Technical Report Update
On the Mineral Resources and Reserves of the Riotinto Copper Project

Located in Huelva Province, Spain

Prepared For

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Glossary of Geological Terms

Albite – The pure sodium-feldspar mineral; can be used as a glaze in ceramics.

Almandine –Mineral of the garnet group, it occurs in medium-grade metamorphic rock and felsic igneous rocks; used as a gemstone and an abrasive.

Amphibole – A group of ferromagnesian silicate minerals that occur as major or minor constituents in a wide variety of rocks. Amphiboles are common minerals in many types of igneous rocks and are important rock-forming minerals in many types of metamorphic rocks. They are particularly abundant in rocks of basaltic composition at most grades of metamorphism. Are divided into four main groups according to the chemistry.

Amphibolite – A class of metamorphic rock with one of the amphibole minerals as the dominant constituent. The features of the original rock are commonly obliterated, thus it is difficult and sometimes impossible to determine the premetamorphic rock.

Amphibolite facies – Metamorphic facies. It's a facies of medium pressure and average to high temperature. It is named after amphiboles that form under such circumstances.

Anticline – It's a type of fold that is convex-up, an arch-like shape and has its oldest beds at its core. The rock layers which form the anticline become progressively older toward the center of the fold

Antiform – is used to describe any fold that is convex up. It is the relative ages of the rock strata that distinguish anticlines from antiforms.

Aureole – A zone surrounding something. A circular or crescentic distribution pattern about the source or origin of a mineral, ore, mineral association, or petrographic feature.

Axial plane – A more or less planar surface that intersects a fold in such a manner that the limbs of the fold are symmetrically arranged with reference to it.

Back-arc basin – Back-arc basins are geologic basins, submarine features associated with island arcs and subduction zones. They are found at some convergent plate boundaries, presently concentrated in the western Pacific Ocean. Back-arc basins are typically very long and narrow.

Basalt – A general term for dark-colored mafic igneous rocks, commonly extrusive but locally intrusive (e.g., as dikes), composed chiefly of calcic plagioclase and clinopyroxene; the fine-grained equivalent of gabbro.

Biotite – Mineral of the mica group; a common rock-forming mineral in crystalline rocks, either as an original crystal in igneous rocks or as a metamorphic product in gneisses and schists; a detrital constituent of sedimentary rocks.

Cataclasis – Rock deformation accomplished by fracture and rotation of mineral grains or aggregates without chemical reconstitution.

Chalcopyrite – Mineral consisting of a sulfide of copper and iron. It is the most important source of copper.

Chlorite – Mineral which is associated with and resemble micas, they may also be considered as clay minerals when very fine grained. Chlorites are widely distributed, esp. in low-grade metamorphic rocks, or as alteration products of ferromagnesian minerals.

Clastic – Consisting of fragments of minerals, rocks, or organic structures that have been moved individually from their places of origin.

Clinozoisite – Mineral of the Epidote Group (calcium aluminum iron sorosilicate mineral).

Cummingtonite – Mineral of the amphibole group.

Fabric – The complete spatial and geometrical configuration of all those components (crystals, particles, cement) that make up a rock. It covers such terms as texture, structure, and preferred orientation.

Feeder zone – Stockwork or stringer zone in VMS deposits.

Felsic – Relating to or denoting a group of light-colored minerals including feldspar, feldspathoids, quartz, and muscovite.

Flysch sequence – It's a sequence of sedimentary rocks that are deposited in a deep marine facies in the foreland basin of a developing orogen. Flysch is typically deposited during an early stage of the orogenesis. It is called a syn-orogenic sediment (deposited contemporaneously with mountain building).

Fold – A geological fold occurs when one or a stack of originally flat and planar surfaces are bent or curved as a result of permanent deformation. Folds in rocks vary in size from microscopic crinkles to mountain-sized folds. Types of folds include intra-foliar, isoclinal, recumbent, open and tight.

Foliation – Refers to repetitive layering in metamorphic rocks. It's any penetrative planar fabric present in metamorphic rocks. It is caused by shearing forces or differential pressure.

Galena – It's the natural mineral form of lead sulfide. It is the most important ore of lead and an important source of silver.

Garnet (Garnet Group) – A group pf silicate minerals.

Garnetite – A metamorphic rock consisting of an aggregate of interlocking garnet grains, composed of more than 75% vol. garnet.

Gedrite – Mineral of the amphibole group.

Gneiss – A metamorphic rock with a banded or foliated structure, typically coarse-grained and consisting mainly of feldspar, quartz, and mica.

Graben – An elongate, relatively depressed crustal unit or block that is bounded by parallel faults on its long sides.

Greeshist facies – Metamorphic facies. It's at medium pressure and temperature. The facies is named for the typical schistose texture of the rocks and green color of the minerals chlorite, epidote, and actinolite.

Greywackes – It's dark coarse-grained sandstone containing more than 15 percent clay.

Halo – see: aureole.

Hinge – The hinge of a fold is where the flanks join together, is the point of minimum radius of curvature (maximum curvature) for a fold.

Hornblende – Mineral of the amphibole group.

Hydrothermal – Relating to or denoting the action of heated water in the earth's crust.

Iberian Massif – It's the core of the Iberian Peninsula consisting of a Hercynian cratonic block. The Variscan or Hercynian orogeny is a geologic mountain-building event caused by a Late Paleozoic continental collision between Euramerica (Laurussia) and Gondwana to form the supercontinent of Pangaea.

Kyanite – Aluminum silicate mineral, used in heat-resistant ceramics. A common rock-forming mineral in schist and gneiss.

Limb – The limbs are the flanks of a fold; the sides of the fold that dip away from the hinge.

Mafic – Relating to, denoting, or containing a group of dark-colored, mainly ferromagnesian minerals such as pyroxene and olivine.

Metabasite – A metamorphosed mafic rock that has lost all traces of its original texture and mineralogy owing to complete recrystallization.

Metagreywacke – A metamorphosed greywacke.

Meta-igneous – A metamorphic rock, the rock was first an igneous rock.

Metamorphic facies – It's a set of metamorphic mineral assemblages that were formed under similar pressure and temperature conditions of metamorphism.

Metamorphism – Process by which the rocks are converted to a new set of minerals with little or no change in bulk composition effected by temperature and pressure.

Metapelite – Metamorphosed mudstones and siltstones.

Metasediment – A type of metamorphic rock, the rock was first formed through the deposition and solidification of sediment.

Metasomatism – Process by which the bulk chemical composition of a rock is changed from some previous state by the introduction of components from an external source. It involves the import and export of chemical components through the agency of a chemically active fluid.

MORB – A mid-ocean ridge basalt. A mid-ocean ridge is a continuous, seismic, median mountain range extending through the North and South Atlantic Oceans, the Indian Ocean, and the South Pacific Ocean. It is a broad, fractured swell with a central rift valley and usually extremely rugged topography. According to the hypothesis of sea-floor spreading, the mid-ocean ridge is the source of new crustal material.

Muscovite – A silver-gray form of mica, a common rock-forming mineral in silicic plutonic rocks, mica schists, gneisses, and commercially in pegmatites; also a hydrothermal and weathering product of feldspar and in detrital sediments.

Mylonitic – Relating to or of the nature of mylonite.

Mylonite – A fine-grained metamorphic rock, typically banded, resulting from the grinding or crushing of other rocks. Produced by the extreme granulation and shearing of rocks that have been pulverized and rolled during overthrusting or intense dynamic metamorphism. Mylonite may also be described as a microbreccia with flow texture

Nappe – A sheetlike, allochthonous rock unit that has moved sideways over neighboring strata as a result of an overthrust or folding on a predominantly horizontal surface.

Nematoblastic –It's a metamorphic texture in which prismatic minerals such as sillimanite or amphiboles are orientated to produce a linear fabric.

Oligoclase – A feldspar mineral common in siliceous igneous rocks, consisting of a sodium-rich plagioclase.

Ophiolite – A group of mafic and ultramafic igneous rocks ranging from spilite and basalt to gabbro and peridotite, including rocks rich in serpentine, chlorite, epidote, and albite derived from them by later metamorphism, believed to have been formed from the submarine eruption of oceanic crustal and upper mantle material.

Paragneiss – A gneiss formed by the metamorphism of a sedimentary rock.

Pelite – A fine-grained sedimentary rock; an aluminous sediment.

Porphyroblast – It is a large mineral crystal in a metamorphic rock which has grown within the finer-grained groundmass.

Pressure/Strain shadows – The area in a metamorphic rock which is protected from deformation by the presence of a relatively rigid porphyroblast.

Prograde metamorphism – Metamorphic change resulting from an increase in temperature or pressure or both.

Protolith – The parent rock from which a given metamorphic rock developed.

Pyrite – Mineral consisting of iron disulfide.

Pyrrhotite – Mineral consisting of iron sulfide.

Retrogressive metamorphism – Metamorphic change resulting from a decrease in temperature or pressure.

Schist – A medium-grained strongly-foliated rock that can be readily split into flakes or slabs due to the well-developed preferred orientation of the majority of the minerals present.

Schistosity – The foliation in schist or other coarse-grained, crystalline rock due to the parallel, planar arrangement of mineral grains of the platy, prismatic, or ellipsoidal types, usually mica.

Shear zone – A tabular zone of rock that has been crushed and brecciated by many parallel fractures due to shear strain. Such an area is often mineralized by ore-forming solutions.

Siliciclastic – Relating to or denoting clastic rocks consisting largely of silica or silicates.

Sill – A tabular sheet of igneous rock intruded between and parallel with the existing strata.

Sphalerite – A mineral consisting of zinc sulfide.

Staurolite – Silicate mineral of aluminum and iron. A common accessory in medium-grade regional metamorphic rocks.

Stockwork – It's a complex 3D network of structurally controlled or randomly oriented veins. They are common in many ore deposit types. They are also referred to as stringer zones.

Subvolcanic – Pertaining to an igneous intrusion, or to the rock of that intrusion, whose depth is intermediate between that of deep plutonic and the surface.

Synsedimentary – That forms within a sediment during sedimentation.

Syn-tectonic – A geologic process or event occurring during any kind of tectonic activity, or of a rock or feature so formed.

Thrust – An overriding movement of one crustal unit over another.

Ultramafic – Igneous rocks that contain more than 90 vol-% mafic minerals.

Variscan Belt (of Europe) – A series of mountain ranges that developed during a span of time extending from 370 million to 290 million years ago (Variscan-Hercynian Orogeny). The Variscan orogenic belt extends in western Europe for more than 3,000 km from Portugal, Ireland, and England in the west through Spain, France, and Germany to the Czech Republic.

VMS – Volcanogenic massive sulfide deposits. They are a type of metal sulfide ore deposit, mainly copper-zinc which are associated with and created by volcanic-associated hydrothermal events in submarine environments. They are predominantly stratiform accumulations of sulfide minerals that precipitate from hydrothermal fluids on or below the seafloor in a wide range of ancient and modern geological settings.

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1 EXECUTIVE SUMMARY

1.1 Project Overview and Introduction

Atalaya Mining Plc. (Atalaya) is a European mining and development company producing copper concentrate from the Riotinto deposit in southern Spain. From an initial 18 months of refurbishment and a subsequent expansion program, followed by commissioning, the mine is operating at the design capacity of 9.5 Mtpa. An updated mineral reserves and resources estimate has been completed based on the mined surface of the open pit as of 31 December 2017.

In 2017, Atalaya completed a study to determine the processing requirements and associated costs to increase the mine process plant throughput from a nominal throughput of 9.5 Mtpa of ROM ore to 15 Mtpa, with a corresponding increase in copper production. In addition, the associated reserves and resources estimate has been updated to support the increase in production.

1.2 Property Description and Location

The property (6°35’W / 37°42’N), is located at the eastern end of the Spanish/Portuguese (Iberian) pyrite belt which extends about 230 km between Sevilla in the east (in southern Spain) and the Atlantic coast near Lisbon to the west (in Portugal). Within the pyrite belt there are eight major mining areas, each thought to contain more than 100 million tonnes of ore. These are from east to west: Aznalcollar-Los Frailes, Riotinto, Sotiel-Migollas, Aguas Teñidas-La Zarza, Tharsis, Masa Valverde, Neves Corvo and Aljustrel. There are also many other smaller deposits. The Riotinto Copper Project is the largest of these. Figure 1.1 below is a map of mines in the Iberian Pyrite Belt.

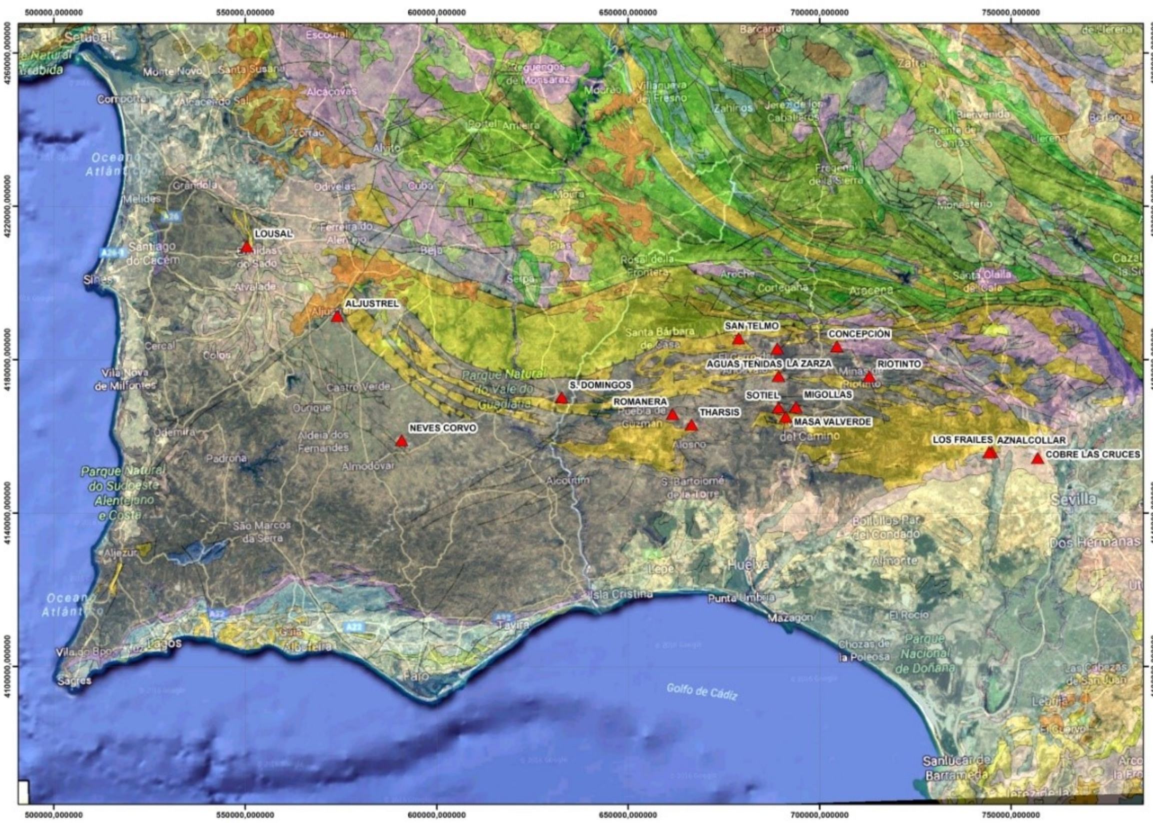


Figure 1.1 - Mines in the Iberian Pyrite Belt (Atalaya 2016 from Google)

In Spain, there are typically three different types of mining permits and concessions:

- Exploration permits (Art. 40.2 Mining Law) granted for a period of 1 year, may be extended for a maximum of one more year.
- Investigation (or Research) permits (Art. 45 Mining Law) granted for the period requested, which may not be more than 3 years and may be extended for an additional 3 years.
- Exploitation (or Operating) concessions (Art. 62 Mining Law) also referred to as a Mining Permit, granted for a 30-year period, and may be extended for equal periods up to a maximum of 90 years.

1.3 Riotinto Copper Project Area

The Riotinto Copper Project was last operated in 2001 and restarted operations in 2015. Within the Riotinto mining district, there are five main orebodies: San Dionisio, Filon Sur, Planes-San Antonio, Filon Norte, and Cerro Colorado. 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 has reduced this to about 250 Mt.

In May 2007, EMED-M was granted an option to acquire 51% of the Riotinto Copper Project assets located adjacent to the town of Minas de Riotinto, 65 km northwest of Sevilla in Andalucía, Spain. In 2001, the mine had been placed by the previous owners on a care-and-maintenance basis, due to the then-prevailing low copper price of less than $1.00/lb.

The main assets included the mineral rights within the main tenements covering an area of 20 km^2. EMED-M established its 51% owned subsidiary company EMED-T to hold these assets. In October 2008, EMED-M acquired the remaining 49% of EMED-T from Mantesur Andevalo S.L. (MSA). In October 2015, the shareholders approved the name change to Atalaya Mining Plc.

The Riotinto Copper Project includes the Cerro Colorado copper-pyrite deposit and open-pit mining area, certain satellite deposits, the waste dumps, parts of the tailings and water facilities, the beneficiation plant and offices and other maintenance and general infrastructure. The Riotinto Copper Project area covers approximately 2,224 hectares as shown in Figure 1.2.

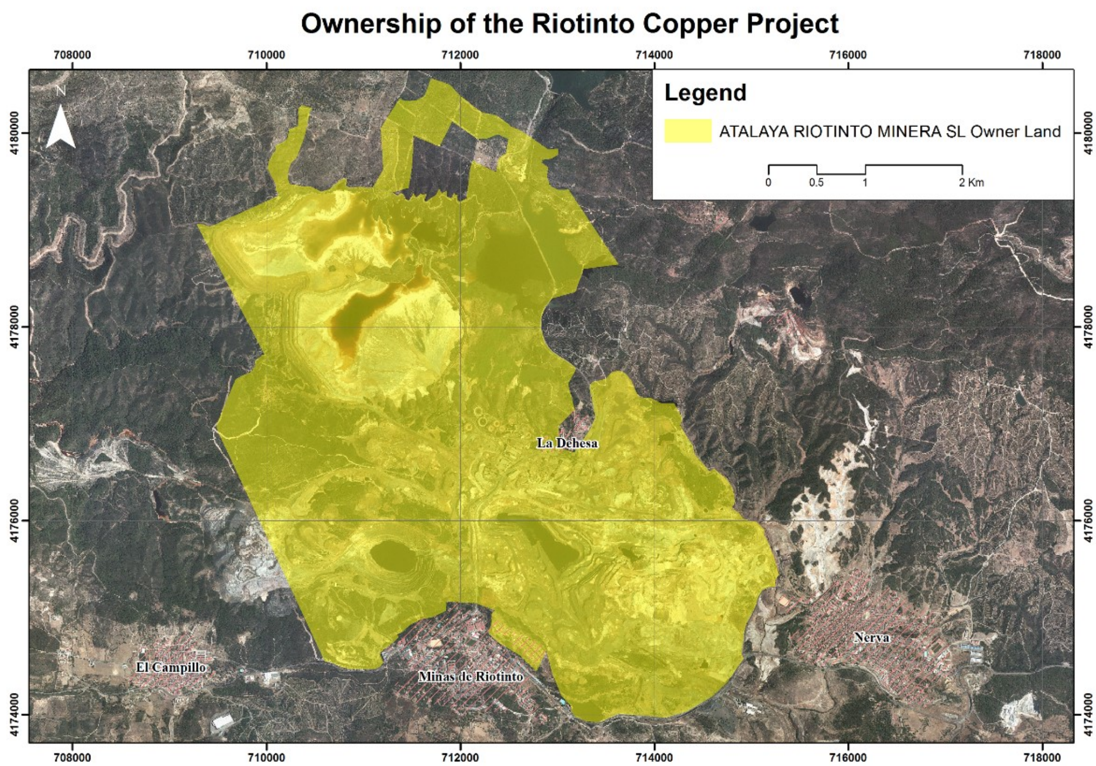


Figure 1.2 – Location and Ownership of the Riotinto Copper Project (Atalaya, 2016)

1.4 History

Historic workings date back to at least 1,000 BC and have been operated by Phoenicians, Romans, British (Riotinto Company and RTZ), Americans (Freeport-McMoRan) and finally, in the 1990s by the Spanish workers' co-operative Minas de Riotinto (MRT). Since Roman times, more than 140 Mt of copper and silver ore has been mined from several open-pit and underground mines. Before the arrival of the British miners in 1873, mining activity mainly consisted of underground mining in the Filón Sur area.

Underground mining in the Filón Norte zone commenced in 1880 but was abandoned in 1894. From 1900 work focused on the open-pit mining of the Salomón, Lago and Dehesa (Filón Norte) zones. In 1940 open-stoping commenced in the Quebrantahuesos zone and continued until 1970. Mining then switched to the low-grade sulfide stockwork ores of Cerro Colorado and production of gold and silver from the superficial gossan (oxide) cap.

Between 1875 and 1976 a total of 128 Mt was mined from the massive sulfide ores. The copper concentrate was transported (70 km by rail) to the Huelva smelter. In 1977, Riotinto Patiño sold its shareholding in the mine to Spanish and English groups and Riotinto Minera SA (RTM) was founded. The Cerro Colorado workings were then expanded and the Alfredo shaft was modernized. A new processing plant was built in 1969 and extended in 1982-1985 by the then operating Company Riotinto Minera SA.

In 2004, the mineral rights and properties were acquired by Mantenimiento en General del Sur, Mantesur Andevalo SL (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 on care and maintenance. With no grid electric power available after 2004, 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, the Australian companies, Oxiana Limited and Minotaur Exploration, entered into 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-M in which Oxiana is a founding shareholder.

1.5 Geology and Reserves

The Riotinto massive sulfide deposits occur in the Spanish side of 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 originated from the fragmentation of a Late Proterozoic mega-continent (Murphy and Nance, 1991) in a series of plates: the SPZ, the OMZ, and the ensemble of the CIZ, West Asturian–Leonese (WALZ) and Cantabrian (CZ) zones (Fig. 1.3).

