: Cu Price Sensitivity Analyses (Noble, 2021).

Required Cu Price US$/lb	Internal Cutoff %Cu	Proven		Probable		Proven + Probable		Waste	
		TONNES (1000's)	%Cu	TONNES (1000's)	%Cu	TONNES (1000's)	%Cu	TONNES (1000's)	Stripping Ratio
$4.00	0.12	161,301	0.34	52,937	0.35	214,238	0.35	313,328	1.46
$3.75	0.13	156,424	0.35	51,541	0.36	207,965	0.35	319,602	1.54
$3.50	0.14	151,005	0.36	49,966	0.37	200,971	0.36	326,596	1.63
$3.30	0.15	145,075	0.37	48,316	0.37	193,391	0.37	334,175	1.73
$3.10	0.16	138,929	0.38	46,791	0.38	185,720	0.38	341,847	1.84
$2.90	0.17	132,503	0.39	45,116	0.39	177,619	0.39	349,947	1.97
$2.80	0.18	126,382	0.40	43,391	0.40	169,773	0.40	357,793	2.11
$2.66	0.19	120,197	0.41	41,747	0.41	161,944	0.41	365,623	2.26
$2.55	0.2	114,155	0.42	40,082	0.42	154,237	0.42	373,330	2.42

Mineral Reserves reported in Datamine - Studio RM

April 2021 Block Model (21D) - 31 Dc 2020 Topo- March 2021 Ultimate pit

No other mining, metallurgical, infrastructure, or permitting factors are presently known that may materially affect the mineral reserve estimate.

16. MINING METHODS

Mining operations at the Riotinto Project site were restarted in June 2015 at Cerro Colorado deposit using conventional open-pit mining methods. Mining benches are on 10-m vertical intervals. Contractors' small-to medium-scale mining equipment is used to execute the development plan, including rock drills capable of drilling 102- to 127-mm-diameter blast holes, hydraulic excavators with bucket capacities of 6-14 m^3, off-highway trucks with 91-tonnes payload capacity, and suitably sized support equipment.

Atalaya Mining is presently using mining contractors for all excavation work, including drilling and blasting, through the joint venture UTE Riotinto. This joint venture includes the companies S&L (Sanchez y Lago S.L.), which handles earthmoving, and Insersa S.A., which is responsible for drilling and blasting. Both companies are significant and well-financed contractors in Spain with extensive metal mining experience. Atalaya Mining is responsible for all grade control and mine planning.

16.1 Mining Phase Designs

The ultimate pit and mining phase designs were created using Datamine NPVS and Studio OP software packages, respectively. NPVS includes a 3-dimensional Lerchs-Grossmann (LG) algorithm for pit optimization and extraction sequence analyses. Cerro Colorado surface topography in the model was updated to reflect mining progress as of December 31, 2020.

The open-pit mining phase designs and production schedules were prepared in March 2021 based on the Cerro Colorado block model dated November 2020 (20K). The current mineral reserve estimates are derived from a block model that was updated in April 2021 (21D) (see Chapter 14). Because there is a minimal difference between the block model dated November 2020 (20K) and the updated block model of April 2021 (21D), mining phase designs and production scheduling update based on the 21D block model was not justified.

16.1.1 Phase Design Parameters

The same metallurgical recoveries, Cu payables, operating costs, overall slope angles, and bulk densities used to evaluate the ultimate pit limits were also used in the analysis of the mining phase development sequence (see Chapter 15). Similarly, no adjustments for mining dilution and ore loss were deemed necessary outside of the provisions already incorporated in the development of the deposit block model. The mining phase design parameters are the same as those used for the ultimate pit (see Chapter 15).

16.1.2 Internal Mining Phases

Mining Phases are based on the previous WLRC's phase designs[24]. Figure 16-1 through Figure 16-6 illustrates the phase development sequence for the Cerro Colorado pit. Mining phase designs were made with Datamine-Studio OP software package. Gridlines are shown at 100-m intervals and the ultimate pit rim is plotted for reference.

Mining Phase 1 (Figure 16-1) was replicated from WRLC's Phase 1 with a bottom at the 210m elevation. WLRC's Phase 2b and 2c were merged into a Phase 2 mining phase with minor changes; this phase

[24] WLR Consulting, Inc. Lakewood, Colorado (USA)

develops the Northside of the pit within the current permitted limits with two bottoms at 190 m and 170 m elevations.

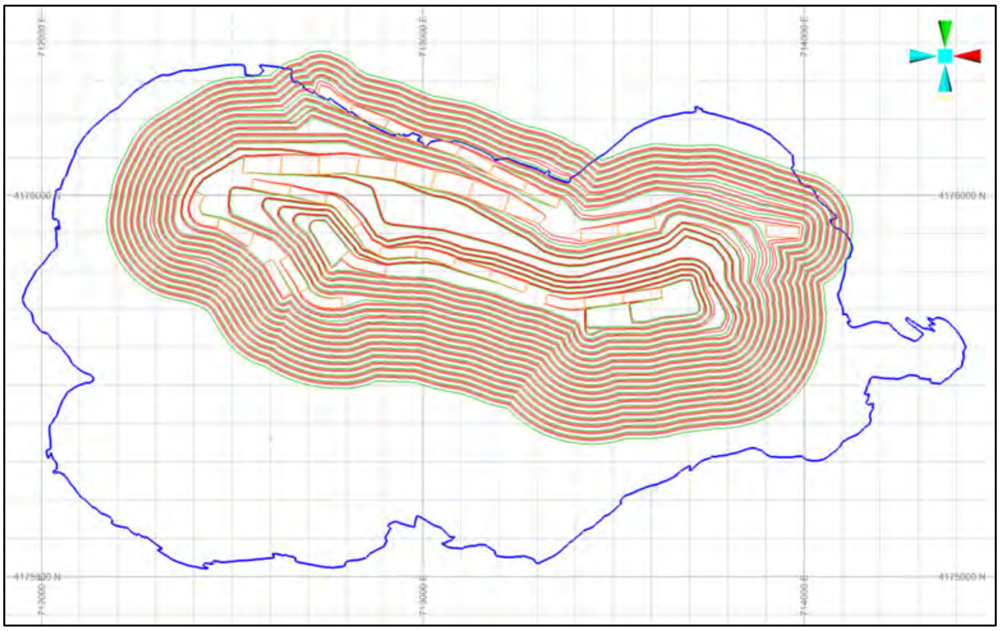


Figure 16-1: Cerro Colorado Mining Phase 2 (Noble & Barrero, 2021)

Mining Phase 3 (Figure 16-2) connects with the Phase 2 ramp at the 300 m elevation. It develops a sector of the final wall in the South with a ramp between the 380 m and 340 m elevations.

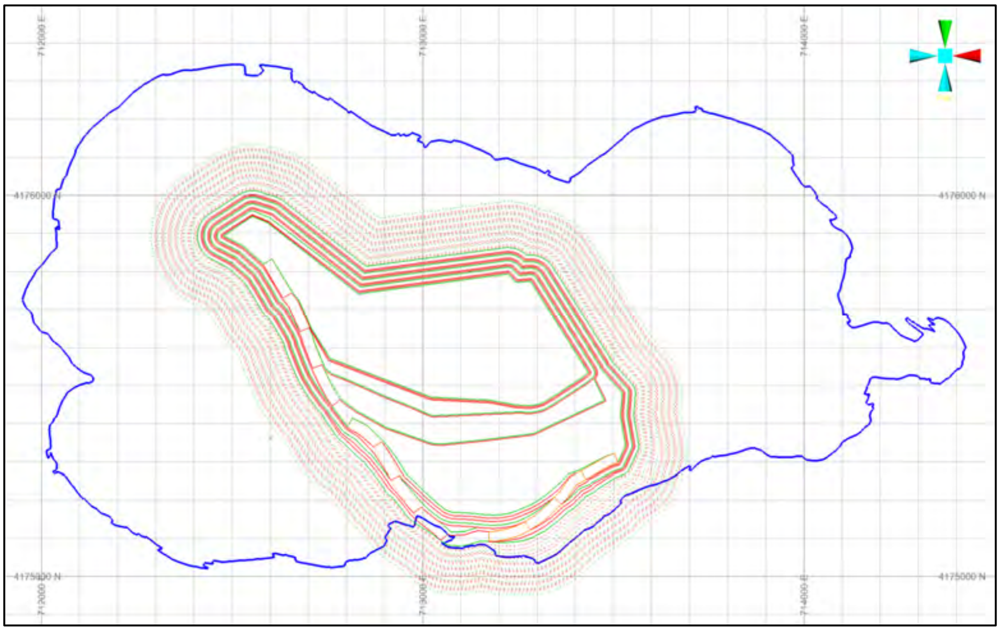


Figure 16-2: Cerro Colorado Mining Phase 3 (Noble & Barrero, 2021)

Phase 4 design (Figure 16-3) is an intermediate pushback on the West and Southwest sides of the pit between the current Phase 2 and the final pushback of that wall in Phase 5.

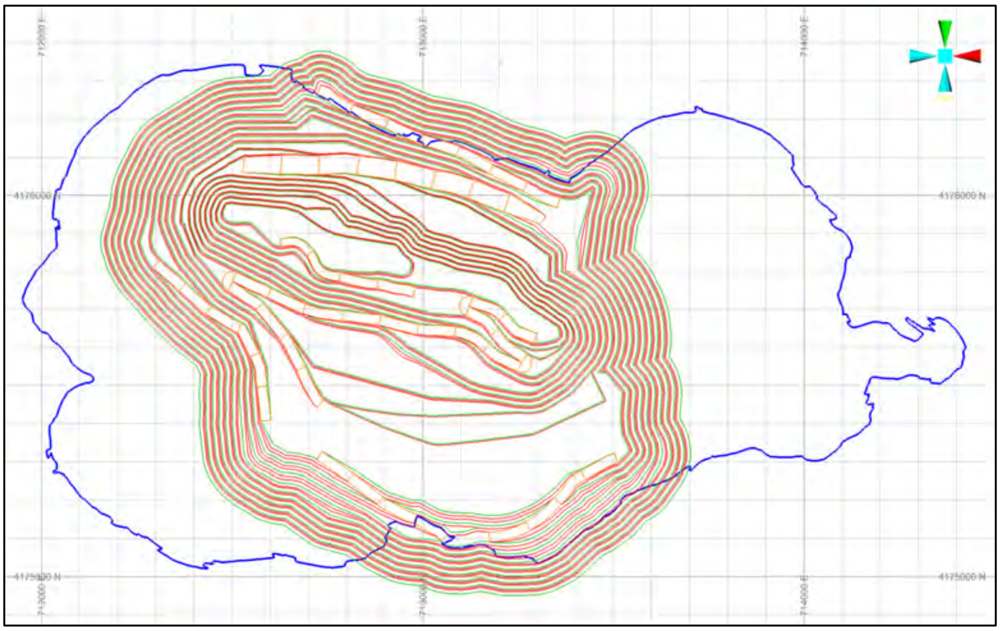


Figure 16-3: Cerro Colorado Mining Phase 4 (Noble & Barrero, 2021)

Phase 5 design (Figure 16-4) defines the ultimate pit limit on the Northwest and West walls and provides access to the two bottoms in this area at 90 m and 130 m elevations, also representing the main access to the final pushbacks. The onset of stripping of this phase starts at the beginning of 2024. The main access is located in the Northwest, with the road starting at 440 m elevation.

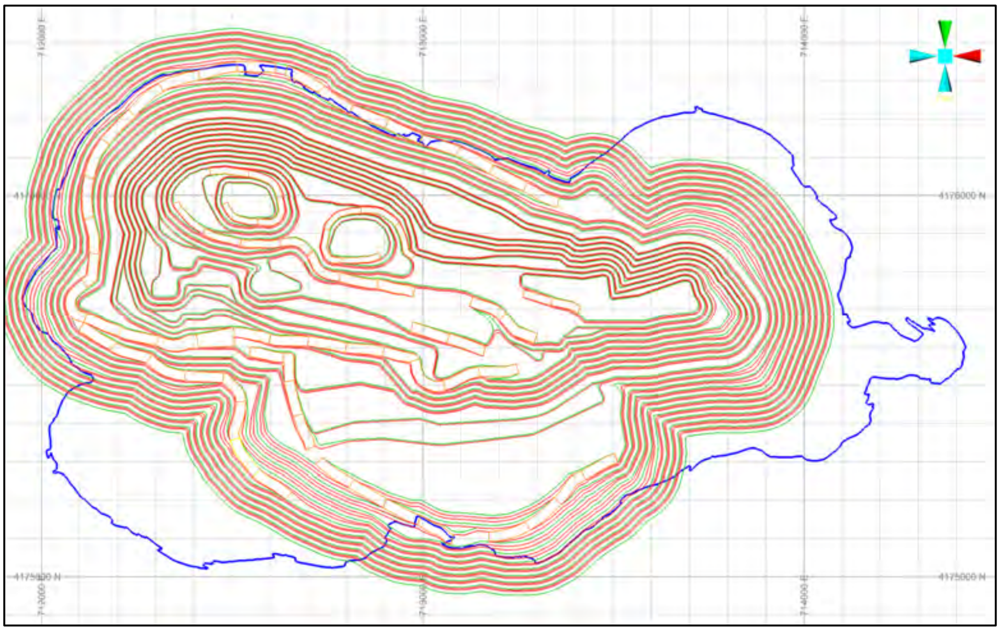


Figure 16-4: Cerro Colorado Mining Phase 5 (Noble & Barrero, 2021)

Phase 6 (Figure 16-5) design is the main pushback in the North-East and East walls with a pit bottom at 50 m elevation. The access to the upper benches is located in the South-East of the pit until the south road switchback at 320 m elevation is reached.

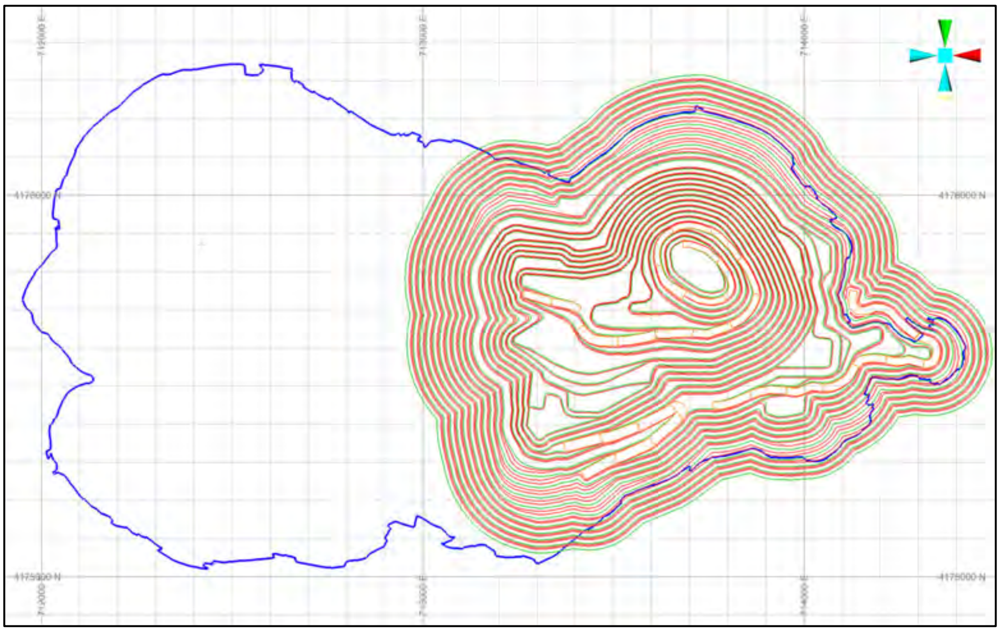


Figure 16-5: Cerro Colorado Mining Phase 6 (Noble & Barrero, 2021).

Phase 7 (Figure 16-6) design is the last pushback; it develops the Filón Sur pit and a small circular pit to the East. The East part of this design is developed along with Phase 6, and the Filón Sur pit is mined subsequently.

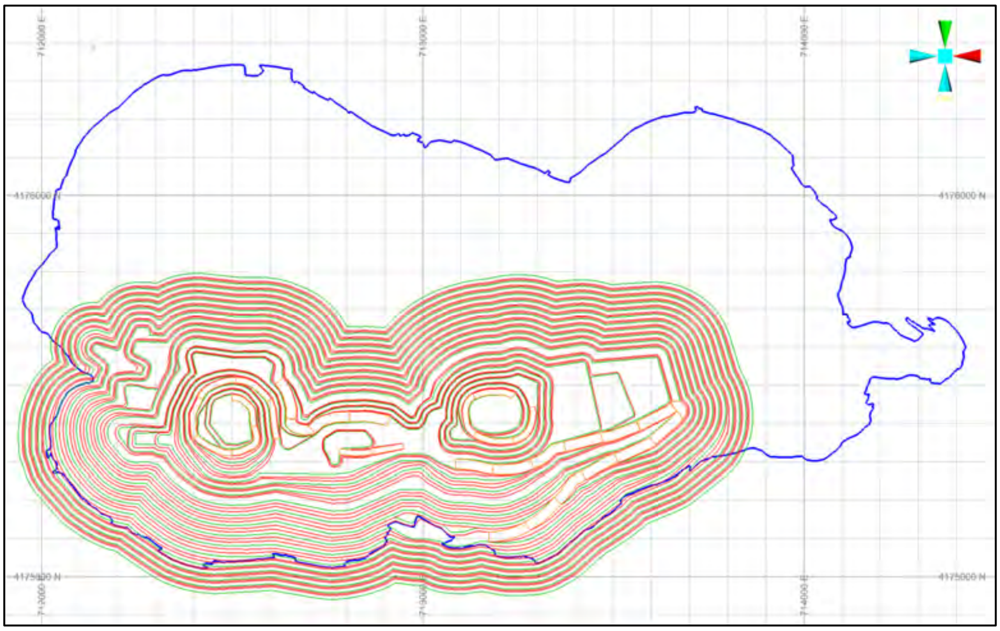


Figure 16-6: Cerro Colorado Mining Phase 7 (Noble & Barrero, 2021)

16.1.3 Estimation of Mineral Reserves by Phase

The mining phase reserve estimates by phase above 0.16% Cu cutoff, effective December 31, 2020 and based on the November 2020 (20K) block model, are presented in Table 16-1. These phase reserve estimates were used to generate a mine production schedule.

Table 16-1: Mineral Reserve Estimates (Proven & Probable) by Mining Phase (Noble & Barrero, 2021).

Mining	Mineral Reserves (>= 0.16 %Cu)			Waste	Total	Strip
Phase	Tonnes (1000's)	% Cu	Copper Tonnes	Tonnes (1000's)	Tonnes (1000's)	Ratio
1	3,029	0.37	11,165	797	3,825	0.26
2	36,881	0.41	150,200	27,600	64,481	0.75
3	1,706	0.38	6,416	14,077	15,783	8.25
4	23,738	0.33	78,945	27,630	51,367	1.16
5	56,390	0.34	191,343	98,293	154,683	1.74
6	41,561	0.39	162,333	96,239	137,800	2.32
7	21,496	0.45	96,647	77,088	98,583	3.59
Total	184,800	0.38	697,050	341,724	526,523	1.85

NPVS Economic Model and Mining Reserves by phase reported in Datamine-Studio OP (Block Model 20k)

TONNES(1000's): thousands of metric tonnes (Kt)

16.2 Mine Production Schedule

Datamine-Studio OP program was used to generate production schedules to meet mill feed targets based on user-specified cutoff grades and the mining phases described in the previous section.

Mill feed target of 15 Mtpa was assumed for all the periods (years). Stripping requirements had been adjusted for each period to ensure sufficient ore exposure throughout the schedule to meet the mill feed target. The starting stripping ratio is 1.82, which is maintained until the first quarter of 2023 when it needs to be increased to 1.98 until the West part of the ultimate pit is mined out in 2029. After that, the stripping ratio is progressively reduced with time.

Atalaya's mining projection in 2021 has been used to guide the mining schedule of the first half of that year. The production schedule is based on a fixed cutoff grade of 0.16 % Cu. Total contained copper in the schedule's mill feed is estimated at 697,050 tonnes (Block Model 20k), which compares with the reserve estimates total copper tonnes of 702,750 (Block Model 21D) in Chapter 15.

The life of the mine is estimated at 12.5 years, for a projected completion in the second quarter of 2033.

> *The mining schedule was developed using a cutoff grade of 0.16% Cu, but the mine is now using a cutoff grade of 0.20% copper. Material between 0.16% Cu and 0.2 % Cu is being stockpiled. While the higher cutoff is rational given current* prices, *there is a high risk that there will be production challenges which could disrupt delivery of ore to the plant. Rescheduling at the higher cutoff is strongly recommended to identify and alleviate scheduling risks.*

16.3 Waste Rock Storage Facilities (WRSF)

The previous designs of the ex-pit Waste Rock Storage Facilities (WRSF) for the Riotinto Project generated by WLRC were reviewed and adjusted to the current ultimate pit limits. The basis for the designs are the December 31, 2020 topography and the aforementioned WRLC designs in DXF format.

Prospective ex-pit waste rock storage facility (WRSF) sites are located to the northeast-east and southeast of the Cerro Colorado open pit. In-pit backfill in the western portion of the ultimate pit will provide supplemental waste storage. Over 341 Mt of waste rock and backfill material are estimated in the mine production schedule.

Expansion of the current permitted WSRF limits is needed to meet the waste rock requirements of the LoM.

16.3.1 WRSF Design Parameters

Ex-pit WRSFs are being constructed from the bottom levels upward in 10- to 20-m-high lifts, with drainage systems constructed in the foundations of the new WRSF areas prior to waste rock placement. Atalaya Mining envisions encapsulating the final WRSF surfaces with a layer of shales to reduce surface permeability and minimize surface runoff water infiltration. Drainage from the WRSFs will be channeled to sedimentation and water treatment ponds.

WRSF input design parameters have not been changed from the previous designs, with final 20 m lifts with a final face angle of 26.6° and a 10-m-wide catch bench every three lifts. Catch benches were placed at 365 m, 425 m, and 485 m elevations in the South WRSF, and 360 m, 420 m, and 480 m elevations in the North WRSF. Ramps were designed with a 10% gradient and 35 m width.

Conceptual in-pit backfills of the West side of the ultimate pit were designed to show the potential capacity of the west area as a dumping space. The design parameters used are the same as the ex-pit WRSFs. No roads were designed assuming that the access to the lifts would be constructed from the main road.

16.3.2 WSRF Plans

Waste rock will be placed into three locations: the main external WRSF around the northeast-east (North WRSF) and east-southeast sides of the Cerro Colorado pit (South WRSF); the in-pit backfill area that becomes available in 2029; and the TSF dam expansions.

The destinations and tonnages for waste rock productions had been estimated based on the December 31, 2020 topography, the previous designs of the North and South WRSFs, and the TSF (Tailings Storage Facility) dam construction requirements. The TSF construction would require 3 Mtpa, and it was assumed that the construction is planned to be finished in 2030. Additional 9.2 Mt are assumed to be used for the photovoltaic facility construction between 2021–2023.

Based on the above, the most likely destinations and tonnages for waste rock productions by time period are presented in Table 16-2 below.

Table 16-2: Waste rock destinations and Tonnages (Noble & Barrero, 2021)

	Tonnes (1000's)		Tonnes (1000's)
TSF Dam	30,000		
PV Plant	9,200		
WRSF Requirements	302,524	**Ex-Pit WRSFs**	207,800
		In-Pit WRSF	94,724
Total Waste	341,724		

Waste Tonnes reported in Datamine-Studio OP (Block model 20k)

North and South WRSFs designs have been adjusted to the current ultimate pit limits with a total estimated capacity of 115 Mt. In-pit backfill in the west side of the ultimate pit will become available in 2029, with a potential estimated capacity between 89–109 Mt. Conceptual designs of the updated ex-pit and in-pit WSRFs are shown in Figure 16-7 and Figure 16-8.

The capacity of the South WRSF will need to be increased to achieve the LOM requirements until the in-pit backfill is available in 2029. A conceptual design of a potential expansion of the South WRSF to meet a capacity of to 176 Mt within the current Project limits is presented in Figure 16-9.