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

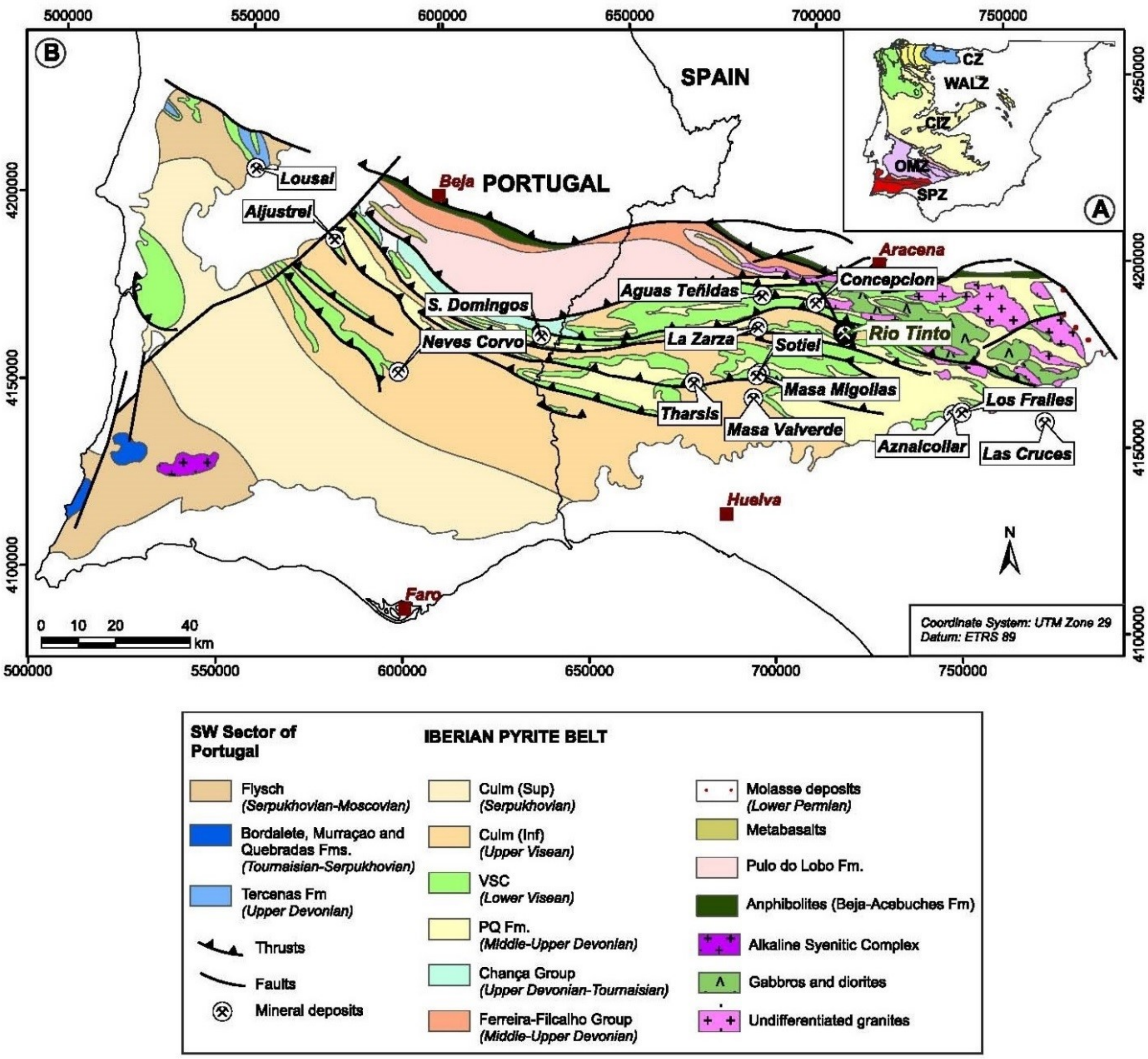


Figure 1.3 – Map of Regional Geology (IGME 2013)

The VSC is formed by dacitic–rhyolitic dome complexes, basaltic lava flows, mafic sills, and 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 (1971).

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

The IPB contains over 100 massive sulfide and stock-work VMS deposits. Over 10 giant (world-class) VMS deposits, each with more than 50 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 (e.g., Solomon et al., 2002; Tornos, 2006; Gumiel et al., 2010a). 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 types (Williams, 1934; Barriga, 1990; Boulter, 1993; Adamides, 2013).

1.6 Deposit Types

According to the genetic, rock association and geodynamic setting, the Riotinto volcanic-hosted pyrite-chalcopyrite mineralization is classified as felsic siliciclastic of Kuroko type. It occurred as lenses of polymetallic massive sulfide that took place at the sea floor in a submarine volcanic environment during the earlier Carboniferous, some 350 Ma.

As most significant VMS mining districts, the IPB is defined by deposit clusters formed within ocean rifts with volcanic centers. The clustering is attributed to a common heat source that caused large-scale sub-seafloor fluid convection systems.

1.7 Drilling and Exploration

Since 2014, Atalaya has completed exploration and resource and development drilling programs in the Riotinto mining area. Exploration has been carried out in two programs:

i. **Resource and development drilling**. Expansion drilling into known ore zones to increase mineral resources and reserves.
ii. **New resource exploration**: Exploration around the deposit in areas without known mineral resources.

The resource development drilling on the Riotinto deposit consists of two different periods of drilling:

I. Historical Riotinto drilling, which consists of data compiled from historical drilling conducted over almost hundred years. This data was compiled and validated in 2008 by EMED.

II. Atalaya resource drilling, which started in April 2014 and continues to present. The Atalaya drilling consists of two drilling programs as follows:

i. ***2014-2015. Cerro Colorado drilling***. 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 a Sb and As, that might need special metallurgical treatment.

ii. ***2016-2018. RT-Resource drilling***. RC and Diamond infill drilling in the Cerro Colorado open pit area to convert inferred resources to indicated and measured. The program also includes some deep drilling, up to 800m depth, to explore deep target areas and add new resources. This program started in 2015 and is still ongoing.

In parallel to the resource drilling, an exploration program to find new resources around the deposit commenced in January 2015 and is still in progress. The new exploration is being carried out over the entire Riotinto concession, in areas outside of the mining plan, and mostly in potentially mineralized areas in which no mineral resources are presently defined. The comprehensive program included work as follows:

- Compilation of all historical geological and mineral data.
- Detailed geological mapping of selected zones.
- Compilation of all historical geophysical data.
- Ground geophysical surveys over selected zones: MT and Gravimetric.
- Diamond drilling.

1.8 Mineral Resource

The copper resource was constrained using a Lerchs-Grossmann pit shell that was run using a copper price of $3.20/lb Cu and all resources including inferred resources. All other slope and economic parameters are the same as those used for design of the open pit for reserve estimation. 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 returns to previous levels that were substantially above $3.20/lb. The resource estimate is summarized in Table 1.1 and Table 1.2.

Table 1.1 - Riotinto Project - Resource Summary
Constrained by the $3.20/lb Cu Pit Shell and 31 December 2017 Topography

Resource Class	Cutoff (% Cu)	Tonnes (millions)	Cu IDP (%)	S IDP (%)
Total Measured	0.15	152.1	0.39	4.95
Total Indicated	0.15	106.1	0.40	5.06
Total M+I	0.15	258.2	0.40	5.00
Total Inferred	0.15	18.1	0.50	7.19

Table 1.2 - Riotinto Project - Resource Summary Using Multiple Cutoffs -
Constrained by the $3.20/lb Cu Pit Shell and 31 December 2017 Topography

Cutoff	Measured			Indicated			M+I			Inferred		
Cu %	M tonnes	Cu_IDP	S_IDP	M tonnes	Cu_IDP	S_IDP	M tonnes	Cu_IDP	S_IDP	M tonnes	Cu_IDP	S_IDP
0.15	152.1	0.391	4.95	106.1	0.405	5.06	258.2	0.397	5.00	18.1	0.504	7.19
0.20	122.0	0.445	5.13	88.7	0.450	5.27	210.7	0.447	5.19	15.7	0.552	7.54
0.25	99.2	0.496	5.38	74.2	0.494	5.51	173.4	0.495	5.43	13.8	0.600	7.91
0.30	81.2	0.545	5.60	60.3	0.544	5.76	141.5	0.544	5.67	11.8	0.655	8.29
0.35	65.5	0.597	5.83	47.7	0.603	6.08	113.2	0.600	5.94	10.2	0.705	8.71
0.40	53.0	0.650	6.07	38.3	0.659	6.47	91.3	0.654	6.24	8.7	0.760	9.26
0.45	42.6	0.705	6.29	30.4	0.720	6.98	73.1	0.711	6.58	7.5	0.817	9.96
0.50	33.9	0.765	6.65	24.0	0.787	7.58	57.9	0.774	7.04	6.4	0.878	10.84

1.9 Mineral Reserves & Mining

Continued exploitation of the Cerro Colorado deposit uses 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 blastholes, hydraulic excavators with bucket capacities of 6 to 14 m^3, off-highway trucks with 55- to 91-t payload capacities, and suitably sized support equipment.

Atalaya 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, which handles earth moving, and Insersa, which is responsible for drilling and blasting. Both companies are significant and well-financed contractors in Spain with extensive metal mining experience. Atalaya is responsible for all grade control and mine planning.

The LG price sensitivity analyses provided guidance in the design of four internal mining phases. Phase 1 was derived from the $1.50 Cu pit shell, Phase 2 from the $1.75-2.00 Cu shells along the north wall, and Phases 3 and 4 from the $2.60/lb Cu (base case) shell. The intent is to mine the highest grade and lowest stripping ratio material in the initial phase and progress to the next best material in subsequent pushbacks, subject to working room and access considerations.

Atalaya Mining plans to expand the ore processing plant by about 58% above current throughput rates and supply the ramp-up and long-term mill feed rates that are summarized in Table 1.3.

Table 1.3 - Mill Feed Rates

Year	Mill Feed Mtpa
2018	9.5
2019	11
2020	15

A stripping analysis using a fixed $6.40/t NSR internal cutoff suggests that an average stripping ratio of nearly 1.64 (tonnes of waste per tonne of ore) will be needed through the first quarter of 2029. Thereafter, waste stripping will decline rapidly as Phase 4b is mined out in 2031.

Sinking rates in each mining phase were limited to about 6-7 benches (60-70 m) per year. Pit bottoms generally did not sink more than three benches per year to allow time for sump construction and pit water removal.

Numerous production scheduling trials were conducted to smooth long-term stripping rates while meeting mill feed targets for each year. The final production schedule is presented in Table 1.4 and is consistent with the mineral reserve estimates described in Section 15. Waste tonnages have been broken down by rock and Filon Sur (FS) backfill tonnages.

Table 1.4 - Mine Production Schedule

Year	Mill Feed (2P Mineral Reserves >= $6.40/t NSR)					Waste, ktonnes		Total	Strip
	ktonnes	NSR $/t	Cu%	RCu%	S%	Rock	FS Backfill	ktonnes	Ratio
2018	9,500	17.02	0.42	0.36	3.88	16,347	153	26,000	1.74
2019	11,000	18.25	0.46	0.39	4.63	15,312	2,688	29,000	1.64
2020	15,000	18.86	0.48	0.40	5.98	19,939	4,061	39,000	1.60
2021	15,000	20.68	0.52	0.44	4.45	22,431	1,569	39,000	1.60
2022	15,000	16.97	0.42	0.36	4.82	20,960	3,040	39,000	1.60
2023	15,000	16.12	0.40	0.34	5.62	21,312	2,688	39,000	1.60
2024	15,000	16.84	0.42	0.36	5.23	20,566	3,434	39,000	1.60
2025	15,000	17.51	0.46	0.37	7.88	22,746	1,255	39,000	1.60
2026	15,000	17.81	0.46	0.38	6.38	25,100	0	40,100	1.67
2027	15,000	15.24	0.39	0.32	4.74	25,100	0	40,100	1.67
2028	15,000	14.09	0.35	0.30	3.96	25,100	0	40,100	1.67
2029	15,000	12.62	0.31	0.27	3.24	17,062	0	32,062	1.14
2030	15,000	16.30	0.40	0.35	2.66	7,963	0	22,963	0.53
2031	11,425	15.28	0.37	0.33	1.98	2,659	0	14,084	0.23
Total	**196,925**	**16.67**	**0.42**	**0.35**	**4.75**	**262,597**	**18,887**	**478,409**	**1.43**

Table 1.5 presents the estimates of proven and probable mineral reserves and the combination of both for the Cerro Colorado open pit. All Filon Sur backfill material and all material classified as inferred mineral resources were treated as waste.

Table 1.5 – Cerro Colorado Pit Mineral Reserve Estimate

Classification	Mineral Reserves >= $6.40/t NSR (or 0.136% RCu)					Waste	Total	Strip
	ktonnes	NSR $/t	Cu%	RCu%	S%	ktonnes	ktonnes	Ratio
Proven	127,964	16.32	0.41	0.35	4.67			
Probable	68,961	17.32	0.44	0.37	4.89			
Proven + Probable	196,925	16.67	0.42	0.35	4.75	281,484	478,409	1.43

Total proven and probable mineral reserves are estimated at nearly 197 Mt grading 0.42% Cu. Contained copper is estimated at 822,000 tonnes. Waste rock and backfill are projected at about 281 Mt, resulting in a stripping ratio of 1.43. All the mineral reserves reported in Table 15.7 are contained within the mineral resources reported in Section 14.

The mineral reserve estimates in this report are effective as of 31 December 2017.

1.10 Mineral Processing and Recovery Methods

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

The ore mined from the Cerro Colorado open pit features different mineralogical characteristics depending on whether it is mined from the east (CCE) or the west (CCW) areas. The CCE ore has a higher copper content than the CCW ore, historically 0.63 % and 0.40 %, respectively. Likewise, the ore from CCE has higher sulfur content at 12 %, versus 4 % from CCW basically because of pyrite content. Another difference between the two ore types is that ore from CCE has a higher content of penalty elements such as arsenic and antimony. Historically, the CCE ore recovered less copper than the CCW ore. This fact was confirmed during the phase 1 period of the Project.

The ore from CCE requires a finer primary grind than the ore from CCW to achieve the same metallurgical recovery. Also, the CCE ore requires less energy to obtain the same particle size as the ore from CCW.

Relatively coarse primary and secondary grinding, at a P_{80} of approximately 160 microns, 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 microns in order to increase the concentrate grade.

Both ore types contain silver but ore from CCE has a higher silver content than ore from CCW. The silver content in the concentrates produced during phase 1 of the operation is between 62 and 150 g/t.

From 1995 until 2001 the Riotinto concentrator processed ore with similar characteristics to what is processed today. In that period of time a total of 23.9 Mt of ore at average 0.54% Cu were processed, which generated information that was used to develop the design criteria and start up plan for the current operation. The old concentrator initially processed 4.5 Mtpa of ore and an expansion made the concentrator reach a processing capacity of 7.3 Mtpa in 1997; a peak annual throughput of 9 Mtpa 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 with conventional flotation machines and a mixture of ditiophosphate and thionocarbamate based chemistry at basic pH of over 10.5. The optimum target P_{80} in the flotation feed has been set to 160 microns as a compromise between copper recovery and throughput. Current plant performance indicates an optimum target P_{80} in the flotation feed of 183 microns.

1.10.1 15 Mtpa Expansion

The expansion includes the addition of a 15 Mtpa capacity SAG mill ahead of the existing ball milling circuits and decommissioning of the existing fine ore stockpile and reclaim systems. All the crushed material from both crushing circuits is combined and reports to a new crushed ore stockpile and reclaim system that feeds the new SAG mill.

The SAG mill discharge is fed to a new primary cyclone cluster, with the cyclone overflow reporting directly to the existing flotation conditioning tank. The cyclone underflow reports to the existing primary mill.

The aim of the 15 Mtpa expansion is to utilize only primary crushing with a SAG mill and eliminate the high operating cost of the existing secondary and tertiary crushing circuit. However, the competency of the ore requires a 22 MW SAG mill. Utilizing this partial secondary crushing of the SAG mill feed will reduce the 80 % passing mill feed (F_{80}) from 160 mm to 90 mm, which in turn will reduce the size of the required SAG mill motor to approximately 18.5 MW, enabling the use of a conventional twin-pinion drive as an alternative to gearless drives should economic considerations be favorable.

Pebble crushing of the SAG mill discharge oversize will be required. Two 370 kW units have been selected to meet this duty (Metso HP5 or equivalent) and the 7 ft Symons tertiary cone crushers will be made redundant.

1.11 Infrastructure

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 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.

Process water is supplied from the Gossan Dam from where it is pumped, at a rate of approximately 1,200 m^3/h, into two steel tanks with capacities of 4,000 and 3,675 m^3.

The 9.5 Mtpy phase 2 expansion included the installation of a new DN-800 process water pipe and a new pumping system located at the Gossan Dam. Two new pumps, with a flow rate of 1,500m^3/h each, will pump water to an intermediate storage reservoir that has a capacity of approximately 3,100 m^3, and booster pumping system that pumps water to the process water tanks at a flow rate of 3,000 m^3/h.

The 15 Mtpa phase 3 expansion comprises the installation of a two new DN-800 process water pipes and a new pumping system located at the Cobre Dam. Three new pumps, with a flow rate of 1,500m^3/h each, will pump water to an intermediate storage reservoir (old gold plant thickener) with capacity of approximately 31,000 m^3, and booster pumping system that pumps water to the process water tanks at a flow rate of 3,600 m^3/h.

Fresh water is supplied from the Campofrio Dam by three pumps with a flow rate of 250 m^3/h each, two operating and one standby. Water is delivered through a HDPE DN-355 PN-16 pipe to the fresh water tank, ensuring supply at any stage in production. Fresh water supply from the Odiel reservoir upstream from the Campofrio Dam will soon be incorporated to the system as an additional reserve of fresh water, increasing the reserves by 7.5 hm^3. A new pumping system with a capacity of 240 m^3/h and a distribution line of 6.5 km is under construction.

The plant fresh water storage tank has a capacity of 1,900 m^3 and has been repaired along with all the valves and distribution network associated with this system.

The Tailings Management Facility (TMF) consists of three adjacent impoundments referred to as Cobre, Aguzadera and the Gossan facilities. Cobre and Gossan facilities were first constructed in the early 1970's to contain 70 Mt of tailings and later, the Aguzadera facility was constructed in the late 1980's, to provide a total of 86 Mt of tailings storage.

Currently there are two tailings facilities in operation, the Cobre and the Aguzadera and both facilities have available storage capacity below the original design elevation of 381.8 masl and 374.8 masl respectively. The Gossan facility has been partly rehabilitated and acts as a contact water reservoir where the tailings water from the Cobre and Aguzadera is treated and pumped back to the plant site.

An update has been studied by Golder Associates considering 197 Mt of mineral reserves and the original annual production of tailings increased from the current 9.5 Mtpa to 15 Mtpa (i.e. to 41,000 tpd).

As the storage required is more than the original capacity of the center line impoundment considered at Cobre, and the tailings daily throughput increased by about 67%. One method to accommodate these changes is to increase the area by combining the three existing tailings impoundments. This was considered the first option, rather than changing the current conventional tailings deposition technology (thickened, paste and filter cake) or adopting a new site. In this way, Golder was able to reduce the rate of raising the impoundments from 3 m/year to 2 m/year and also preserving the original dam center line raise height of 30 m in accordance with the updated mineral reserve estimate.

Additional geotechnical characterization of the zone near the north diversion canal (construction of the canal has provided preliminary information) and of the existing dam near the national road will be developed and the plan is to progress to detailed engineering during 2018.

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).

1.12 Market Studies and Contracts

Atalaya has been actively marketing the copper concentrate product to global consumers. Currently, the concentrate production is committed to three companies through offtake agreements that average for life of mine reserves as reported in the Technical Report on EMED´s Rio Tinto Copper Project dated February 2013:

- IXM (Louis Dreyfus Company Metals S. A.) – 49.12%
- Trafigura PTE Limited – 19.34%
- Transamine Trading S. A. – 31.54%

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 and currency exchange rates.

1.13 Environmental Studies, Permitting, and Social or Community Impact

Mining and mineral processing activities have been taking place at Riotinto for many years. Reclamation has only taken place in some parts of the Corta Atalaya Waste dumps, and more recently in the eastern section of the Cerro Colorado Waste dump. As a result of this and the fact that much of the waste material has a high acid generating potential, the Riotinto Project area is an environmentally degraded site with significant environmental legacy issues. The chief legacy issues, as is the case in many mine sites that host potentially high acid generating materials, is related to Acid Mine Drainage (AMD) and the mitigation and control in an environmentally, technically, and financially sustainable manner. Atalaya's environmental policy, environmental management system, and operating and final closure plans have been developed in order to address this, other legacy, and future issues in a sustainable manner.

In June 2008 an international mining environmental consultant conducted an ISO 14001 environmental audit for the overall site (Thirtle, 2008a). This report produced recommendations for the implementation and improvements to infrastructure, procedures and practices to reflect European and World best available practices. Atalaya has been implementing some of the recommendations included in this audit and it is envisaged that all recommendations will be completed. As a result of the audit and the implementation of Atalaya's environmental policy, a set of 17 Environmental Management Plans (EMP's) (Thirtle, EMED Tartessus S.L.U. PRT Feasibility Study Report 2008b) to address known and potential environmental and community issues arising from operating a large mine in the proximity to urban areas have been developed.

These plans, when fully implemented, will reflect global best industry practice and are based on the ISO 14001 system. As part of the Environmental Management System (EMS) these plans will be regularly checked to monitor performance and to ensure that Atalaya's environmental targets and objectives are being met. They will also be regularly reviewed by management to ensure that the objectives of the EMS are being met and to make recommendations for continual improvement of the EMS. Continual improvement of the EMS will address three core dimensions related to the expansion, enrichment and upgrading of the EMS within Atalaya. An independent audit of the EMS was performed in March 2018 with a view to further refine recommendations. The plan is to have the EMS certified under ISO 14001 by 2018 year-end.

Final restoration is an integral part of the Riotinto Project and both the operating and final restoration plans (FRP) have been developed to make them compatible with each other and to ensure that the final restoration can be completed as soon as possible after the cessation of mining, processing and waste disposal operations. The objectives of Atalaya's FRP are to:

- Protect the environment,
- Minimize any long term negative environmental impacts of the Project,
- Guarantee the chemical stability of waters discharging from Riotinto,
- Ensure the physical stability of any soils is maintained,
- Recover any soils that will be disturbed during mining operations and reuse them appropriately,
- Recover the natural vegetation in a manner that is compatible with the surrounding habitat,
- Reduce the contamination to external areas by dust or other emissions,
- Preserve and maintain the mining heritage in the Riotinto area and,
- Minimize social impacts as a result of the mine closure at the end of its life.

In accordance with current applicable legislation, Atalaya has submitted for approval an FRP as part of the Project approvals process. The FRP (Eygema, 2012b) is submitted as part of the AAU to the Consejería de Medio Ambiente y Ordenación del Territorio for review and approval including a period of public consultation. After approval of the AAU, the FRP, with any amendments brought about as a result of the approvals process is submitted along with the final reclamation bonding deposits to the Consejeria de Economia, Innovacion, Ciencia y Empleo for final approval. Again this process includes a period of public consultation.

The 15 Mtpa expansion project will require permitting the various components of the Project according to the Spanish regulatory authority.

The mill expansion is considered a minor modification to the existing permit since it only requires updating the existing equipment with minimal increase in the affected area. The permit to begin mill construction was granted in early 2018 and the operating permit will be obtained within 30 days after the completion of construction.

The remaining components will be divided into a number of separate permit applications: relocation of the Federal road, A-461; expanding the current open pit footprint; expanding the waste rock storage facility (WRSF), the tailing storage facility (TSF), and the supporting infrastructure.

These permit applications will be submitted in parallel in order to expedite the approval process. Only the Federal road relocation, the WRSF, TSF, and infrastructure expansions will require the submittal of an ESIA. All regulatory approvals are expected to be received prior to their respective start-up requirement.

An Occupational Risk Prevention Plan was established in 2014 as a tool to integrate the Company's risk prevention activities into the general management system. The Occupational Risk Prevention Plan was approved by the Company management and was then assumed by the entire organizational structure, and is known by all workers.

Resources to perform safety activities are organized as 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.

Atalaya promotes the establishment of extensive communication channels and actively seeks opportunities for dialogue with its stakeholders, in order to ensure its business objectives are in line with societal needs and 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 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.

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.).

1.14 Capital and Operating Costs

The capital and operating costs, expressed in US dollars and the following tables, were extracted from the financial analysis prepared by Atalaya and are discussed further in Section 21. Euro-based costs have been converted to US dollars at an average life-of-mine exchange rate of €1:$1.18.

In 2016, Atalaya completed an expansion from (phase 1) 5.0 Mtpa to (phase 1 + expansion) 9.5 Mtpa and a further expansion to 15 Mtpa is planned for completion in 2019. The ore reserve discussed in Chapter 15 is estimated at 197 M tonnes averaging 0.42% Cu. Production over the life of mine is summarized in Table 1.6.

Table 1.6 – Life of Mine Production (total)

Waste	281.5	M tonnes
Ore	196.9	M tonnes
Grade Cu	0.42	%
Contained Metal in concentrate, Cu	696.5	k tonnes
Payable Metal, Cu	664.2	k tonnes

1.15 Life of Mine Capital Costs

Life of Mine capital costs including expansion to 15 Mtpa, sustaining and tailings capital are estimated to be $178.9M. Including the tailings dam, sustaining capital ranges from $11.8M in 2019 to $7.3M in 2023, and $6.3M in 2028, with a total expenditure of $83.9M. Development capital spent to date (April 2018) by unit area is shown in Table 1.7.

Table 1.7 – Development Capital Expenditure to Date

	Actual Cumulative to Date	Actual Committed to Date	Forecast to Completion
Occupational Health and Safety	$2,121	$3,334	$151,914
Exploration and Geology	$0	$0	$123,430
Mining	$40,533	$403,665	$196,824
Processing	$7,337,216	$3,1435,997	$5,1087,424
Infrastructure	$710,550	$1,873,325	$6,102,921
Engineering	$3,285,008	$64,097	$6,997,816
Construction Management	$239,620	$1,759,241	$25,215,422
Owners Costs	$59,276	$0	$1,898,925
Permitting	$130,932	$0	$481,651
Insurance	$0	$0	$858,371
Contingency	$0	$0	$1,831,539
Capital Expenditure Total	**$11,805,257**	**$35,539,660**	**$94,946,236**

Capital requirements are shown below:

Sustaining Capital	$9.9 M	Total, life-of-mine
Sustaining Capital Tailings Dam	$74.1 M	Total, life-of-mine
Development Capital	$94.9 M	15Mtpa expansion
Overall Capital Programs	$178.9 M	Total, life-of-mine

1.16 Life of Mine Operating Costs

The Life of mine operating costs are based on the current Riotinto operating budget for 2018. Both fixed and variable costs have been estimated for the life of mine operating and are summarized in Table 1.8.

Table 1.8 - Life of Mine Operating Costs

Site Operating Costs	Unit Cost ($/t-ore)	Unit Cost ($/t-waste)	Unit Cost ($/t mined material)
OH&S	0.09	0.06	0.04
Exploration & Geology	0.15	0.10	0.06
Mining	4.23	2.96	1.74
Fixed Processing	0.43	0.30	0.18
Variable Processing	4.83	3.38	1.99
Laboratory	0.26	0.18	0.11
Fixed Maintenance	0.37	0.26	0.15
Variable Maintenance	1.09	0.76	0.45
Fixed Technical Services	0.15	0.10	0.06
Variable Technical Services	0.71	0.50	0.29
Additional Tailings Cost (Expansion)	0.02	0.01	0.01
Environmental	0.13	0.09	0.05
HR	0.04	0.03	0.02
Administration	0.63	0.44	0.26
Land Freight Transport Cost	0.19	0.13	0.08
Total Site Operating Costs	13.29	9.30	5.47
Total per pound Copper Sold	1.79		

Mining costs, inclusive of those capitalized, are equivalent to an average unit cost of $4.23 per tonne of ore. The average unit processing cost is $5.26 per tonne of ore. Silver by-product credits assume 9.4M ounces sold at $18.0/oz. life of mine. Site Operating Costs average the equivalent of $1.79 per pound of copper sold.

1.17 Economic Analysis

Atalaya has developed a financial model for the Riotinto Project that incorporates the updated reserve estimate. The assumptions for price and financial factors utilized in the financial model and resultant forecasts are as follows:

- All amounts are in constant 2018 US dollars (US$).
- Amounts in Euros (€) were converted to US$ at an average life of mine exchange rate of €1.00:US$1.18
- Copper production is sold at average life of mine copper price of US$3.00/lb.
- Corporate income tax rate of 25%.

This financial forecast shows that after tax, net cash flows, inclusive of capital expenditures, and closure costs, will total $1,206.7M over the life of the project for an NPV of $511.8M at an 8% discount rate. The overall project cash costs (C1), net of silver credits is US$2.10 per pound of copper sold increasing to US$2.22 per pound of copper sold, net of silver credits, adjusting for the sustaining costs (AISC).

It is noted that the production schedule incorporated into the financial model (refer Table 22.1) was based on mining progress through to 31 December 2017 which predicted copper production of 34.2kt in 2018. Since then the company has updated its short-term mine planning and budget forecast for 2018. The company is currently targeting to produce between 37kt-40kt copper in 2018 which is as per guidance provided to the market. This increase in 2018 production is not considered to have a material impact on the balance of the life of mine production schedule and project economics and consequently the more conservative production schedule derived from 2017 year-end mining progress was retained in the financial model and economic analysis.

1.18 Conclusions and Recommendations

Atalaya has successfully refurbished and expanded the Riotinto plant and infrastructure and is presently mining the Cerro Colorado open pit. 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 $6.40/t NSR (or nearly 0.14% RCu) will be employed to maximize the total cash flow of the mining schedule based on an initial ore processing rate of 9.5 Mtpa in 2018, expanding to 15 Mtpa in 2020 and thereafter. At a Cu price of $2.60/lb, total proven and probable mineral reserves are estimated at nearly 197 Mt grading 0.42% Cu and containing about 822,000 tonnes of Cu metal. Waste rock, including backfill in old workings, totals about 281 Mt for an average stripping ratio of 1.43. The mine's life is estimated at 13.8 years.

In addition, Lerchs-Grossman analysis of the mineral resource indicates that with a 15% increase in copper price, from the base case $2.60/lb to $3.00/lb could increase the reserve tonnage by approximately 21%.

While no major work programs are suggested, the recommendations that follow and that are further outlined in Chapter 26 are meant to improve operations and/or the economics of the Riotinto Project. Most of these can be evaluated by Atalaya's in-house management and technical staff and do not require expenditures outside the normal operating and capital budgets.

- Continue to instill a culture of safety and safe practices both at work and home. Make environmental compliance equal to safety and production.
- The mine has been making progress transitioning to recoverable copper (RCu) cutoffs for short-term planning. Additional investigations of Cu recovery and deleterious element correlations are warranted. Arsenic and antimony are being included in grade control assaying and, if possible, should be included in future updates to the deposit model as both metals have significant concentrations in the Cerro Colorado deposit that can trigger higher treatment charges and/or reduced payables at the smelter. A net smelter return (NSR) cutoff is recommended, which could account for both variable Cu recoveries and charges associated with deleterious metals. Statistical studies are presently underway to support this work.
- Continue to optimize processing operations in order to increase production rates and increase product quality. This can be accomplished by conducting debottleneck analysis to increase throughput and installing added flexibility in production lines. Install the ability/flexibility to dedicate a grinding line with a flotation train so that various ore types and reagents can be independently evaluated.
- Continue evaluation of possible bias in the blast hole samples used for grade control. This study is in progress.
- Set up automatic sampling of 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 and reagents, mill steel, and energy.
- Develop additional geotechnical characterization of the zone near the north diversion channel of the TSF and the existing dam near the national road.

2 INTRODUCTION AND TERMS OF REFERENCE

The property is located at the eastern end of the Spanish/Portuguese (Iberian) pyrite belt which extends about 230 km between Seville in the east (in southern Spain) and the Atlantic coast near Lisbon in the west (in Portugal). The Project was last operated in 2001 and restarted operations in 2015 under the ownership of Atalaya Mining. The Project location is shown in Figure 2.1.

Figure 2.1 – Riotinto Copper Mine Location (Atalaya 2018)

2.1 Background Information and Terms of Reference

Ore Reserves Engineering was contacted by Atalaya Mining in January 2018 and was requested to prepare an updated resource estimate for Atalaya's Proyecto Riotinto mine in the Province of Huelva, Spain as part of the overall 15 Mtpa expansion project. This resource estimate was to be documented in an updated NI 43-101 compliant report.

Pursuant to accomplishing the above tasks, Mr. Alan C. Noble of Ore Reserves Engineering (ORE), Mr. William Rose of WLR Consulting along with Mr. Jaye T. Pickarts traveled to Spain in May 2018 and conducted a site visit over a period of four days. During the site visit, the following personal inspections were conducted:

Mr. Noble:

1) Reviewed the overall project status and history with project personnel.
2) Reviewed the geological interpretation with project geologic personnel.
3) Reviewed drilling methods and exploration with project geologic personnel.
4) Visited the open-pit mine and reviewed operational procedures and grade control.
5) Discussed current methods for resource estimation with mine technical staff.
6) Visited the assay laboratory and reviewed sample preparation and assaying procedures.

Mr. Rose:

1) Reviewed the overall project status and history with project personnel.
2) Reviewed project infrastructure.
3) Visited the open-pit mine areas, existing WRSF sites, and the TSF area.
4) 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 marketing studies and contracts.
5) Reviewed environmental permitting and compliance procedures.
6) Reviewed project safety procedures.

In addition, Minnovo Pty Ltd. (Minnovo) was retained to assist in the preparation of the report. Minnovo's principal scope is in the area of metallurgy and process plant design. Matt Langridge and John Fleay visited the site in October 2016 and Mr. John Baines assisted in the preparation of Chapter 13, Mineral Processing and Metallurgical Testing, and Chapter 17 Recovery Methods. During the site visit, the following personal inspections were conducted:

Mr. Langridge:

1) Reviewed the overall project status and history with project personnel.
2) Inspected the overall project site.
3) Inspected the process plant.
4) Discussed hydrology and geotechnical aspects of project site with project personnel.

Mr. Fleay:

1) Reviewed the overall project status and history with project personnel.
2) Inspected the overall project site.
3) Reviewed geology and drill core and selected samples for metallurgical testwork.

4) Inspected the process plant.
5) Inspected potential sites for locating plant and tailings dam expansions.

Golder 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 tailing management facility. Mr. Roger White provided the direction and oversite. Specifically:

Mr. White:
1) Reviewed and updated the tailings management facilities design.
2) Reviewed and updated the tailings parameters and design criteria.
3) Reviewed and updated the tailings deposition plans.
4) Reviewed and updated the tailings processing plant design.
5) Reviewed and updated the closure measures proposed for the tailings management facilities.

Atalaya have 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.

2.2 Scope of Work

The scope of work for the project included:
1) Preparation of an updated resource and reserve estimates for copper.
2) Preparation of a complete open pit mine design including phasing, road access, annual production schedule, waste dump design, and periodic mine progress maps.
3) Review of the plant facility, plant operations, and plans for improvement of plant performance.
4) Review of environmental, safety, marketing, and costs.
5) 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 a previous technical report, independent resource estimation reports, feasibility reports, and plant design documents.

2.4 Definitions and Units of Measure

Units of measure in this report are SI Units including meters, kilometers, kilograms, metric tonnes, liters, etc., unless explicitly stated. Currency units are in U.S. dollars, and copper prices are in $US/pound copper (454 grams).

This report has been prepared in accordance with Form 43-101F1 Technical Report and the CIM Definition Standards for Mineral Resources and Mineral Reserves adopted by the CIM Council in April, 2011.

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

The property is located at the eastern end of the Spanish/Portuguese (Iberian) pyrite belt which extends about 230 km between Seville in the east (in southern Spain) and the Atlantic coast near Lisbon in the west (in Portugal). Within the pyrite belt there are eight major mining areas, each thought to contain more than 100 million tonnes of ore. These are from east to west: Aznalcollar-Los Frailes, Riotinto, Sotiel-Migollas, Aguas Teñidas-La Zarza, Tharsis, Masa Valverde, Neves Corvo and Aljustrel. There are also many other smaller deposits. The Riotinto Copper Project is the largest of these. Figure 4.1 below is a map of mines in the Iberian Pyrite Belt.

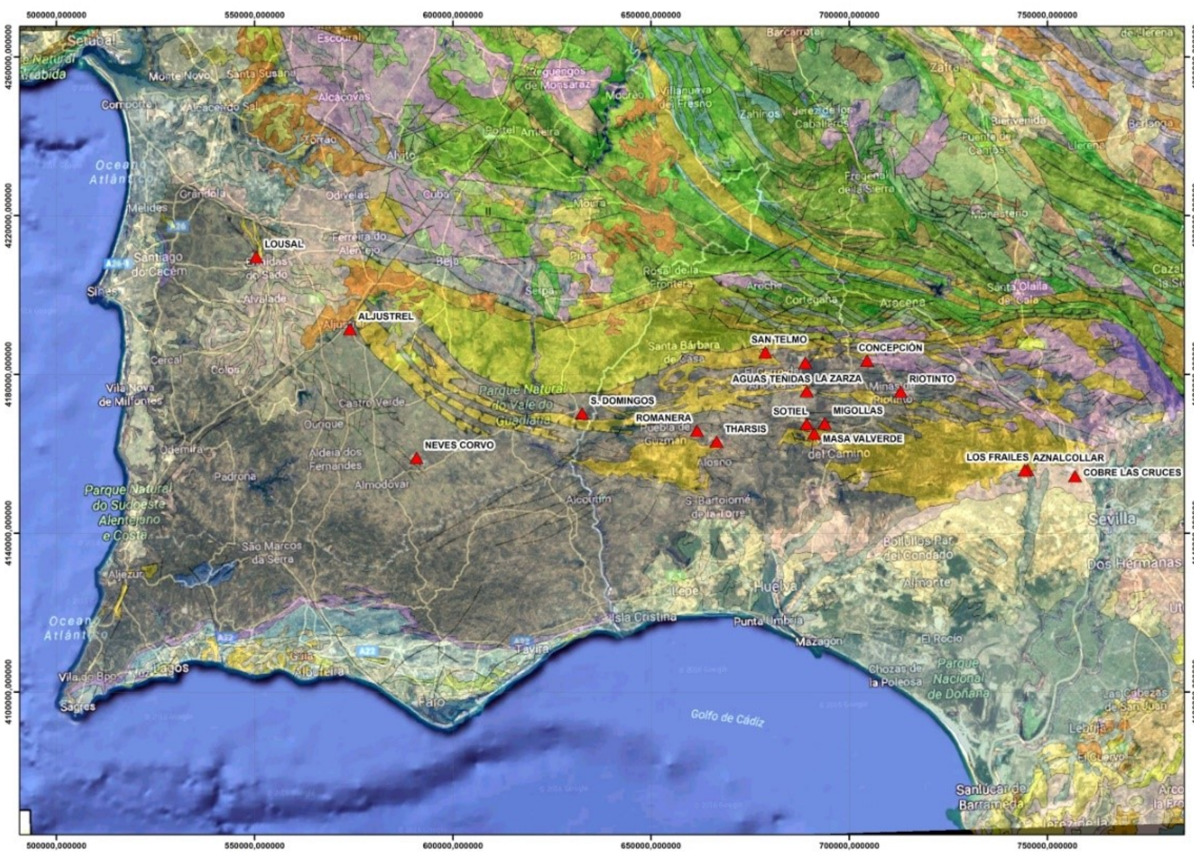


Figure 4.1 – Mines in the Iberian Pyrite Belt (Atalaya 2016 from Google)

In Spain, there are typically three different types of mining permits and concessions:

- Exploration permits (Art. 40.2 Mining Law) granted for a period of 1 year, may be extended for a maximum of one more year.
- Investigation (or Research) permits (Art. 45 Mining Law) granted for the period requested, which may not be more than 3 years, but may be extended for an additional 3 years.
- Exploitation (or Operating) concessions (Art. 62 Mining Law) also referred to as a Mining Permit, granted for a 30-year period, and may be extended for equal periods up to a maximum of 90 years.

4.1 Riotinto Copper Project Area

The Riotinto Copper Project was last operated in 2001 and restarted operations in 2015. Within the Riotinto mining district there are five main orebodies: San Dionisio, Filon Sir, Planes-San Antonio, Filon Norte, and Cerro Colorado. 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 mining activity has reduced this to about 250 Mt.

In May 2007, EMED-M was granted an option to acquire 51% of the Riotinto Copper Project assets located adjacent to the town of Minas de Riotinto, 65 km northwest of Seville in Andalucía, Spain. In 2001, the mine had been placed by the previous owners on a care-and-maintenance basis, due to the then-prevailing low copper price of less than $1.00/lb.

The main assets included the mineral rights within the main tenements covering an area of 20 km^2. EMED-M established its 51% owned subsidiary company EMED-T to hold these assets. In October 2008, EMED-M acquired the remaining 49% of EMED-T from Mantesur Andevalo S.L. (MSA). In October 2015, the shareholders approved the name change to Atalaya Mining Plc.

The Riotinto Copper Project includes the Cerro Colorado copper-pyrite deposit and open-pit mining area, certain satellite deposits, the waste dumps, parts of the tailings and water facilities, the beneficiation plant and offices, and other maintenance and general infrastructure. The Riotinto Copper Project area covers approximately 2,224 hectares as shown in Figure 4.2.

4.2 Land Position at Riotinto

The Riotinto mineral rights were sold by the Spanish Government to Riotinto Limited Company in perpetuity under the private property regime (Law of June 25, 1870, Act of December 26, 1870, Act of December 26, 1872 and Decree Law of February 14, 1873 to ratify the above, published in the Gaceta de Madrid on February 16, 1873).

These historical mineral rights are attached to land plot 843 much of which is in the municipality of Minas de Riotinto, where the Riotinto Copper Project is located. Atalaya is now the sole owner of the mining rights. Figure 4.2 below shows the location and ownership of the Riotinto project.

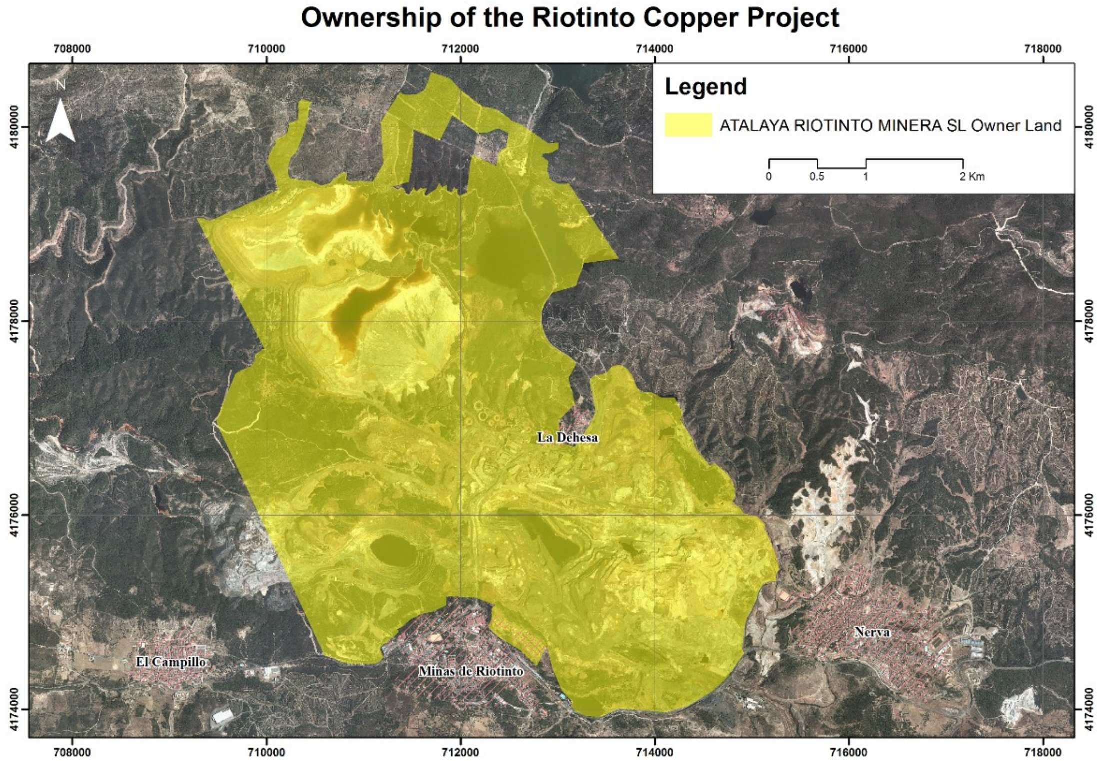


Figure 4.2 – Location and Ownership of the Riotinto Copper Project (Atalaya, 2016)

Although there are a number of liens on the various land packages, the only one that is critical to the restart project is a lien held by the Tesoreria General de la Seguridad Social. In May 2010, EMED entered into an arrangement whereby Social Security would not exercise their lien in return for EMED repaying the total amount, owed by a former owner of the mine, over a period of 5 years. In June 2017, the Group completed repayment of €16.9 million to the Social Security's General Treasury in Spain. Repayment was completed according to the agreed repayment schedule.

In August 2012, EMED acquired ownership of and options over all lands required for operations and potential expansion. This removed the possible need for expropriation of lands required for the restart. All land required for the project or for future expansion has been secured through acquisition or by options to purchase.

In May 2009, EMED submitted a request to the Government for Administrative Standing, (pursuant to the provisions of Articles 95.2, 97.1 and the Second Transitional Provision of the current Mining Act) for the development of the Riotinto Copper Project.

This Administrative Standing request was accompanied by supporting documentation (including relevant technical documentation) as well as contracts and title transfer deeds showing that EMED owned the mineral rights including the registered land plot 843 (which incorporates the area of the Cerro Colorado pit), the facilities and the exclusive rights of operation and beneficiation of minerals from the soil and subsoil within the Mining Permit.

5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

The project is located 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 is governed by the Junta de Andalucía, which is one of the historic Autonomous Communities of Spain, with a local parliament and president.

5.1 Accessibility

The project site is well serviced by paved highways to Seville, Huelva and Aracena. It 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 the capital Madrid.

5.2 Climate and Physiography

Due to the geographical location and varied topography, the climate in the Andalucía province is diverse, with a Continental Mediterranean climate in the inland areas and a Mediterranean climate along the coast. The average annual mean temperature is 18.7ºC, the daily temperature ranges from 3ºC in January to 40ºC in July and August. Average annual precipitation is 795 mm. Operations are possible all year around.

5.2.1 Local Resources and Infrastructure

The modern Riotinto mining complex dates back to 1873, when a group of British businessmen purchased the Riotinto mines from the Spanish Government and established the Riotinto Company Ltd. 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 (population 4000) provides most of the facilities required for mineral exploration and mining activity, and all other facilities are available nearby.

In 1970, a copper smelter and refinery were built next to the port of Huelva. In 1993 Freeport-McMoRan Copper & Gold Inc. acquired Riotinto Minera S.A. and decided to dispose of the mining operation to local interests and concentrate on the smelter and refinery (Atlantic Copper S.A.) by investing more than €200M (about $260M at current exchange rates) to double Huelva's smelting and refining capacity.

5.2.2 Physiography

The Riotinto 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.

6 HISTORY

Historic workings at Riotinto date back to at least 1000 BC and have been operated by Phoenicians, Romans, British (Riotinto Company and RTZ), Americans (Freeport-McMoRan) and finally, in the 1990s, the Spanish workers' co-operative Minas de Riotinto (MRT). Since Roman times, more than 140 Mt of copper and silver ore has been mined from several open-pit and underground mines. Before the arrival of the British miners in 1873, mining activity mainly consisted of underground mining in the Filón Sur area.

Underground mining in the Filón Norte zone commenced in 1880 but was abandoned in 1894. From 1900 work focused on the open-pit mining of the Salomón, Lago and Dehesa (Filón Norte) zones. In 1940 open-stoping commenced in the Quebrantahuesos zone and continued until 1970. Mining then switched to the low-grade sulfide stockwork ores of Cerro Colorado and production of gold and silver from the superficial gossan (oxide) cap.

In 1954, the mines were taken over by the Spanish company, Compañia Española de Minas de Riotinto S.A. In 1962 the Riotinto Company Limited merged with the Zinc Corporation to form the London-based Riotinto Zinc Corporation (RTZ), which became a minority shareholder in the Riotinto copper mines. Minas de Riotinto S.A. operated the mines, modernized the facilities and improved working conditions. Over the years the operating company changed its name successively to Riotinto Patiño and then to Riotinto Minera.

Between 1964 and 1967 an exploration campaign resulted in the discovery of the Cerro Colorado copper deposit. In 1969, the copper concentrator started up with a design capacity of 3 Mtpa. This was later expanded to reach the current nominal capacity of 10 Mtpa. In 1971, a gold leach plant commenced operation at a designed throughput of 1.5 Mtpa of oxidized (gossan) ores and was later expanded in increments to reach a design capacity of 6.0 Mtpa. The gold leach plant still exists but is not operational.