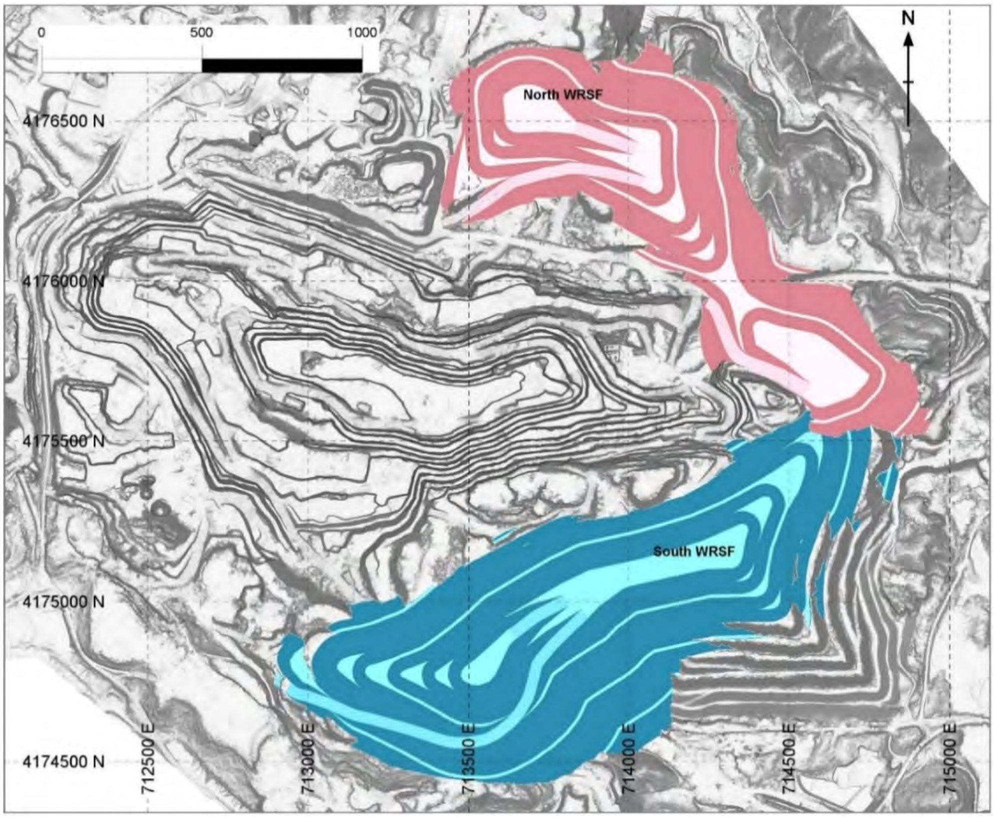


Figure 16-7: Conceptual designs of North and South ex-pit WRSFs (Noble & Barrero, 2021).

Figure 16-8: Conceptual in-pit backfill - West side of the ultimate pit (Noble & Barrero, 2021).

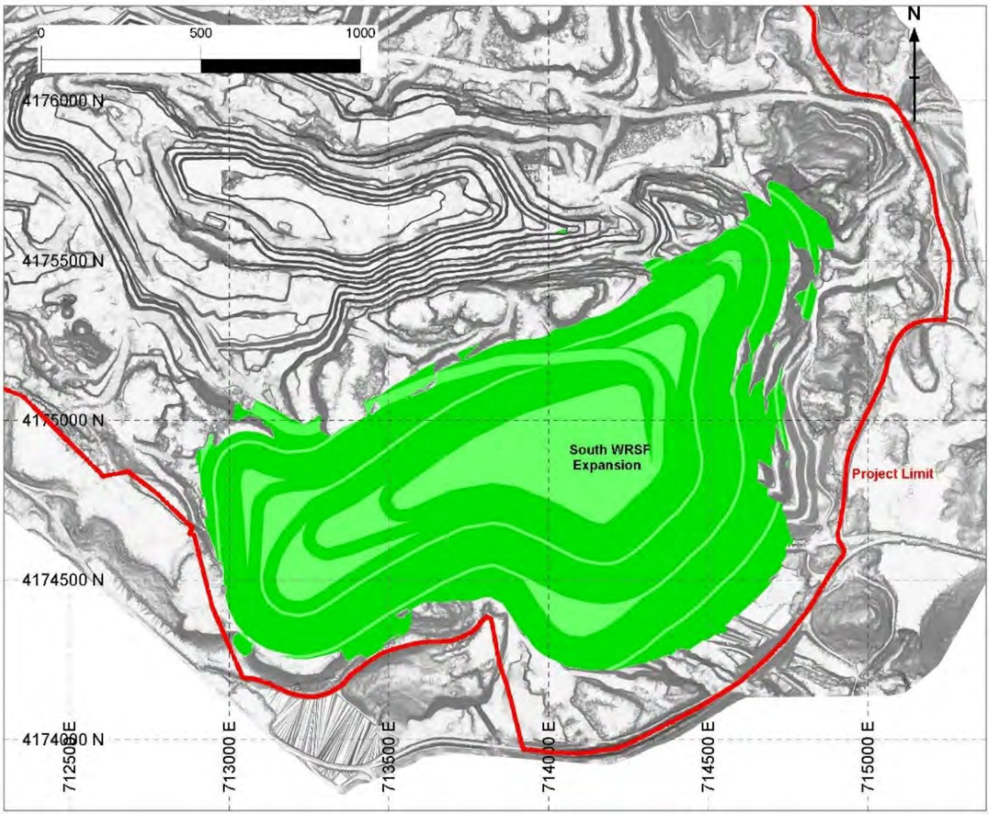


Figure 16-9: Conceptual expansion design of the South WRSFs (Noble & Barrero, 2021).

16.4 Mining Equipment

Presently, contractors' operating crews work 7 days per week, for a total of 360 days per year. The mining contractors will provide all of the primary and auxiliary equipment fleets to meet the mine production schedule, build and maintain all roads, suppress dust from haul roads and muck piles, construct and maintain all WRSFs, perform equipment repairs and maintenance, and conduct all other activities normally associated with mine operations.

Contractor equipment fleets and manning levels will be adjusted as necessary to meet mine production targets. Table 16-3 lists the mining contractors' current primary equipment fleet. Similarly, Table 16-4 summarizes the mining contractors' auxiliary mining equipment fleet dedicated to Cerro Colorado pit operations.

Table 16-3: Primary Mining Fleet (Atalaya, 2022).

Mining Equipment		Capacity	Current Fleet
Drills	Sandvick DPI1500	114-127 mm diamt	8
	Sandvick DPI1100	114-127 mm diamt	2
	Atlas Copco C50	114-127 mm diamt	2
	Atlas Copco C45	114-127 mm diamt	2
Hydraulic Excavators	Komatsu 2000	$14m^3$	6
	Komatsu 1250	$7.5m^3$	2
Haul Trucks	Komatsu 785	91 tonnes	40

Table 16-4: Auxiliary Mining Fleet (Atalaya, 2022).

Equipment	Current Fleet	Expected Fleet
Caterpillar 824 wheel dozer	2	3
Caterpillar D8T track dozer	1	2
Caterpillar 390 hydraulic backhoe	1	1
Hitachi 210 hydraulic backhoe	1	1
Caterpillar 14 motor grader	2	3
Caterpillar 583 vibratory roller	1	1
Water truck, 90-t	4	4
Water truck, 30-t	0	2
Volvo A40 articulated truck	2	3
Volvo A25 articulated truck	1	2

16.5 Mining Personnel

Mining contractor personnel will be devoted to supervision and craft labor – i.e., mine operations and equipment maintenance. The work of Atalaya Mining's mine department employees will be limited to contract management, safety and supervision tasks, and most technical services (engineering, geology, etc.). Table 16-5 summarizes the estimated levels of mining-related personnel.

Table 16-5: Mining-Related Personnel (Atalaya, 2022).

Worker Type		Number
Contractor	Supervision	22
	Craft Labor	160
Atalaya (owner)		18
Total Mining Personnel		200

16.6 Old Workings

There are old galleries and waste fill zones, as well as some other underground workings that were created by prior mining operations in the Cerro Colorado deposit. Although the location of many of these workings is known, procedures will be developed to drill from operating benches of the pit to locate all voids left by previous operations. These old workings may be filled if necessary to ensure the safety of proximate operations and personnel.

17. RECOVERY METHODS

This section was compiled by Atalaya Mining technical staff and reviewed by Jaye Pickarts, P.E., who is a Qualified Person for the purpose of NI 43-101, Standards of Disclosure for Mineral Projects.

17.1 Process Summary

The Riotinto concentrator processes copper sulfide ore using conventional froth flotation to produce a copper concentrate. The plant employs a combination of existing equipment associated with the historical operations as well as expanded and upgraded facilities.

Relatively coarse primary and secondary grinding, at a P_{80} of approximately 160–220 µm, is used to float the minerals containing chalcopyrite and pyrite to produce a rougher concentrate. This concentrate must then be reground to a relatively fine grain size of around 40 to 20 µm in order to increase the concentrate grade.

The Filón Sur Zone (FSUR) located in the Southwest area of Cerro Colorado requires the same processing parameters.

The processing department staff consists of 115 people plus 10 who work in management and supervisory positions, and the balance occupy positions assigned to middle management and operating personnel. The concentrator is being managed through an ongoing improvement system which aims to maintain or improve the historic metallurgical results.

Since refurbishment and re-commissioning in June 2015 (Phase 1), the process was upgraded and successfully expanded to 9.5 Mt/y (Phase 2), and is currently operating at 15 Mt/y.

17.2 Expansion History and Current Process

17.2.1 Phase 1

The original concentrator, consisting of crushing, grinding, and flotation that was designed and built in the 1960s and 1970s was refurbished to process ores from the mine operations.

In June 2014 Atalaya Mining started working with engineering firms that specialized in detailed engineering, construction, and commissioning, to develop the Phase 1 project of the Riotinto plant. Completion of Phase 1 required the reconditioning of the existing equipment and infrastructure, as well as the installation of new equipment and systems. This phase was successfully completed on schedule in June 2015. The commissioning and ramp-up of Phase 1 was accomplished in seven months, reaching a nominal milling rate of 5 Mt/y in February 2016.

17.2.2 Phase 2

The basic engineering design to increase the plant throughput rate from 5 Mtpy (Phase 1) to 9.5 Mtpy (Phase 2) began in March 2015. Similar to Phase 1, engineering firms that specialize in the design of processing plants were hired for detailed engineering and construction. Commissioning and ramp-up of the Phase 2 plant commenced in March 2016.

In order to achieve the expansion production rate of 9.5 Mtpy, the existing crushing and screening plant equipment was refurbished, and new equipment was added where required. New grinding, flotation and concentrate handling equipment was also added to the existing plant.

The process flowsheet features 3 crushing stages, 2 ball mill grinding stages, a rougher flotation circuit, 1 rougher concentrate regrinding stage, and a 3-stage cleaner circuit. The process ends with a thickening and filtering stage to obtain a final copper concentrate product.

17.2.3 Current Operations, Phase 3 – 15Mt/y

As part of the Riotinto Project 15M Upgrade Project, the basic engineering design to increase the plant throughput rate from 9.5 Mt/y to 15 Mt/y commenced in July 2017. Detailed engineering design and installation activities were completed, and the plant operated at design capacity in 2021 (Figure 17-1).

After the installation of modern mechanically forced air flotation cells during Phase 2, it was observed that acceptable upgrading and recoveries were achievable with rougher and cleaners only utilizing the new flotation cells on cleaning duty.

A summary of the Phase 3 design criteria and its comparison with the previous facility is shown in Table 17-1. In the primary crushing plant, 15 Mt/year of copper ore are processed from open-pit mining in two crushing lines, gyratory, and jaw crusher.

The gyratory crusher has a capacity of 1,700–2,200 t/h and processes 10 MT per year with a product size of P_{80} 165 mm.

Similarly, the jaw crusher has a capacity of 700–900 t/h and processes 5 MT per year with a product size of P_{80} 165 mm. The primary crushing product is fed into a live crushed ore stockpile with a capacity of approximately 126,000 tonnes.

Ore from the crushed ore stockpile is then fed into a conventional SAG Mill circuit that process 2,050 t/h. The SAG mill discharges through a trommel with a port opening of 12 mm and into the secondary ball mill circuit to further reduce the ore to a P_{80} of 160-200 µm. Secondary milling is followed by tertiary milling and cyclone classification in a closed circuit.

The cyclone overflow is fed to a conditioning tank, where chemical reagents (collectors and frothers) are added and then to the rougher flotation circuit. The rougher tailings are thickened and pumped to the tailings storage facility.

The rougher concentrate is then reground and floated in a cleaner circuit to achieve a concentrate grade between 21-25% Cu, depending on the ore type.

Table 17-1: Design Criteria for Previous Facility and current 15 Mt/y Operation

	Unit	9.5 Mt/y	15Mt/y	Comments
Throughput				
Feed Grade	% Cu	0.49	0.49	
Total Plant Feed	t/a	9,500,000	15,000,000	
Availabilities				
Hours per Year	h	8,760	8,760	

	Unit	9.5 Mt/y	15Mt/y		Comments
Crushing Plant	%	59	65		Existing case includes 22% downtime
Rest of Plant	%	85	85		due to mining.
Crushing Plant			Parallel Trains		
			Re-tasked	New	
Configuration		3-Stage Crushing	2 Stage Crushing	1-Stage Crushing	Combined throughput of 15 Mt/y
Operating Hours	h	5,694	5,694	5,694	
Crusher Plant Feed	t/a	9,500,000	10,000,000	5,000,000	
	t/h	1,838	1,756	878	
F_{100}	mm	1,000	1,000	1,000	
F_{80}	mm	399	399	400	
Primary		1 x 460kW Gyratory	1 x 460kW Gyratory	1 x 250kW Jaw	
Secondary		1 x 325kW Cone	3 x 325kW Cone	Nil	
Tertiary		3 x 325kW Cone	Nil	Nil	
P_{80}	mm	17.7	65		Coarser product, suitable for SAG milling
Primary Grinding					
Configuration		2 Stages Ball	ABC + 2 Stages Ball		
Operating Hours	h	7,446	7,446		
Grinding Feed Rate	t/h	1,276	2,015		
SAG		Nil	23MW SAG		New in Open Circuit
Pebble Crushing		Nil	2 x 370kW Cone		
Primary		1 x 7.6MW Ball	1 x 7.6MW Ball		Open Circuit
Secondary - Line 1		1 x 7.6MW Ball	1 x 7.6MW Ball		Closed Circuit - Oversize Motor
Secondary - Line 2		1 x 1.84MW Ball	1 x 1.84MW Ball		Closed Circuit
Secondary - Lines 3,4		2 x 2.47MW Ball	2 x 2.47MW Ball		Closed Circuit
Grind Product P_{80}	µm	183	183		Comparable grind product sizing
Concentrate Regrind					
Configuration		Ball	Parallel Ball		
Open/Closed Circuit		Closed	Closed		
Regrind Mill 1		2.4MW Ball	2.4MW Ball		
Regrind Mill 2		Not used	0.9MW Ball		
Feed Rate	t/h	84	148		
F_{80}	µm	146	146		
P_{80}	µm	38	38		
Grinding Spec. Energy	kWh/t	19	19		
Power Required	kW	1,567	2,780		
Power Available	kW	1,567	3,000		

	Unit	9.5 Mt/y	15Mt/y	Comments
Flotation				
Rougher Vol.	m^3	944	1,500 + 644 + [300]	Five 300 m^3 cells + Forty-six 14 m^3 cells + Three 100 m^3 cells [optional]
Cleaner 1 Vol.	m^3	500	300	Re-tasked 3 x 100 m^3
Cleaner 1 Scav Vol.	m^3	272	Decommissioned	
Cleaner 2 Vol.	m^3	136	200	Re-tasked 2 x 100 m^3
Cleaner 3 Vol.	m^3	16	136	Sixteen 8.5 m^3 cells
Rougher 1 Res. Time	min	20	31.35	
Cleaner 1 Res. Time	min	37	~~25.9~~	Cleaner 1 tail to roughers
Cleaner 2 Res. Time	min	38	~~43.6~~	Cleaner 2 tail to Cleaner 1
Cleaner 3 Res. Time	min	32	~~N/A~~	Cleaner 3 tail to Cleaner 2
Production				
Concentrate	t/a	171,503	281,639	Thickening/Filtration upgraded as required
Copper in Conc	t Cu	38,845	52,961	
Concentrate Grade	% Cu	22.6	22.0	
Recoveries				
Copper Recovery	%	84.3	84.3	
Mass Pull	%	1.8	1.9	

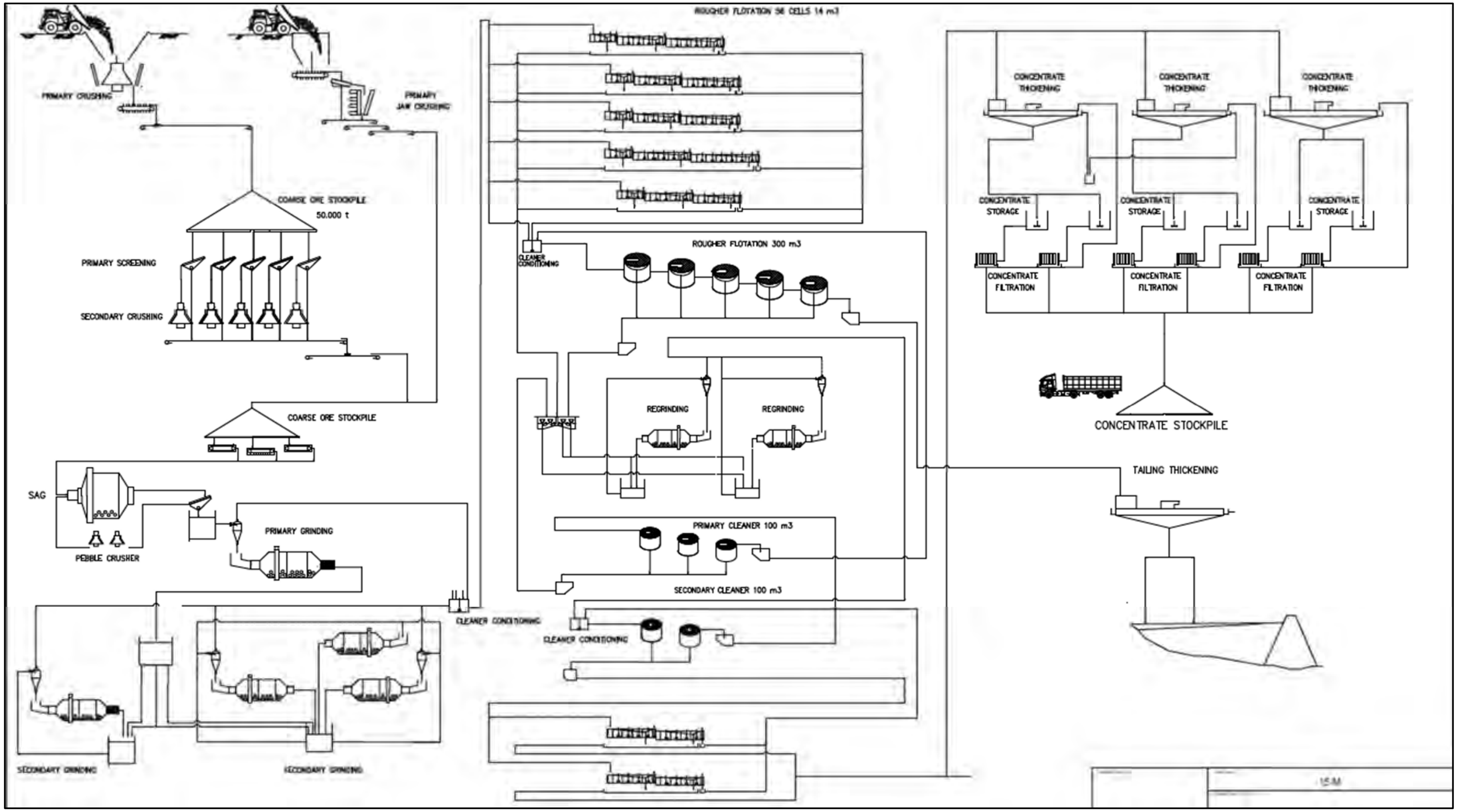


Figure 17-1: Current Flowsheet (15.0 Mtpa)

17.2.3.1 Concentrate Thickening and Filtration

The final cleaner concentrate, at approximately 15% solids by weight, is pumped to two, 9 m diameter concentrate thickeners operating in parallel, where the slurry is thickened to 55% solids by weight. Each thickener has underflow pumps to send the thickened concentrate to filtering systems, each with two 52-plate press filters. The final copper concentrate product contains approximately 6%-10% moisture. The filtered concentrate is transported to the concentrate storage building at site from where it is loaded onto trucks, weighed, and transported to the Port of Huelva.

17.2.4 Production Data

The Riotinto project had been in continuous ramp-up since August 2015 with the goal of achieving 5.0 Mt/y. Ramp-up of Phase 1 and construction activities for Phase 2 started to overlap in September 2015 when the Phase 2 engineering and construction started.

At the end of December 2015, the processing plant achieved an annualized throughput rate of 4.9 Mt/y. In this same period Phase 2 reached 92% completion with final construction activities and tie-ins to existing operations pending.

Atalaya declared commercial production in February 2016. Overall copper recoveries during Q1 2016 were consistently above 82% and concentrate specifications were within commercial terms.

The Phase 2 expansion, with a planned increase in production from 5 Mt/y to 9.5 Mt/y, was declared as “mechanically complete” the first week of May 2016, ahead of schedule and under budget with the 15 Mt/y achieving design production in 2021.

Table 17-2 presents the Life of Mine (LOM) production data, which demonstrates that the upgraded facility is consistently achieving recoveries and final concentrate grades both higher than the original design criteria expectations.

Table 17-2: LOM Production (Atalaya 2022)

PRODUCTION			2015 Daily	2016 Daily	2017 Daily	2018 Daily	2019 Daily	2020 Daily	2021 Daily
Grinding									
	Dry Tons	t	**1,347,778**	**6,505,883**	**8,796,715**	**9,819,838**	**10,453,116**	**14,833,916**	**15,822,610**
	Availability	%	88.89	87.82	90.44	93.23	93.05	83.68	87.07
	Production Rate	t/h	413	843	1,110	1,202	1,282	2,018	2,074
Plant Head Grade									
	Cu	%	0.57	0.48	0.49	0.49	0.49	0.45	0.41
	Ag	ppm				3.86	3.57	3.68	3.87
	Zn	%	0.13	0.11	0.09	0.11	0.13	0.12	0.11
	Pb	%	0.05	0.02	0.01	0.01	0.01	0.01	0.01
	As	ppm	850	393	253	146	125	177	213
Concentrate Grade									
	Cu	%	17.66	21.42	22.39	23.31	23.01	21.83	21.29
	Ag	ppm							64.40
	Zn	%	4.37	4.45	3.49	4.21	4.53	4.10	4.07
	Pb	%	0.60	0.38	0.17	0.11	0.07	0.21	0.30
	As	ppm	7,360	3,868	2,352	1,546	1,194	1,043	1,442
Tailings Grade									
	Cu	%	0.16	0.08	0.07	0.06	0.06	0.07	0.06
	Ag	ppm							
	Zn	%	0.04	0.03	0.03	0.04	0.06	0.06	0.05
	Pb	%	0.04	0.01	0.00	0.00	0.00	0.01	0.01
	As	ppm	652	319	208	121	102	164	190
Concentrate Grade									
	Concentrate Production	t	31,047	122,284	165,965	180,660	195,072	256,001	264,569
	Copper Production	t	**5,483**	**26,179**	**37,163**	**42,114**	**44,886**	**55,890**	**56,326**
	Silver Production	oz							547,812
Copper Recovery		%	71.90	83.29	85.46	88.30	87.07	84.52	86.05

17.2.5 Control Philosophy

A Process Control System (PCS) utilizing a Distributed Control System (DCS) was implemented to monitor and control the process at the Riotinto plant. This system is also used to ensure the safe operation of the plant as well as the protection of personnel, equipment, and the environment.

The crushing plant is monitored and controlled from a dedicated control room in close proximity to the primary crusher while the rest of the plant is monitored and controlled from a central control room or from dedicated equipment local control stations as per operator needs.

All conveyor belts are fitted with emergency trip switches and low-speed detection sensors. Belt drift switches and belt rip detectors are installed on long conveyors. Belt drift switches will alarm for a predetermined period and, if the alarm condition persists, will then trip the affected conveyor. Blocked chute detectors are installed on conveyor transfer chutes. Critical bins, ore stockpiles and tanks are fitted with level indication and control.

A level transmitter together with one- or two-level control valve(s) is installed at the end of each step along each flotation bank and on each flotation tank cell. The level transmitter and level control valve(s) are used to control the flotation cells pulp levels (froth depths).

17.2.5.1 Current 15 Mtpa Operation

Diverse control loops exist in crushing, grinding, flotation, thickening and filtration to protect equipment and to control the process.

An on-line analyzer system was installed to sample and determine on-line metals concentrations to control the flotation circuit. This information is used to create dynamic copper recovery equations and concentrate mass pull equations for the operators to make decisions about process control.

There is a plant sampling system that generates samples to measure and control shift performance. These samples are sent to the analytical lab on site from where shift data are sent to key personnel to have the shift-by-shift and daily metallurgical balance generated.

Closed-circuit television cameras were installed to monitor various critical locations throughout the plant, including several cameras in primary, secondary, and tertiary crushing. Cameras are also located at several conveyor belts and transfer chutes in the grinding area.

The existing control system was upgraded to cater for an updated architecture to include the new items. Each area is allocated a control system remote input output (RIO) panel to capture the instrumentation for the related area. This is tied into the existing system currently on site and the licensing updated accordingly.

For the conveyor systems, each unit will be allocated trip switches, alignment detection, speed detection, tear detection and take-up limits according to the final design requirements. These will be wired back to the control system and electrical buckets, for both display of status and the required safety trips.

17.2.6 Production Support

The Riotinto Project has well-equipped analytical and metallurgical laboratories on site. These laboratories are delivering daily results to the metallurgical and to the process team. State of the art equipment and well-trained personnel deliver excellent results that go through routine quality controls to ensure accuracy and that all processes are performing with design specifications.

The Riotinto Project has a water supply system consisting of a fresh water make up system and a process water system, where water recovered from the tailings area is recirculated back to the concentrator.

The technical services area operates the water system and the tailings management system. This group makes sure that the system is operated with higher than 99% availability and that, at the same time, operational information is gathered to comply with operation and legal standards as indicated in all the permits Atalaya Mining has been granted to operate the mine.

Process water is a product of the thickened concentrate and of the tailings settling system. Water coming from the concentrate thickeners is blended with process water and pumped to the plant.

The plant has two air supply systems. One is a high-pressure compressed air system located throughout the plant. The other system is a low-pressure air system that mainly feeds the air needs of the rougher and cleaner flotation cells.

17.2.7 Manpower

The plant team is headed by a Plant Superintendent and has 5 crews of operators and supervisors who work in 8-hour shifts. There are 2 operating crews off site every day taking their breaks or vacations.

The analytical laboratory crew reports directly to the site General Manager. The concentrators also have a Metallurgy team with its own Superintendent. The maintenance team has millwrights and electricians working on all shifts, but most of the maintenance team work on day shift.

The Process Plant Manpower is shown in *Table 17-3*.

Table 17-3: Process Plant Manpower

Description	Existing Manpower
Plant Manager	**1**
Process Engineer	1
Chief Metallurgist	1
Metallurgy Team	5
Plant Operations Superintendent/Supervisor	2
Concentrate shipment	5
Operations Crew	99
Water Treatment Supervisor	1
Water Treatment Crew	11
Maintenance Manager	**1**
Maintenance staff (Supervisors and millwrights)	68
Electrical and Instrumentation Staff	28

New equipment has been added to the existing Phase 2 plant design and the resulting plant design has been modified as well as reconfigured to achieve the increased plant throughput rate of 15 Mt/y. A new primary crushing circuit, a coarse ore stockpile, a new primary milling circuit, a new rougher flotation circuit, a new thickener and two new filters has been incorporated in the Phase 3 plant design. Details of the new equipment and modified equipment are presented in Table 17-4 and Table 17-5 respectively.

Table 17-4: Equipment Summary for Current 15 Mt/y Operation

Plant Area	Equipment	Description of Duty
Primary Crushing	• 1 x 250 kW jaw crusher with associated feed arrangement.	• Parallel crushing line designed to process 5 Mt/y of ROM ore
Coarse Ore Handling	• Coarse ore stockpile • Conveyer system from new crushing circuit. • Reclaim system	• Transportation and storage of combined crushed product from exiting crushing circuit and new crushing circuit. • Reclaim to feed new SAG mill
Primary Milling	• 23 MW SAG Mill • 2 x 300 kW cone crusher	• Open circuit SAG mill with pebble crushers to process coarsely crushed product and preparation for existing ball milling circuit
Primary Mill Classification	• 10 x 600mm cyclones	• Classification of SAG mill product • Overflow directly to flotation • Underflow to existing ball milling circuit
Rougher Flotation	• 4 x 300 m^3 tank cells	• Rougher flotation consists of existing 46 x 14 m^3 cells, 300 m^3 cell and 4 x new 300 m^3 cells to make combined rougher volume of 1,500 m^3
Concentrate Thickening	• 14 m diameter thickener	• Expansion of thickening capacity for additional concentrate generation
Concentrate Filtration	• 2 x 55.2 m^2 vertical plate filters	• Expansion of filtration capacity for additional concentrate generation
Tailings	• 2 x 14-12 pumps • 1 x pipeline	• Duty and standby pump for new pipeline as required for additional tailings generation

Table 17-5: Equipment Modifications Summary for Current 15 Mt/y Operations

Plant Area	Equipment	Description of Modification
Screening	Primary Screens	• Modify the double deck screen chutes to discharge to a common conveyor • Replace the top screen meshes with 120 mm screen meshes • Replace the bottom screen meshes with 65 mm screen meshes
Screening	Fine Ore Tripper Feed Belt Conveyor	• Shorten conveyor belt length • Modify discharge head and chute to feed new combined crushed ore conveyance system
Secondary and Tertiary Crushing	Tertiary Crushers	• Convert tertiary crushers from short head crushers to standard head crushers (ex-tertiary crushers to be on secondary crushing duty)
Regrind	2.4 MW Ball Mill D x L = 4.75 x 6.4m 0.9 MW Ball Mill D x L = 3.8 x 4.6m	• Increase ball charge to draw maximum power available • Refurbish and recommission smaller regrind mill
Rougher Flotation	300m^3 Pre-cleaner	• Reconfigure to re-task as first rougher cell • Tail to feed new rougher cells installed • Concentrate combines with the concentrate from the new rougher cells to be pumped to the existing regrind circuit
Primary Cleaner Flotation	3 x 100m^3 Primary Roughers	• Reconfigure to re-task as primary cleaner bank • Tail to be pumped to first rougher cell as described above • Concentrate to report to be pumped to secondary cleaner circuit as described below
Secondary Cleaner Flotation	2 x 100m^3 Primary Cleaners	• Reconfigure piping to re-task as secondary cleaner bank • Concentrate to be pumped to concentrate thickening • Tails to be pumped to primary cleaner bank as described above
Concentrate Thickening	Concentrate Thickener 1 or 2	• Convert thickener to a clarifier (clarification of overflows from the concentrate thickeners)

Figure 17-2 presents a simplified general arrangement for the 15 Mt/y upgrade including color coding to what equipment is new, existing, or has a modified duty compared to Phase 2.

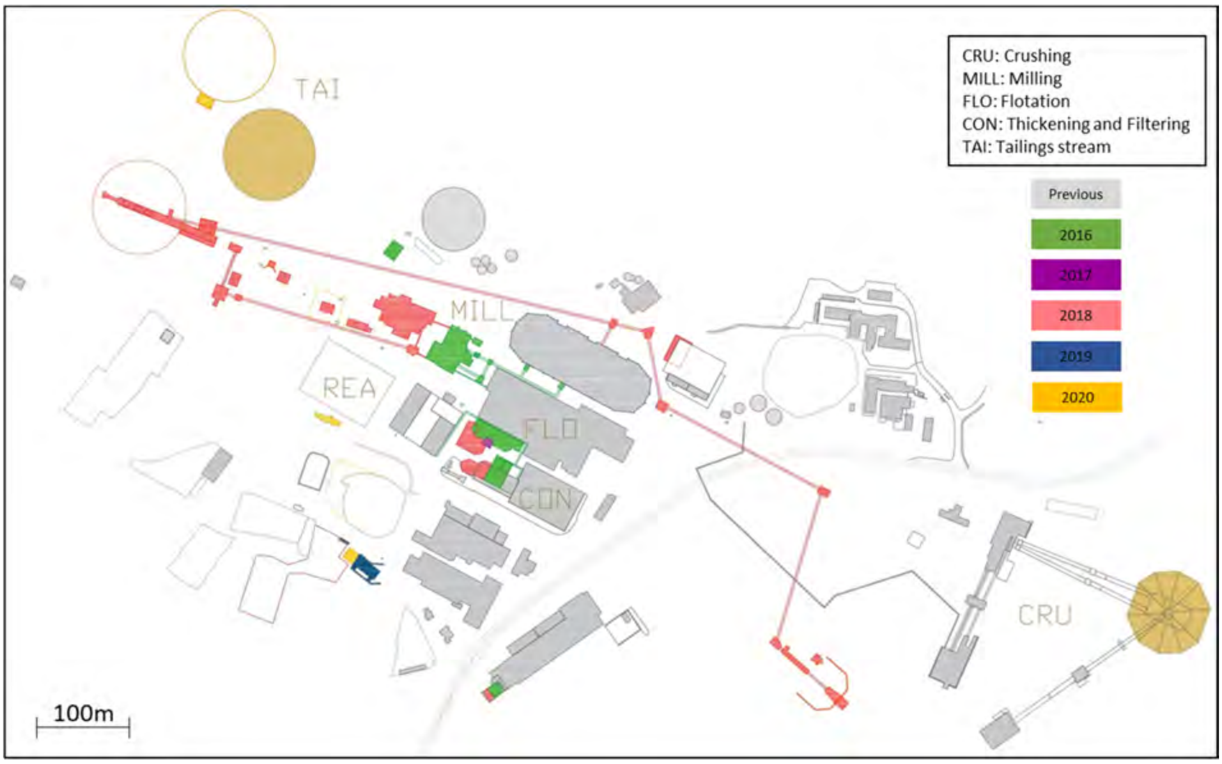


Figure 17-2: Current Plant General Arrangement (Atalaya 2022).

18. INFRASTRUCTURE

18.1 Access

The property is well connected for road transportation via a high-quality national road system that was recently renovated. The site is located 75 km from the port and the industrial city of Huelva, and 88 km from the regional capital, Seville.

Copper concentrate is transported by road to the Huelva port where it is stored for ocean transport to various commercial destinations. A fleet of 25-tonne-capacity trucks transport the concentrate in cycles of three roundtrips per day. This fleet has the flexibility to accommodate variability in production rates. A local company that specializes in this type of service has been contracted to transport the concentrate to the port.

The project also uses other nearby ports such as Algeciras and Cadiz, and international airports in Seville, Madrid, and Faro (Portugal).

The layout of the National Road (A-461) that runs through the vicinity of the Cerro Colorado open pit is planned to be modified to facilitate expanded mining operations in the existing pit. The current project considers re-routing of the existing national road around Corta Atalaya on the western side of the property, as explained in Section 18.4.

18.2 Electrical Supply

The main incoming electrical substation has a 132 kV capacity on the incoming high-voltage side and 6.3 kV and 20 kV on the outgoing low-voltage side. The substation was fully reconditioned and updated as part of previous development programs. The substation consists of a 1.3 km line that has been repaired and is currently operating from La Dehesa substation (ENDESA independent power supplier) using 3 outgoing lines on 3 main transformers:

- Transformer 1: 32 MVA 132/6,3 kV
- Transformer 2: 20 MVA 132/6,3 kV – to be replaced by a new 32 MVA 132/6,3 kV
- Transformer 3: 20 MVA 132/6,3 kV – to be replaced by a new 50 MVA 132/20 kV

These transformers have been completely repaired and checked (dielectric oil analysis). There is a condenser battery system to correct the power factor, which has been repaired and updated with a capacity of 9.6 MVA currently working at 0.98 cos ϕ. Protection equipment was originally repaired and later upgraded to current requirements.

Several 6,300/400 V transformers down from the main substation serve different operating areas. Transformers are PCB-free and are equipped with protection and communication systems.

Phase 1 production (5.0 Mt/y) utilizes Transformer 1 and demands 15 MW of power, while an additional 24 MW (from both Transformers 1 and 2) was available to test new equipment for the phase 2 expansion. Phase 2 expanded production (9.5 Mt/y) requires 31 MW of power. Transformers 1 and 2 at the main substation are in service, and Transformer 3 has been repaired with all tests satisfactorily completed.

The expansion electrical design followed the same format as the original and Phase 2 expansion plant designs.

For the new ROM and crusher area, the design is to utilize the existing medium voltage (MV) switchgear and add a new feeder breaker to feed to a new 2 500 kVA transformer. A new Power Distribution Panel (PDB) and Motor Control Center (MCC) will supply power to all the new equipment in this area.

New switchgear (MAIN-MVSG-03) will be utilized to feed power to the new primary mill MV switchgear due to the high current requirement for the new mill area. Two feeder panels in parallel will be used to feed power to the new MV switchgear located at the new SAG mill area. Two 2, 500 kVA transformers will supply power to the PDB and MCC for the equipment in this area.

A new substation building will be built in the stockpile area to house a new MV switchgear. This MV switchgear will be supplied from the new SAG milling area MV switchgear. This substation will supply power to all the equipment in this area via a 2500 kVA transformer, PDB, and MCC.

The additional flotation cells, thickener, and filter presses will be supplied from a new MCC to be located inside the current concentrate thickening (CON1) area MCC building.

18.2.1 Solar Farm

The planned 50 MW solar farm for self-consumption will also help to reduce the Company's long-term power costs while at the same time lowering its carbon emissions. The solar plant, which is expected to provide approximately 22% of the Company's electricity needs, is under construction following the signing of an agreement with an affiliate of Endesa, the Spanish power supply company. Atalaya received approval for the construction of the solar farm in March 2022.

With ground preparation underway and equipment on order, full commissioning of the solar plant is expected in during 2023 (Figure 18-1).

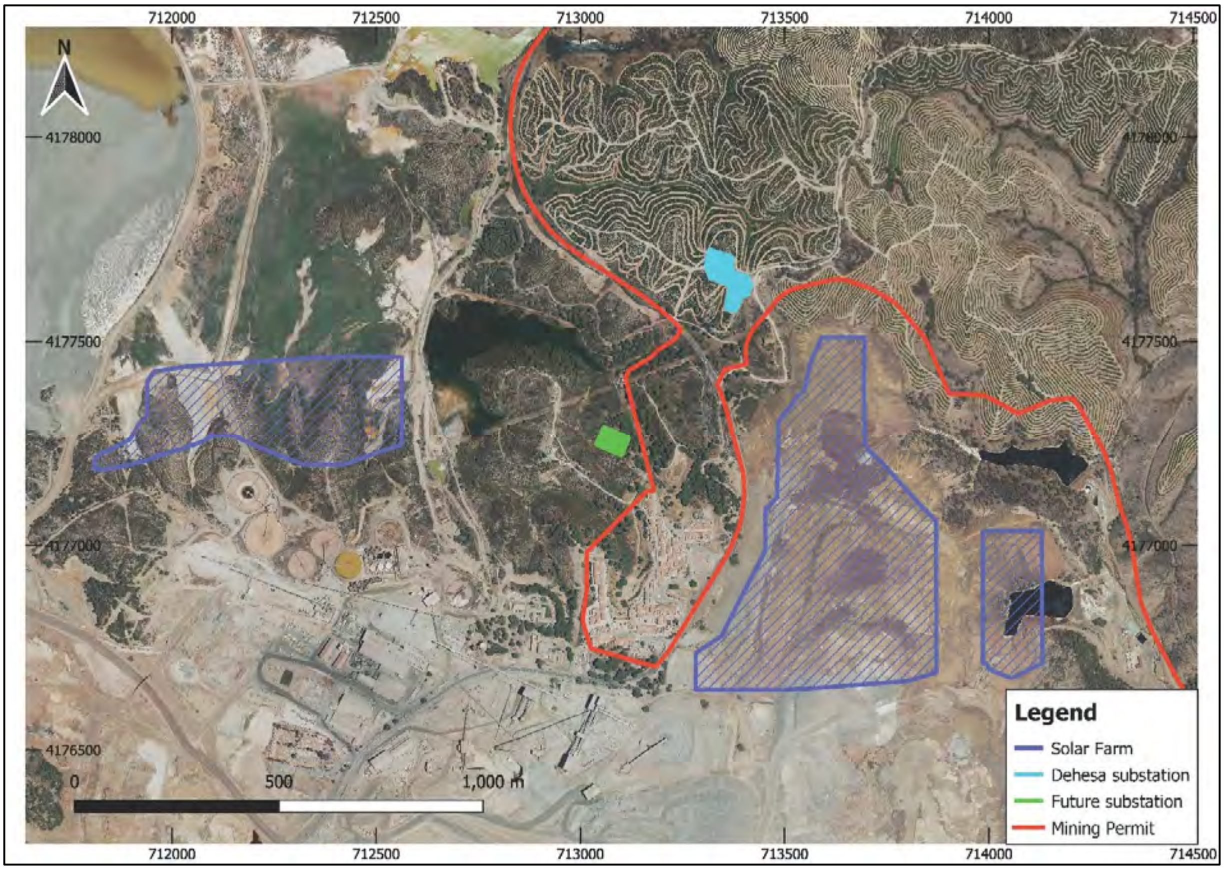


Figure 18-1: Layout of the solar farm project (Atalaya, 2022).

18.3 Water Systems

Process water is supplied from Gossan Dam through two pumping stations, where it is pumped at a rate of approximately 4,400 m^3/h. These include two pumps with a flow rate of 1,000 m^3/h and two pumps with a flow rate of 1,200 m^3/h. In addition, thickened tailings process water (overflow) is pumped to steel tanks at a rate of 1,000 m^3/h.

The process water system also includes an intermediate storage reservoir consisting of three pumps that pump at a rate of approximately 3,600 m^3/h to the three process tanks with storage capacities of 5,080m^3, 3,600 m^3, and 30,000 m^3.

Process water from Cobre is pumped either to the Gossan Dam or directly to process tanks through a pumping system consisting of two pumps, each with a capacity of 1,700 m^3/h. Process water from Aguzadera is also pumped to the Gossan Dam through a pumping system consisting of three pumps with capacities of 2,100 m^3/h and 1,600 m^3/h.

Freshwater is supplied from the Campofrio, Aguas Limpias, and Odiel reservoirs using four pumps with a capacity of 230 m^3/h each, three operating and one standby. Water is pumped through two pipes to the freshwater tank. The Odiel reservoir, which is upstream from Campofrio, has recently been incorporated into the freshwater system as an additional reserve. A new pumping system has been installed with a capacity of 480 m^3/h, four pumps operating and one standby, and a 6.5 km distribution line. A new line is currently under construction.

The freshwater storage tank has a capacity of 1,680 m^3 and has been repaired along with all the valves and distribution network to the plant.

The distribution tanks are situated between the national road and the current office facility. Water is distributed to the entire operation via a pipeline system made of high-density polyethylene and carbon steel. Before commissioning the existing tanks were re-conditioned with proper surface treatment, thicknesses were checked, and worn piping and valves were replaced or repaired. This freshwater distribution system is shown in Figure 18-2.

Potable water is supplied by the utility company, GIHASA, which manages the water system for the municipality of Minas de Riotinto. The potable water is stored in a 50 m^3 poly tank located next to the fresh water and process water tanks, where it is distributed to the dining hall, changing rooms, contractor huts, mine shops, and safety showers via polyethylene pipes.

Acidic water coming from Corta Atalaya, Cerro Colorado, and waste dump ponds is pumped through the piping and pumping system to the treatment plant and onto the process water storage tank.

Five Pachuca tanks from the old gold processing plant were rehabilitated for the water treatment plant. The water treatment plant has a capacity of 200 m^3/h, and the treated water is reused as process water.

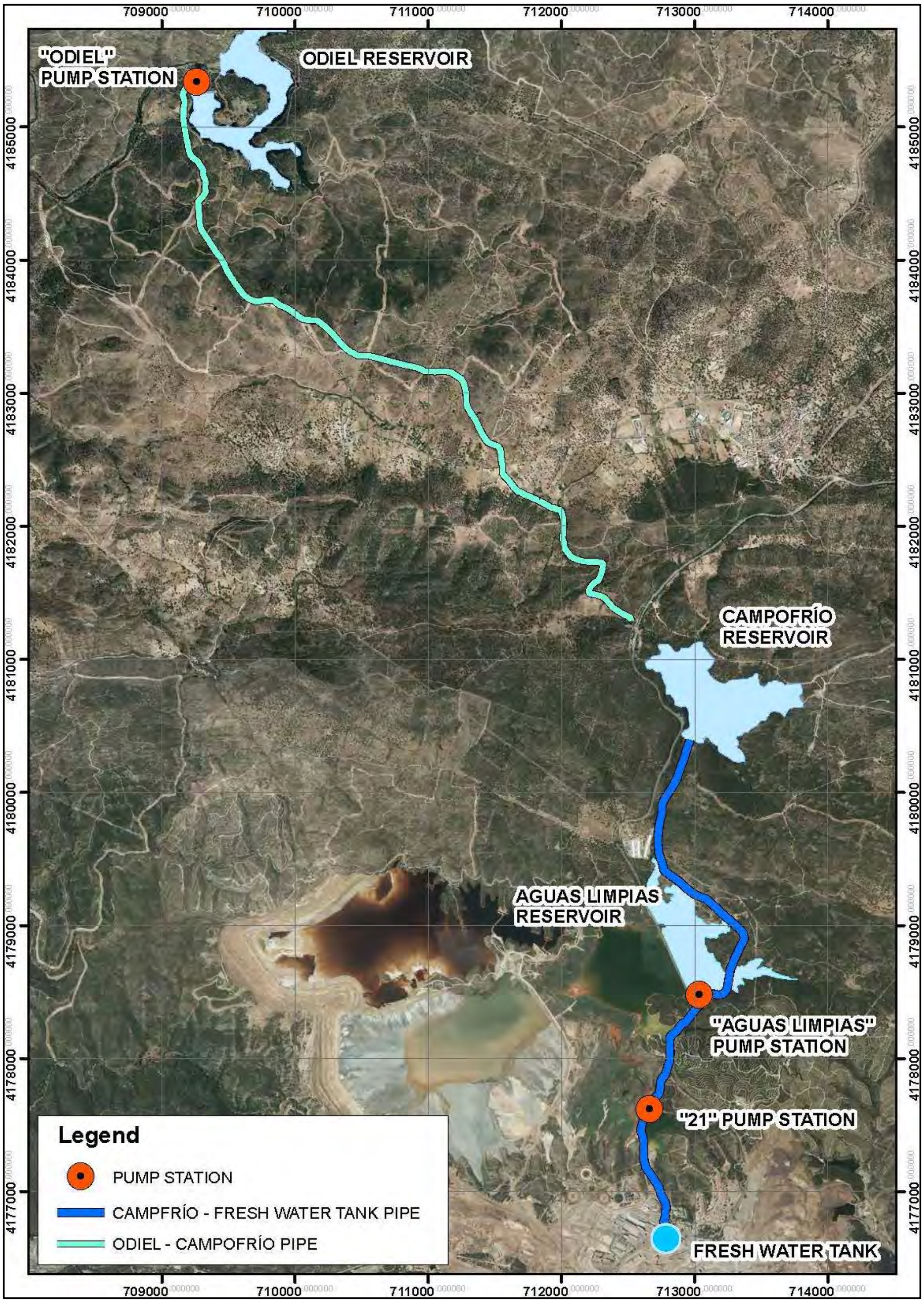


Figure 18-2: Fresh Water Distribution System (Atalaya, 2022)

18.4 Re-routing of National Road (A-461) and power line

Accessing Cerro Colorado mining Phase 5, which defines the ultimate pit limit on the northwest and west areas, requires re-routing of the National Road A-461, the main road in the section between Minas de Riotinto and the town of La Dehesa, and reallocation of the current power lines. The regional government has approved the beginning of the layout project of the new road section; the permitting process is still ongoing. The National Road A-461 must be relocated prior to the beginning of 2024 to prevent disruptions in the mine production schedule (Figure 18-3). Delays in permitting may delay the mine production schedule.

Additionally, an agreement has been signed with the electricity supply company to change the current layout of the power line, which is going to be carried out prior to the diversion of the road. In addition, there is a communication line (fiber optic) that needs to be reallocated and this is being discussed with the communications supply company.

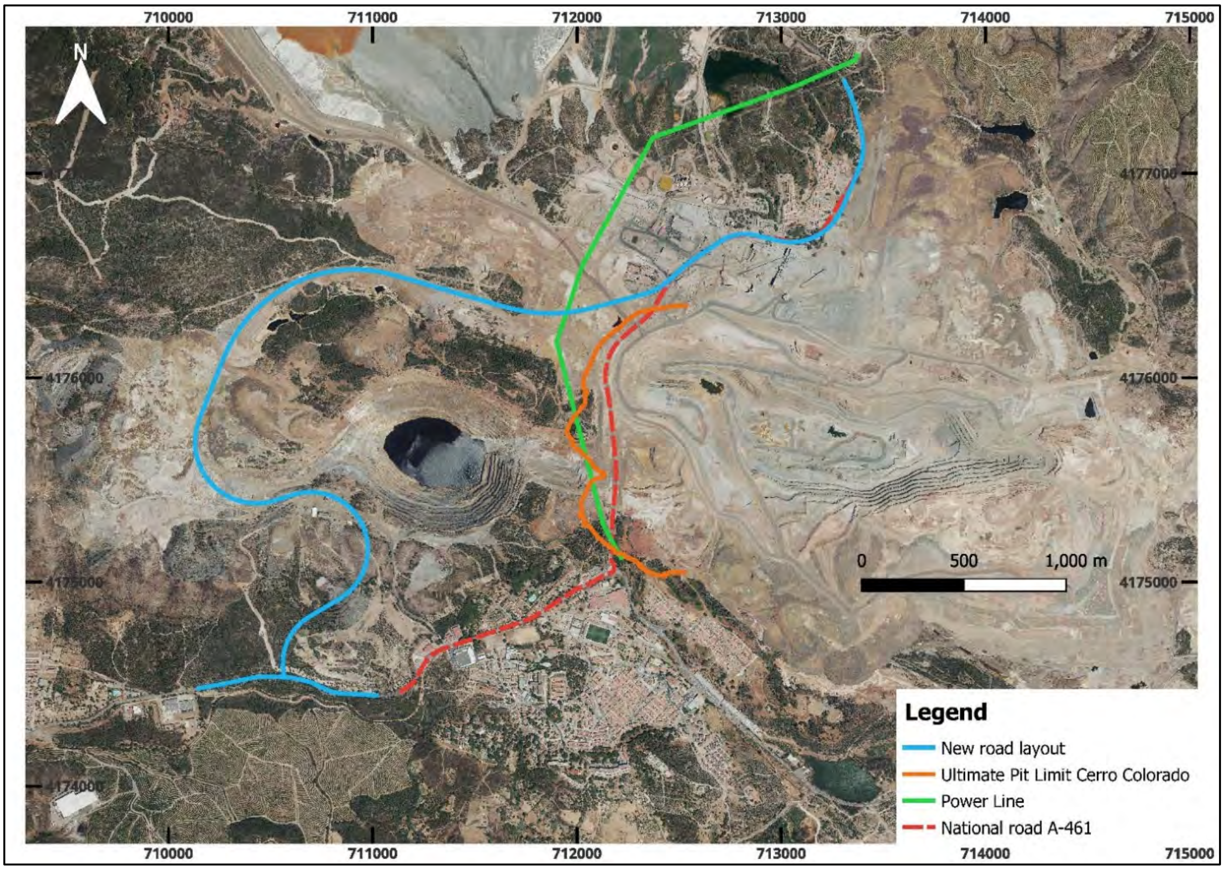


Figure 18-3: Current layout of National Road A-461 and re-routing project (Atalaya, 2022).