Between 1875 and 1976 a total of 128 Mt were mined from the massive sulfide ores. The copper concentrate was transported (70 km by rail) to the Huelva port and then smelter. In 1977, Riotinto Patiño sold its shareholding in the mine to Spanish and English groups and Riotinto Minera S.A. (RTM) was founded. The Cerro Colorado workings were then expanded and the Alfredo shaft was modernized. A new processing plant was built in 1969 and extended in 1982-1985 by the then operating company Riotinto Minera S.A.

Mining continued until 1987 when low copper prices forced the closure of the copper plant and a reduction of mining operations. Work at the Alfredo shaft ceased and the Cerro Colorado operation was restricted to mining and treatment of gossans for gold and silver, at a rate of 190,000 t/month (2 Mtpa). All production was temporarily halted in 1990.

In 1992 RTZ sold its shares in the mine to Freeport-McMoRan Inc. and Minas de Riotinto S.A.L. (MRT) was founded. In 1995, Freeport as the major shareholder in MRT decided to close the mine and focus investment in the smelter at Huelva.

The mine was acquired by MRT, and from 1995, MRT operated the mine as a workers' cooperative comprising former senior management and unions. 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. The mine was closed again in 2001 due to low copper prices. As a result of 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 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 on care and maintenance. With no grid electric power available since 2004, work has 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, the Australian companies, Oxiana Limited and Minotaur Exploration, entered into 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-M in which Oxiana is a founding shareholder.

In October 2008, EMED-M announced that it had completed the acquisition of EMED-T, the owner of the Riotinto Copper Project, and, as a result of this acquisition, the Company was the sole owner. EMED received the mine permit and restoration plan approval 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

In the 1980s, there were four working mines, two open-pit mines, Corta Atalaya and Cerro Colorado, and two underground mines, Pozo Alfredo (which together with Corta Atalaya, exploited the San Dionisio deposit) and the Planes - San Antonio mine.

6.1.1 Cerro Colorado Mine

The latest mining operations were focused on the Cerro Colorado - Salomon open pit and the adjacent San Lucas 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 felsites 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 is 1,560 m long, 850 m wide and 230 m deep and covers 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 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 plan view.

Figure 6.1 – Cerro Colorado mine (Atalaya 2018)

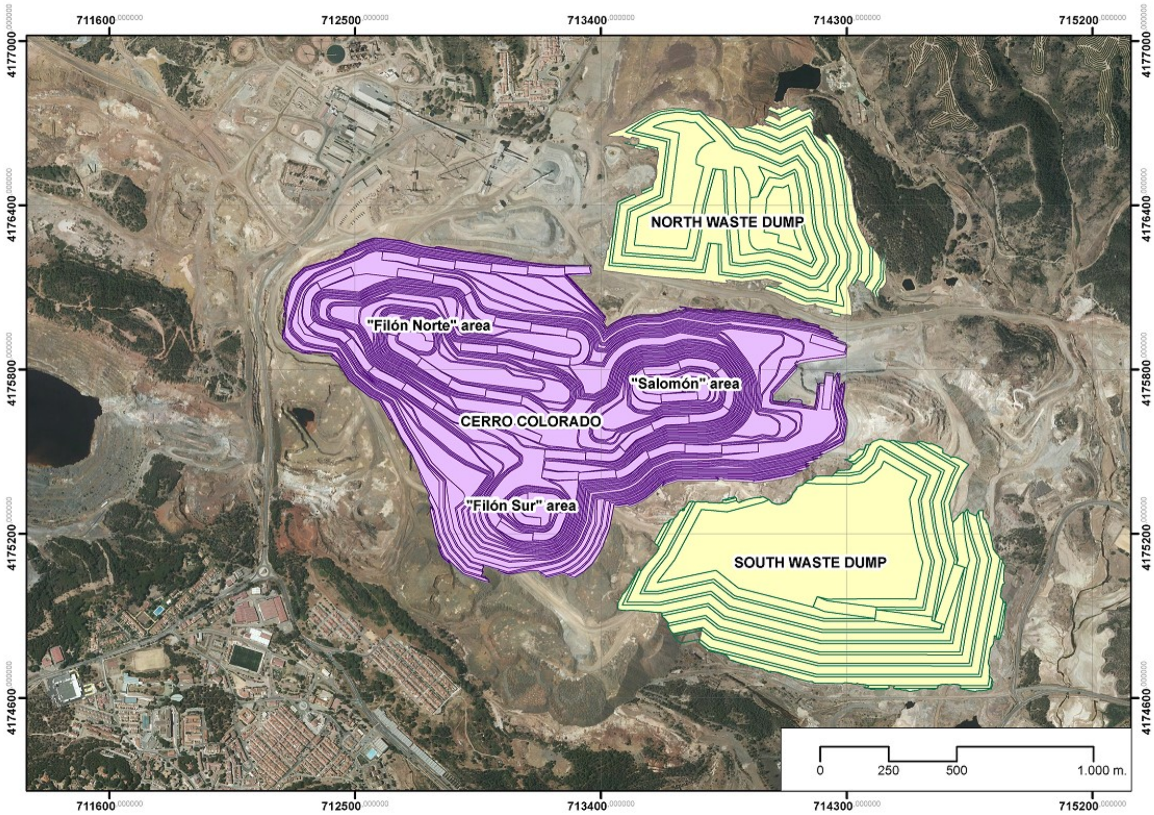


Figure 6.2 – Cerro Colorado Pit (Atalaya 2018)

7 GEOLOGICAL SETTING AND MINERALIZATION

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

7.1 Regional Geology

The Riotinto massive sulfide deposit occurs in the Spanish side of 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 originated from the fragmentation of a Late Proterozoic mega-continent (Murphy and Nance, 1991) in a series of plates: the SPZ, the OMZ, and the ensemble of the CIZ, West Asturian–Leonese (WALZ) and Cantabrian (CZ) zones (Fig. 7.1).

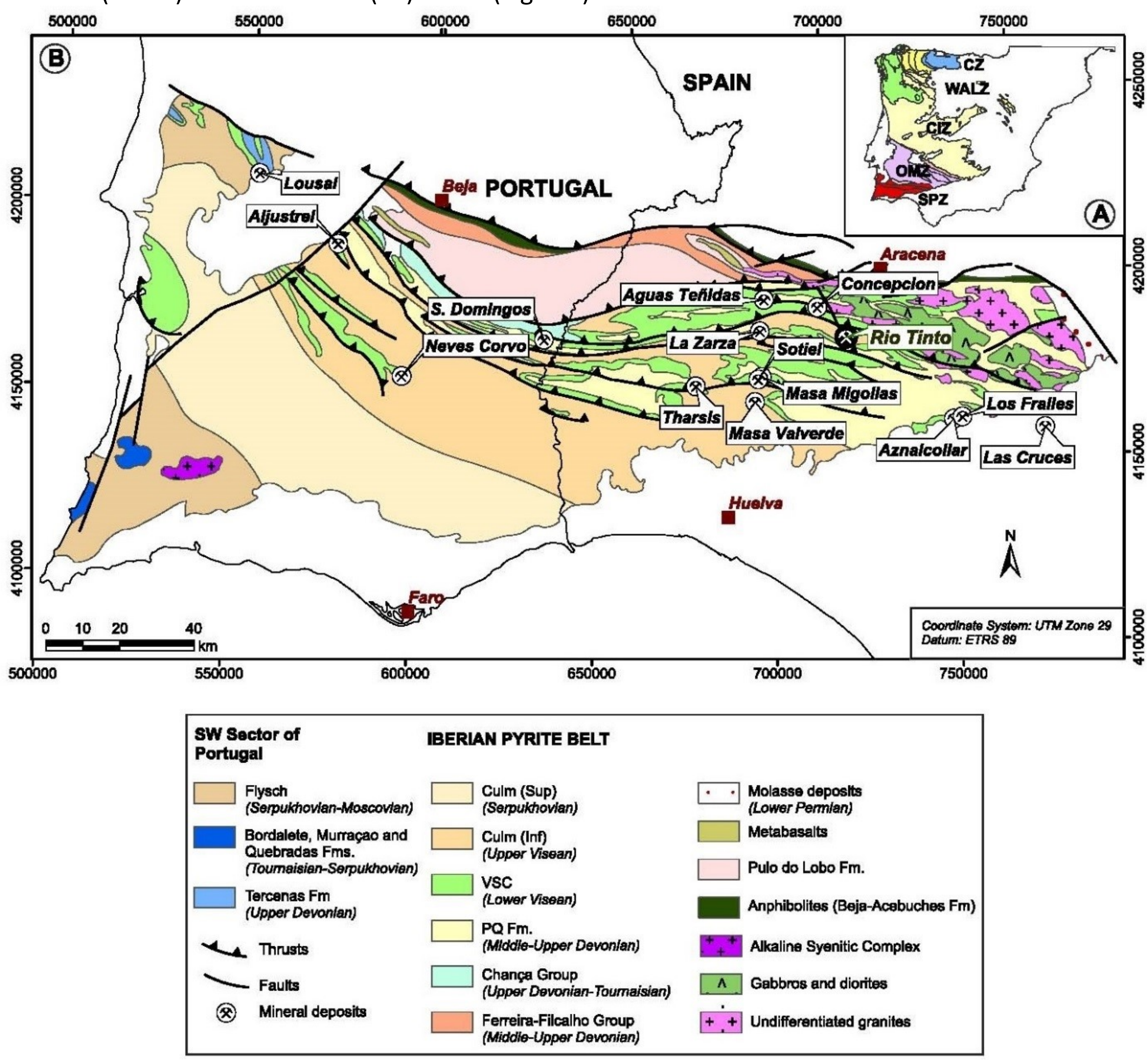


Figure 7.1 – Map of Regional Geology (IGME 2013)

The IPB was formed as a series of marine basins that developed during the left-lateral transcurrent faulting generated by the subduction and collision of Laurentia with Gondwana during the Variscan orogeny (Late Devonian−early Carboniferous; Silva et al., 1990; Oliveira, 1990). These basins were formed within the passive margin of Laurentia, now represented by the SPZ and adjacent to the collision suture (A. Martin-Izard 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 overlaid 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 (1971).

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

The IPB contains over 100 massive sulfide and stock-work VMS deposits. Over 10 giant (world-class) VMS deposits, with more than 50 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 (e.g., Solomon et al., 2002; Tornos, 2006; Gumiel et al., 2010a). 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; Barriga, 1990; Boulter, 1993; Adamides, 2013).

7.2 Geology of the Riotinto Deposit

7.2.1 Stratigraphy

The Riotinto 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.

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 VSC. In chrono-stratigraphic order from the bottom to the top, these units are as follows (Table 7.1):

Table 7.1 – Riotinto Deposit Stratigraphic Units

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.
TS	Transition Series. Mostly a sedimentary unit formed by black shales, slates with radiolarian, conglomerates and mafic pyroclastic. Approximately thickness is 50m.
VS2	Felsic Volcanic Unit. Rhyolitic lavas, rhyodacites and felsic volcanic pyroclastic and epispastic rocks. In Cerro Colorado and eastern prospects rhyodacitic domes and lavas dominate from the pyroclastic tuffs, whereas the western zones the domain is mostly pyroclastic. Thickness is very variable, from some 75 m at the western Corta Atalaya, up to 400 m in Cerro Colorado close to the northern fault.
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).
Massive sulfides	The Massive sulfide flows took place during the latest phases of the felsic volcanism 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, Filon Sur Lode and San Dionisio—Corta Atalaya.
VS	Volcano sedimentary unit consisting on green shales and tuffaceous shale. This unit represents the most distal zones from the volcanic centers where deposition of sediments dominates. Laterally they grade to the felsic unit. Thickness is very variable, depending on the distances from the feeders.
PJ	Purple shale, cinerites and jaspers. Volcano sedimentary unit formed by purple shales (Fe-Mn rich) with interbedded lenses of jaspers. They represent the lateral extension of the latest volcanism VS3. These levels are the only continuous stratigraphic horizons in the VSC.
VS3	Felsic and intermediate volcanic cinerites, tuffites and domes that represent the latest volcanic event of the IPB.
CULM	A sequence of shales, slates and fined greywackes with turbiditic features. The Culm Group ranges in age from Late Visean to Middle-Late Pennsylvanian. It is interpreted to represent a synorogenic flysch related to the Variscan tectonic event. The sequence is very thick. Drilling at Riotinto indicated thickness of about 650m in the southern limb at Filon Sur, and more that 800m in the northern limb, at Dehesa.

These stratigraphic units are represented in Fig.7.2 and a geological map of the Riotinto deposit is presented in Fig.7.3.

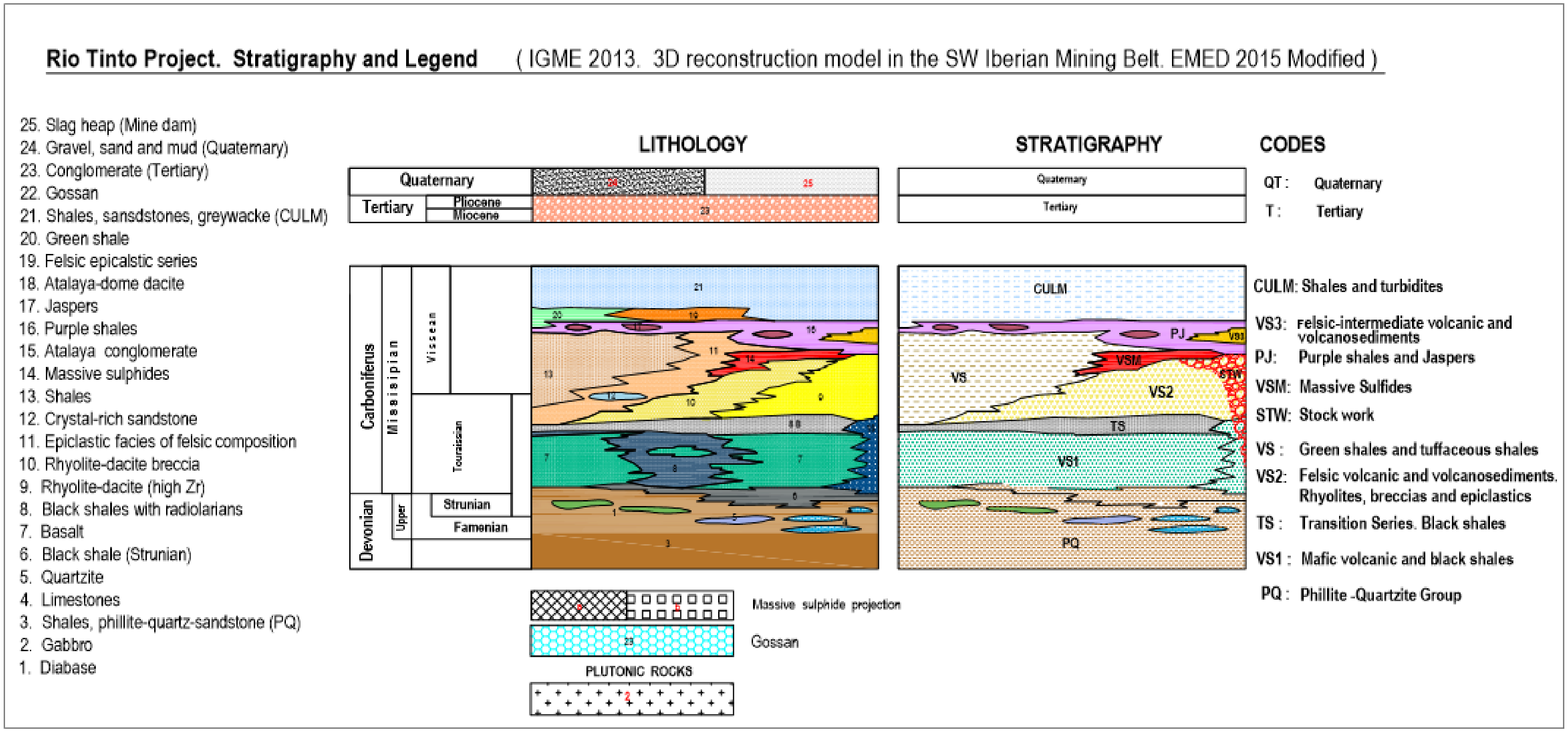


Figure 7.2 – Stratigraphy of Riotinto (IGME 2013)

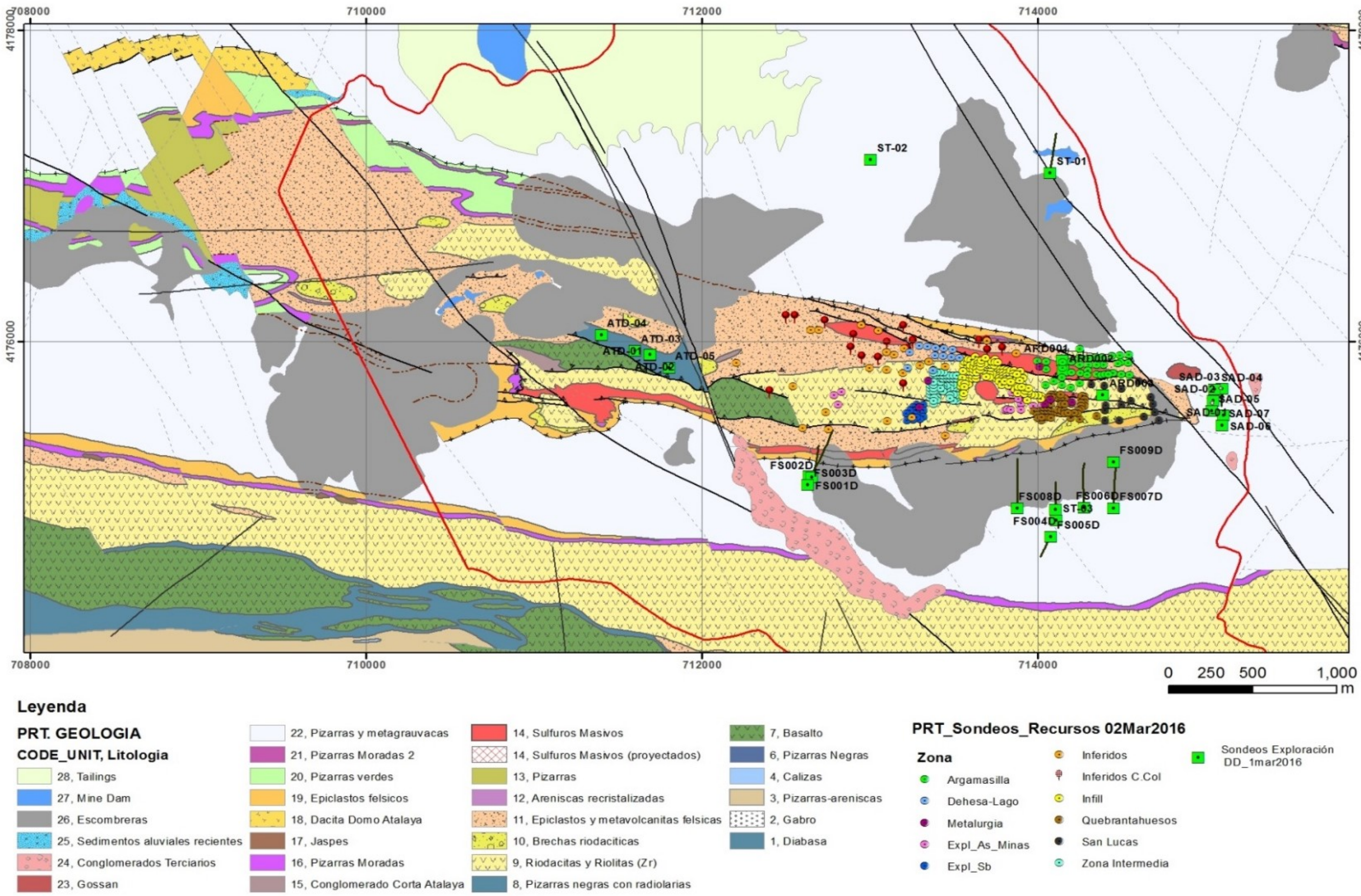


Figure 7.3 – Geological map of the Riotinto Deposit (IGME 2013)

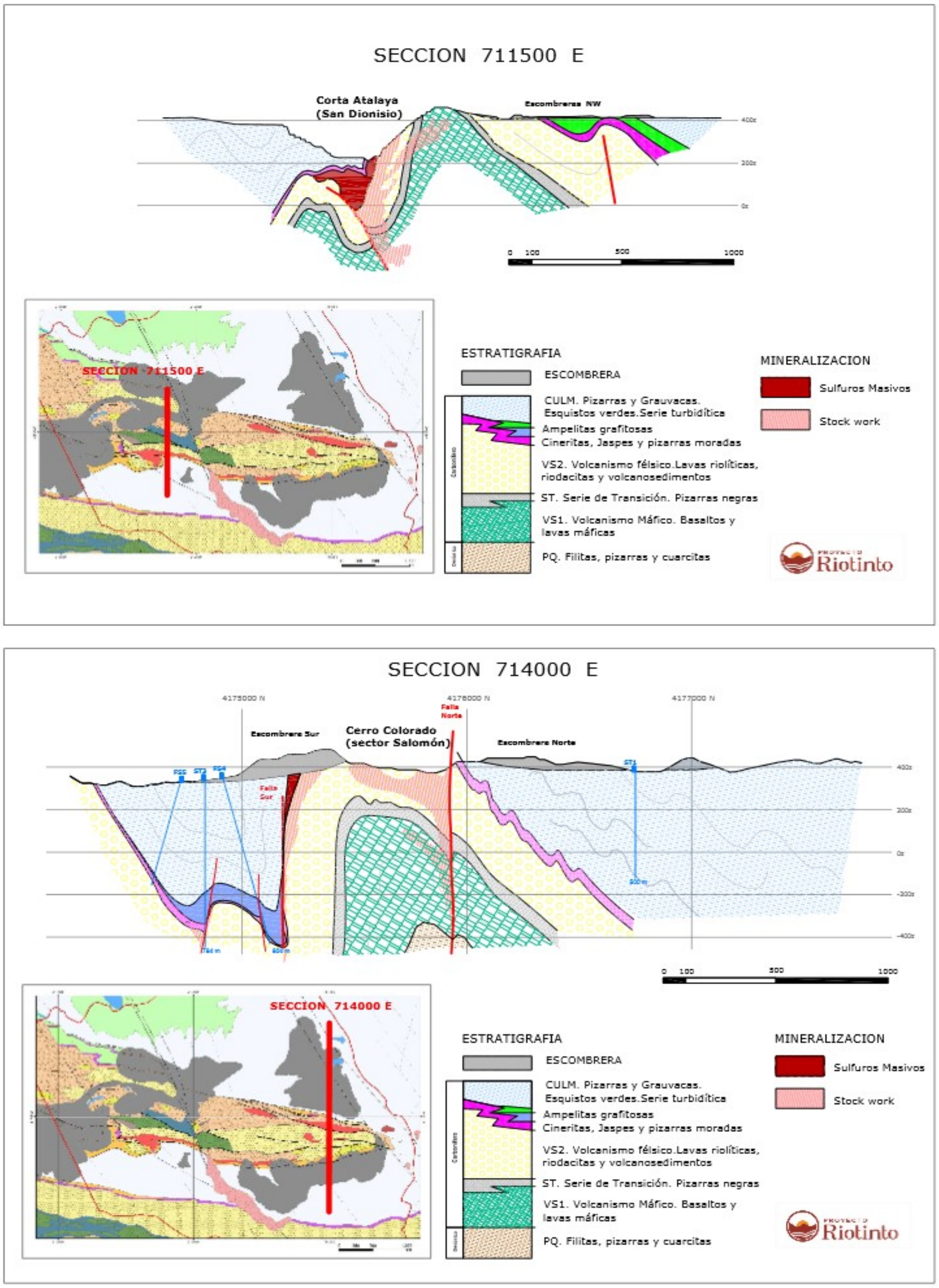


Figure 7.4 – Geological sections (Atalaya 2016 from IGME 2013)

7.2.2 Structure

The Riotinto 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.