18.5 Tailings Management Facility

18.5.1 General

The site comprises current and historical mining installations, including the closed Atalaya Open Pit, the currently operated Cerro Colorado Open Pit, processing plant and ancillary infrastructure for the operation and management of the mining project. The site also includes three tailings storage facilities named "Embalse Cobre" (Cobre TSF), "Embalse Aguzadera" (Aguzadera TSF) and "Embalse Gossan" (Gossan TSF). The Cobre and Gossan facilities were first constructed in the early 1970s to contain 70 Mt of tailings, and later the Aguzadera facility was constructed in the late 1980s, to provide a total of 86 Mt of tailings storage. The Gossan TSF is no longer used for tailings storage but as a water reclaim reservoir.

Figure 18-4 below shows the relative location and comparative size of the three tailings facilities in relation to the mining operations at Riotinto, and the villages surrounding the project, including Minas de Riotinto, La Dehesa, Nerva to the southeast, and El Campillo to the south west.

The current Riotinto Mining Project started commercial production in 2016 with an initial production of 5 Mtpa ramping up to 9.5 Mtpa and then to 15 Mtpa achieved by 2019.

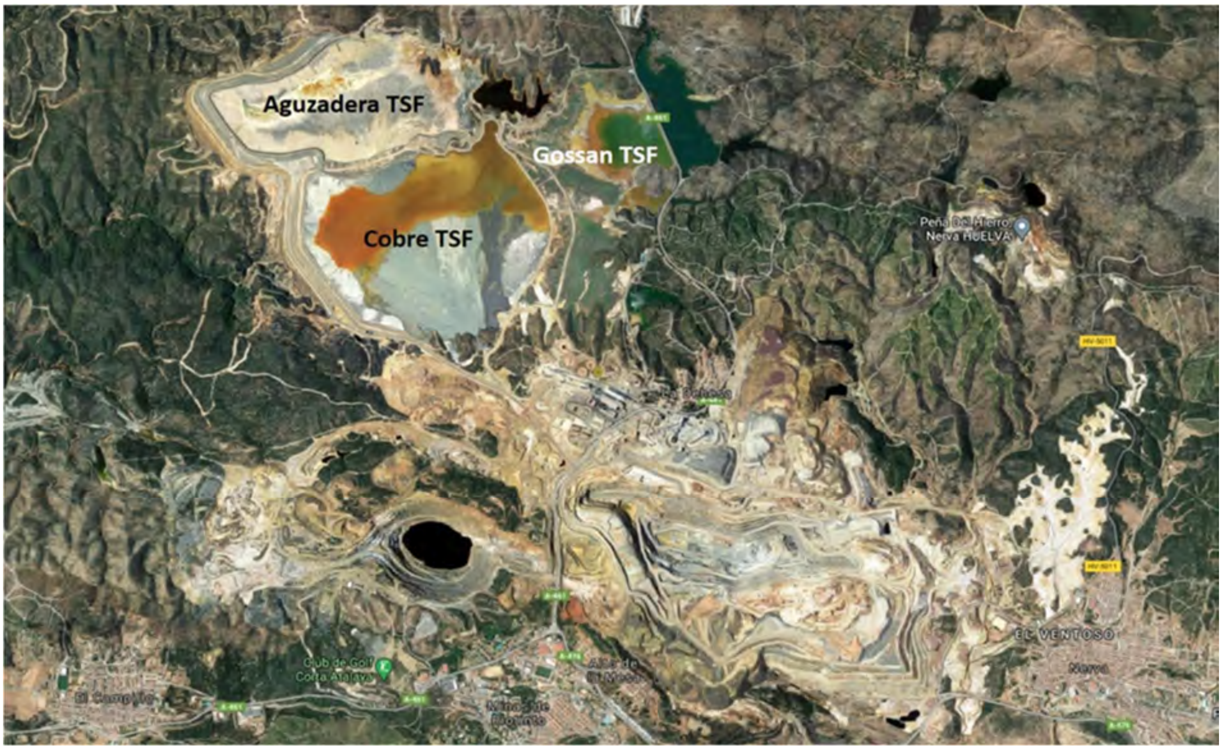


Figure 18-4: Riotinto Site View (source Google Maps 2021)

Tailings disposal has been undertaken at the Cobre and Aguzadera tailings facilities, which are currently at a crest elevation of 388 masl and 382 masl respectively. The design of the current raise of the Aguzadera tailings facilities was completed during 2019. Tailings are currently being discharged into this facility at a solids content of 55%. Prior to the granting of the approvals, Atalaya Mining undertook a series of ground improvements in the areas where the foundation material is previously deposited tailings for the final downstream embankment walls. These areas are in the northwest section of the Aguzadera dam, the southeast section of the Cobre dam, the area termed as "entronque" where Cobre and Aguzadera join to the south of the facility, and in the interfaces between these and the Gossan impoundment area.

The remaining Life of Mine production will be 15Mtpa which will require additional total tailings storage requirement from 2022 of approximately 161 Mt. This future development of the tailings facilities will include raising the Aguzadera embankment to an initial crest elevation of 388 masl. From this elevation, both the embankments will be raised together with their dividing wall to a final elevation of 417 masl. The approval to raise both facilities to 417 masl has not yet been granted.

Table 18-1 below shows the planned deposition and elevation development for the facility over LoM, and Figure 18-5 shows the proposed layout of the tailings facilities at 2032 when operations are planned to stop on site.

Table 18-1: Tailings Disposal Facility Development Plan (Golder Associates, 2021)

Period	Year of Operation	Tailings Disposal (Mt)	Cumulative Disposal (Mt)	Comments
1	2022	15.0	15.0	Deposition at Aguzadera to 382 masl
2	2023	15.0	30.0	Deposition at Aguzadera to 388 masl
3	2024	15.0	45.0	Single Impoundment to 394 masl
4	2025	15.0	60.0	
5	2026	15.0	75.0	Single Impoundment to 400 masl
6	2027	15.0	90.0	
7	2028	15.0	105.0	Single Impoundment to 406 masl
8	2029	15.0	120.0	
9	2030	15.0	135.0	Single Impoundment to 412 masl
10	2030	15.0	150.0	
11	2032	11.0	161.0	Single Impoundment to 417 masl

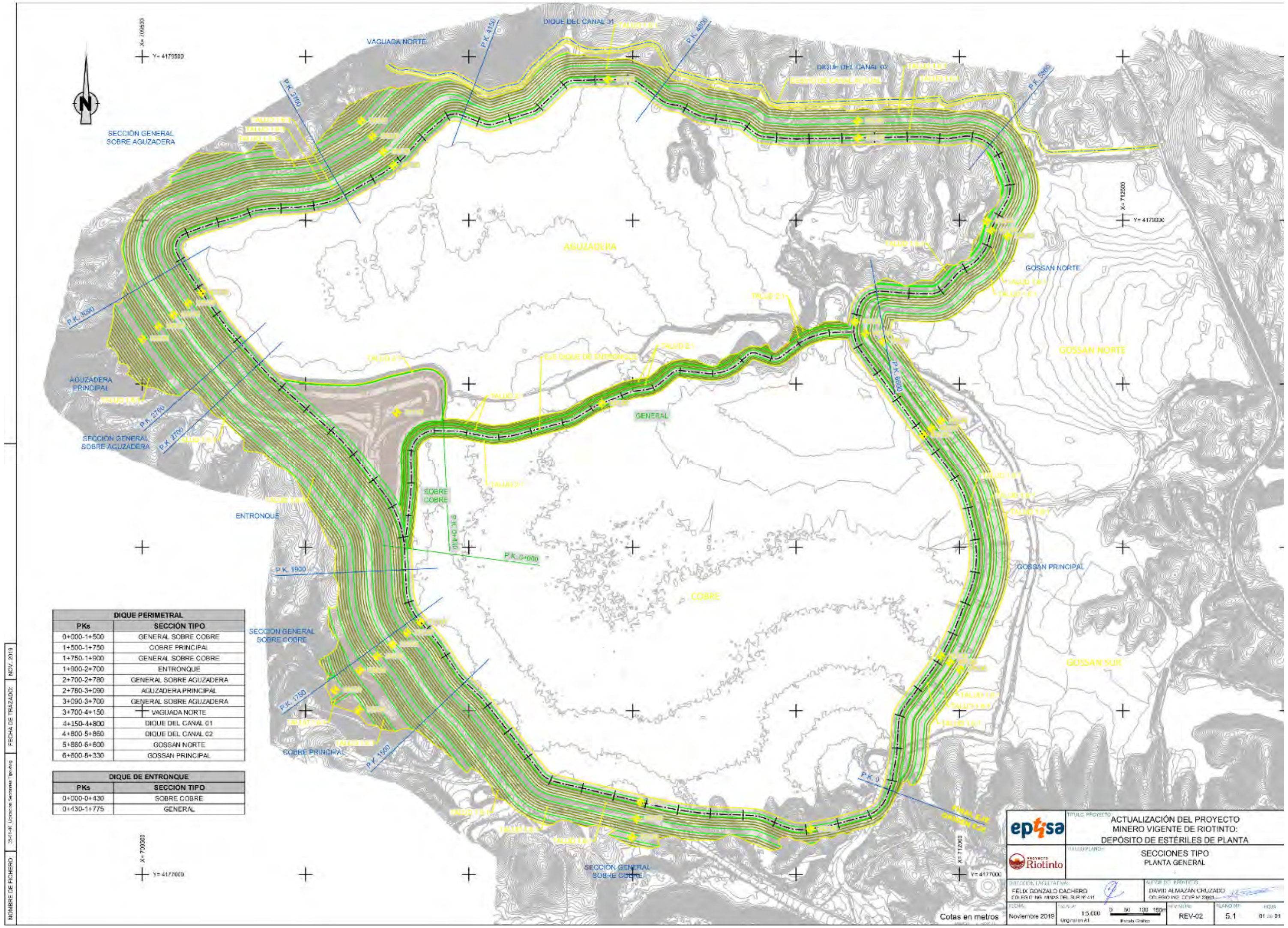


Figure 18-5: Tailings Disposal Facility Layout to year 2032 (Eptisa, 2021)

The dividing wall between the two facilities is also raised using the centerline method as seen in the figure and, therefore, theoretically is separated but raised as one.

Alternative options/solutions for future tailings expansion are under being studied.

18.5.2 Embankment Walls

18.5.2.1 General

The facilities are located upon a low-permeability shale formation with low hydraulic conductivities (permeability). The Eduardo fault, which traverses in a NW-SE direction, was characterized by EPTISA and determined to be inactive and was infilled with low-hydraulic-conductivity material.

The Cobre TSF will be raised some 29 m in 9 years, and the Aguzadera TSF some 35 m in 11 years, which is at the upper limits of raising using the centerline or upstream method. Typically, the rate of rising is generally confined to between 1.5 m and 3.0 m. The hot climate accelerates desiccation and strengthening of the tailings, therefore, an annual 3.0 m raise would be acceptable subject to the overall performance of the facilities based on inspection and monitoring.

The original upstream embankment walls were not lined, and therefore, seepage emanating from the facilities is collected from sumps located at the low points in the main valleys and pumped back into the facilities. Approximately 2.8 mm^3 of seepage water is returned to the facility each year.

There are no external catchment areas, as the facilities form a ring dyke and therefore can safely operate without an external spillway. The once in a 1000 year and once in 10,000 years 24-hour flood event are 225 mm and 306 mm respectively, which are readily contained within the facilities. The current perimeter length of the combined facilities is approximately 8 km and cover an area of some 4 km^2.

There is a diversion channel located to the north of the facilities, which originally transferred water from the reservoir to the east and surface runoff from the north. This is to be realigned to the north at a higher invert elevation to accommodate the tailings expansion to 417 masl. The reservoir to the east is used as water for the processing plant, while the main reclaim pumps are located in the southeast sector of the Aguzadera TSF. Water from the Cobre TSF spills into the Aguzadera reclaim sump. The water is then pumped and treated with lime in the Gossan reservoir.

18.5.2.2 Cobre TSF

The main embankment at the Cobre TSF could be considered an embankment of hybrid construction, as it was initially constructed using the downstream method with Gossan material (mine waste) used to create a starter embankment which was provided with a low-permeability layer (Nucleo) on the upstream face.

Up to approximately the 340 masl elevation, the embankment was raised with a downstream method using rockfill (Escollera) on the downstream and cycloned material forming a barrier (filter) between the rockfill and the fine tailings (lamas) being deposited in the impoundment.

From the 340 masl to the app. 376 masl elevation, the dam was raised using the upstream method with cyclone sands forming the main body of the embankment with a rockfill toe constructed to strengthen this section against instability.

As part of the 2016 design project (Golder Associates, 2016), the downstream section was reinforced with the construction of a rockfill buttress, and this was used to raise the crest of the embankment to the 382 masl elevation. The latest design project by EPTISA, completed in late 2019 (Alamazan Cruzado, 2019) and approved for construction in January 2021, allows for the raising of the dam using the centerline method with the construction of a significant downstream reinforcement section that will, as it is raised, improve the stability of the structure.

Figure 18-6 below shows a typical section of the Cobre TSF main embankment with the current profile shown as a dotted line and the planned life of mine project raises presented to the final planned elevation at 417 masl. The overall slope of the rockfill buttress forming the downstream sector of the embankment wall is about 2H:1V and satisfactory.

From the cross section of the proposed embankment construction, the centerline method is adopted, and the upstream sector of the individual raises are founded on recent deposited tailings. Also, at depth, the cyclone sands (“arena de Ciclonado” – coarse fraction of the tailings arising) and to a small extent slimes (“lamas” fine fraction of the tailings arising) are loaded as a result of the centerline raised. The success of centerline construction method relies on the strength of materials in the downstream side of the centerline, and the tailings materials in these areas need to be sufficiently drained and consolidated such that they have gained sufficient strength to ensure stability of the embankment.

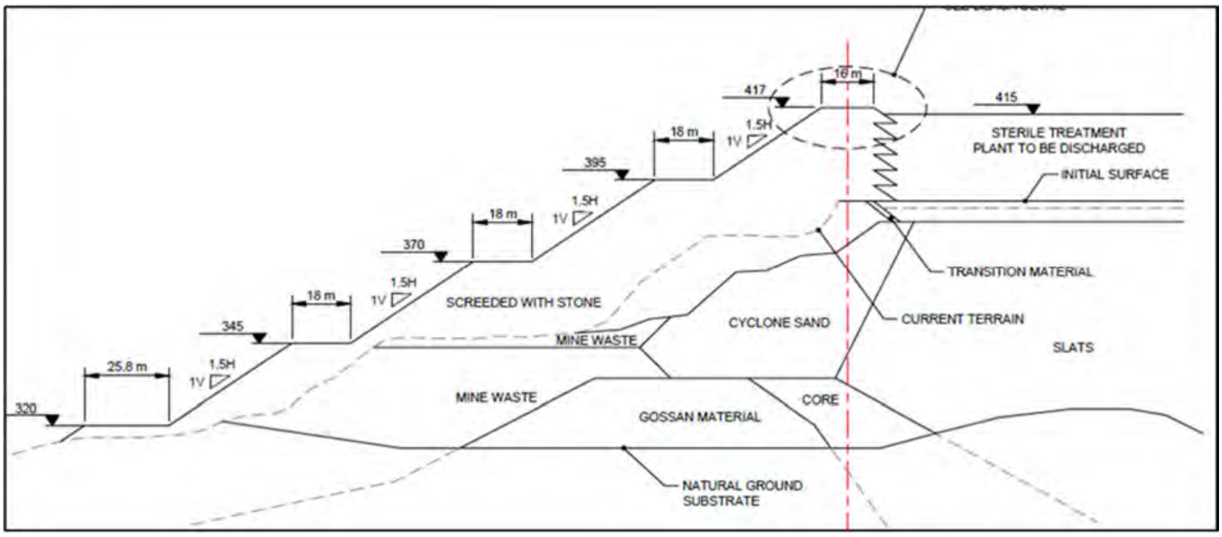


Figure 18-6: Typical Section – Cobre TSF to final planned elevation (Eptisa, 2021)

Figure 18-7 shows the methodology as described in the operations manual for the Cobre Dam for the management of tailings disposition and the formation of a “tailings beach” to ensure the drainage, desiccation and consolidation of the tailings deposited lead to the strengthening of the materials prior to the construction of the centerline raise.

A minimum operational beach length of 50 meters (distance between the upstream toe of the embankment and the edge of the tailings water pond) is required. This methodology allows for the consolidation and strengthening of the materials in the beach, and provides a margin of protection in the impoundment against extreme rainfall events of between 1.5 and 2.0 m to prevent accidental overtopping of the embankment.

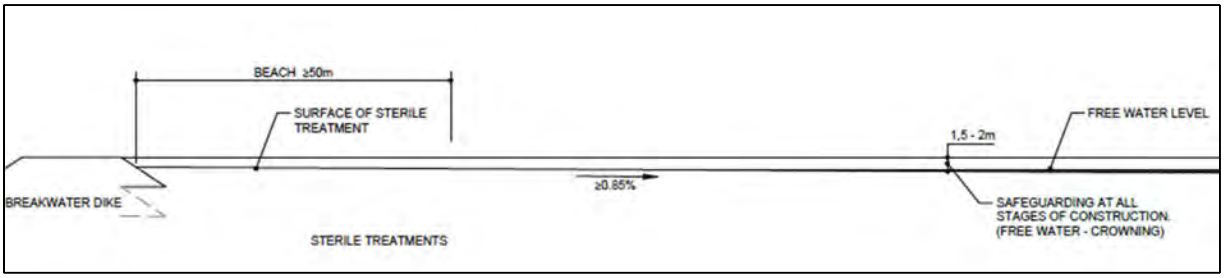


Figure 18-7: Typical tailings beach management detail (Eptisa, 2021).

An HDPE lining system has been installed on the upstream face of the embankment constructed as part of the 2016 design. The lining of the embankment started above the 376 masl elevation with the objective of ensuring the phreatic level in the downstream sector of the main embankment wall is maintained at the lowest elevation possible and to minimize seepage. The materials used for the construction of the embankment below the 376 masl elevation will continue to result in seepage being generated at the toe of the embankment. The seepage characteristics and volumes are and will need to continue to be monitored to ensure no issues of internal erosion affect the structure.

18.5.2.3 Aguzadera TSF

A typical section of the Aguzadera TSF embankment is shown below in Figure 18-8. The cross section is similar to that adopted for the earlier Cobre dam embankment, with a starter embankment formed from rockfill material (Escollera) and an upstream protection layer formed from ground slate (Pizarra).

The development followed a centerline construction to the 345 m elevation, with the downstream section of the embankment formed with rockfill material. Above the 345 masl elevation, the embankment was raised using the upstream method of construction using cyclone sands as the embankment construction material. This coincided with the declining years of the operation; therefore, it is likely that this method was adopted primarily as a cost-saving measure.

The 2016 design incorporated a downstream buttress formed of rockfill material similar to the strengthening buttress included in the Cobre TSF section. The design also included the use of an HDPE liner forming an impermeable layer on the upstream face of the embankment from elevation 369 masl with the same objective as described above for the Cobre Embankment.

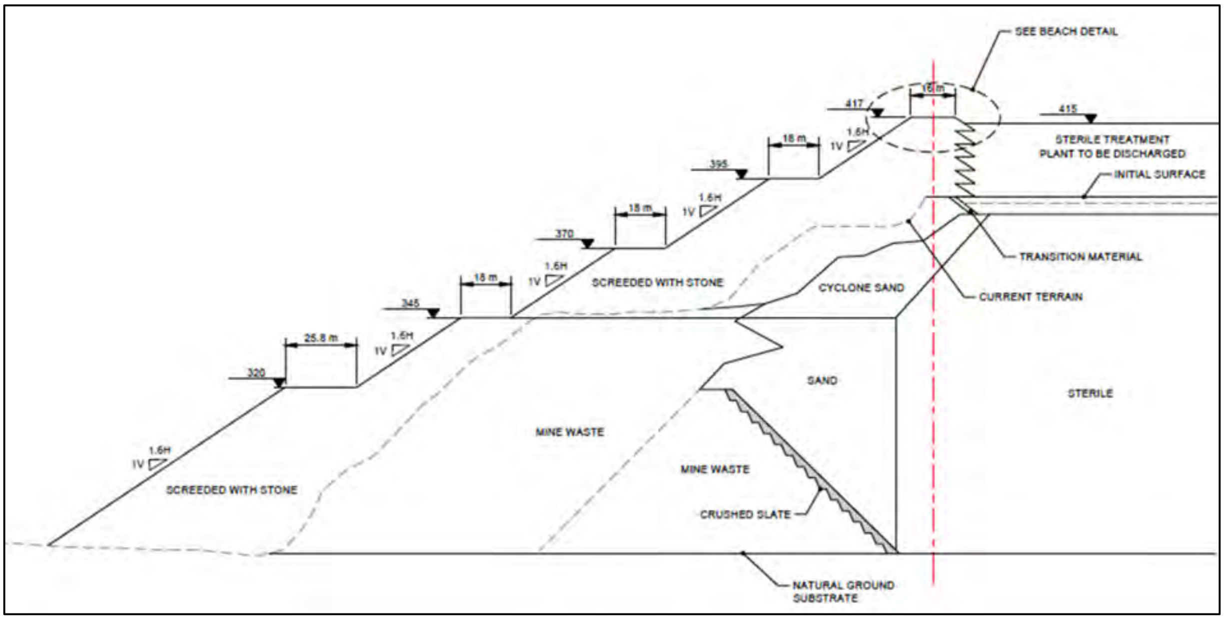


Figure 18-8: Typical Cross Section - Aguzadera TSF to Final Planned Elevation (Eptisa, 2021).

The operational, monitoring, and maintenance requirements for the Aguzadera TSF up to the 388 masl elevation are similar to those described for the Cobre TSF, and those will apply as well for the unified TSF above the 388 masl elevation to the final level at 417 masl. At this elevation the embankment crest height above the downstream toe is some 130 m, a significant structure.

Currently, deposition of tailings is in the Aguzadera and will continue until the next dam wall raise from 382 masl to 388 masl.

18.5.2.4 Foundation Improvement

As part of the design for the LoM tailings disposal, the identification of the centerline for the future embankments was completed early in the process, and additional site investigations were completed in areas where gaps in the knowledge of the materials or strata forming those foundations were identified.

Various areas were identified as requiring improvement of the foundation tailings to ensure a suitable foundation was available when the facilities were raised. Since 2020, improvement works have been carried out in these areas. These have included backfilling valleys with rockfill, replacement of any soft foundation tailings with rock fill, or the installation of gravel columns in the deeper sections of soft tailings.

18.5.3 Geotechnical Site Work

18.5.3.1 Investigations

Several geotechnical site and laboratory investigations have been undertaken on the TSF's site as listed below.

- 1969 Rejondillo Project
- 1979 Reformed Project

- 1987 Aguzadera Dam Project
- 1995 Aguzadera Reformed Project
- 2009-2010 Riotinto Project
- 2013-2014 Riotinto Project Phase 1 and Phase 2
- 2018-2019 Riotinto Project Update – TSF
- 2020 Site and laboratory investigation (388 masl raise)

18.5.3.2 Additional Site Work

Further investigation work will be undertaken during the raising of the facility to assess the ongoing performance of the Cobre and Aquzadera embankment raises.

18.5.4 Embankment Wall Stability

In the following sections, the actual expansion project under the review of the competent authority and pending approval is described. Although the final permitted project might be subject to revisions and more restrictive design modifications, the required tailings storage capacity will remain unchanged.

18.5.4.1 Geotechnical Characterization

The geotechnical characterization for the TSFs used field and laboratory data obtained from site investigations undertaken in 2020 and previous years. Twelve geotechnical units were identified, five in the tailings, six in the construction materials, and the foundation material.

The friction angle (ɸ) for the sand and silty sand tailings was from 35º to 38º, which is reasonable; but for the silty clayey tailings a value of 25º has been assigned, which is considered conservative.

Based on the results of field and laboratory tests, the potential for static and dynamic liquefaction of tailings exists depending on material and depth.

Based on previous studies, the material corresponding to the starter walls comprise mine waste rock and borrow materials of various sizes, which were selected based on the zone of the starter dam where it was placed (coarse fill for the main body, fine graded material for “impervious” and transition zones). The friction angle varied from 30º for clayey samples to 36º for coarse material, which is reasonable.

Cyclone sand was used in the past for embankment construction for the Cobre and Aguzadera embankments and was classified as low- or non-plastic sand and low-plasticity silty sand. The geotechnical characterization of these materials by Eptisa (2021) has been based on previous studies and assumes an average friction angle of 32º to 33º. The results of triaxial tests suggest that for this material the potential for static liquefaction exists.

Coarse rockfill has been used for erosion protection and for the access road on the crest of embankment protection where required. Large test pits have been excavated to collect representative samples for the determination of the grading of coarse (>200m) material in the field. Fines recovered from pits samples (<200m) were sent to the laboratory for further analyses (particle size distribution and large shear box tests). Friction angles of 40º to 42º were obtained from shear box tests.

Field tests including density (water replacement) and geophysical survey. Multi-channel Analysis of Surface Waves (MASW) were also undertaken to determine the in-situ characteristics of these materials and seismic response (Vs30).

18.5.4.2 Phreatic Level in Embankment Walls

There are several piezometers installed in the embankment walls to measure the phreatic level. The phreatic level in the embankment sections for the stability analyses follows the line of the HDPE liner on the upstream face of the embankment, with a line deduced from piezometric measurements in the embankment below the 376 masl elevation. This is considered the worst-case scenario, and the adoption of this assumption is supported.

Additional work carried out by EPTISA (2021) using flow net modelling based on predicted phreatic surfaces, general geotechnical, and hydrogeological characterization were used in the stability analysis undertaken for the embankment walls at full height (417 masl).

18.5.4.3 Seismic Design Coefficients

A Peak Ground Acceleration (PGA) value of 0.07 g corresponding to a 1000-year return period seismic event has been selected based on national building regulations (MdMa, 2009) and corrected to consider foundation conditions (Eptisa, 2021).

18.5.4.4 Factors of Safety

Table 18-2 below shows the factor of safety (FoS) required for each condition assessed based on the type of facility being assessed. Under the current development project, the Aguzadera and Cobre embankments are treated as one facility and classified under Spanish Regulation as a Category A facility, the most restrictive level possible.

Table 18-2: Target FoS for dams extracted from Spanish Legislation (MdMa, 1996 & MdMa, 2009).

Type of Dam	FoS per Condition Assessed		
	Extreme	Accidental	Normal
Class 1 or Category A or B	1.4	1.3	1.2
Class 2	1.3	1.2	1.1
Class 3	1.2	1.1	1.0

The stability analyses have been carried out under static and pseudo-static (seismic loading) conditions using finite element and limit equilibrium methods.

The tailings materials (cyclone sands and slimes) have been assessed as susceptible to liquefaction. These materials fall within the area of influence of the foundation of the main embankment centerline raises to 417 masl and, therefore, a liquefaction assessment of the materials in the embankment was undertaken by EPTISA (2021) based on peak undrained shear strength and post liquefaction strength of the tailings materials.

The stability of the structures as represented by the calculated factors of safety (FoS) against failure are shown to be satisfactory by the stability analyses completed by the designer. All FoS calculated by EPTISA (Eptisa, 2021) and by Knight Piesold (Knight Piesold, 2021) for all the conditions assessed exceed the minimum FoS required under the legislation.

18.5.5 Monitoring

With all embankments retaining tailings and water, the performance is based on the inspection and monitoring results. Inspections and monitoring of the deposition management operations of the facilities, the monitoring data and the condition of the monitoring equipment, and the verification of the remedial and construction works undertaken, are verified by APPLUS Norcontrol SLU, an independent consultant charged with verifying the findings and reports prepared by Atalaya Mining with respect to the geotechnical control and monitoring, as well as the quality control of construction projects.

The facilities are comprehensively instrumented, including standpipe piezometers, closed piezometers (vibrating wire), inclinometers, and 2D and 3D survey points. The mine is currently in the process of automating all instruments, termed the Minerva project, to provide real-time results which are uploaded to the cloud.

The Minerva project will comprise the following ground control equipment and techniques:

- GNSS-based Leica System with automated GNSS sensors recording real-time location to an accuracy of millimeters.
- Automated EDM monitoring of prisms with Leica total stations.
- Automated open and close piezometers and inclinometers.
- Ibis ARC-SAR Radar system (Hexagon IDS GeoRadar) which provides real-time monitoring of critical areas of the TSF.
- AI-surveillance consisting of real-time video analysis of the TSF conditions.
- Continuous ground deformation monitoring using Sentinel-1 satellite images and InSAR technique.
- Passive seismic surveying methods for detecting natural low-frequency earth movements.

The Hexagon GeoMonitoring Hub platform (Leica Geosystems) will be set up with an external 24/7 Geomonitoring Room that will be managing real-time data integration from the various sources mentioned previously, allowing the rapid representation and interpretation of the monitoring data recorded and enabling the establishment of a real-time alarm system. The initial schedule of the Minerva Project considers the following:

1. Set up two automated Leica total stations for TSF monitoring and the GeoMonitoring Hub platform in 2022.
2. Two additional automated Leica total stations and a radar unit for TSF monitoring, and 24/7 Geomonitoring Room for external monitoring control in 2023.

Trigger levels based on a green/orange/red system have been developed for the piezometers, and all the monitoring data are reviewed by the designer, EPITSA. The monitoring and control reports and inspection undertaken by APPLUS Norcontrol are required to be competed every three months.

Some of the standpipe piezometers, inclinometers, and survey points have to be raised during construction and, therefore, are prone to being damaged or give spurious readings. Further instruments will be systematically installed as the facilities are raised.

18.5.6 Closure

A preliminary closure plan has been put in place for the facility as part of the design project for the LoM operation by EPTISA 2021 Reclamation (Figure 18-9). The plan focuses on the physical and chemical stability of the structures in the long-term following the cessation of operations at the site.

The closure plan allows for the removal of the remaining pond water from the facility for treatment and discharge to allow for the surface of the tailings to drain and consolidate. Once the tailings surface is dried and has gained sufficient strength to allow for trafficability, the surface will be modified to a landform that facilitates water management on the surface of the facility and minimizes the risk of erosion.

The surface will then be sealed with an HDPE liner protected by a geotextile and covered with a layer of compacted crushed slate some 300 mm in thickness. The final surface will be vegetated. Figure 18-9 shows the proposed closure surface drainage layout, which will be shaped to allow surface water to flow in a controlled manner for discharge into the Gossan section via a 200 m wide shallow spillway.

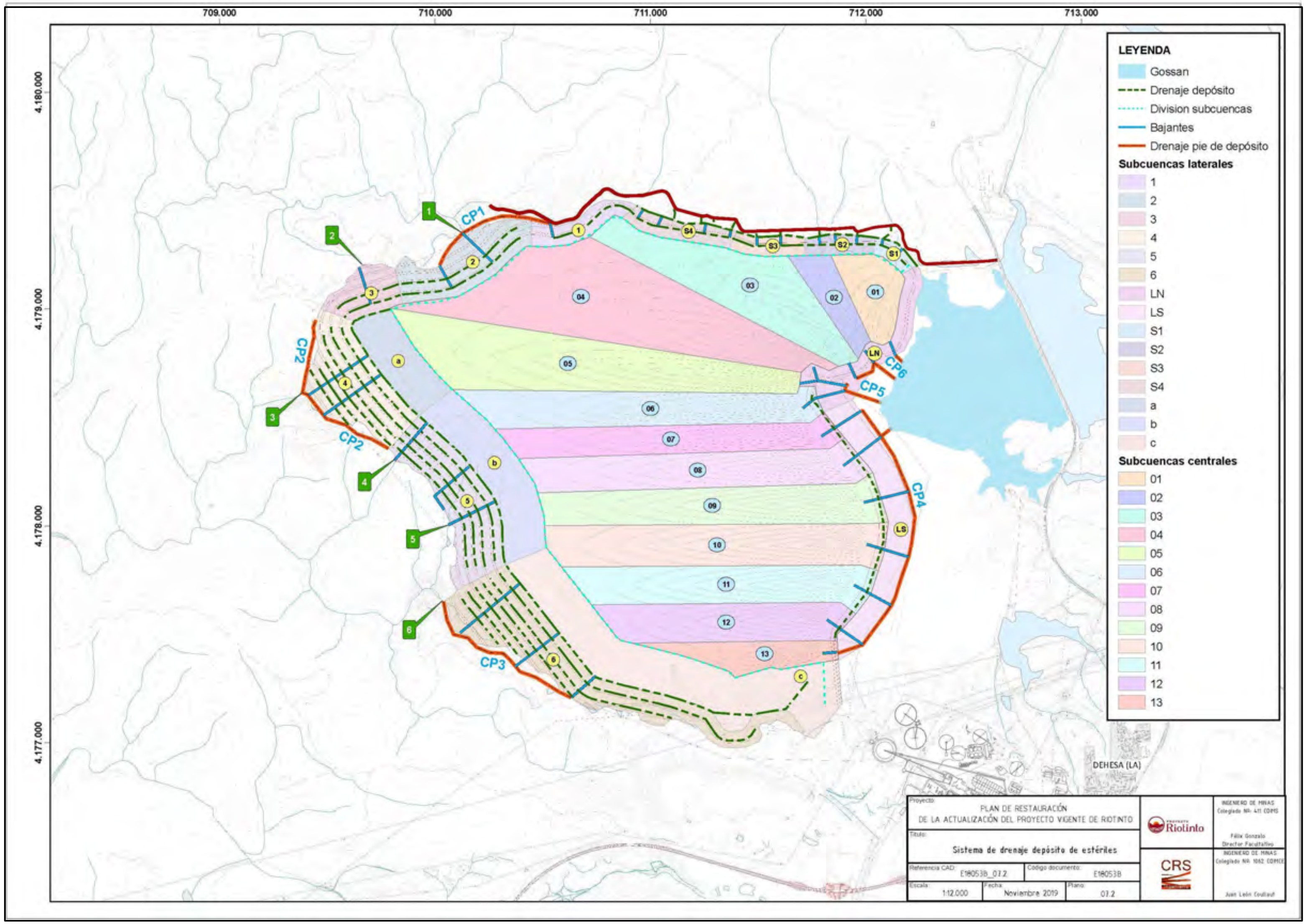


Figure 18-9: Conceptual Closure Plan – Surface Drainage (Eptisa, 2021).

Further design work and trials are to be undertaken to develop the conceptual closure plan and finalize the design.

18.5.7 Management

The management structure for both the operational aspects of the tailings deposition and operation of the facilities, as well as for the construction projects relating to the raising of the embankments, are clearly stated in the Emergency Response Plan for the facilities and other documents, and the roles and responsibilities of each member of the team is well defined. However, it would be preferable to separate the document into an Operation Maintenance and Surveillance (OMS) manual and Emergency Response Plan (ERP).

Similar to the operational management structure, the construction management structure for the expansion, in charge of all construction projects in the TSFs, is well defined and the roles and responsibilities associated with each position are well understood by the team.

A weekly plan for deposition management and control is prepared and followed by the deposition control team.

Construction of the TSF below the 376 masl and 369 masl for the Cobre and Aguzadera sections respectively did not include any low-permeability barrier design to minimize seepage and filtrations. As a result, seepage and filtration of tailings water has to be managed by a network of drainage locations and pumped back to the process plant for recirculation into the process.

The flow sheet and measurements of seepage and drainage pumped at each location, as well as a detailed water balance for the operation, is maintained and a monthly report to the Director Facultativo is presented.

The water management at the TSFs is well understood and effectively controlled. The water balance at the site is naturally in deficit, which requires additional effort by the operators to ensure good management of the water available such that fresh water make up can be minimized.

All construction activities and events that are undertaken or affect the TSFs at Cobre or Aguzadera are reported in the monthly construction report prepared by the Director de Obras (Director of Works) and presented to the Director Facultativo, legally responsible for the tailings facilities.

The ERP for the TSFs is based on a risk assessment of the facilities and incorporates an emergency response team with well-defined roles and responsibilities for the personnel appointed to act in different positions within the emergency response structure. The plan is complemented by a Dam Break Analysis completed by Knight Piésold in 2021, which covers raising of the embankments to the 417 masl elevation. The results indicate that, basically, the tailings would be confined by the narrow valleys and there would be minimal deaths down valley. Based on Canadian Dam Association (CDA, 2014) criteria, the facility would be classified as a high-risk dam.

Under Spanish Legislation the responsibility for the External Emergency Response Plan (EERP) falls under the Directorate General for Emergencies (Dirección General de Emergencias) which depends on the Andalusian Government (Junta de Andalucia) under Royal Decree 975. The EERP prepared by the authorities includes details of the alert levels, evacuation scenarios, and communication with people and infrastructures potentially affected by an emergency at Atalaya Mining.

The plan includes also a detailed identification of all monitoring equipment for the facility, and establishes trigger levels at which the different actions of the ERP need to be implemented.

The ERP was updated in 2020 as a result of the proposed construction projects for the TSFs described in the Eptisa Design Report of 2019 and will lead initially to the raising of the Cobre section to the 388 masl elevation. The plan is reported to be updated regularly and at least every time a design change is put in place.

Although the management, monitoring, and control of the facilities at Riotinto complies, as reported by APPLUS with all legal requirements, compliance with the ICMM Global Industry Standard on Tailings Management (GTS, 2020) should be the adopted in the future by the Atalaya management team. A brief summary of the GTS contents is given below.

The GTS is divided into 6 topics:

- Affected Communities;
- Integrated Knowledge Base;
- Design, Construction, Operation and Monitoring of the Tailings Facility;
- Management and Governance;
- Emergency Response and Long Term Recovery; and
- Public Exposure and Access to Information.

Included within the 6 topics are 15 basic principles which are tabulated below in *Table 18-3*.

Table 18-3: GTS Principles (GTS, 2020)

GLOBAL INDUSTRY STANDARD ON TAILINGS MANAGEMENT
TOPIC I: AFFECTED COMMUNITIES
PRINCIPLE 1: Respect the rights of *project-affected people* and *meaningfully engage* them at all phases of the *tailings facility lifecycle*, including closure.
TOPIC II: INTEGRATED KNOWLEDGE BASE
PRINCIPLE 2: Develop and maintain an interdisciplinary *knowledge base* to support safe *tailings* management throughout the *tailings facility lifecycle*, including closure.
PRINCIPLE 3: Use all elements of the *knowledge base* - social, environmental, local economic and technical - to inform decisions throughout the *tailings facility lifecycle*, including closure.
TOPIC III: DESIGN, CONSTRUCTION, OPERATION AND MONITORING OF THE TAILINGS FACILITY
PRINCIPLE 4: Develop plans and design criteria for the *tailings facility* to minimise risk for all phases of its *lifecycle*, including closure and post closure.
PRINCIPLE 5: Develop a *robust design* that integrates the *knowledge base* and minimises the risk of failure to people and the environment for all phases of the *tailings facility lifecycle*, including closure and post-closure.
PRINCIPLE 6: Plan, build and operate the *tailings facility* to manage risk at all phases of the *tailings facility lifecycle*, including closure and post-closure.
PRINCIPLE 7: Design, implement and operate monitoring systems to manage risk at all phases of the facility lifecycle, including closure.
TOPIC IV: MANAGEMENT AND GOVERNANCE
PRINCIPLE 8: Establish policies, systems and accountabilities to support the safety and integrity of the *tailings facility*.
PRINCIPLE 9: Appoint and empower an *Engineer of Record*.
PRINCIPLE 10: Establish and implement levels of review as part of a strong quality and risk management system for all phases of the *tailings facility lifecycle*, including closure.
PRINCIPLE 11: Develop an organisational culture that promotes learning, communication and early problem recognition.
PRINCIPLE 12: Establish a process for reporting and addressing concerns and implement whistleblower protections.
TOPIC V: EMERGENCY RESPONSE AND LONG-TERM RECOVERY
PRINCIPLE 13: Prepare for emergency response to *tailings facility* failures.
PRINCIPLE 14: Prepare for long term recovery in the event of *catastrophic failure*.
TOPIC VI: PUBLIC DISCLOSURE AND ACCESS TO INFORMATION
PRINCIPLE 15: Publicly disclose and provide access to information about the *tailings facility* to support public accountability

18.6 Fire Protection

The fire protection system was completely renovated as required by the Spanish Royal Decree 1389/1997 of September 5, 1997, which approves the minimum provisions for protecting workers' health and safety at mines.

A new detection, flashing and alarm system, with direct communication to the main control room, was installed for all electrical rooms, conveyor belts, and buildings. The system was equipped with automatic detectors, alarm push buttons, and optical and acoustic alarms.

The new extinguishing systems include:

- A complete pumping station dedicated to fire extinguishing, including an electric pump, diesel, and jockey pump to guarantee sufficient water flow. There is 350 m^3 of reserve water in the system storage tank.
- Automatic sprinklers for all systems in underground tunnels.
- Fire hydrants equipped with hoses for all conveyor belts in outdoor areas including optical signage.
- HFC-227ea gas extinguishing systems for all electrical rooms and the main substation, including optical on/off signage.
- ABC and CO_2 powder extinguishers located in all areas and plant buildings with the corresponding optical signage to protect equipment, systems, and electric motors.
- An extinguishing hydrant system connected by buried HDPE lines, including connections, cabinets, and the necessary hoses.

18.7 Other Environmental Aspects

Roofs and walls containing asbestos on industrial buildings and office buildings that were in poor condition were repaired or replaced with new corrosion-resistant aluminum plates.

18.8 Warehouses

There are two large warehouses on the mine property along with an outdoor storage area. The locations for replacement parts and material deliveries have been separated and clearly defined.

The warehouses feature sufficient shelving units to organize large-size replacement parts and cabinets for small items. All warehouse shelving units are officially approved and newly installed. Two secure areas were prepared within the warehouses to store inflammable products to comply with APQ laws (chemical storage).

The low-voltage power and lighting system was replaced to comply with current laws on low-voltage electrical systems. A computer control system was also installed for incoming and outgoing materials, with three computer connections to the general administration system.

18.9 Maintenance Facilities

The maintenance warehouse was re-conditioned and rehabilitated. All of the necessary equipment, such as bridge cranes (20 t and 5 t), vertical drills, etc. was re-certified as required by the Spanish Royal Decree 1215/1997 of July 18, establishing the minimum health and safety provisions for use by workers.

All changing room, toilet, and office facilities next to the mechanical/electrical repair shop, as well as the main offices and facility access control, were restored and modernized.

19. Market Studies and Contracts

19.1 Introduction

Atalaya has been actively marketing the copper concentrate product to global consumers. Currently, a small proportion of the concentrate is sold on the open market. The remaining portion of the concentrate production is committed to the following companies according to market-standard offtake agreements that average for the life of mine reserves as reported in the Technical Report on EMED´s Rio Tinto Copper Project dated February 2013:

- IXM, S.A.
- Transamine, S.A. (formerly Transamine Trading S. A.)
- Trafigura PTE Limited

Copper is an internationally traded commodity and prices are set through trading on the major metals exchanges: the London Metal Exchange (LME), the New York Commodity Exchange (COMEX), and the Shanghai Futures Exchange (SHFE). Copper prices on these exchanges generally reflect the worldwide balance of copper supply and demand, but are also influenced significantly by investment flows, currency exchange rates, and other macro indicators of the global economy.

19.2 Supply and Demand

Copper consumption increased in 2021 by 4.2% to 24,430 k tonnes of copper annually. The increase in copper consumption was higher in ex-China markets, which is expected to continue to be the case in the upcoming years. The increase in copper consumption in the period 2022 to 2025 is expected to be well above 2.5% and potentially higher after 2025 as expectations on metals demand increase in an energy-transition world. Population and income growth, new investment to serve an increase in environmental-friendly industrial plans, global renewal energies expansion, and transition to electric cars are leading the rise in consumption, which is expected to continue to increase at a higher rate in ex-China markets compared with modest increases in China. In addition, a favorable political environment and public stimulus for the energy transition will add extra pressure to an expected strong demand, which may lead to a tight market in the next several years.

The global copper inventory deficit in 2021 is expected to continue in the future, with an expected inventory increase or surplus in the years when major new mines are expected to come into production.

Global mine supplies will have their own challenges. Unexpected mine disruptions, such as health-related quarantines due to COVID-19 in 2020, estimated to be in the range of 1.19 million tonnes, may continue impacting future mine production. Latin America and other regions' geopolitical risk may also add extra pressure to mine production. Chile and Peru continue to be critical sources of copper supply. Political changes, communities and other environmental challenges, and other technical factors such as permitting delays, taxes and governments royalties, declining grades, and increases in production costs could also imbalance the global supply; those countries represent 25% and 11% of global supply, respectively. There is a lack of new projects to compensate for the expected growth in demand. Only a few greenfield/ brownfield projects or expansions in existing operations are expected, and may also be delayed for permitting or other environmental concerns.

In summary, a global deficit in copper supplies is likely to occur toward the beginning of the next decade and will likely push copper pricing to peak levels. The long-term copper incentive price will likely be increased to compensate for inflationary pressure and environmental, social, and political risks to reach the minimum returns required by miners.

19.3 Sales of Concentrates

The typical copper concentrate specification is shown below in *Table 19-1*. This specification is based on the actual production by Atalaya during the years 2020 to 2021. It is based on processing all Cerro Colorado ores.

Table 19-1: Copper concentrate typical assay

Element	Unit	Value
Cu	%	21 – 23
Pb	%	0.2 - 0.3
Zn	%	3.5 - 4.5
S	%	29 - 34
Fe	%	28 - 33
As	ppm	1200 - 2800
Sb	ppm	2000 - 2500
Bi	ppm	220 – 280
Hg	ppm	20 - 25
Au	ppm	0.7 - 1.5
Ag	ppm	50 - 80

Copper concentrate is a complex material containing elevated levels of some penalty elements, including mercury, antimony, arsenic, and bismuth. These elements will limit the quantities of concentrates that can be taken by certain smelters and, therefore, by the off-takers. Historically, concentrates from the mine have been delivered to the Atlantic Copper smelter in Huelva and, to a lower extent, to other smelters within Europe.

Concentrates produced from 2016 to 2022 were mainly delivered to Chinese smelters. Table 19-2 summarizes copper production in concentrates and realized copper price for the same period. Project economics are detailed in section 21 of this report.

Table 19-2: Copper production and market price

		2016	2017	2018	2019	2020	2021
Copper concentrate	tonnes	122,468	165,965	180,661	195,072	256,001	270,713
Contained Copper	tonnes	26,179	37,164	42,114	44,950	55,890	56,097
Market Copper Price	$/lb	2.21	2.80	2.93	2.72	2.80	4.23

20. ENVIRONMENTAL STUDIES, PERMITTING, SOCIAL AND COMMUNITY IMPACTS

20.1 Permitting

Mining and mineral processing activities have been conducted at Riotinto for many years. Reclamation has only taken place in some parts of Corta Atalaya Waste dumps, and more recently in the eastern section of Cerro Colorado South Waste dump.

The main permits for Riotinto are:

- **AAU (Autorización Ambiental Unificada or Unified Environmental Authorization):** Is an instrument of integrated environmental prevention and control created by the Andalucia autonomous region in 2007. It regulates mining activities and auxiliary facilities associated with mining at an environmental level. The permit was obtained in 2014 and was validated in May 2020. The AAU has undergone several modifications, both non-substantial and substantial. A second substantial modification is currently in progress due to the update to the mining project or "PRT" (Proyecto Rio Tinto), this update includes the construction project to raise both tailings' facilities to the 417 masl.
- **The Mining Project/Permit (PRT–Proyecto Rio Tinto) and Final Restoration Plan (FRP):** After receiving the approved Unified Environmental Authorization ("AAU") for the Riotinto Copper Project and the transfer of the Riotinto mining rights in April 2014, Mining Permit and Restoration Plan approval was granted in January 2015 and validated in May 2020. In July 2020 Atalaya submitted to the competent authority the update of the PRT which includes the construction project to raise the tailings facilities to the 417 masl. The project is under review by the competent authority; final approval of the project has not been granted to date. The Final Restoration Plan (FRT) is an integral part of the PRT, the submitted modification of the PRT includes an update of the FRP (CRS, 2018).
- **Water Concession:** Riotinto has been granted a public water concession for 4.93 hm^3/year, of which 2.5 hm^3/year is sourced from the Odiel, Campofrío, and Aguas Limpias reservoirs, and 2.43 hm^3/year is sourced from rainwater. Similarly, the PRT has obtained a new temporary permit for an additional water supply. Atalaya will request authorization for the modification of the water concession to include this temporary supply in order to consolidate the freshwater resource.

Other permits include:

- The re-alignment of the National Road A-461 outside the mining areas, which is still in progress.
- Construction of a 50MW solar farm. Atalaya received approval for the construction of the solar farm in March 2022.
- The Integrated environmental authorization procedure (Autorización Ambiental Integrada, AAI)[25] for the E-LIX™ plant has been initiated with the regional authority; the estimated date for approval is approximately July 2023.

[25] Both AAU and AAI regulate the implementation and development of polluting activities and are granted by the regional authority of Andalucia. AAU applies to the extractive industry (metal production and processing) and the AAI to metal production and transformation.

20.2 Environmental & Cultural Approvals

Prior to the start of mining, processing, and waste disposal activities, Atalaya has received the following approvals:

- The Autorización Ambiental Unificada (AAU) or Unified Environmental Authorization
- Cultural approvals

20.3 Autorización Ambiental Unificada (AAU)

The AAU is the main environmental process/approval that was completed prior to the start of the refurbishment, mining, processing, and waste deposition activities. The AAU was approved by the Consejería de Agricultura, Ganadería, Pesca y Desarrollo sostenible of the Junta de Andalucía[26].