Riotinto is characterized by having a high intensity of Variscan deformation that generated S to SSW vergence folding structures. The Riotinto 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, Figure 7. 4.

Two major subparallel synsedimentary E-W faults that occur approximately 1km apart at both flanks of the anticline are named Northern Fault and Southern Fault. The felsic volcanism and the deposition of the massive sulfides are closely associated to these two faults that represent the margins of the volcanic basin. The two faults were first activated during a distension period before the Variscan orogeny, and they formed an extensional basin. A further tectonic movement of the faults caused a roll-over anticline and the development of two sub-basins: the northern basin (Cerro Colorado, Salomon and Dehesa) and the southern basin (Filon Sur, San Dionisio and Atalaya). These faults are also the two main structures that controlled the mineralization flows.

Another synsedimentary fault has been identified within the main transtensional basin which has been named Intermediate Fault. This fault also controls the deposition of the felsic volcanic and the massive sulfides.

This faulting system is highly affected by the Variscan compression that changed the cinematic of the structures. The Southern Fault becoming a reverse fault that brings the felsic unit and massive sulfides over the shales from the Culm, and the Northern fault remain as a normal fault.

The faulting system and the anticline are crosscut by the NW-SE trending Eduardo Fault zone, which dissects the whole body into two sectors. To the east: the Cerro Colorado and Filon Sur areas. To the west: San Dionisio-Atalaya.

7.2.3 Metamorphism

The metamorphic grade in Riotinto is mostly of very low grade, normally 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 (Munhá, 1990).

7.2.4 Mineralization

Mineralization is typical of the VMS deposits and occurs as stockwork and massive sulfides. Beside these, oxidation weathering of the primary mineralization has developed gossans and enrichment zones in places.

The stockworks occur as irregular veins, fractures and fissures filled with quartz and sulfides. Two main types of stockworks are identified: 1) pyritic (20% S content) and 2) cupriferous (2% Cu content). 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.
In the Riotinto district mineralization, hydrothermal alteration and secondary replacement (i.e., silicification, chloritization, sericitization and sulfidization) often occur associated to some stockwork zones, and along thin fractures and veins. The alteration zone is characterized by an inner core of chlorite

alteration surrounded by an envelope of sericitic alteration, silicification, and pyrite and carbonate alteration. The copper-rich mineralization is most closely associated with the chlorite altered zone.

The massive sulfide consists of lenses of pyrite plus chalcopyrite emplaced on the marine basins surface as a result of black smoker flows. They occur overlaying the felsic volcanic and the stockworks.
The primary sulfide mineralization consists mostly of pyrite, with minor chalcopyrite, sphalerite, tetrahedrite and sulfosalts of Sb and As. Chalcopyrite is the predominant copper mineral and mostly occurs within small fractures in the pyrite, on a lesser extent it occurs in isolation.

The massive sulfide deposits are located as dismembered lenses along the axis and the flanks of the anticline close to the Northern and Southern Faults. The principal deposits are San Dionisio-Atalaya, Filón Sur, Filón Norte (Cerro Colorado, Dehesa, Lago and Salomon).

Nowadays, massive sulfides remain only at San Dionisio-Atalaya. At Filon Sur and Filon Norte, all the massive sulfides were mined. In the core of the anticline at Cerro Colorado-Salomon open pit, it is believed that the deposits originally formed an almost continuous lens of massive sulfides of about 5 km long, 750m wide and 40m thick, containing more than 500 million tonnes of sulfide mineralization.

Well-developed stockwork mineralization occurs in the volcanic rocks that underlay parts of the massive sulfide ore at all the zones from Filon Norte. Beside the stockwork and the sulfides, secondary mineralization occurs in places. An important volume of sulfides in Cerro Colorado and minor amounts in Corta Atalaya have developed extensive gossans, which were exploited for gold and silver as described in Chapter 6. Gossan and the zone of supergene enrichment are characterized by the occurrence of secondary minerals goethite-limonite and chalcocite-covellite respectively. Figure 7.5 shows a schematic N-S cross section through the Cerro Colorado deposit.

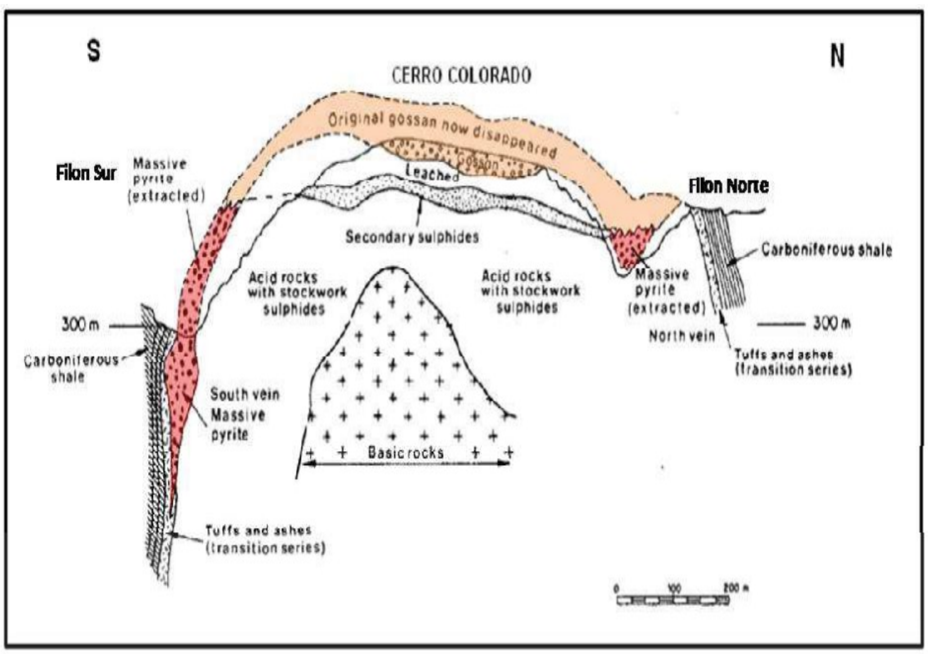


Figure 7.5 – Schematic N-S cross-section through the Cerro Colorado deposit (EMED 2012)

8 DEPOSIT TYPES

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

Riotinto is a typical Volcanogenic Massive Sulfide (VMS) deposit, which are formed in extensional tectonic settings of oceanic seafloor, including spreading ridges subductions zones and arc environments.

According to genetic, rock association and geodynamic setting, the Riotinto volcanic-hosted pyrite-chalcopyrite mineralization is classified as felsic siliciclastic of Kuroko type. It occurred as lenses of polymetallic massive sulfide that took place at the sea floor in a submarine volcanic environment during the earlier Carboniferous, some 350 million years.

As with most significant VMS mining districts, the IPB is defined by deposit clusters formed within ocean rifts with volcanic centers. The clustering is attributed to a common heat source that caused large-scale sub-seafloor fluid convection systems.

As with most VMS deposits, Riotinto has two morphological and genetic components:

- A mound-shaped to tabular strata bound body composed mainly of massive sulfides.
- An underlying zone with development of a stockwork system of irregular veins filled by quartz and disseminated sulfides that represent the pipes of the volcanic feeders.

Furthermore, Riotinto as well as other VMS deposits, is characterized by extensive zones of hydrothermal alteration as a result of subvolcanic intrusions and fluid convection systems, which define zones of discordant alteration in the immediate footwall and hanging wall of the deposit.

9 EXPLORATION

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

9.1 Summary

Since 2014, Atalaya has completed exploration and resource and development drilling programs in the Riotinto mining area. Exploration drilling is discussed in this chapter, and development drilling is discussed in Chapter 10. Exploration activities have been carried out in selected prospect areas within the Riotinto Concession and outside of the current mining area, in order to find new resources and/or to confirm resources available and reported by historical reports.

Exploration activities commenced in January 2015 and are still in progress. The comprehensive exploration program includes the following:

- Historical Data Compilation.
- Geological Mapping.
- Geophysics.
- Exploration Drilling.

The prospective areas for exploration were selected based on historical data compilation and exploration results as follows:

- Northern zone
- Filon Sur (deep extension)
- Filon Sur and Masa Valle (east extension)
- San Dionisio – Atalaya pit
- Planes
- San Antonio

9.2 Data Compilation

Compilation of all historical geological, geophysical and mineral data in the Riotinto mine archives was started in 2012 by Emed-Tartessus, who converted the paper-based historical data into electronic format. Since 2014 Atalaya has georeferenced most of the available data and has imported drilling and other data into a GIS system (ArcMap) and mining software (Datamine and Recmin).

9.3 Geological Mapping

The geology of the Riotinto mining area and concession has been continuously updated by Atalaya. Historical maps are taken as a basis to add new outcrops, field observations, and geological interpretations of the pits and surrounding areas. The current geological map is presented in Figure 9.1.

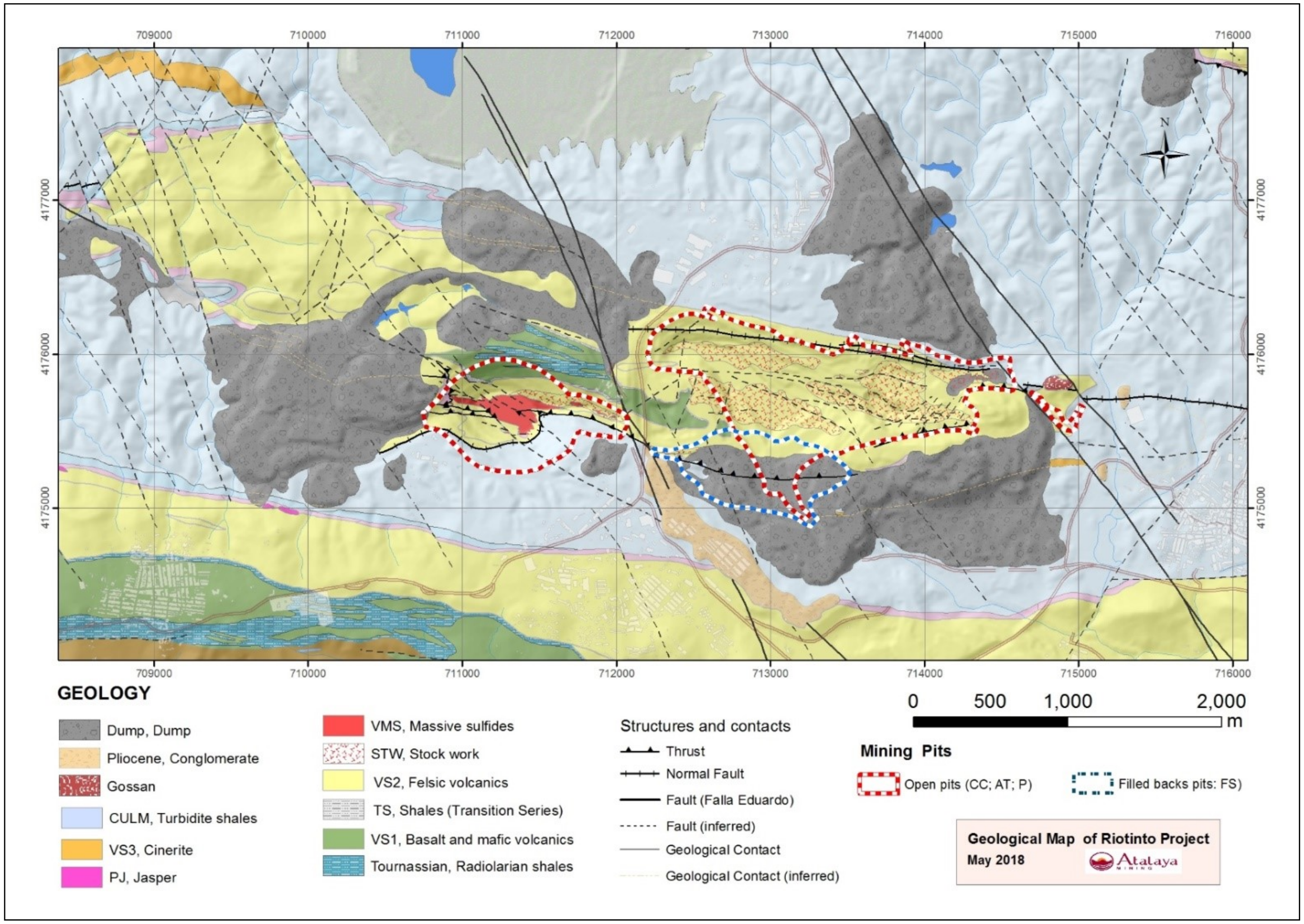


Figure 9.1 – Geological Map (Atalaya 2018)

9.4 Geophysics

Atalaya has compiled geophysical data from historical surveys carried out by different companies in the Iberian Pyrite Belt (IPB) since 1980. These include two regional gravimetric surveys (airborne), a magnetic survey (airborne) and a series of gravimetric and electromagnetic ground surveys. Also, all available DTM, topographic and Landsat data has been compiled from various sources. The geophysical data has been reprocessed and modeled to generate new exploration targets.

9.4.1 Ground Geophysics

In 2015 Atalaya conducted a ground geophysical survey covering the northern and the southern flanks of the Riotinto anticline. The survey included measurements of electrical resistivity by Audio-Magnetotelluric (MT) and Gravimetric methods. The MT method is a passive ground electromagnetic technique that measures the resistivity and conductivity below surface.

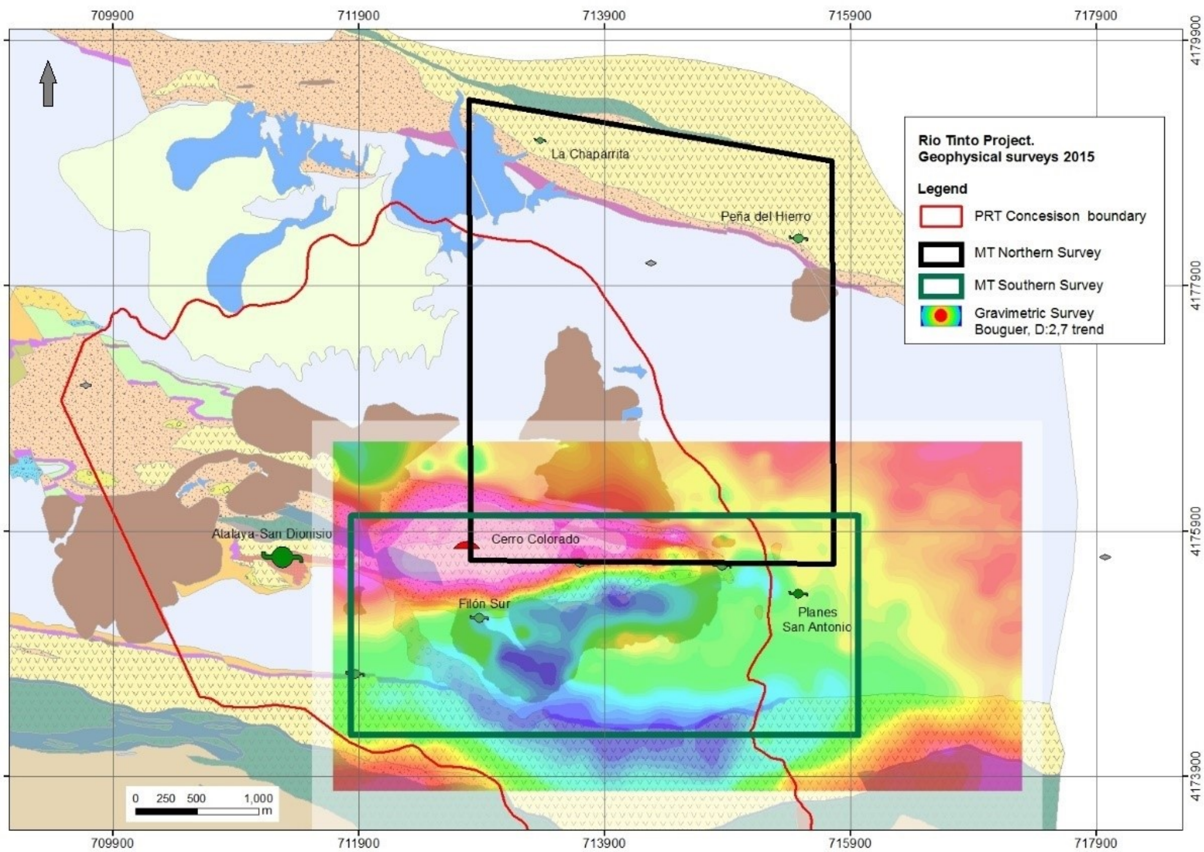


Figure 9.2 – Areas Covered by Geophysical and Gravimetric Surveys (Atalaya 2018)

Figure 9.2 shows the areas covered by ground geophysical surveys and Figure 9.3 shows a MT profile completed around the southern flank of the Cerro Colorado anticline, east of the Filon Sur zone.

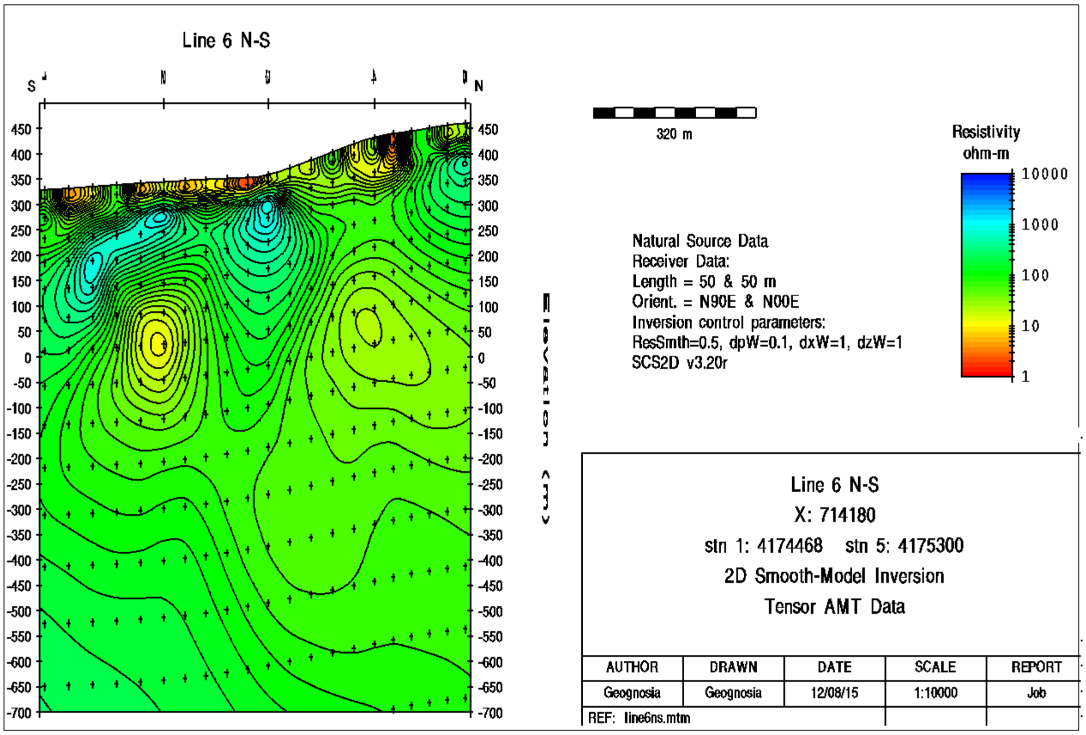


Figure 9.3 – Example of a North-South MT profile (Line 6) on the Southern Survey (Geosnosia 2015)

9.4.2 Airborne Geophysics

Atalaya conducted a versatile time-domain electromagnetic (VTEM) airborne geophysical survey in 2017 that was operated by Geotech. The surveying was done over two blocks at the Iberian Pyrite Belt including all Atalaya mining properties in the IPB region as represented in figure 9.4.

The VTEM surveyed areas and general flight specifications are summarized in Table 9.1.

Table 9.1 – VTEM Survey Areas and Flight Specifications

Survey block	Line spacing (m)	Area (km²)	Line-km	Flight Direction	Line numbers
RT West	Traverse: 100	58	601	N 0° E / N 180° E	L4000-L5120
	Tie: 1500			N 90° E / N 270° E	T6000-T6030
RT East	Traverse: 100	89	903	N 0° E / N 180° E	L7000-L-8180
	Tie: 1500			N 90° E / N 270° E	T9000-T9090
TOTAL:		147	1504		

The final VTEM processing data was delivered by Geotech in January 2018 and is presented as a series of Electromagnetic, Magnetic, and Resistivity maps plus ancillary data including the waveform.

Many cultural responses introduced high amplitude spurious anomalies. Nevertheless, after noise filtering of the geophysical data, several anomalous zones were outlined at both blocks.

Conductance values are significantly higher in the East block, ranging from 0 to 80 Siemens, with high conductance directly related to mineralization. Conductance in the West block are much lower, ranging from 0 to 15 Siemens. The low conductance values are believed to be due to conductive shales.

The geophysical data is currently being evaluated by an independent consulting geophysicist. Figure 9.4 shows the location of the two surveyed blocks over a geological map. Figures 9.5 and 9.6 show some of the electromagnetic maps produced at each block.