The AAU regulates mining activities and auxiliary facilities associated with mining and environmental compliance. The AAU was obtained in 2014 and validated in May 2020. The AAU has undergone several modifications, both non-substantial and substantial. A second substantial modification is currently in progress as a result of the update to the PRT. The updated AAU should be approved in 2022. Once the AAU is approved, the Exploitation Project and the Restoration Plan presented in the Second Substantial Modification will be approved.

Applicable legislation with regards to the AAU is as follows:

- Ley 7/2007, de 9 de julio, de Gestión Integrada de la Calidad Ambiental.
- Decreto 356/2010, de 3 de agosto, por el que se regula la autorización ambiental unificada.

The AAU incorporated all relevant documentation required for a Project of this type into a unified document for submission and regulatory approval. In the case of Riotinto this includes the following:

- An Environmental Impact Study.
- Reports from each of the municipalities affected by Riotinto (Minas de Riotinto, Nerva, and El Campillo) confirming that the Project is compatible with their respective urban plans.
- An application for authorization to produce non-mining hazardous waste oil, tires, etc.
- An application for authorization to discharge to the atmosphere, including proposed measures in order to meet discharge standards.
- A study on the dispersion and prevention of atmospheric contaminants (dust).
- A light contamination/prevention study.
- A noise contamination/prevention study.
- A study of impacts on Natural Spaces and Nature 2000.
- An application for authorization to discharge water to the public domain, including proposed mitigation measures in order to meet discharge standards.
- A study of the impacts on the protected species Erica and evalensis (a type of heath endemic to the area) and bats.

[26] https://www.juntadeandalucia.es/medioambiente/portal/home

- A final restoration plan.
- Management plans and final closure of waste storage facilities at Riotinto, specifically the waste dumps and the Tailings Storage Facilities (TSF).

20.4 The Mining Permit (PRT – Proyecto Rio Tinto) and Final Restoration Plan (FRP)

EMED Mining Public Ltd received the approved Unified Environmental Authorisation (“AAU”) for the Riotinto Copper Project and the transfer of the Riotinto mining rights in April 2014 through its Spanish subsidiary Emed Tartessus S.L.U.

The Mining Permit and Restoration Plan approval was received in January 2015, and construction and refurbishment operations commenced immediately after.

In October 2015, the shareholders approved the name change to Atalaya Mining Plc, and in March 2016 the change of the corporate name to ATALAYA RIOTINTO MINERA S.L.U was endorsed by the Territorial Delegation of Economy, Innovation, and Science in Huelva.

In July 2020 Atalaya submitted to the competent authority the update of the PRT which includes the construction project to raise the tailings facilities to the 417 masl. In November 2021 during the public information procedure, the Territorial Delegation of Huelva sent a favorable proposed resolution on the waste management plan associated with the revision of the FRP in relation to the PRT project update.

The project is under review by the competent authority; final approval of the project has not been granted to date.

The Final Restoration Plan (FRT) is an integral part of the Riotinto Mining Project (PRT). Both the operating and final restoration plans have been developed to make them compatible with each other and to ensure that final restoration can be completed as soon as possible after the cessation of mining, processing, and waste disposal operations.

Since the beginning of its operation in 2015 Atalaya has implemented an FRP, in accordance with applicable legislation, aimed at the following objectives:

- Landscape and environmental integration of the areas created, preserving the values of the mining landscape which is characteristic of the area, and which is culturally protected.
- To guarantee adequate water quality in the restored areas.
- To ensure the safety and long-term stability of the remaining structures.
- To generate an end user of the land that is beneficial to the socio-economic environment of the area where the mining operation is located.

In addition, Proyecto Riotinto’s Restoration Plan envisages the rehabilitation of non-active areas inherited from previous mining activities in the area (mine tailings) and which are not the result of activity by Atalaya Mining.

Any modification of the PRT by Atalaya will prompt an update of the FRP, which will follow the guidelines already approved in the current restoration plan and incorporate new actions within the mine plan.

In any update of the FRP, the resulting surfaces will be remodeled in a manner consistent with the surrounding landscape. This action will provide structural security and will allow the formation of slopes and work platforms on which to carry out environmental restoration work. The plan also provides for the sealing of the created surfaces, which will minimize exposure to the collected material. The sealing of these surfaces may be carried out using slate that can be accessed by updating the mining project.

The restoration project also proposes the use of geomembrane and geotextile as the best available technique for the closure and sealing of the tailings dam, after managing the stored water.

Finally, the installation of an exhaustive monitoring network of the remaining structures to guarantee the water quality for the receiving environment, the value of heritage goods, and new routes for visitors are other actions considered.

In accordance with the relevant legislation, the submitted modification of the PRT includes an update of the FRP (CRS, 2018), which is under review for approval by the competent authority.

One year prior to the completion of mining or tailings deposition activities Atalaya must submit for approval an application for authorization to abandon the mine, waste dumps, TSF, and site infrastructure. Currently, these applications must be made to the "Consejería de Economia, Innovación, Ciencia y Empleo" for approval.

20.4.1 Rehabilitation Areas

The Riotinto Project Boundary encompasses the following areas, as shown in Figure 20-1:

- Areas that will be disturbed as a result of the planned Project that Atalaya is responsible for rehabilitating (for example, the planned waste dumps).
- Areas already disturbed that are required for the planned Project that Atalaya is responsible for rehabilitating (for example, the TSF, plant area, etc.).
- Areas already disturbed not required for the planned Project that Atalaya is responsible for rehabilitating (for example, the Marginal Waste Dump).
- Areas already disturbed not required for the planned Project that Atalaya is not responsible for rehabilitating (for example, the eastern section of the Corta Atalaya Waste Dumps).

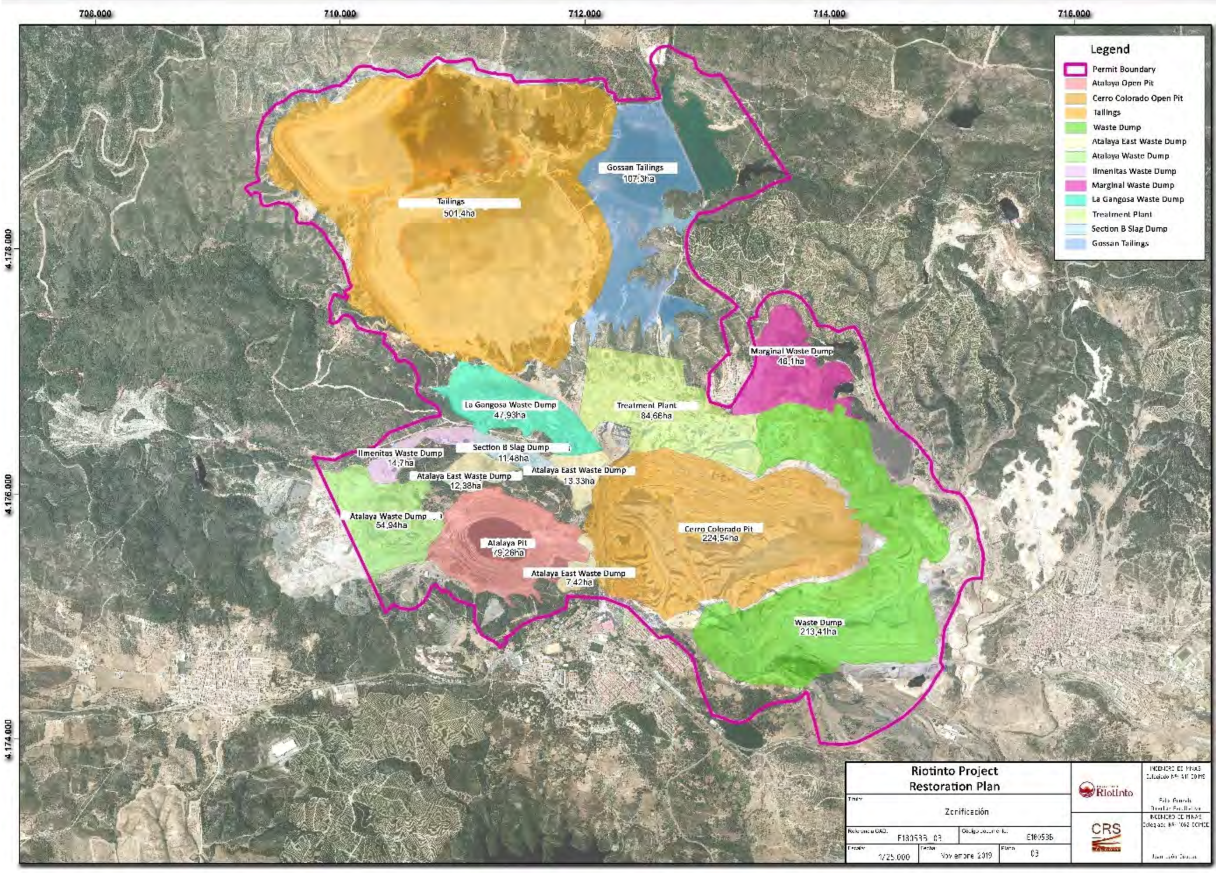


Figure 20-1: Project Restoration Boundary (Atalaya, 2019)

Although Atalaya has not committed to rehabilitating previously disturbed areas outside the project restoration boundary, these have been included in the mine water management system.

Atalaya's FRP covers the following areas:

- Cerro Colorado Open Pit,
- Corta Atalaya Open Pit,
- Cerro Colorado North and South Waste Dumps,
- Vacie Marginal and Filon Sur Waste Dumps,
- Corta Atalaya Waste Dumps,
- Plant site and general infrastructure, and
- The TSF.

The FRP has been developed to ensure the preservation and promotion of cultural heritage and minimize the social impact as a result of mine closure upon the completion of the planned Project. The FRP includes post-closure monitoring and maintenance. It has been completed in accordance with current regulatory requirements and EU BAT for the management and closure of waste disposal facilities (European Commission, 2009).

20.7 Waste Rock Storage Facilities

The waste rock storage facilities (WRSF) are described in detail in Chapter 16. In addition, there is old waste-rock material deposited in several areas inside and outside the Atalaya lease areas. Some are specifically designated waste dumps, while others have been 'temporarily' stockpiled adjacent to the excavations.

Although some waste-rock faces have been listed by Culture and Heritage as protected, they will be covered as part of the final restoration plan to meet environmental requirements. Current sampling and analysis show that drainage from these old dumps is potentially acidic, and that seepage ponds could potentially pose a risk during high rainfall to the Rio Tinto River. In a study to investigate the geochemical stability of the waste dumps, waste-rock grab samples were analyzed to determine which areas of the existing dumps were responsible for acid seepage. Surprisingly, all samples had less than 2% S, and some produced neutral paste pH.

Prospective ex-pit waste rock storage facilities (WRSF) sites are located to the northeast, east, and southeast of the Cerro Colorado open pit. In-pit backfills in the western portion of the ultimate pit will provide supplemental waste storage. Nearly 342 Mt of waste rock, Filón Sur backfill, and low-grade material (below internal cutoff grade) are estimated in the mine production schedule as of December 31, 2020.

Waste rock will be placed in four locations: the main external WRSF around the northeast, east, and southeast sides of the Cerro Colorado pit; an in-pit backfill area that becomes available in 2029; and the TSF construction. A small proportion of waste rock will be dedicated to the solar plant construction between 2021 and 2023.

The dumps are to be constructed using a bottom-up method. An outer berm will contain the first 20-m lift that will be tipped progressively towards the berm. Subsequent lifts will be stepped back for a maximum overall slope of about 27° (2h:1v), and each lift face will be covered with suitable material after final contouring. In this way, each lift can be progressively rehabilitated. The final landform will have whatever topsoil is available to spread to cover the slope to aid revegetation with mixed local species, reduce infiltration, and prevent erosion.

The design required a final cover and progressive revegetation.

Drainage channels are incorporated into the WRSF designs to reduce the amount of water that can infiltrate the dumps and minimize AMD (Acid Mine Drainage). The Atalaya operational and end-of-mine plan for waste dump drainage and toe seepage is for collection and treatment, and wetland remediation to raise water quality above that of the receiving waters, prior to discharge to the Rio Tinto. Studies have looked at the long-term stability of the waste dump facilities and the development of suitable emergency management plans.

Atalaya will rehabilitate the historical waste rock dumps located within the mining permit. The proposed restoration work will largely be composed of re-contouring, covering, and revegetation, which requires a slight modification to the overall restoration design and an increase of the Project footprint.

20.8 Tailings Storage Facility

The Tailings Storage Facility (TSF), as previously described in Chapter 18, consists of three adjacent impoundments referred to as Cobre, Aguzadera, and the Gossan facilities. The Cobre and Gossan facilities were first constructed in the early 1970s to contain 70 Mt of tailings; the Aguzadera facility was constructed in the late 1980s to provide a total of 86 Mt of tailings storage. The Gossan facility, which was previously used to store fine gold tailings, acts as a contact water reservoir where the tailings reclaim water from the Cobre and Aguzadera is treated and pumped back to the plant site.

There are two tailings facilities in operation, Cobre and Aguzadera, with crest elevations of 388 masl and 382 masl. The Cobre facility is nearly filled, and tailings discharge is currently limited to the Aguzadera facility. The Aguzadera facility is currently under construction to raise the embankment to 388 masl and requires the tailings to be at approximately 381 masl before the centerline raise can be constructed on this facility. From this elevation, both the embankments will be raised together with their dividing wall to a final elevation of 417 masl to contain an additional 161 Mt and extending the LoM to 2032. The approval to raise both facilities to 417 masl has not yet been granted.

An operational improvement plan was undertaken by Golder Associates in 2016 which included modifications of the dam construction raise material from cyclone coarse tailings (sands) to rockfill.

The main points of the plan included:

- Improvement in the design of the dam expansion by using a rock fill material composed of mine waste that provides a reinforcement buttress of the existing embankment walls, thus increasing the overall stability of the dam.
- Improvement in water management, through the implementation of measures for efficient transfer between the reservoirs. In addition, a new tailings discharge system with discharge points every 50 m and/or single discharge at approximately 100 m spacing will be installed. This improves water management and maintenance of balance of volumes to maximize the storage capacity in the event of extreme floods. It also ensures a consistent beach formation.

This study concluded that the most appropriate method to increase the capacity of the Cobre and Aguzadera facilities was to raise the existing embankments utilizing the centerline method using rockfill on the downstream side and an HDPE lined above a low-permeability soil, with filters separating the soil from the rockfill.

The facilities are designed as a closed system, with no discharge to the environment. Process water in the Gossan reservoir is treated with lime to reduce the pH and precipitate metals. The facilities are operated without a spillway as there is sufficient flood storage capacity to accommodate storm flows and the external catchment area is limited. A spillway/drainage outlets will be installed at closure. Adjacent to Gossan and separated by a dam supporting a public road, there is a water reservoir (Presa Aguas Limpias) which is exclusively used as make up water for the mine process and show signs of significant contamination. This may have resulted from surface runoff from legacy mine waste dumps upstream of the water reservoir. The overflow for this structure is discharged into the northern diversion channel.

Seepage from the facilities is collected from four downstream sumps at low points in the valley floor and pumped back to the facility. These sumps would also intercept long-term acid rock drainage from material used in the buttress and previous material used in embankment wall construction.

Atalaya submitted the tailings project update to raise the embankment to the 417 masl in July 2020. The authorization process is in progress, approval to raise both facilities to 417 masl has not yet been granted.

20.9 Mine Reclamation Plan

Atalaya will ensure that its approach to mine reclamation complies with the full regulatory requirements that are in force at the time of eventual closure. To this end, Atalaya has:

- Adopted a policy of progressive rehabilitation of non-operational areas of the site in order to reduce both environmental impacts and the costs associated with final closure.
- Regularly reviewed and revised the closure plans in accordance with changes to the regulatory framework and any changes to the LOM operating plan.
- Consulted with the regulatory authorities and other stakeholders on matters relating to the post-mining land-use, conservation of valuable assets, and preservation of the unique landscape of the area.
- Made an appropriate financial commitment to ensure that sufficient funds are available to cover the expected cost of eventual closure and rehabilitation.

The key areas covered by the reclamation plan are the Cerro Colorado and Corta Atalaya open pits, the waste dumps, the Corta Atalaya waste dumps, the TSF, the plant area, and all associated infrastructure.

Atalaya operations will leave the Cerro Colorado open pit in a geotechnically stable condition, and no further measures are required post-closure. The sealed pit will be allowed to become inundated through rainfall and run-off and will also take excess surface water and treated seepage from the tailings dam. Perimeter drains will divert uncontaminated surface runoff, and water balances for the post-closure pit have been modelled.

The waste dumps will be constructed to ensure physical and geochemical stability and minimize the effects of AMD. Progressive rehabilitation and revegetation during mining operations will reduce post-closure requirements.

Operational design and closure plans for the TSF ensure their physical stability and capacity to withstand extreme flood events, prevent the overflow of seepage from site, and include capping and revegetation of surfaces. Storm water diversion channels will prevent clean water from entering the TSF, and the only water entering the tailings dam post-closure will be directly from rainwater. With natural evaporation rates, this will maintain sufficient freeboard on the walls. Rock armoring of the outer dam walls will increase strength and reduce erosion.

Wherever possible, the FRP separates 'fresh' water from contact water, allowing fresh water to discharge off-site while any potential contact run-off will be redirected to the open pit. Seepage from both the TSF and waste dumps will be treated through appropriate systems to increase pH and reduce entrained metals before discharge to the river systems.

Monitoring of the site post-closure will concentrate on the tailing's dams, general site water management, and maintenance. Dust monitoring below the tailings dams will continue until a suitable vegetation cover has been established. The progress of site revegetation will be monitored, and maintenance continued until vegetation has been established. Provisions for this are included in the closure budget.

Except for buildings and structures that have cultural or heritage values, all other buildings, structures, and general infrastructure will be removed and disposed of appropriately. Structures remaining on site will be decontaminated and left in a physically stable condition. The plan also provides for dismantling, removal or preservation of roads, foundations, structures, and fittings as required, as well as industrial waste and rubbish dumps.

Social and labor impacts have only been superficially addressed in the FRP, and work is still required to develop robust post-mining sustainability for the area. Ongoing studies and discussions with local communities are being undertaken throughout the operating life of the mine to investigate various possibilities in preparation for final closure. These include expanding tourism through mining history and archaeology, and diversification to recycling enterprises and agricultural developments.

In Andalucía, there is a strong emphasis on maintaining the perceived historical and cultural aspects of the post-closure landscape, with access to education and tourism. The management of neighboring restored mine sites has been previously undertaken by the Rio Tinto Foundation (RTF), funded by the Government, other mining operations, and tourism income. In compliance with requirements of the Ministry of Culture and Heritage, post-closure land use will primarily be to maintain the areas of mining heritage to develop the tourism potential of the site. The plan provides for the physical and chemical stability of all land surfaces and structures remaining after closure, and for protection of visitors and adjacent communities. Geochemical stability is considered within the contexts of the legacy of past mining operations, the current and required water quality of the receiving environment, and current official regulations. The unique aquatic fauna and flora that have evolved in the low-pH and high-dissolved-metal content of local rivers due to the mining history are now protected by Ministry of Environment legislation.

The Project, with associated environmental management and final restoration plans, will leave the Riotinto Project area in a much better state.

20.10 ESG (Environmental, Social and Governance)

At the end of 2020, Atalaya committed to supporting the Ten Principles of the United Nations Global Compact, referring to Human Rights, Labor Rights, the Environment, and Anti-corruption.

Atalaya is committed to sustainability and to conducting its activities in accordance with the highest Environmental, Social, and Governance standards. The Company approved a specific corporate policy in this area in 2021 (Figure 20-2). This policy was based on a diagnosis developed previously, which made it possible to assess the state of management of the different aspects included in sustainability, as well as some priorities to be undertaken. Among other issues, this policy covers social, environmental, and governance aspects. It also includes commitments to operational safety, occupational health and safety, and commitment to innovation.

Atalaya has developed a specific sustainability strategy to ensure that management of its operations and the proposal of new projects are aligned with the principles of the aforementioned policy. This strategy also aims to ensure that the sustainable exploitation of its projects provides society with essential raw materials required for the achievement of goals established by the main national and international sustainability policies, such as climate change mitigation and energy transition.

Since the approval of this policy the Company has implemented several steps, including the creation of a specific department responsible for implementing the necessary procedures and practices. This department also has the support of a specific body, the Sustainability Committee, composed of management from the operation and departments of HR, safety, environment, communication, and R&D, among others, which are coordinated by the sustainability department. This Committee will ensure compliance with the policy, as well as the priorities that may be established in management.

In April 2022, Atalaya announced the publication of its inaugural Sustainability Report (Atalaya Mining plc, 2022), which has been prepared following the Global Reporting Initiative Standards (GRI).

Atalaya is committed to the application of sound corporate governance as an AIM and TSX-listed company and complies with recognized corporate governance codes such as the QCA Code (Quoted Company Alliance) and the National Policy 58-201 of the Canadian Securities Administrators. Atalaya also has a Risk Management Policy whose objective is to assist the Company in establishing an effective system of both risk control and internal control.

	Policy main axes	Main axes	Sustainable development goals
Good governance	Ensure a sound system of good corporate governance, integrating the achievement of sustainable development goals as a strategy in decision making.	Sustainable Good Governance	8, 10, 16, 17
		Human Rights	
		Code of Conduct	
		Fight against corruption in all its forms	
		Transparency and accountability	
	Implement effective risk and opportunity management strategies and systems for our mining operations.	Legal compliance	
		Risks and Opportunities	
People	Promote quality employment, enabling people's personal and professional development and contributing to inclusive and sustainable economic growth.	People in the organization	5, 8, 10
		Freedom of association and collective bargaining	
		Gender equality	
		Integration of diversity	
		Towards a sustainable corporate culture	
		Talent management	
		Communication channels	
Safe operation	Prioritise safe operation, striving for continuous improvement in the area of people's safety and health with the ultimate goal of zero harm.	Continuous improvement	3, 8, 9, 12
		Training	
		Hazardous materials management	
		Mining waste management	
		Monitoring and communication	
		Emergencies	
Environment and climate change	Respecting the natural environment, maintaining a preventive approach that pursues continuous improvement in the environmental performance of operations, integrating the fight against climate change into the sustainable strategy.	Preventive approach	6, 7, 9, 12, 13, 15
		Biodiversity protection	
		Promotion of Circular Economy	
		Emission to the air: Mitigation, compensation and climate change adaptation	
		Water sustainable management	
		Monitoring and communication	
		Environmental training	
	Proactively participate in the achievement of lasting territorial development, beyond the life of the mine, by promoting the creation of alternative territorial capital.	Restoration and closure	
Society	To contribute to the development of the territories where we operate, participating in the improvement of the living conditions of our environment from a perspective of social responsibility.	Local communities	8, 11, 12, 17
		Cultural heritage	
	To transfer our culture of sustainability to our entire value chain.	Suppliers, contractors and supply chain	
		Customers	
		Investors and shareholders	
	Respond with transparency to our stakeholders, through economic, environmental and social performance indicators, with a focus on integrity, comparability and accuracy in the information generated.	Communication	
Innovation and technology	Promote innovation, through research and development of sustainable technologies and circular economy processes, establishing alliances and collaborations with other stakeholders.	Commitment to innovation	8, 12, 17

UN Sustainable development goals:

Figure 20-2: Atalaya Mining's Sustainability Strategy: Main axes and goals (Atalaya, 2022).

20.10.1 Contracting and Training

Atalaya increased the workforce 814% since 2012 with 503 employees in 2021, including contractor employees. A significant proportion of them work on Proyecto Riotinto and, although the majority are men, the Company has a much higher proportion of female employees than the industry average in Spain. The consolidation of a trained and effective workforce capable of sustaining the growth of operations has been a priority for Atalaya since the start of its operations. The contractors include mining and service companies which are all under the management of Atalaya.

The Company has relied heavily on people from Riotinto surrounding areas to create its workforce, demonstrating its commitment to the local community. The objective of preferentially hiring personnel from the area near the Project is to guarantee that local communities benefit from the economic activity. This objective has been developed through a collaboration program between the Company and the seven municipalities in the mining area. Local personnel currently represent 65% of the staff. Technical and specialized personnel do not come from the area, but rather have been selected from within other areas in Spain. However, it is worth noting that nearly 100% of the personnel are Spanish nationals.

Emigration following the previous closure of the Riotinto mines has caused a lack of specialists and qualified labor. This situation has been resolved by re-attracting mining personnel to the area and with internal training. Thus, the most pressing training needs are mainly related to mine safety and machinery operation, as well as specific training in different operational areas.

Collaboration programs have been implemented with various educational institutions to foster internships within the Company. Therefore, programs have been developed with post-secondary centers and the University of Huelva on subjects related to the Project (i.e., Electromechanics, Industrial Engineering, Chemistry, and Mine Engineering).

In 2021 Atalaya created a Diversity Committee composed of members of Human Resources, communications, corporate social responsibility, and sustainability departments, with the mission of promoting projects of a very diverse nature that foster knowledge of social reality, raising awareness in society in general and in business in particular. The Company has also initiated the development of an Equality Plan which seeks to ensure equal opportunities for men and women in the company; this plan will be approved in 2022. The Diversity Committee had already launched the Family Plan, consisting of a program to identify potential needs to achieve maximum vital autonomy for people with disabilities. Atalaya hires staff with special needs above the 2% threshold set by the applicable legislation.