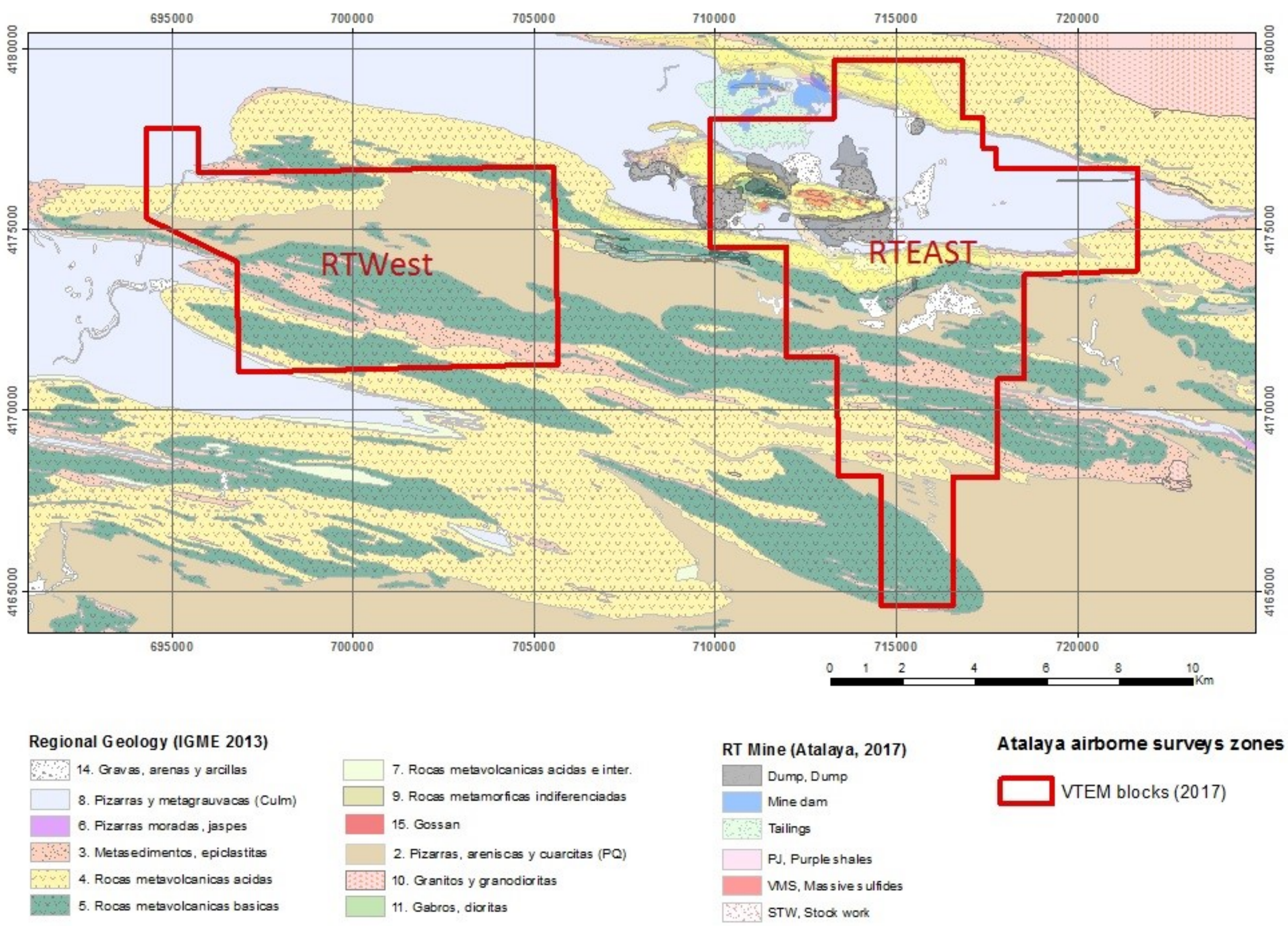


Figure 9.4 – Location of the Atalaya Mining VTEM Airborne Surveys (Atalaya 2017)

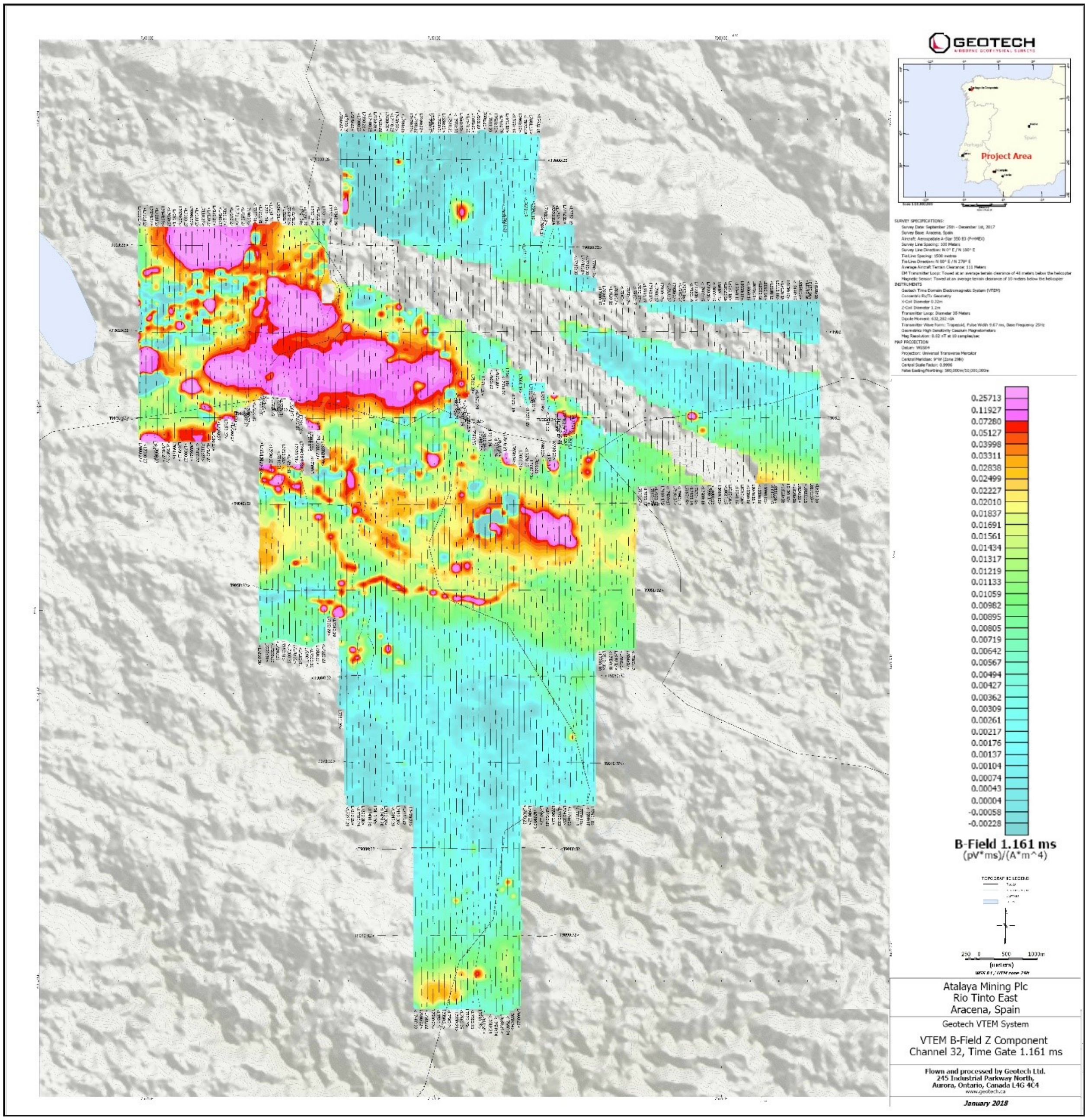


Figure 9.5 – Example of VTEM Results - East Block (Geotech 2018)

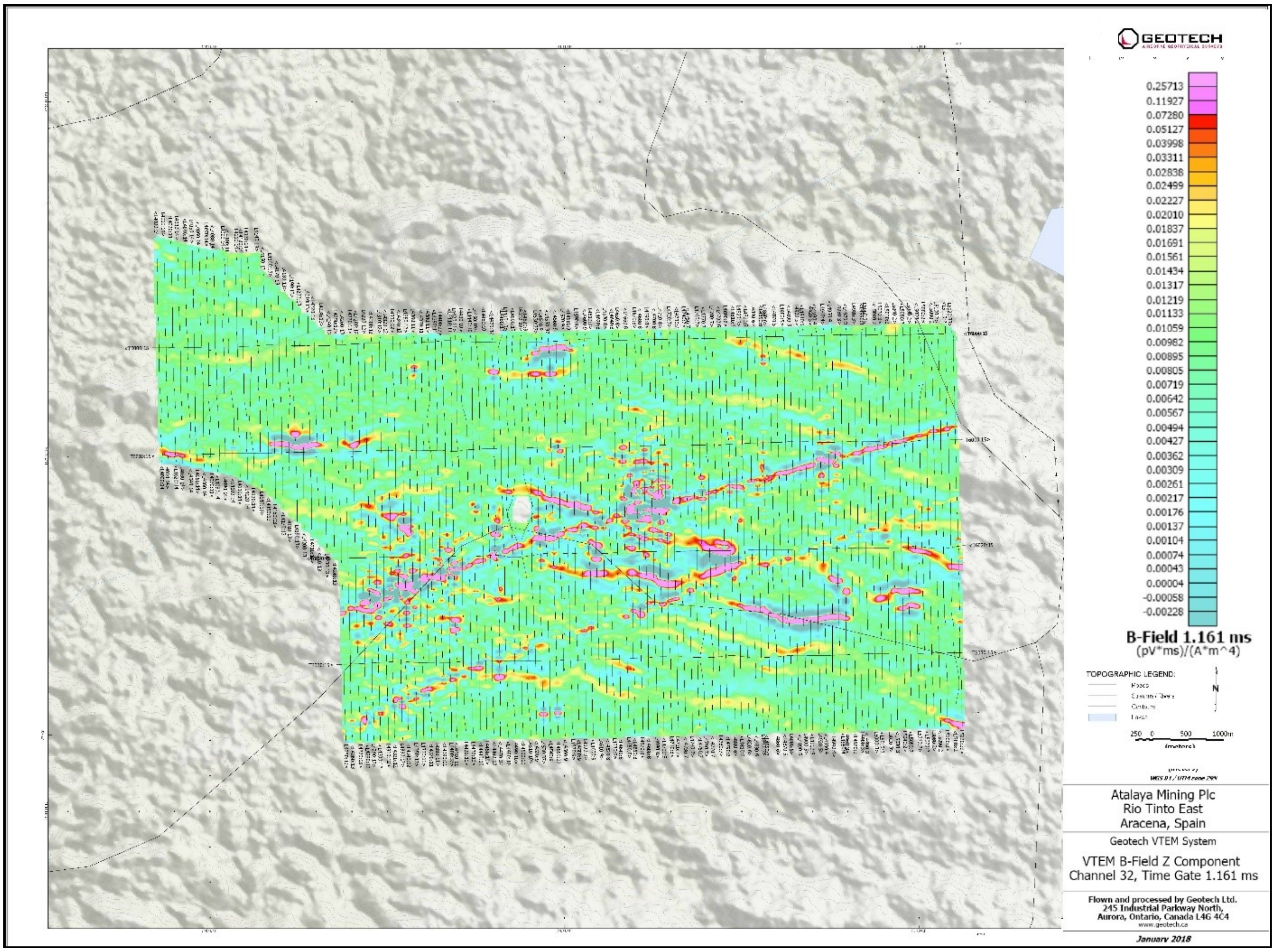


Figure 9.6 – Example of VTEM Results - West Block (Geotech 2018)

9.5 Exploration Drilling

Diamond drilling was carried out during 2015 and 2016 over selected prospect areas based on historical data compilations and geophysical surveys. A summary of the exploration drilling completed is summarized in Table 9.2.

Table 9.2 – Summary of Exploration Drilling Programs

Year - Exploration Drilling Program	Exploration target	Number of holes	Total Drill-m
2015. Filon Sur Deep	Filon Sur - deep exploration	3	2 565.55
2015. Northern zone (Culm)	Culm and northern anticline flank	2	1 651.30
2015. San Antonio	Western San Antonio Deposit	8	1 504.20
2015-2016. Filon Sur (East) - Masa Valle	Filon Sur East extension and Masa Valle	8	3 861.00
2015-2016. San Dionisio. Atalaya	San Dionisio northern chloritic stockwork	8	3 077.60
2016. Planes	Planes Deposit - remaining resource	8	940.7
	TOTAL	37	13 600.35

Location for the exploration drill holes is shown in figure 9.7. The drilling results for each prospect area are presented in section 9.6.

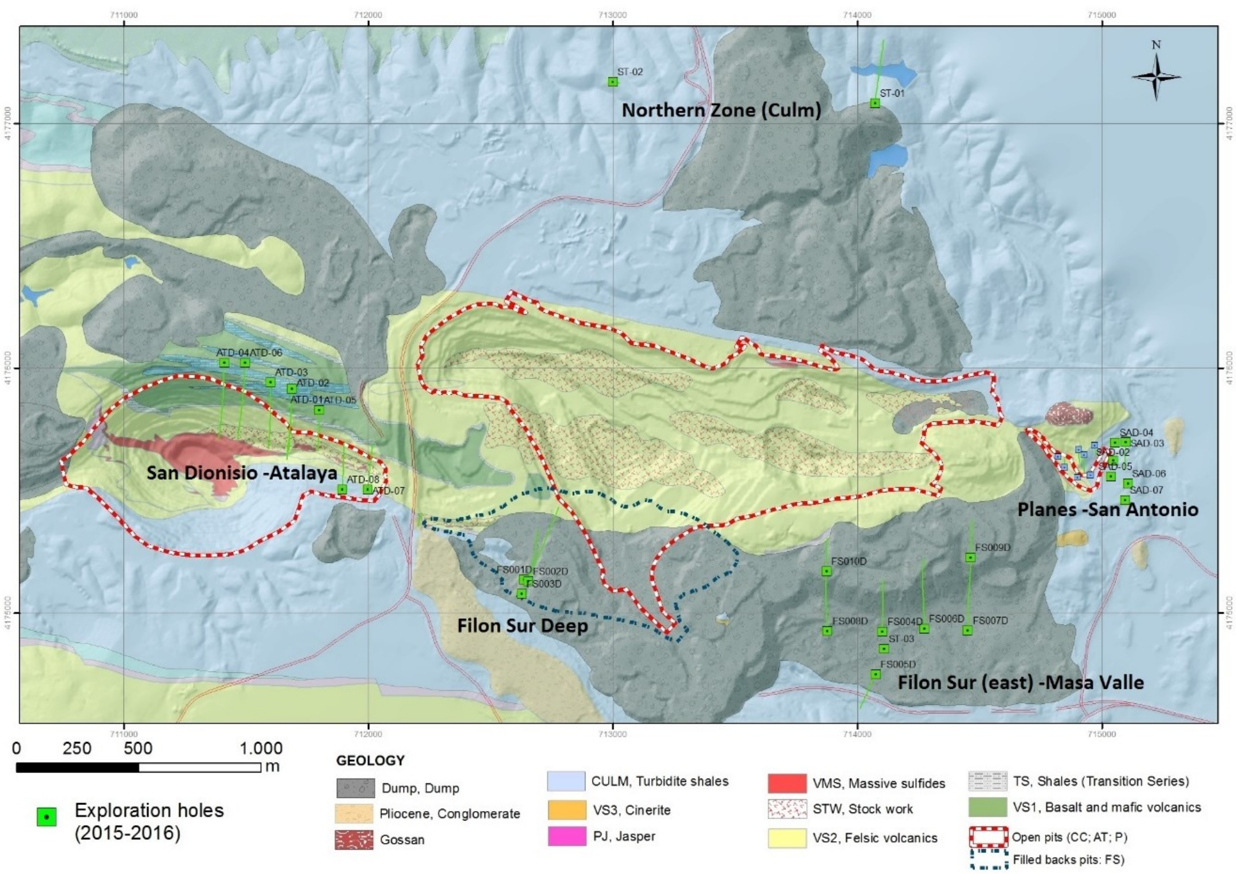


Figure 9.7 - Exploration Drill Hole Locations (Atalaya 2015-2016)

9.6 Prospect Areas

The exploration activities discussed in this section were within the Riotinto concession both inside and outside of the Cerro Colorado deposit in a series of prospects in the current mining area.

9.6.1 Northern Zone (CULM)

Two holes were drilled in shales of the CULM unit on the northern flank of the anticline to test two gravimetric anomalies identified in the historical geophysical surveys.

Hole ST1 reached 500m length and was continuously in shales from the CULM unit. Hole ST2 intersected 878 m of CULM and ended at 1,120m in fine grained felsic cinerites. The intercepted width of shale together with the data from the MT survey suggest that the contact between the CULM and the volcanic complex is dipping north and that the thickness of the CULM increases towards the north, thus reducing the potential for further mineralization in the northern zone. An electromagnetic downhole survey (TEM) was performed in hole ST1, giving negative results.

9.6.2 Filon Sur (deep)

Three long holes were drilled in the western Filon Sur ore zone to determine if the massive sulfides extend at depth.

The first hole FS001D was drilled close to vertical (85 degrees inclined to north) and ended at 694,70m. The hole intersected shales/culm from the surface to 509m and thereafter volcanic lithologies with varying grades of alteration but no massive sulfides. A TEM survey was conducted in the first hole that picked up two conductors that have a conductivity thickness of 80-90 S.m. The first conductor was picked up at depths between 120m and 250m and was interpreted (coincident) as the down-dip extension of the Filon Sur ore zone, already mined out. A second conductor was picked up deeper, between 450m-600m depth. This is shown in Figure 9.8.

Holes FS002D and FS003D were drilled to follow up the deeper conductor. Both holes intersected deep Zn-sulfide mineralization in a shear zone in the Transition Series and Mafic Unit. Hole FS002D yielded 6m of 0.95% Zn but Cu values were low. The depth and grade of the zone did not justify the continuation of drilling.

The best drill intercepts are presented in Table 9.3 below.

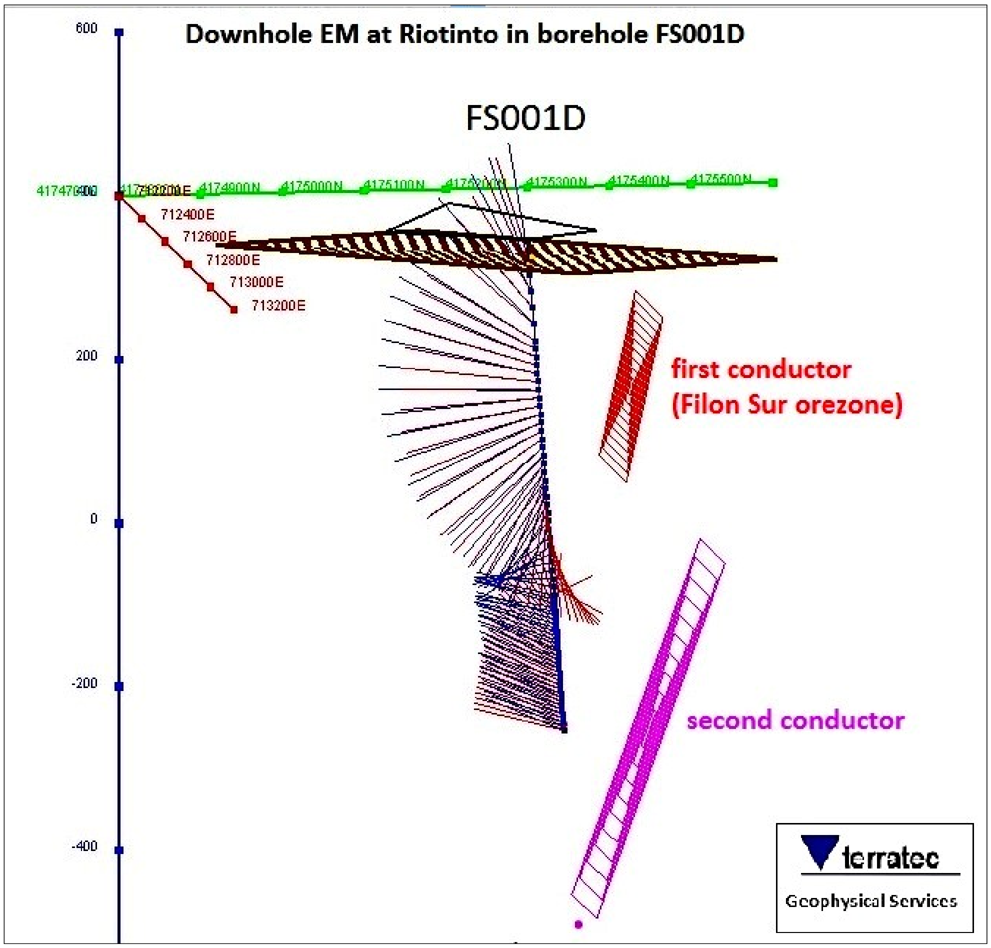


Figure 9.8 – Downhole EM in Drill Hole FS001D (Atalaya 2015)

Table 9.3 – Best Drill Intercepts

Zone	Hole	From	To	drill-int	Cu (%)	S (%)	Pb (%)	Zn (%)	Fe (%)	As (ppm)	Sb (ppm)	Bi (ppm)
Filon Sur	FS002D	702.0	703.0	1.0	0.46	2.97	0.35	3.94	3	144	< 10	25
		766.0	767.0	1.0	0.51	7.54	0.22	0.58	9	283	<10	20
		778.0	784.0	6.0	0.19	7.85	0.39	0.95	8	344	<10	30
	Including	783.0	784.0	1.0	0.62	15.01	2.04	3.69	14	789	14	74
Filon Sur	FS003D	634.0	635.0	1.0	0.43	7.01	0.02	0.22	9	<10	28	19
		787.0	792.0	5.0	0.35	2.60	0.00	0.00	14	<10	30	<10
	Incl. (	787.0	788.0	1.0	0.80	5.22	0.00	0.01	17	<10	41	<10

9.6.3 Filon Sur (east extension) and Masa Valle

The decision to explore the eastern extension of Filon Sur was based on the ground geophysical surveys performed in 2015 (Gravimetric and MT) and on geological evidence since the area is on the eastern extension of the southern fault and southern flank of the anticline. Furthermore, this area is aligned with the Masa Valle ore zone, a small orebody of massive sulfides located at Riotinto village that is partially covered by the large dump south of Cerro Colorado.

A total of 3,861m of drilling in eight holes was completed, all of them collared at the southern edge of the Filon Sur dump, or on the top of the dump. The list and details of the holes completed are presented in Table 9.4 below.

Table 9.4 – Best Drill Intercepts

HOLE ID	ETRS_89 X	ETRS_89 Y	Z	Depth	AZIMUT	DIP	Comments
ST03	714109.41	4174851.58	346.318	784.9	0	-90	EM down hole surveyed
FS004D	714102.45	4174922.08	352.717	804.7	0	-75	
FS005D	714074.83	4174747.39	340.105	528.5	215	-75	
FS006D	714273.12	4174935.11	348.648	431.9	0	-50	
FS007D	714451.19	4174928.39	351.574	451.35	0	-50	
FS008D	713877.45	4174924.51	361.781	391.7	180	-50	
FS009D	714461.82	4175224.87	415.429	256.5	0	-55	
FS010D	713873.10	4175169.88	443.922	211.6	0	-50	
			Total mete	3861.15			

One of the holes (ST03) was surveyed by a downhole EM, but the survey did not detect any conductor. Holes ST03, FS004D and FS005D intersected a thick horizon of graphite-ampelite shale on the contact between the Culm and the Felsic Unit (VS2) with tinny interbedded layers of exhalative pyrite, thus an encouraging indication of a possible massive sulfide occurrence. Follow up by downhole EM survey at ST03 and further drilling did not confirm this hypothesis.

A cross section through the syncline structure at Filon Sur and anticline at Cerro Colorado is shown in Figure 9.9.

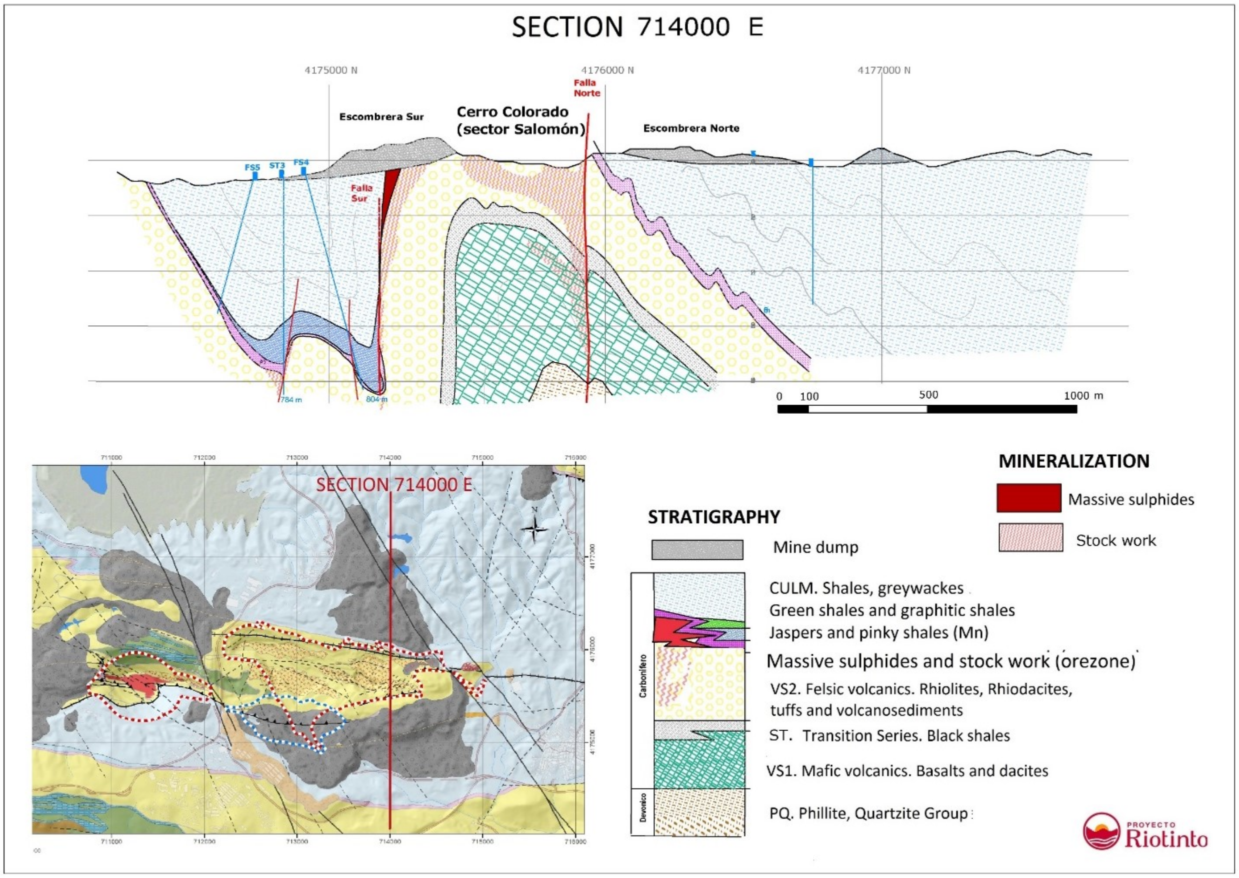


Figure 9.9 – Cross Section 714000 Through Filon Sur and Cerro Colorado (Atalaya 2016)

9.6.4 San Dionisio-Atalaya

San Dioniso–Atalaya pit, one of the main Riotinto ore zones, is the western extension of Filon Sur deposit. Mining of the San Dionisio deposit started at the end of the 19th century by underground methods at Pozo Alfredo followed by opencast mining at Corta Atalaya in 1907. Mining continued through 1990 when mining operations ceased. Despite the long history of mining, the deposit still contains unmined mineralization. According to the compiled historical data, 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 stockwork zone located on the northern flank of the deposit, generally above +100 m above sea level, (Figure 9.10).

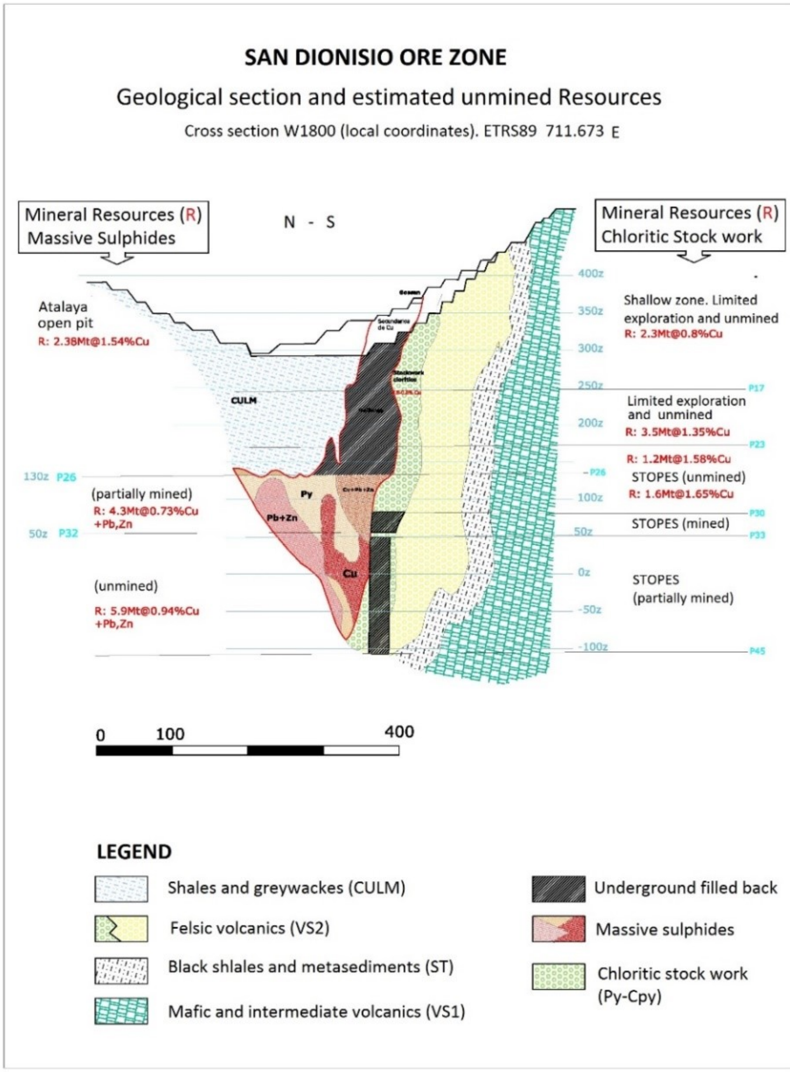


Figure 9.10 – San Dionisio Ore Zone and Unmined Resources (Atalaya 2018)

Eight diamond drill holes were completed by Atalaya in 2015 in this area to confirm and evaluate the shallow stockwork resources located at the northern flank of the deposit. 3,077m were drilled in total. The holes were collared at the top of the hill, north of the deposit and inclined to south. Drilling results confirmed the occurrence of a subvertical strongly chlorite-altered stockwork zone hosted in rhyodacites that underlay the previously mined massive sulfides.

Preliminary studies confirmed that a mineral resource is present in this zone, but further drilling is required to gain confidence for resource evaluation of the whole deposit.

Following the historical data compilation and the drilling completed by Atalaya in 2015, it is confirmed that San Dionisio is the western extension of the Filon Sur syncline structure. It hosts massive sulphides in the axis of the syncline, and stock work mineralization in rhyodacites at the northern flank of the syncline. The main structure of the deposit is shown in Figure 9.11.

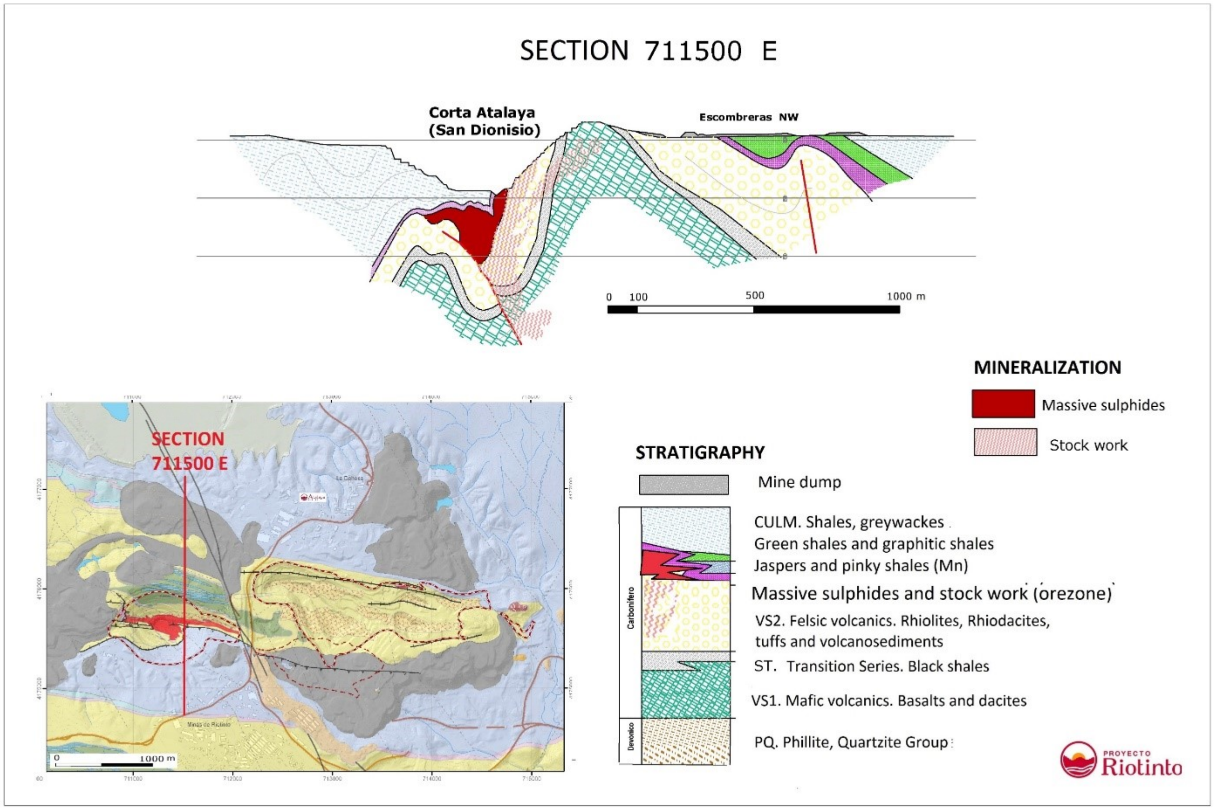


Figure 9.11- Cross section 711500E Through Corta Atalaya-San Dionisio (Atalaya 2016)

9.6.5 San Antonio

San Antonio is a known deposit located at the eastern end of the Cerro Colorado ore body. It is the eastern extension of the Planes deposit, which was mined by underground methods in the early 20th century. Mineralization consists mostly of massive sulfides and lesser amounts of stockwork. This is shown in Figure 9.12.

A historical database compiled by EMED in 2011 included information of 183 drill holes, 188 galleries and assays with 5,865 records for Cu, S, Pb and Zn. The deposit dips approximately 25 degrees to the east, and it occurs at depths between 120m to 200m, as shown on Figure 9.12.

A non-compliant resource was identified by EMED in 2011, but no resource is included in the present report. This deposit was never mined but it already has two vertical shafts, a ramp and a series of underground galleries.

Currently, the western part of the deposit is within the Riotinto Concession and belongs to Atalaya, and the eastern part is in the Tejonera Concession that is pending to be transferred to Atalaya. The boundary between the two mining concessions is the Riotinto River.

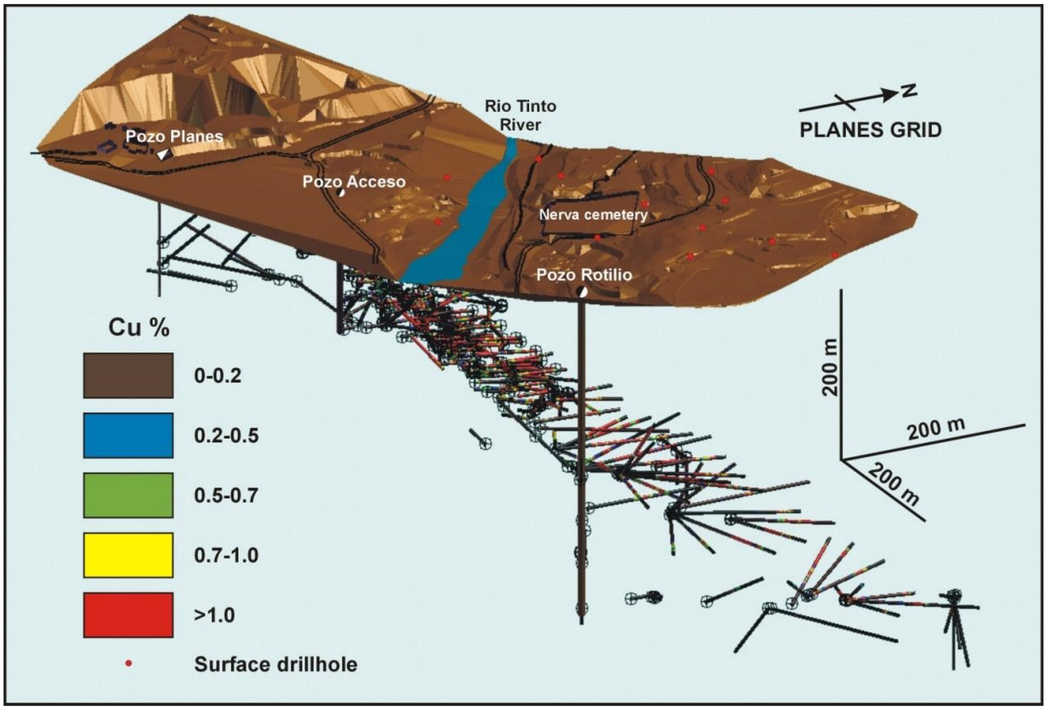


Figure 9.12 – San Antonio Deposit (Atalaya 2016)

In 2015, Atalaya performed limited drilling in the western part of the deposit, to confirm grades and intercepts. Drilling included 8 diamond drill holes for 1,504m of drilling. The orebody was intersected by most of the holes, however grades were slightly lower than expected. Drill intercepts over 0.25% Cu are listed in Table 9.5.

Table 9.5 – Drill Intercepts over 0.25% Cu

Zone	Hole	From	To	drill-int	Cu (%)	S (%)	Pb (%)	Zn (%)	Fe (%)	As (ppm)	Sb (ppm)	Bi (ppm)
San Antonio	SAD-01	92.0	104.0	12.0	0.84	34.42	0.04	0.06	30	6632	277	118
		119.0	126.0	7.0	1.01	10.82	0.01	0.05	9	604	29	108
		132.0	133.0	1.0	0.32	6.28	0.04	0.30	5	455	28	15
		146.0	147.0	1.0	0.32	9.90	0.01	0.10	8	283	42	<10
San Antonio	SAD-02	143.0	148.0	5.0	0.58	13.17	0.02	0.13	10	2172	79	118
		159.0	162.0	3.0	0.80	12.50	0.01	0.07	9	620	37	46
		173.0	177.0	4.0	0.30	9.10	0.01	0.09	7	2032	21	87
		195.0	206.0	11.0	0.47	8.81	0.01	0.02	9	248	65	<10
San Antonio	SAD-03	134.0	135.0	1.0	0.44	15.48	0.05	0.04	39	415	309	12
		136.0	141.0	5.0	0.59	24.92	0.02	0.04	24	1569	182	56
		142.0	143.0	1.0	2.11	45.97	0.11	0.04	39	2253	313	186
San Antonio	SAD-03b	132	148	16	0.92	27.80	1.08	1.97	27.66	2289	219	607
		170	198	28	0.23	8.14	0.01	0.20	8.32	734	41	27
San Antonio	SAD-04	109	110	1	0.3	6.26	0.06	0.09	6.4	319	11	7
		123	124	1	0.2	3.83	0.00	0.05	3.41	302	12	9
San Antonio	SAD-05	81	88	7	0.53	9.90	0.04	0.03	10.01	1424	25	56

9.6.6 Planes

The Planes mineralization is located between the Argamasilla and the San Antonio ore bodies and has been completely mined in the past.

The ore consists of a lens of massive sulfides and associated stockwork. The mineralized hydrothermal fluids generated a pipe of massive sulfide, probably the feeder, surrounded by a stockwork. This structure cuts the felsic volcanics and generates a massive sulphide "umbrella shaped" zone rich in copper, generally chalcopyrite. The massive sulfide lies along the slate-felsic volcanic contact in a sub-horizontal striking lens (Figure 9.13)

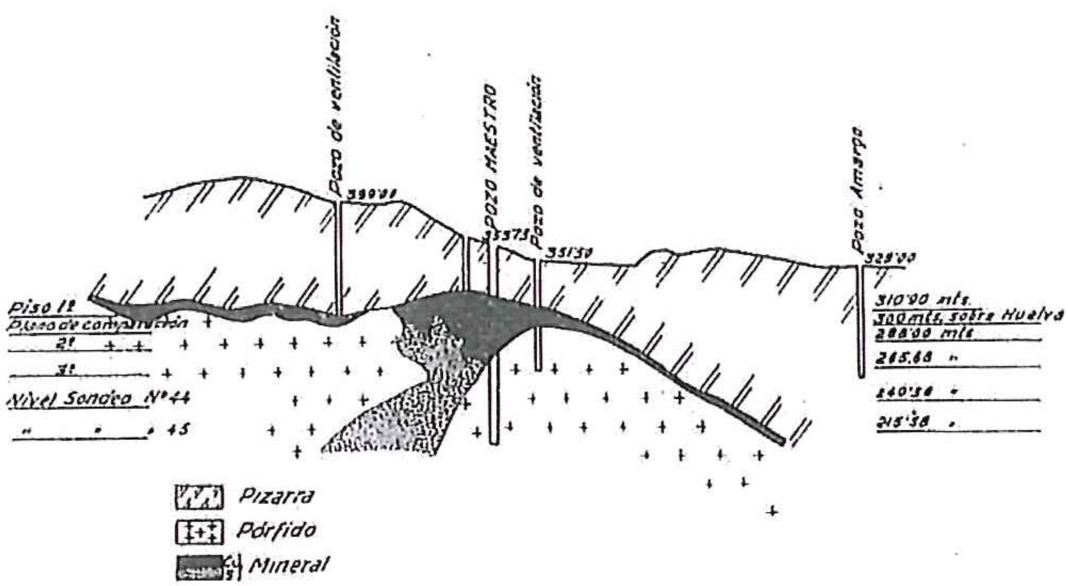


Figure 9.13– Planes Deposit (Pinedo Vara 1963)

This sub-horizontal shape has allowed 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.

Underground mining in Planes was undertaken between 1873 and 1960, with alternating periods of operations and shutdowns. According to historical records, 2,122,000 tons of ore were mined with a production rate up to 50,000 tons per year. In the 1990's mining recommenced by open pit in order to mine the gossan and shallow sulfides, as well as to get material to fill the galleries.

Recently Atalaya performed a short drilling program to explore the stockwork below the mined massive sulfides and to assess if it would be feasible to add the remaining ore to the mineral reserves of the mining plan. The program consisted in 8 drill holes, both reverse circulation and diamond drilling. Mineralized intercepts are listed in Table 9.6. The estimated resource was very limited so its inclusion in the current resource was dismissed.

Table 9.6 – Drill Intercepts over 0.25% Cu

Hole_id	From	To	drill-int	Cu (%)	S (%)	Pb (%)	Zn (%)	As (ppm)	Sb (ppm)	Se (ppm)	Bi (ppm)	Hg (ppm)	Fe (%)
PLD001	77	80	3	**1.54**	38.24	0.14	0.01	4164.00	183.67	75.33	145.00	0.00	32.86
PLD001	95	105	10	0.42	39.03	0.03	0.03	1555.60	46.50	27.70	167.60	0.00	34.54
PLD001	115	121	6	0.39	43.67	0.01	0.00	626.67	0.17	14.50	107.67	2.33	40.97
PLD002	113	116	3	**2.41**	36.87	0.06	0.15	817.67	11.00	63.33	187.33	0.00	33.97
PLM001	52	75	23	0.45	6.75	0.07	0.01	415.26	21.35	10.48	36.87	0.09	6.88
PLM001	80	82	2	0.47	31.98	0.01	0.01	509.00	15.00	149.00	251.00	0.00	28.06
PLD004BIS	34	40	6	**1.08**	17.73	0.07	0.03	2197.00	167.00	0.00	70.00	4.00	15.97

10 DRILLING

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

This chapter describes Atalaya's resource development drilling area that was done to define resources in areas with scarce data, to gain confidence in known resources, and to better define the boundaries and shapes of the mineralization.

10.1 General Description

The resource development drilling on the Riotinto deposit consists of two different periods of drilling:

III. **Historical Riotinto drilling**, which consists of data compiled from historical drilling conducted over almost hundred years. This data was compiled and validated in 2008 by EMED.

IV. **Atalaya Resource drilling**, which started in April 2014 and continues to present. The Atalaya drilling consists of two drilling programs as follows:

   ii. ***2014-2015. Cerro Colorado drilling***. 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 a Sb and As, that might need special metallurgical treatment.

   iii. ***2016-2018. RT-Resource drilling***. RC and Diamond infill drilling in the Cerro Colorado open pit area to convert inferred resources to indicated and measured. The program also includes some deep drilling, up to 800m depth, to explore deep target areas and add new resources. This program started in 2015 and is still ongoing.

Drilling for the two periods is summarized in the table 10.1 and table 10.2, and is shown graphically in Figure 10.1.

Table 10.1- Resource Drilling Summary EMED Technical Report February 2013 historical database

Data Type	Drilling (m)	Sampling (m)
Surface Diamond Drilling	143,855	2,696
Surface Investigation RC and Percussion Drilling	264,314	224,337
Underground Diamond drilling	14,392	2,361
Underground Channel Samples	19,954	4,137

Table 10.2 - Atalaya Mining Resource Drilling Summary 2014-2017

Years / Program	Number of Holes	Drilling (m)
2014-2015. Cerro Colorado Ore zones Drilling	389	26,193.90
2016. RT-Resource Drilling	53	10,593.80
2017. RT-Resource Drilling	36	7,013.40

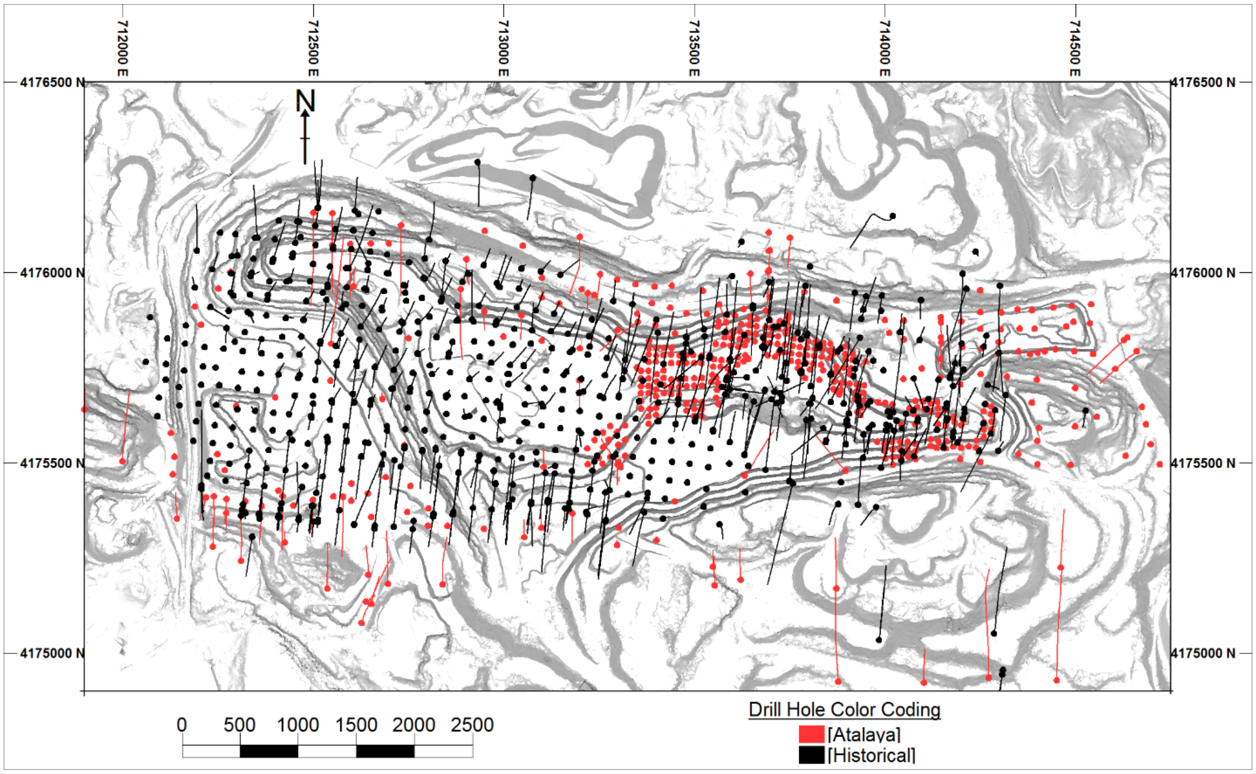


Figure 10.1- Plan Map Showing Atalaya and Historical Drilling in the Resource Area (Noble 2018)

10.2 Historical Drilling Procedures

Procedures for the historical drilling, much of which was completed in the 1960's, are not currently available. That drilling was performed by RTZ, a major mining company, over the entire Cerro Colorado open pit area using a nominal 50 m grid. Drilling is believed to have been done using diamond core methods and, based on the reputation of RTZ, is believed to have been conducted using the best available industry standards at that time.