Atalaya has an Annual Training Plan aimed at the entire staff of the Company, which is administered by the Human Resources Department based on proposals by the area managers. The Plan includes legal requirements (i.e., Basic mining safety standards, guidelines for mobile mining machinery, etc.), as well as other staff development needs.

In accordance with the Company's Code of Ethics, Atalaya's salary policy promotes equal opportunities among staff members.

20.10.2 Labor Relations

The Spanish Workers' Statute establishes a law outlining minimum requirements in any sector in Spain. Company-employee relations are governed by a collective bargaining agreement that will be sector-related or internal to the Company. Companies with more than 50 workers shall choose a "Works Council", which is the body that represents all workers before the Company. Although union membership is not mandatory, it is likely most of the workers belong to one. The Spanish mining sector is strongly connected to the unions.

Atalaya is currently governed by a Sector Agreement. A Works Council is in place.

20.10.3 Public Relations

Atalaya Mining promotes the establishment of extensive communication channels, and actively seeks opportunities for dialogue with its stakeholders to ensure its business objectives are in line with societal expectations. The Company aims to be transparent by providing relevant and accurate information on its activities, fostering constructive dialogue, and encouraging continuous improvement.

Since the Project began, the Company has fostered a direct relationship and proactive line of communication with the groups, entities, government authorities, institutions, press, and the general public that are interested in its operations. This is based on an open-door policy with a view to being transparent about its activities.

Members of the organization have also participated in internal, public sector, technical, and general events when there is an opportunity to communicate its values and explain its operations and activities. Moreover, it is a member of different business and social organizations with which it shares goals, and which are used as a platform for its business and communication policies.

Finally, the Company has been effectively using all available channels to communicate new developments and explain its ideas using internal resources (website, social media, newsletters, e-mailing, etc.) as well as the press (press releases, interviews, participation in special editions, press visits, etc.).

To this end, the hope is that this policy continues to be successful in earning a positive reputation for Atalaya Mining as an excellent and trustworthy mine operator that is well integrated within its environment and the local community. This is based on maintaining excellent relations with the media and institutions which lead to public opinion through transparency and proactivity on the one hand; and on the other, the availability of information and opening of direct communication channels with any member of the public through the extensive circulation of communication materials issued.

20.10.4 Health & Safety

From the beginning of the Riotinto Project, Atalaya has been committed to guaranteeing safety and preventing any accident in the mining operation, formalizing a Major Accident Prevention Policy that establishes the principles to reach the highest level of protection and is the basis of the Safety Management System of the company. The provision of specialized training to the workforce is also a key principle in improving safety management.

The Company regularly collaborates within its industry association AMINER[27] and with public administrations to improve safety regulations.

Major improvements in safety of the extension of the tailings dam project will be the installation and improvement of the real-time control systems, as well as the continuous monitoring of deformation and interstitial water pressures (Minerva Project). Atalaya projects to commission a second pre-thickener as a pre-settling tank, which would contribute to diminish water going to the tailings facilities by increasing the solids content from 35% to 50%.

Atalaya has a self-protection plan to foresee possible emergency situations and establish actions, provide adequate responses, and assist the authorities to integrate the approach followed by the Company. The current self-protection plan for PRT was updated in December 2020 by Atalaya's Prevention Service and the Company's Facultative Director and submitted to the authorities (Centre for the prevention of emergencies in the province of Huelva, Fire Service and Riotinto town council).

Atalaya is committed to ensuring the occupational health and safety of the workforce by implementing an Occupational Health and Safety Management System which has been externally certified in accordance with ISO 45001:2018. The system undergoes regular internal and external audits in accordance with the ISO standard under which it is certified. In addition, it also undergoes an audit in accordance with legislation every two years, also by an accredited external body. The Occupational Risk Prevention Plan was established in 2014 and was approved by Company management; it was then disbursed to the entire organizational structure and is known by all workers.

Resources to perform safety activities are organized per Company criteria through its own safety department. The internal safety service is a specific organizational unit that determines the safety activities to be developed and the means to implement them within the entire organization.

For the purposes of determining the necessary capacities and skills to evaluate the risks and perform prevention activities, there are three specialty areas or prevention disciplines within Atalaya's prevention service: workplace safety, industrial hygiene, and applied ergonomics and psycho-sociology. They are implemented by experts with the appropriate skills for the required tasks, with an occupational medicine service also fully operational.

Prevention services offer guidance and support needed based on the types of risk, specifically:

- Design, implementation, and application of a prevention plan that makes it possible to include prevention within the Company;
- Evaluation of the risk factors that may affect the workers' safety and health;
- Activities to determine priorities when adopting prevention measures and monitor their efficiency;
- Employee information and training;
- The provision of first aid (an infirmary and an ambulance are available on site) and emergency plans (coordination with fire-fighting services, police and the emergency 112 hotline), in addition to surveillance of employee health as related to the risks derived from their jobs.

[27] https://www.aminer.es/

The Safety and Health coordinators supervises different activities at the worksite, in particular when they may create risks classified as serious or very serious, or when activities are performed at the worksite that are incompatible with each other due to the implications for workers' health and safety. The aim is also to balance risks that exist at the worksite, which may affect workers at the various companies, and the measures applied for their prevention. In addition, necessary measures are adopted so that only the companies and personnel authorized may access the facilities.

As a Company with a prevention service, external audits and evaluations occur. These audits include a systematic analysis of how the initial and periodic risk assessments are done, and analysis of the results and verifications when there are doubts. The type of prevention activities and their planning fit with the provisions of the general regulations as well as specific risk-related regulations that are applicable, considering the results of assessments. Based on all of the above, the integration of prevention within the Company's general management system in all activities as well as at all hierarchical levels is assessed with the implementation and application of the Occupational Risk Prevention Plan.

Atalaya's priority is to reinforce the safety culture for all employees through continuous training of the workforce in these aspects, and the implementation of a safety leadership program. The program consists of 26 groups with a total of 103 technicians from all areas and departments, who once a month carry out various preventive activities: audits, observations, inspections, and "stop and talk", among others.

In addition to fighting against COVID-19 spread in its own facilities, Atalaya has supported the efforts of public administrations to expand vaccination against the virus. The Company has joined the "Sumamos Plan" of the Andalusian Regional Government for the vaccination of its own workers and contractors.

20.10.5 Environmental Management System

Atalaya is committed to conducting its mining operation on a sustainable basis, with maximum prevention of any negative environmental, social, or cultural impact, which is reflected in the Environmental Policy approved for the Riotinto Project. The principles of this Policy include compliance with applicable environmental legislation and regulations, as well as other environmental commitments to which the Company subscribes. The policy was updated in 2021 to include a commitment to fight climate change and integrate resilience and adaptation as part of continuous improvement.

The Environmental Management System (EMS) is certified to the ISO 14001 standard. The certification of the EMS was completed in June 2020 and will be re-certified in 2022. Both internal and external audits are conducted every year.

The EMS is based on the Environmental Monitoring Plan (EMP) approved by the regulatory authorities. The aim of the EMP is to guarantee compliance with the preventive and corrective actions proposed in the Unified Environmental Authorization (AAU), as well as the applicable legislation.

The Plan establishes the frequent execution of environmental controls, as well as the submission of reports to the regulatory administration, and contains the environmental data and records of potential historical incidents, which allows feasible traceability of Riotinto.

Likewise, environmental performance monitoring is required. Riotinto has a series of specific criteria that cover all the project's environmental impacts. In total there are 20 criteria corresponding to environmental control points, such as emissions, air quality, noise, receiving environment, groundwater, and surface waters from the historical activity prior to Atalaya. For each of these, a reference value and a monitoring frequency are established. In addition, there is a program of inspection, control, and monitoring points where operations are verified with the indicated frequency, aimed at controlling consumption, waste, and emissions.

The project has an independent environmental technician on-site to guarantee compliance with these environmental conditions, including inspecting and controlling all aspects of the EMP.

20.10.6 Environmental Monitoring

Atalaya has developed a comprehensive monitoring program involving a combination of routine visual observations, physical inspections, sampling and analyses of air and water quality, and measurements of noise and vibration. The environmental staff has the responsibility for providing continual observation and compliance with environmental regulations.

The entire mine workforce has a shared responsibility for environmental compliance and undergoes environmental training. A regular sampling program has been in place since 2008 to assess baseline conditions and monitor seepage from the tailings dam and existing waste dumps. The monitoring program will continually be updated to comply with any regulatory requirements and address operational changes.

20.10.7 Energy Transition and Climate Change

Energy consumption represents an important part of the Riotinto Project's carbon footprint. Atalaya has adopted actions to reduce energy consumption and greenhouse emissions:

- Installation of new flotation cells and replacement of old equipment.
- Construction of a solar power plant for self-consumption.
- Development of a plan to reduce its carbon footprint by 15% in the period 2021-2025.

20.10.8 Ecology

Fauna, flora, and habitat studies listed species occurring in the area but recognized that it was impossible to determine what the original ecosystem was like, having been impacted by mining and human activity for millennia. It is also acknowledged that the area is naturally acidic due to the underlying geology and mineralogy, and that the local ecosystem has evolved to suit the conditions that have been amplified by mining activities.

These studies identified regional protected ecosystems and species, developed management plans, and summarized general conservation and rehabilitation procedures for the site. Issues of feral and introduced species were also addressed, with eucalyptus, Scandinavian pine, and feral cats being the focus of study. Eucalyptus grows very well and rapidly in the area and is an easy and often effective revegetation species for erosion control and visual, noise, and dust screening. But it often out-competes indigenous trees and shrubs. Similarly, aggressive, and robust grass naturally colonizes inhospitable locations on the site, including the surface of mine tailings and on waste rock material, out-competing local species, and potentially restricting diversity.

20.10.9 Air, Noise, and Vibration

Areas and activities of noise generation have been identified and are monitored, and noise reduction methods have been implemented. Blasting, milling operations, and haulage have a strict timing schedule to reduce the impact on residential neighbors. Areas of dust generation have also been identified and optimum monitoring locations and suppressant methods adopted in the relevant EMPs. These include strictly enforced speed limits for all unpaved haul and access roads, dust collars, spraying, and tree screen planting for suppression management.

Blast vibration monitoring is included in the EMP, and timing and operational practices are employed to reduce the impacts on close communities and residents. Monitoring and mitigation of blasting impacts have been incorporated into the mine operations contracts.

20.10.10 Circular Economy

The generation of waste and its correct management is one of the most significant aspects of project mining activity; mining waste constitutes a significant part of the mine's impact, mainly due to the volumes generated. The management policy for Proyecto Riotinto follows the "3Rs" rule (i.e., Reduce, Reuse, and Recycle) and includes a waste minimization plan that is reviewed annually.

Waste rock is used in the restoration and reinforcement of tailings dams. Non-mining waste is temporarily stored in a designated waste storage park until its collection by an authorized contractor. In 2021 Atalaya built a non-hazardous waste park to help segregate waste and provided specific training in waste management to the Riotinto Project staff.

The Atalaya Environmental Management system incorporates procedures and facilities for collecting, segregating, handling, and disposing of or recycling all industrial and domestic waste materials. The system includes non-hazardous waste such as paper, glass, aluminum, timber, and other construction materials. Specific bermed areas have been designated for storage of recyclables. Procedures are also in place for tires, scrap metal, and electrical equipment. There are also procedures for hazardous materials such as oils and grease, laboratory reagents, and solvents, and all are covered by the appropriate EMP.

20.10.11 Water Distribution System

The water distribution system was previously discussed in Chapter 18. The Project site is bounded to the east by the Rio Tinto River, which has been impacted by the long history of mining in the area, and the Rio Odiel to the west, where water quality is better. Water demand will largely be supplied from within the mine site recirculation system, which will be supplemented with fresh water from the Campofrio and Odiel reservoirs, and the nearby Aguas Limpias water dam for potential shortfalls of water during the summer. The site has a positive water balance, but various civil works will allow rainwater run-off to be diverted and increase storage on the site.

All water systems are regulated by both regional and federal governmental agencies. The operational plans maximize water recycling throughout the mine site, returning all decanted tailings water and accumulated catchment rainwater to the processing plant. Fresh surface water that has not contacted exposed mine workings or waste material is diverted away from the site to one of the river systems. A perimeter channel surrounding the TSF is designed to collect all fresh surface run-off. Emergency plans have been implemented and tested to divert as much water away from the TSF and other ponds as possible, with adequate pumping and alternative storage capacity, and an emergency discharge policy if the dam walls are threatened.

Atalaya has assumed that waste-dump seepage and in-pit water are to be treated and recycled. The specific mine discharge requirements are defined in the permits, but Atalaya has taken a pragmatic approach to this problem by constructing a water-treatment system, including dams, pumping, and piping infrastructure, and a water treatment plant.

20.10.12 Water Management

Water resource management at Proyecto Riotinto prioritizes the reuse and recirculation of water by relying on supply from an external source only when necessary.

Under normal operating conditions, the project has a closed circuit by conditioning the various mining effluents for use in ore processing. The Company also has a water treatment line which allows mine water to be conditioned for use in mining and industrial applications. As a result, water consumption is reduced, with the percentage of fresh water being around 10-15% of the total.

The estimated total water footprint in 2019 represents a reduction of 21.33% compared with 2016, which is the reference year.

20.10.13 Protection of Cultural Heritage

Atalaya's Environmental Policy also aims to prevent any negative cultural impact, and among its compromises is to protect, conserve, and enhance the value of the historical heritage present as an essential part of the Company's commitment to society.

There is a historical and archaeological value in the area, with important examples of industrial and Victorian infrastructure, and evidence of medieval occupation going back through Roman, Carthaginian, and Phoenician times. Atalaya recognizes this responsibility and duty of care while operating at Riotinto.

Any activity on site must be approved by the Department of Culture and Heritage. The Department holds a pragmatic view of the mine operation, understanding the balance between the sometimes-conflicting heritage and environmental and operational requirements, and have raised no significant issues. General requirements for the preservation of cultural heritage in the area have been set out, and include:

- Restriction of re-vegetation of the old waste dumps to preserve certain historic vistas;
- Prior inspection and documentation of heritage items and authorization by the Department before any extension of the open-pit and waste dumps;
- Preservation of the Roman ruins outside the planned mining area and next to the pit;
- Reassembly of the dismantled "Pozo Alfredo" headframe.
- Building a large-scale model of the disused gold processing plant; and
- Consolidation and enhancement of various cultural elements within the mining perimeter, creation of tourist routes, and construction of an interpretation center for visitors.

Any activities affecting items listed in the Heritage Register require detailed documentation and prior authorization of the Department of Culture and Heritage.

Atalaya has developed a Global Project for the Management of the Historical and Archaeological Heritage of the Riotinto project, authorized by the Competent Administration, which establishes a series of actions for the management of the affected historical heritage including:

- Earthworks control to verify the existence of archaeological remains, and to enable their documentation and the collection of movable goods. The Director of the Riotinto Mining Museum undertakes the tasks of valuation and protection of any action involving earthworks, with the consensus of the Archaeological Inspection of the Territorial Delegation.
- Archaeological monitoring of all the elements that form part of the Riotinto Project and are protected as part of the Asset of Cultural Interest, documenting its transformation because of the development of the mining project.
- Archaeological excavations to discover and investigate all kinds of historical or paleontological remains, as well as geomorphological elements related to them. In all cases, the presentation of an intervention project authorized by the competent administration is required.
- Documentary and graphic studies of archaeological sites and of the materials deposited in museums or other institutions or centers.

21. CAPITAL AND OPERATING COSTS

The capital and operating costs given in the following tables were extracted from the financial analysis prepared by Atalaya. Costs are Euro-based, and copper prices have been converted to U.S. dollars per pound at an average life-of-mine (LOM) exchange rate of €1:US$1.15. Quantities and values are presented in both metric and U.S. customary units unless otherwise specified. No escalation has been applied to capital or operating costs. All costs are before inflation.

21.1 Assumptions

The economic parameters for pit design are shown previously in Chapter 15. These parameters are based upon current market conditions, vendor quotes, design criteria developed by Atalaya personnel, and benchmarks against similar existing projects.

The 3-year moving average method was used to select the assumed €:US$ exchange rate. The 3-year average exchange rate for the period ending December 2021 is 1.15, which compares well with the 5-year average for the period ending December 2021 of 1.155.

The revenue from the sale of copper concentrate containing silver credits is based on an average LOM copper price of US$3.10 /lb of contained copper (Chapter 15, section 15.2.2). As discussed previously in Chapter 19, Atalaya has committed a significant portion of its concentrate production to three companies through offtake agreements for Life of Mine reserves as reported in the Technical Report on EMED's Rio Tinto Copper Project dated February 2013.

21.2 Life of Mine Production

In 2016 Atalaya completed an expansion from (phase 1) 5.0 MTPA to (phase 1 + expansion) 9.5 MTPA to 15 Mtpa in 2020. The ore reserve discussed in Chapter 15, from the end of December 2020 topography, is estimated at 185.7 Mt averaging 0.38% Cu. Production over the life of mine is summarized in Table 21-1.

Table 21-1: Life of Mine (LOM) Production (total)

Waste	341.8	Mt
Ore	185.7	Mt
Grade Cu	0.38	%
Contained Copper Metal in ore	703	kt
Payable Metal, Cu	606	kt

21.3 Life of Mine Capital Costs

LOM capital costs for the overall capital program, including sustaining and tailings capital costs, are estimated to be US$430M. In addition, the investment pipeline for 2022/2023 includes the construction of a 50MW solar plant exclusively used to provide energy to the mine operations. Total Capital spent to-date (December 2021) by category is shown in Table 1-13.

Table 21-2: Development Capital Expenditure to end of 2021, US Dollars

	Actual Cumulative to Date	Actual Committed to Date	Forecast 2022 and beyond
Sustaining capital	US$26.1M	US$2.9M	US$18.0M
Tailings dams project	US$22.0M	US$3.7M	US$93.2M
Solar Plant	US$0	US$0	US$30.0M
Development capital	US$261.0M	US$0	US$0
Capital Expenditure Total	**US$309.1M**	**US$6.6M**	**US$114.2M**

21.4 Life of Mine Operating Costs

Estimated Life of Mine operating costs are based on the current Riotinto operating budget for 2022. Both fixed and variable costs have been estimated for LOM operating and are summarized in Table 21-3.

Mining costs, inclusive of those capitalized, are equivalent to an average unit cost of 4.81 € per tonne of ore. The average unit processing cost is 5.33 € per tonne of ore. Site Operating Costs average the equivalent of US$2.11/lb of copper sold.

Table 21-3: Estimated Life of Mine Operating Costs based on 2022 Budget (Atalaya, 2022).

Site Operating Costs	€ per tonne of ore
Mining	4.81
Processing	5.33
Maintenance	1.93
Compliance	0.15
General & Administration Services	0.72
Environmental	0.07
Laboratory	0.20
Exploration and Geology	0.05
Total Site Operating Costs	**13.26**

Exchange Rate (€: US$)	*1.15*
Copper Recovery (%)	*86.2*
Average Copper Grade (Cu %)	*0.38*
US$/lb Copper Sold	*2.11*

21.5 Taxes and Royalties

21.5.1 Royalties

There are no payable royalties applied to this project.

21.5.2 Taxes

Regular tax is computed by subtracting all allowable operating expenses, overhead, depreciation, amortization, and depletion from current year revenues to arrive at taxable income. The tax rate is then determined from the published progressive tax schedule. An operating loss may be used to offset taxable income, thereby reducing taxes owed.

As of January 1, 2015, the general rate of company tax in Spain has been reduced from 30% to 28% in 2015, and further reduced to 25% in 2016 currently. Tax losses are allowed to be carried forward; all previous tax losses were carried forward to the 2021 Corporate Income Tax.

Specifically, the mining industry in Spain has certain tax benefits such as the depletion factor. The depletion factor is a tax figure established in Spain with the aim of promoting geological exploration research and mining of non-renewable resources. By means of this tax, companies have the ability to deduct from their tax base an amount that contributes to a fund which subsequently is allocated to new exploration-research works in order to foster mining activity. As a result, the effective tax for the Company becomes approximately 18%.

22. ECONOMIC ANALYSIS

Not applicable for operating mines.

23. ADJACENT PROPERTIES

In addition to the Riotinto permit (PRT), which is a Mining or Exploitation Concession (CE), there are other Exploitation Concessions and Investigation permits near the Riotinto Project area that belong to Atalaya. Together, these mining permits are denominated "Concesiones Agrupadas or Grouped Concessions". The Grouped Concessions were acquired by Atalaya under a contract of sale, transfer of the permit ownership to Atalaya is pending approval of the mining authorities. The Grouped Concessions are listed in Table 23-1, and their location is shown in Figure 23-1 and Figure 23-2.

Table 23-1: Adjacent Properties to the Riotinto Project

Name	Type	Situation
Proyecto Riotinto	CE	Active
Peña del Hierro	CE	Under ownership change
Chaparrita	CE	Under ownership change
Grupo Riotinto	CE	Under ownership change
Corralejos	CE	Under ownership change
Poderosa	CE	Under ownership change
Socavón	PI	Under application

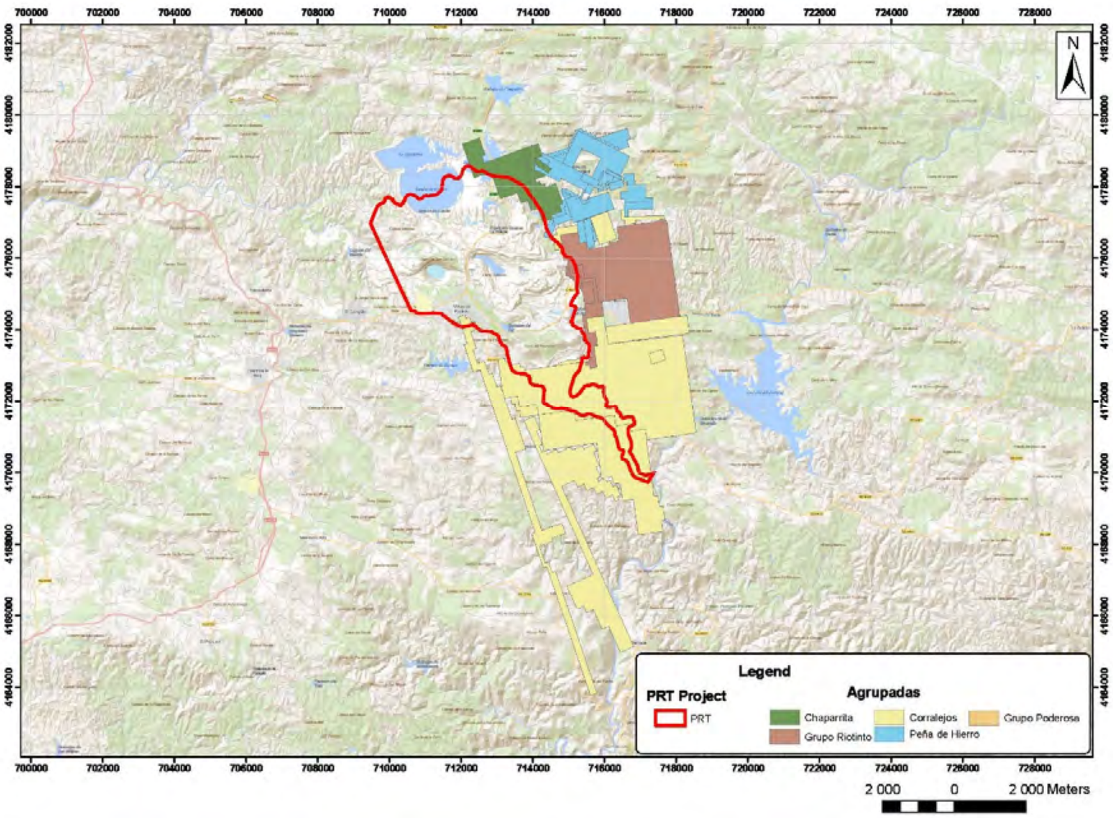


Figure 23-1: Plan map of the Riotinto Exploitation Concession and the location Grouped Concessions (Atalaya, 2022).

In December 2020, Atalaya entered into a Memorandum of Understanding with a local private Spanish company to acquire a 100% interest in three investigation permits (PI) located to the east of the Riotinto Project (Peñas Blancas, Cerro Negro, and Herreros), which are referred to as “Proyecto Riotinto East” (RT East Project, Figure 23-2). An exploration program is planned for the PRT East Project which is currently under preparation.

In October 2020, Atalaya acquired The Masa Valverde polymetallic project. The mining permits in and around this project are listed in Table 23-2. The location of the these mining permits is shown in Figure 23-2.

Table 23-2: Mining permits at the Masa Valverde polymetallic project

Name	Type	Situation
Beas	PI	Granted
Valverde	CE	Granted
Mojarra	PI	Under application

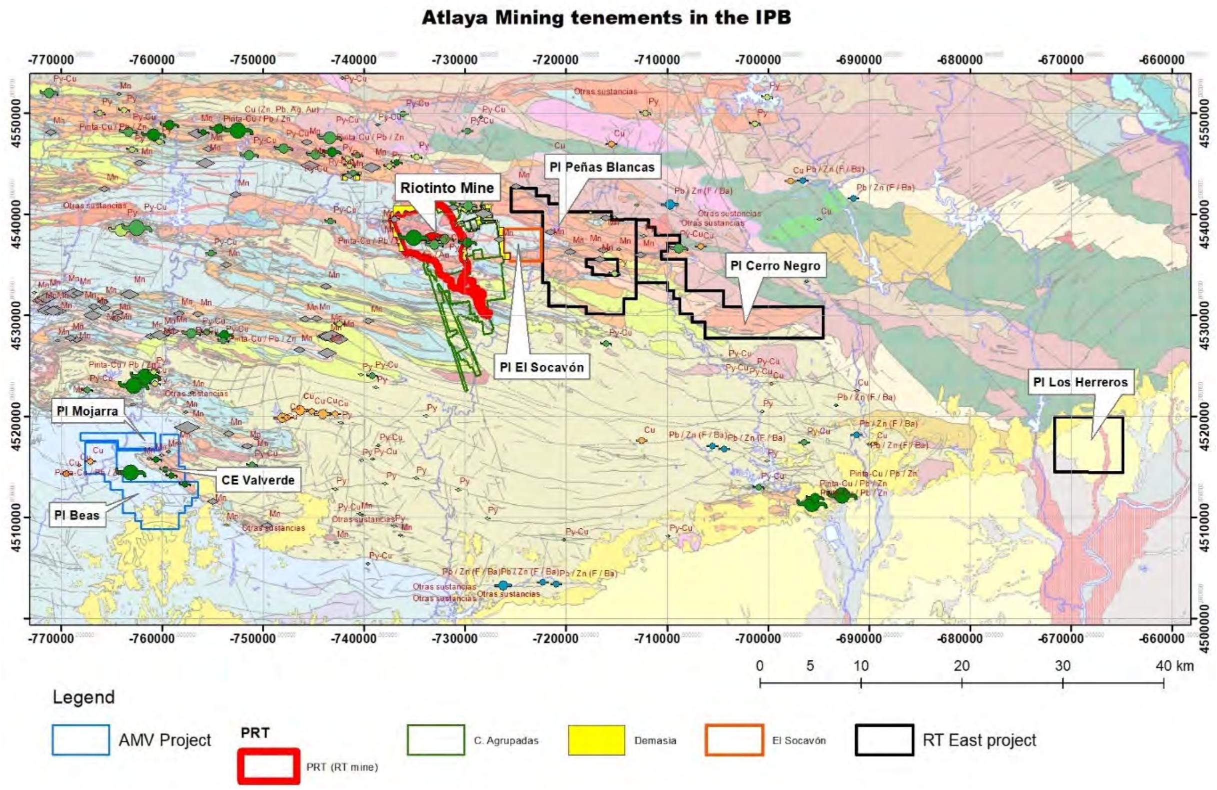


Figure 23-2: Plan map with the location of the adjacent Properties (Atalaya 2022)

There are three major deposits nearby the Atalaya Mining properties. These are Aguas Teñidas, Magdalena, and Concepción, which belongs to MATSA. The location of these properties is shown in Figure 23-3

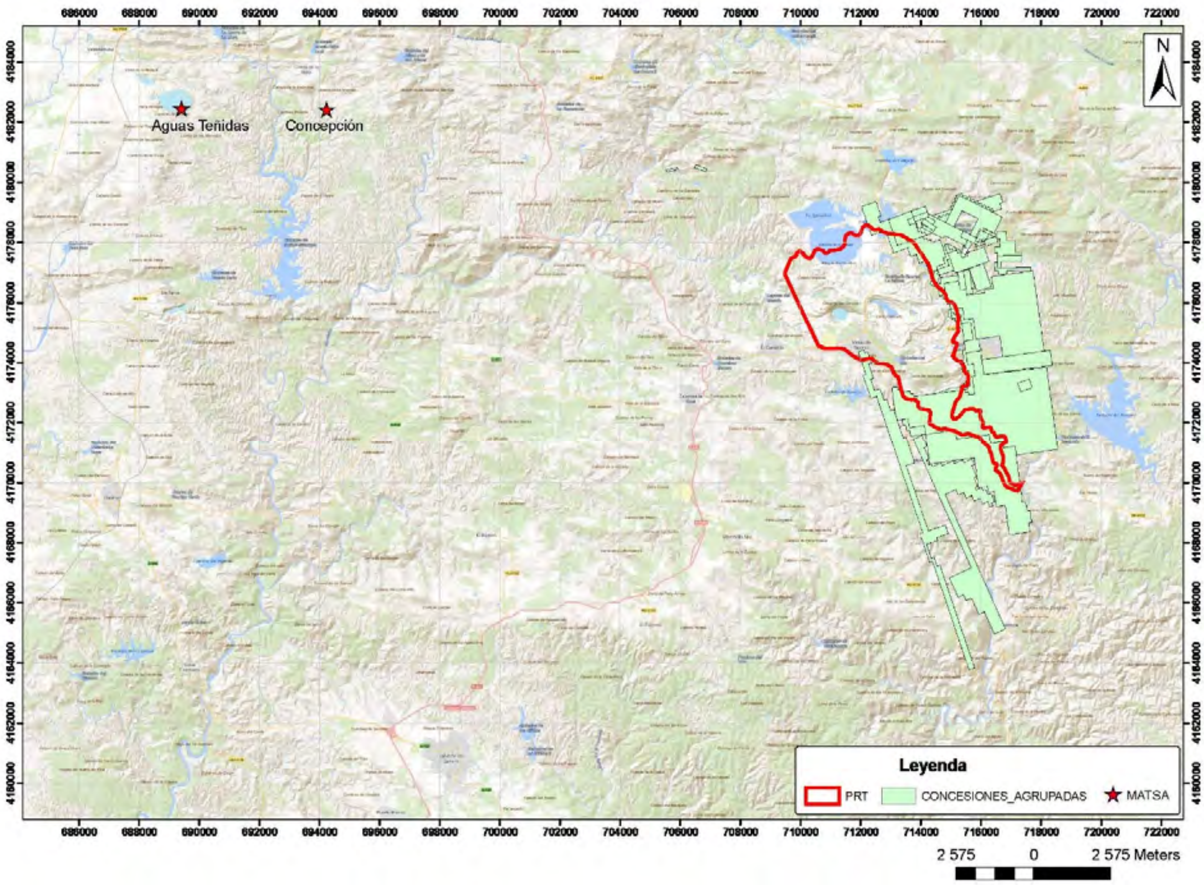


Figure 23-3: Plan map of the location of the MATSA properties (Atalaya, 2022).

24. OTHER RELEVANT DATA AND INFORMATION

Atalaya Mining PLC (AIM:ATYM, TSX:AYM) announced on March 24, 2022 its audited consolidated financial statements for the year ended December 31, 2021, then on May 19, 2022 its unaudited, condensed, interim consolidated financial statements for the three months ended March 31, 2022.

The announcements are available under the Company's profile on SEDAR at www.sedar.com and on the Company's website at www.atalayamining.com.

25. INTERPRETATIONS AND CONCLUSIONS

25.1 Resource Estimation

The three most significant factors for the estimation of the Cerro Colorado resource are high variability of copper grades, highly overlapping zones of low and higher-grade mineralization, and folding of the deposit into a plunging anticlinal shape. The effect of the overlapping grade zones is minimized by assigning grade-zone codes to resource model blocks.

Many years of mining on the Riotinto Project have established that a significant copper resource is present and can be extracted by open-pit mining methods. This conclusion has been confirmed by current mining from 2015 to 2021. Riotinto copper mineralization, however, has high variability, much more like a gold deposit. While the high variability does not preclude estimating the overall resource with a level of accuracy suitable for measured and indicated resource, the mine is likely to experience annual differences in copper grade that are as much as 15% higher or lower than the predicted grade.

25.1.1 Resource Risks and Opportunities

The primary resource risk is that the mine must always be prepared for annual production that is significantly worse or better than planned production. The high variability of copper grade also means that grade control practice must be of the highest quality to minimize dilution and maximize extraction of ore.

25.2 Mining

The exploitation plan for the Riotinto Project utilizes conventional truck and excavator open pit mining methods for the Cerro Colorado deposit. A fixed internal cutoff of 0.16% Cu will be employed to maximize the total cash flow of the mining schedule based on a current ore processing rate of 15 Mtpa. At a Cu price of US$3.10/lb., total proven and probable mineral reserves are estimated at nearly 186 Mt grading 0.38% Cu and containing about 703,000 tonnes of Cu metal. Waste rock, including backfill in old workings, totals about 342 Mt for an average stripping ratio of 1.84. The mine's life is estimated at 12.5 years.

25.2.1 Risks

Typical of many base metal projects, mineral reserves at Cerro Colorado are sensitive to commodity prices and operating costs. A Lerchs-Grossmann (LG) analysis of economic pit limits, see Section 15.5.1, indicates that the differences between the LG Shells at US$3.10 and US$3.50 are not significant.

The mining schedule was developed using a cutoff grade of 0.16% Cu, but the mine is now using a cutoff grade of 0.20% copper. The material between 0.16% Cu and 0.2% Cu is being stockpiled. While the higher cutoff is rational given current prices, there is a high risk that there will be production challenges that could disrupt the delivery of ore to the plant. Rescheduling at the higher cutoff is strongly recommended to identify and alleviate scheduling risks.

National road A-461 presently lies along the western edge of the Cerro Colorado pit and potentially impacts the development of phase 5, initial stripping, which is scheduled for the first quarter of 2024. Atalaya Mining is presently planning to have the road moved to the west of the old Atalaya open pit (located along the southwest wall of the ultimate Cerro Colorado pit); the permitting process for its relocation is still in progress. Failure to relocate the road would likely impact the long-term mine plan. The current mine plan is very tight and would not accommodate changes in scheduling, with the risk of having to reduce the ore processing rate and the non-availability of internal dumping space for waste needed to mine the east portion of the ultimate pit and the Filón Sur area.

The currently permitted WRSFs have a limited storage capacity. New designs have been completed for a large ex-pit WRSF that merges the old, and permitted North and South WRSFs around the northeast, east, and south sides of the Cerro Colorado pit. In-pit backfilling of up to 109 Mt can be accommodated by the pit development plan, but the capacity of the South WRSF will need to be increased to achieve the LOM requirements until the in-pit backfill is available in 2029.

25.2.2 Opportunities

Higher commodity prices could increase mineral reserves through both lower cutoff grades and potentially larger pit limits. Higher prices may also allow mining at higher cutoff and stripping ratios to maximize cash flow.

The E-LIX™ process may provide significantly higher recoveries and profits for polymetallic ores. E-LIX™ is a newly developed electrochemical extraction process developed and patented by Lain Technologies with the financial support of Atalaya. E-LIX™ is a process for the leaching of refractory minerals such as the primary sulfides of copper, lead, zinc, and millerite, in particular chalcopyrite, galena, sphalerite, and millerite.

This makes it possible to treat combined polymetallic concentrates, thus increasing overall recoveries considerably versus traditional selective flotation, where recoveries are severely compromised to produce concentrates with sufficiently high grades for smelting. It, therefore, has the potential for significant added value in the case of polymetallic deposits, even possibly making the difference between a deposit being economically feasible or not.

Completing construction of the solar facility is expected to reduce electrical costs. Atalaya and Endesa, one of Spain's largest power companies, are building a 50 MW photovoltaic plant. The solar farm will be located on a 60-hectare site within the Riotinto mining property and will supply 25% of the mine's energy needs. The facility will off-set approximately 40,000 tonnes of CO_2 emissions, thus reducing the carbon footprint. This will be the first facility in Spain to supply clean energy to a mining operation.

25.3 Tailings Storage Facility

The current tailings expansion project under application can retain approximately 161 Mt, which extends the LoM to year 2032. The design is robust, but is a centerline method of construction and, therefore, the performance of the facilities is dependent on routine inspection, geotechnical monitoring, and investigations. Ore reserves to date indicate that additional tailings capacity will likely be required beyond the year 2032.

25.3.1 Risks

The main risks relate to the performance of the facilities such as:

- not conforming to the design;
- the materials do not meet the design criteria;
- the predictions of embankment wall phreatic levels are higher than anticipated; or
- the construction quality assurance is not achieved and rectified.

Good management during operations, together with ongoing inspection, monitoring, and investigations, will highlight any discrepancies. Issues relating to stability could be readily improved by increasing the size of the downstream rockfill buttress.

Another issue could be the potential of long-term acid rock drainage from rock used in the buttresses and from previous material used in dam wall construction, which is currently collected in the seepage sumps and pumped back to the facility during operations. At closure, this seepage water may require long-term treatment.

25.3.2 Opportunities

To contain additional tailings material, it may be possible to raise the facilities beyond 417 masl subject to investigations, the performance of the existing facilities, detailed design, and approval from the permitting authorities. A 6 m raise on the combined facility would contain approximately 30 Mt of tailings.

Alternatively, depending on the tonnage of tailings to be retained, consideration could be given to a new site. This would take several years from scoping study, land purchase, detailed design, and permitting. The cost, excluding land purchase, would be in the order of several million US dollars to investigate, design, and permit. The cost of construction for a modern lined facility, as a guide, would be of the order of US$1/tonne to US$2/tonne of tailings stored.

Depending on the final location and design of a new facility, there would be the opportunity for this structure to intercept the contaminated seepage emanating from the existing tailings facilities and legacy waste rock dumps and accommodate a passive wetlands treatment system.

26. RECOMMENDATIONS

Atalaya has successfully refurbished and expanded the Riotinto mine, processing plant, and infrastructure, and is presently mining the Cerro Colorado open pit through the UTE Riotinto joint venture.

The recommendations that follow are meant to improve operations and/or the economics of the Riotinto Project and to further develop the resources at San Dionisio and San Antonio.

26.1 Cerro Colorado

- Continue evaluation of possible bias in the blast hole samples used for grade control (US$5,000).
- Review the resource model on an annual basis to evaluate the model performance (US$10,000).
- Update the life-of-mine mining plan to use higher cutoffs and maximize revenues (US$15,000).

26.2 San Dionisio

- Complete a Preliminary Economic Assessment based on two phases:
  - A – Copper ore (low zinc) via open pit and existing plant
  - B – Polymetallic ore via open pit and underground with the addition of Cu/Zn/Pb circuit
- Additional infill drilling at San Dionisio, mainly directed to confirm the presence of mined-out areas. Drilling from the existing tunnel will provide fresh core for metallurgical testing, density measurements, data for new resource modeling, etc. The cost of the drilling program and access underground is estimated to be US$2M.
- Conduct pumping and pit dewatering studies, including the potential recovery of dissolved metals (US$50 000).
- Conduct additional pit geotechnical studies that may include new geotechnical drilling and water level monitoring in the south wall with piezometers and stability of future dumps (US$200 000).
- Further optimization of metallurgy for the polymetallic ore, including the integration with E-LIX^{TM} (US$500 000).
- Complete a new resource model, including the results of additional drilling (US$20 000).
- Evaluate additional expanded tailings storage capacity for San Dionisio, including potential space for San Antonio and others (US$50 000).

26.3 San Antonio

- Initiate a 7000 m core drilling program to confirm historical grades, assess core recovery in relation to grade, provide density data related to assays, provide basic geotechnical data through geotechnical logging of the core, etc. (cost estimated at US$1.5M).
- Update the resource model with results of the additional drilling (US$20 000).
- Conduct a hydrogeologic study on the Planes/San Antonio area including pumping tests and treatment of existing mine water (US$100 000).
- Complete an underground mining Preliminary Economic Assessment (US$100 000).

26.4 Others, General

- Complete construction of the first phase of an industrial-scale plant of E-LIX™ and operate with Riotinto and other concentrates.
- Continue permitting, design, and construction of additional waste rock storage.
- Set up an automatic sampler for the final concentrate and extend a sample exchange program with external laboratories to improve analytical reliability.
- Continue to look for opportunities to improve operating costs. Set up a detailed program to monitor the higher cost/use consumables, such as reagents, mill steel, and energy.
- Formalize a social and community development plan that incorporates both company and community issues. Need to develop a post-mine use plan.
- Continue to instill a culture of safety and safe practices both at work and at home. Make environmental compliance equal to safety and production.
- Although management, monitoring, and control of the tailings facilities at Riotinto comply, as reported by APPLUS Norcontrol, with all legal requirements, compliance with the ICMM Global Industry Standard on Tailings Management (GTS) should be adopted in the future by the Atalaya design and management team.

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28. QUALIFIED PERSONS

The Consultants preparing this Technical Report are specialists in the fields of geology, mineral resource and reserve estimation and classification, environmental engineering, permitting, metallurgical testing, mineral processing design, tailings storage facilities, capital and operating cost estimation, and mineral economics.

None of the Consultants employed in the preparation of this report has any beneficial interest in Atalaya. The results of this Technical Report are not dependent on any prior agreements regarding the conclusions that are reached. There are also no undisclosed agreements concerning any future business between the Consultants and Atalaya.

The following Consultants, by virtue of their education, experience, and professional associations, are considered Qualified Persons (QP) as defined by the NI 43-101 standards and are members in good standing of the appropriate professional institutions.

CERTIFICATE OF QUALIFIED PERSON

Alan C. Noble, P.E.
Ore Reserves Engineering
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I, Alan C. Noble, do hereby certify that:

I am a self-employed Mining Engineer working as Ore Reserves Engineering at 3085 Mill Vista Rd Unit 2209, Highlands Ranch, Colorado 80129 and have carried out this assignment as overall author/reviewer.

1. This certificate applies to the Technical Report titled "Technical Report on the Riotinto Copper Project" (the "Technical Report"), dated September 2022 for Atalaya Mining Plc.
2. I graduated from the Colorado School of Mines in Golden, Colorado with a Bachelor of Science Degree in Mineral Engineering in 1970.
3. I am a Registered Professional Engineer in the State of Colorado, USA, PE26122
4. I have practiced my profession as a mining engineer continuously since 1970, for a total of 52 years. During that time, I worked on mineral resource estimates and mine planning for over 158 mineral deposits.
5. 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, registration as a professional engineer, and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.
6. I am responsible for the overall review of the report and co-authored Chapters 7 through and 15 of the Technical Report. I prepared the mineral resource estimate that is the subject of Chapter 14.
7. I have visited the property from February 19–26, 2016, November 8–10, 2016, May 7–10, 2018, and most recently November 11–14, 2019. I have had prior involvement with the property as an author of the previous Technical Report dated August 2020.
8. I am independent of the issuer, applying all of the tests of Section 1.5 of NI 43-101.
9. I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with the instrument and form.
10. At the effective date of the Technical Report, to the best of my information, knowledge and belief, the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

I consent to the filing of the Technical Report with any Canadian stock exchange and other securities regulatory authority and any publication by them for regulatory purposes of the technical report.

Dated the 16th day of September 2022

"Signed and Sealed, Alan C. Noble, P.E."
Alan C. Noble, P.E. 26122

CERTIFICATE OF QUALIFIED PERSON

Roger White
113, Concorde Park, Concorde Road, Maidenhead,
Berkshire, SL6 4BY, United Kingdom.
Telephone: +44 1628 851855
Email: rwhite@golder.com

I, Roger White, do hereby certify that:

1. This certificate applies to the Technical Report titled "Technical Report on the Riotinto Copper Project", located in Huelva Province, Spain (the "Technical Report"), dated September 2022 for Atalaya Mining Plc.
2. I am a Principal Tailings Engineer with WSP/Golder (UK) Ltd located at 113, Concorde Park, Concorde Road, Maidenhead, Berkshire, SL6 4BY, United Kingdom.
3. I graduated with a BSc degree in Mining Geology from the Royal School of Mines, Imperial College, London University, UK in 1974 and an MSc degree in Engineering Geology from the University of Leeds, UK in 1977, and have practiced the profession of engineering in the mining industry since my graduation. I have been employed with Golder (UK) Ltd since 1984.
4. I am an engineer with over 45 years of experience, of which 40 years have been related to the design, permitting, expert witness, construction, commissioning, operation, monitoring, and decommissioning of tailings management facilities. I am registered as a Chartered Engineer (Registration Number 452865) with the Institute of Materials, Minerals and Mining (Membership Number 49360), a professional society as defined by NI 43-101.
5. I have read the definition of "qualified person" set out in National Instrument 43-101 *Standards of Disclosure for Mineral Projects* ("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 of a "qualified person" for the purposes of NI 43-101.
6. I have completed a site visit to the Rio Tinto Property.
7. I have reviewed the key Technical Reports compiled by Golder, Eptisa, Applus Norcontrol and Knight Piesold, and I am responsible for the preparation of sections in Chapters 1 and 26 and Sections 18.5, 20.8, and 25.3 of the Technical Report relating to the Tailings Storage Facilities.
8. I am independent from Atalaya Mining Plc. pursuant to Section 1.5 of NI 43-101.
9. I have read NI 43-101 and Form 43-101F1, and sections in Chapters 1 and 26 and |Sections 18.5, 20.8 and 25.3 of the Technical Report in relation to the Tailings Storage Facilities have been prepared in compliance with the instrument and form.
10. At the effective date of the Technical Report, to the best of my information, knowledge and belief, sections in Chapters 1 and 26 and Sections 18.5, 20.8 and 25.3 of the Technical Report in relation to the Tailings Storage Facilities, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: 16 09 2022
Signed Date: 16 09 2022

Roger White, ARSM, BSc, MSc, CEng MIMMM

CERTIFICATE OF QUALIFIED PERSON

Jaye T. Pickarts, P.E.
9792 West Unser Avenue
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Telephone: 303 570 3370
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I, Jaye T Pickarts, do hereby certify that:

I am a self-employed Metallurgical and Environmental Engineer, 9792 West Unser Avenue, Littleton, Colorado 80128

1. This certificate applies to the Technical Report titled “Technical Report of the Riotinto Copper Project, located in Huelva Province, Spain (the “Technical Report”), dated September 2022 for Atalaya Mining Plc.
2. I graduated from the Montana College of Mineral Science and Technology, Butte, Montana, with a Bachelor of Science Degree in Mineral Processing Engineering in 1982.
3. I am a Licensed Professional Engineer in the State of Colorado, USA, PE37268, State of Wyoming, USA, PE13891 and the State of Nevada, USA, PE020893. In addition, I am a Registered Member of the Society for Mining, Metallurgy, and Exploration (SME) No. 2543360 and a Qualified Person member of the Mining and Metallurgical Society of America (MMSA).
4. I have practiced my profession continuously since 1982, and have been involved in mineral processing, and metallurgical and environmental engineering for a total of 36 years.
5. 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, registration as a professional engineer, 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.
6. I am responsible for the editing of Chapters 1, 2, 5, 25, and 26 and review of Chapters 13, 17, 18, and 20 of the Technical Report that were prepared by Atalaya staff.
7. I have visited the property in February 2016, November 2016, and May 2018, and most recently in July 2021. I have had prior involvement with the property as a Qualified Person of the previous Technical Reports dated September 2016 and November 2018.
8. I am independent of the issuer as described in Section 1.5 of NI 43-101.
9. I have read NI 43-101 and Form 43-101F1, and Chapters 1, 2, 5, 25, and 26 and review of Chapters 13, 17, 18, and 20 of the Technical Report have been prepared in compliance with the instrument and form.
10. At the effective date of the Technical Report, to the best of my information, knowledge and belief, Chapters 1, 2, 5, 25, and 26 and review of Chapters 13, 17, 18, and 20 of the Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated the 16th day of September 2022

“Signed and Sealed, Jaye T. Pickarts, P.E.
Jaye T. Pickarts, P.E. 37268/13891/020893

CERTIFICATE OF QUALIFIED PERSON

Monica Barrero Bouza, EurGeol.
Consulting Resource Geologist
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I, Monica Barrero Bouza, do hereby certify that:

1. I am a self-employed Geologist working as an independent consulting resource geologist at Rio San Pedro 7, 4ºD, Oviedo, 33001 (Asturias, Spain), and have carried out this assignment as an author/ reviewer.
2. This certificate applies to the Technical Report titled "Technical Report on the Riotinto Copper Project", located in Huelva Province, Spain (the "Technical Report"), dated September 2022 for Atalaya Mining Plc.
3. I graduated from the Department of Geology of the University of Oviedo (Spain) with a Bachelor of Science Degree in Geology in 1996.
4. I am a registered Eurogeologist (EurGeol Membership Number 1328) and a registered member of the Official Association of Professional Geologists of Spain (ICOG Membership Number 7210).
5. I have practiced my profession as a geologist continuously since 1997, for a total of 25 years. My relevant experience includes exploration and mining geology, mineral resource estimation, hydrogeology, rock mechanics, and ground instrumentation. I have been involved in several scoping studies and pre-feasibility studies. I have participated in precious and base metals projects.
6. 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, registration as a Eurogeologist, and past relevant work experience, I fulfill the requirements to be a "Qualified Person" for the purposes of NI 43-101.
7. I am responsible for the site visit, the compilation and verification of the drilling and geological data, and mineral resource estimation, and Chapters 4 through 12, and 14 of the Technical Report.
8. I last visited the property that is the subject of this Technical Report in July 2021.
9. I am independent of the issuer, Atalaya Mining Plc., applying all of the tests of Section 1.5 of NI-43-101.
10. I have read NI 43-101 and Form 43-101F1, and Chapters 4 through 12, and 14 of the Technical Report have been prepared in compliance with the instrument and form.
11. At the effective date of the Technical Report, to the best of my information, knowledge, and belief, Chapters 4 through 12, and 14 of the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated the 16th day of September 2022.

"Signed and Sealed, Monica Barrero Bouza, EurGeol."
Monica Barrero Bouza, EurGeol 1328