10.3 Atalaya Drilling Procedures

Atalaya drilling has been done primarily with reverse-circulation drill holes (RC), with smaller amounts of diamond drill holes (DDH), and mixed RC/DDH. Drilling is the responsibility of the Project Geologist and the Exploration Manager, who are the persons responsible for implementing the protocol procedures and ensuring that the required QA/QC standards are followed.

10.3.1 Site Preparation

The geologist marks the drill hole location with a hand-held GPS; if more accuracy is required, the surveyor marks the point 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 fine-tunes the drill rig position with the compass.

10.3.2 Logging and Sampling Procedures

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 analyzed, including method used (AA, ICP, etc.), laboratory, etc.
- Assay results.

RC chips are logged in an appropriate format that includes lithology, alteration, mineralization and other notable characteristics. Every sampled interval is stored in the chip trays and photographed; the picture shows clearly the sample numbers and interval of sampling.

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 are recorded in a separate form.

10.3.3 RC Samples

Reverse circulation drilling is performed by an experienced drilling company with a 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 by 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 2m for both RC and diamond drilling. While the 5m interval used in 2014-2015 is considered a reliable sample, Atalaya believes that a 2m interval gives more confidence and detail in the sampling. As such, the sampling interval used for the RT Resource Drilling at 2016 and 2017 is generally 2m.

The 2m sample is collected from a splitter that is directly connected to the cyclone of the RC rig. The splitter divides the bulk sample into 1/8 and 7/8 portions. The two portions are weighed (bulk weight) and the data is recorded in a spreadsheet for further recovery estimation. The 1/8 portion is delivered to the sample preparation laboratory, and the 7/8 portion is rejected. The 1/8 sample is oven-dried (in case of moisture) and weighed again. Depending on recovery, the weight of the final 1/8 dried sample varies between 6 and 10kg.

Before delivery to 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. The QC procedures also include the insertion of 2 individual samples of 1m drill interval per hole, to check the representativeness of the 2m sampling interval.

A submission order is generated when the batches are submitted to Atalaya laboratory in Riotinto for further sample preparation and assaying.

10.3.4 Core Drill Samples

Drilling is performed under the supervision of Atalaya geologist responsible for drilling.

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 the core shed by two workers from Atalaya Exploration Department using a pickup truck. A typical drill rig and core are shown in Figures 10.2 and 10.3, respectively.

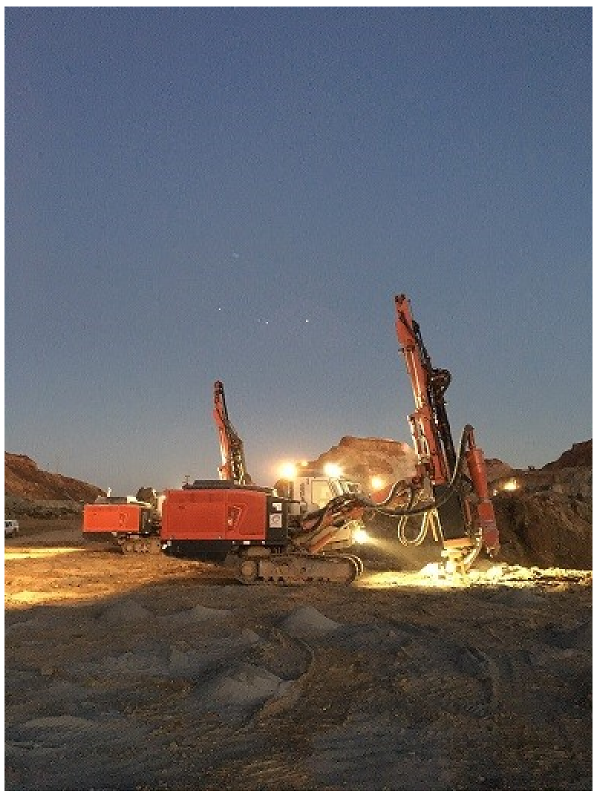


Figure 10.2 – Drill Rig (Atalaya 2018)

Figure 10.3 – Typical Riotinto Core (Atalaya 2018)

11 SAMPLE PREPARATION, ANALYSES, AND SECURITY

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

11.1 Historical Procedures

Sample preparation, analysis, and security methods are unknown for the historical drilling, but RTZ was known to have high standards for such procedures and the sample preparation, analysis, and security procedures are believed to be reliable.

11.2 Atalaya Procedures

Samples collected at drill holes are initially delivered to the logging core shed, shown in Figure 11.1, for logging purposes. Subsequently core samples are moved to the storage core shed, shown in Figure 11.2 for permanent storage. Both of these facilities are locked and secure. Coarse rejects from reverse circulation (RC) drilling are stored in plastic drums in a fenced and secure yard, which is shown in Figure 11.3.

Figure 11.1 - Logging Core Shed (Atalaya 2018)

Figure 11.2 - Exterior and Interior Views of the Storage Core Shed (Atalaya 2018)

Figure 11.3 - Storage Yard for RC Cuttings (Atalaya 2018)

RC and diamond drill hole (DDH) samples are prepared and assayed at the Atalaya laboratory using the sample collection and preparation flow chart shown in Figure 11.4. The sample is reduced through splitting, crushing, pulverizing and quartering to get a final pulp sample of approximately 125g that is treated by acid digestion and analyzed by ICP. Pulps are stored at the laboratory.

11.2.1 RC Samples

The RC sample is collected from a cyclone that is directly connected to the RC rig. The samples are collected every 2m and poured directly from the cyclone into a riffle splitter that generates two samples of 1/8 and 7/8 of the bulk sample.

The larger sample (7/8) is rejected and the smaller sample (1/8 of approximately 10kg) continues to the preparation as shown in Figure 11.4.

RT Project. Flow Chart of Sampling Procedures for 2m RC samples

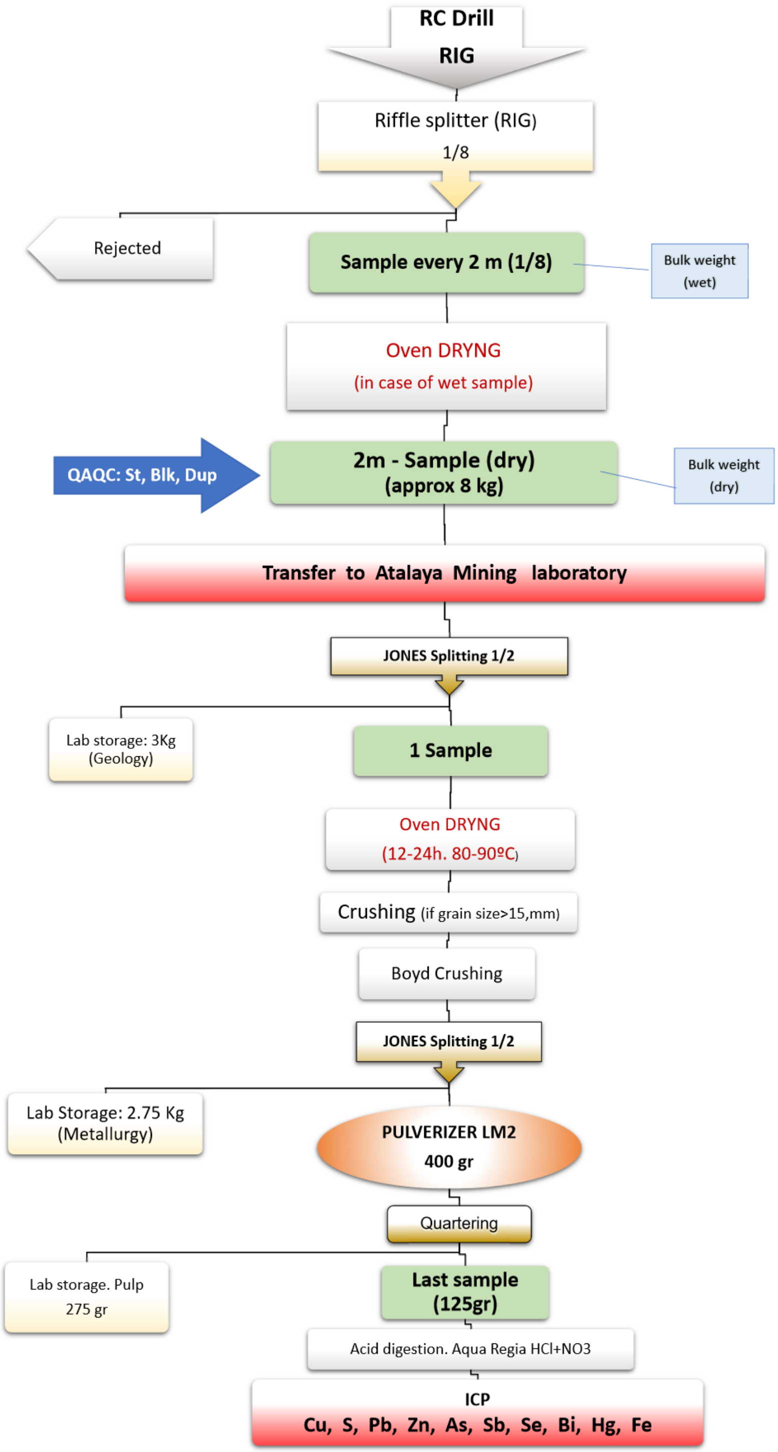


Figure 11.4 - Sample Collection and Preparation Flow Chart (Atalaya 2016)

11.2.2 Core Samples

Drilling is performed under the supervision of the Atalaya geologist responsible for the drilling program.

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 the secure core shed by two workers from the Atalaya exploration department using a pickup truck.

A digital photograph is taken of each core box. The core is inspected and logged by the Atalaya project geologist. The typical sampling length used for the resource drilling program is 2m but can vary according to lithological variations and program requirements. The drill core samples are split into two halves 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 logging and sawing facilities are shown in Figure 11.5.

Figure 11.5 –Logging and Sawing of Drill Core (Atalaya 2018)

The half core selected for sampling is crushed and split to get a 2m sample of approximately 1500-2000 grams that is submitted to Atalaya laboratory.

11.3 QA/QC

11.3.1 Labeling

Each sample is labeled according to a code bar system following this scheme:

→ CODE IMD N 000 E
→ CODE IMD N 000 ABDE
→ CODE IMD N 000 G

Where:

CODE	is a code used to identify a zone or a specific program (RT, ETR, FS, AT etc.)
IMD	indicate the type of drilling, (I) for RC drilling, (M) for combined RC + DDH, and (D) for DDH
N	is the hole number
000	is the number of the sample
E	indicates to the laboratory that the sample is being submitted for analysis, as per the established Exploration protocol
ABD	is the code that corresponds to the standard (A), the blank (B) and duplicate (D)
G	is the code that corresponds to a 1m sample; while the standard sampling interval is 2m, two samples of 1m length are analyzed each hole to verify the quality of the 2m-composite

The G-samples typically are chosen from ore-grade mineralization based on visual examination. The drill samples are delivered to Atalaya laboratory in batches that usually represent individual holes. Sample procedures and analytical methods used by Atalaya laboratory are the same as described for the RC samples.

11.3.2 2016-2017 QC Procedures

The Standards and Certified Reference Materials (CRM) material used by Atalaya during the 2016-2017 time period were provided by AGQ laboratory in Sevilla and made by material from the Riotinto mine. The list of Reference Material used and the certified values are shown in Table 11.1 below:

Table 11.1 – Reference Material

MR	Codigo CORE	Resultados	As (mg/kg)	Bi (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	S (mg/kg)	Sb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
ETR 068 116E	B2	Valor cert	169.56	82.59	11,789.77	215,455.85	1.44	50.68	196,198.50	6.70	40.82	3,245.30
		Interv 95%	16.30	9.48	951.72	23,674.16	1.02	5.82	9,337.81	2.38	17.63	281.60
		RSD (%)	4.81	5.74	4.04	5.49	35.30	5.74	2.38	17.75	21.60	4.34
ETR 072 046E	M2	Valor cert	339.39	36.58	1,464.78	325,817.27	0.14	68.93	389,732.42	6.73	70.61	344.36
		Interv 95%	4.82	6.00	215.13	41,677.32	0.03	4.04	28,388.95	0.63	32.10	34.59
		RSD (%)	0.71	8.20	7.34	6.40	10.10	2.93	3.64	4.65	22.73	5.02
ETR 074 106E	M1	Valor cert	285.48	39.53	17,107.50	276,637.49	1.25	25.70	279,797.32	4.98	80.99	2,103.65
		Interv 95%	19.12	3.34	986.52	34,277.01	0.44	0.94	22,180.71	-	32.26	157.89
		RSD (%)	3.35	4.22	2.88	6.20	17.55	1.83	3.96	-	19.91	3.75
ETR 076 066E	A1	Valor cert	342.84	91.17	47,198.68	295,825.00	1.17	39.30	379,182.95	5.88	96.72	1,636.88
		Interv 95%	26.06	9.72	2,772.67	6,508.20	0.30	2.08	7,271.76	1.19	37.49	183.24
		RSD (%)	3.80	5.33	2.94	1.10	12.79	2.64	0.96	10.14	19.38	5.60
ETR 078 036E	A2	Valor cert	1,374.40	151.49	26,750.76	311,640.00	4.00	1,705.89	432,286.43	84.26	95.57	4,127.58
		Interv 95%	53.08	17.99	1,900.80	7,395.40	1.81	233.10	10,289.46	11.13	37.67	375.26
		RSD (%)	1.93	5.94	3.55	1.19	22.61	6.83	1.19	6.60	19.71	4.55
CCR 001 151E	B1	Valor cert	7.43	1.16	74.83	61,761.31	0.05	4.05	3,850.00	0.88	0.70	153.03
		Interv 95%	0.84	0.38	7.64	2,142.31	0.06	0.14	115.47	0.11	0.28	22.28
		RSD (%)	5.65	16.53	5.10	1.73	56.57	1.75	1.50	6.43	20.20	7.28

From the above list, material B1 was used as a blank, due to its low Cu content. The frequency of insertion within the sample chain was 1 standard + 1 duplicate every hole, typically at the end of the hole. If the hole was a long hole of >200m or a combined drill hole of RC-DDH, the frequency was 1 standard + 1 duplicate every 100 samples or 1 standard + 1 duplicate at the end of the RC drilling and at the end of the DDH drilling.

11.3.3 2018 QC Procedures

The Exploration Department has designed a new QC protocol for drill samples which was initiated in April 2018. The new protocol uses new CRM as well as changes in the frequency of the insertions.

The new CRM have been purchased from Geostat Pty Ltd in Australia and are listed in Table 11.2:

Table 11.2 – New Certified Reference Materials

BLANK
CCR 001 151E (B1)
Cu 75ppm 0,007%

MEDIUM
GBM916-10
Cu 4.544ppm 0,45%
Porphyry Copper

MEDIUM
GBM910-5
Cu 7.952 ppm 0,79%
Copper ore sulfide

LOW
GBM906-10
Cu 1.916ppm 0,19%
Milled waste material, basic rock

HIGH
GBM910-6
Cu 10.084 ppm 1%
Copper ore sulfide

HIGH
GBM914-5
Cu 12.920ppm 1,29%
Copper rougher feed

The revised frequency of insertions is as follows:

- 1 Standard + 1 Blank every 50 samples
- 1 Duplicate-D and 2 Duplicates-G at the end of each hole

11.3.4 Density Measurements

Density Measurements (DM) are performed directly on core samples by weighing the core samples out of water, and then when suspended in water, using a calibrated high precision scale. The DM reading (g/cm^3) of each sample is obtained by dividing the weight of the dry sample by the apparent weight of the wet sample.

The samples for DM determinations are selected by the Project Geologist. The DM is performed by a senior field assistant and supervised by the Project Geologist.

11.3.5 CORE Logging System

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

11.3.6 RC Drilling Recovery Charts

The recovery for RC drilling 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 11.6. These charts indicate that the RC recovery is generally very good, although there is usually a significant drop 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 is to add a second compressor and/or a booster.

If the extra power and air volume is sufficient to inhibit water inflow, drilling continues, if not the RC drilling is suspended and continued by diamond drilling.

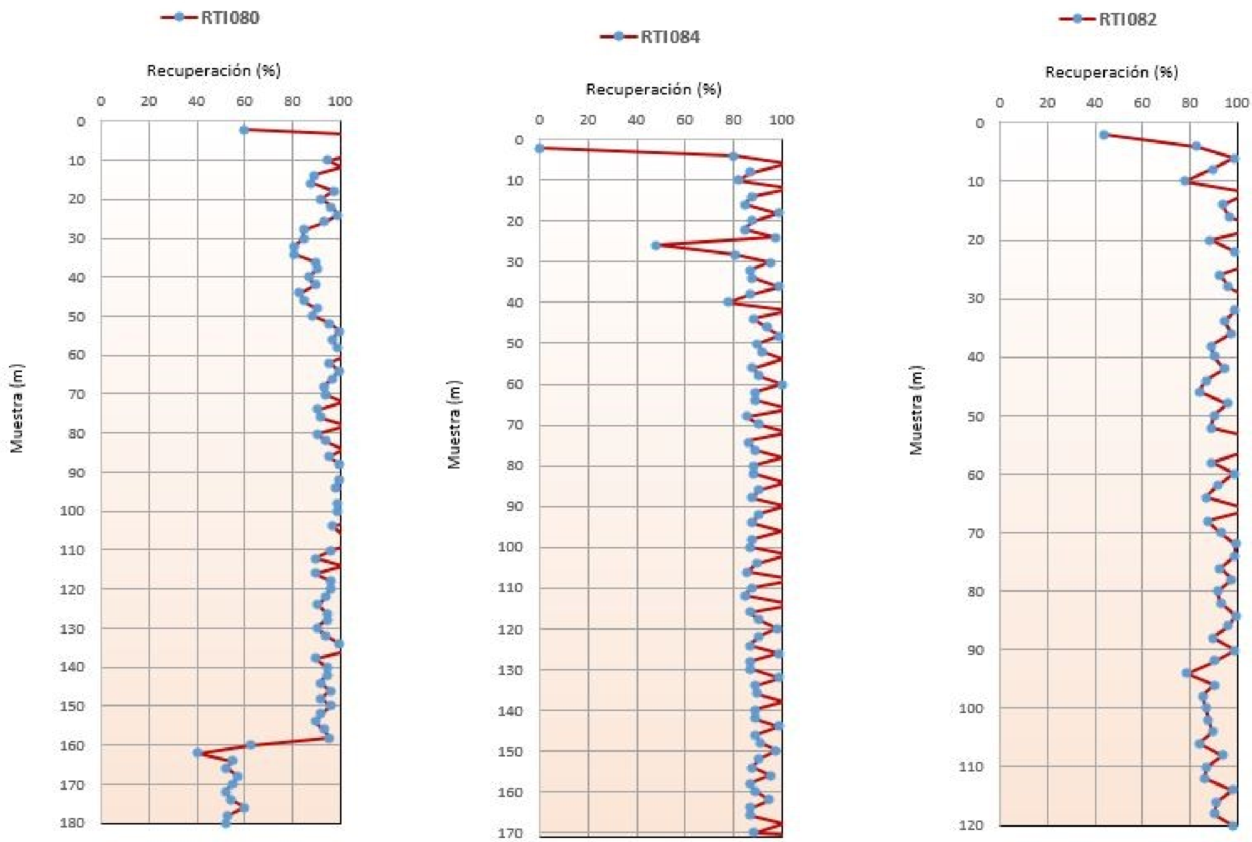


Figure 11.6 – RC Recovery for Drill Holes RTI080, RTI082, and RTI084 (Atalaya 2018)

12 DATA VERIFICATION

Alan Noble and Jaye Pickarts, both 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 and are appropriate for resource estimation. 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

As is typical with a restarted mining operation, much of the detailed information on assaying QA/QC was either not part of a standard procedure when the work was done or has been lost over time.

Nevertheless, there are some good indications that the assay data is suitable for resource estimation, as follows:

1. There is a very good reconciliation between the resource model and mill production for the period from 2015 through 2017. This reconciliation includes nearly 17 million tonnes of plant production. Estimated tonnage is 0.6% higher than the plant and copper grade is 9.7% higher. When anomalies related to a few high-grade pods are excluded, estimated tonnage is 0.2% lower than the plant and copper grade is 4.8% higher. This level of accuracy would be impossible if there were significant problems with assays.
2. Blasthole assay data were paired with 10-m drill hole composites that were within a 2.1-m radius of the blastholes. Blasthole copper grades appear to be biased slightly higher than drill hole grades. This bias is attributed to blastholes and is the subject of continuing study.
3. A small set of data (119 assays) from a 2010 study were available where historical core was reassayed at the ALS laboratory in Vancouver, BC, Canada. Copper grade at ALS averaged 9% lower than the original RTM historical copper grade, but the difference was less than 1% in the critical range from 0.15% Cu to 1% Cu. ALS sulfur grades averaged 34% higher than the RTM historical sulfur grades. It is unclear what caused this difference, but it is not regarded as critical for resource estimation, since it implies only that density and tonnage may be slightly higher if the ALS sulfur grades are correct.
4. Continued monitoring of the reconciliation and blast hole-drill hole assay comparisons is recommended and is in progress.

A tour of the Atalaya assay laboratory was conducted during the May 2018 site visit and sample preparation and assaying procedures were reviewed. All laboratory procedures appear to meet or exceed industry standards. Formal QA/QC procedures were implemented for the 2017 drilling and are summarized in Table 12.1. During 2015, however, geology QA/QC consisted only of insertion of the in-house standards. Duplicate samples were added in 2016.

Table 12.1 - Assaying QA/QC Procedures

Geology QA/QC	Each Drill Hole	1 – In-house Standard
		1 – Duplicate of a 2m RC Sample
		2 – Duplicates of the 1m RC Samples
Laboratory QA/QC	Each lot of 20-25 Samples	1 – Blank
		1 – Duplicate
		2 – Certified reference samples
	External Duplicates	One pulp sample from every 50 is retained at sample preparation for assaying at an external, commercial laboratory. These are shipped to the external lab in batches of 100 samples that include four certified reference samples and a blank.

12.1.1 Results of Geology Department Duplicates

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. These duplicate pairs show no statistically significant bias between the pairs, either on an overall basis or within grade ranges, as summarized in Table 12.2. Paired statistics show a standard deviation of 10% for copper assays above 0.10% Cu. The results are shown graphically in Figure 12.1. One outlier is observed in these data with a value of 0.333 for the original sample and 0.032 for the duplicate sample, which is most likely the result of a misplaced decimal point. It is recommended that Atalaya re-assay the entire batch that included that sample to resolve the question.

Table 12.2 - Statistical Summary of Duplicate Samples Prepared by Geology Department

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	92	0.031	0.028	0.032	0.029	0.001	0.011	34.6%	3.7%
0.1	0.2	10	0.152	0.048	0.146	0.030	-0.006	0.035	60.8%	-3.9%
0.2	0.5	9	0.301	0.077	0.300	0.068	0.000	0.017	95.4%	-0.1%
0.5	100	28	2.360	1.439	2.307	1.474	-0.054	0.280	32.1%	-2.3%
0	100	139	0.526	1.125	0.516	1.116	-0.010	0.126	33.0%	-2.0%
0.1	100	47	1.496	1.531	1.463	1.534	-0.033	0.217	29.9%	-2.2%

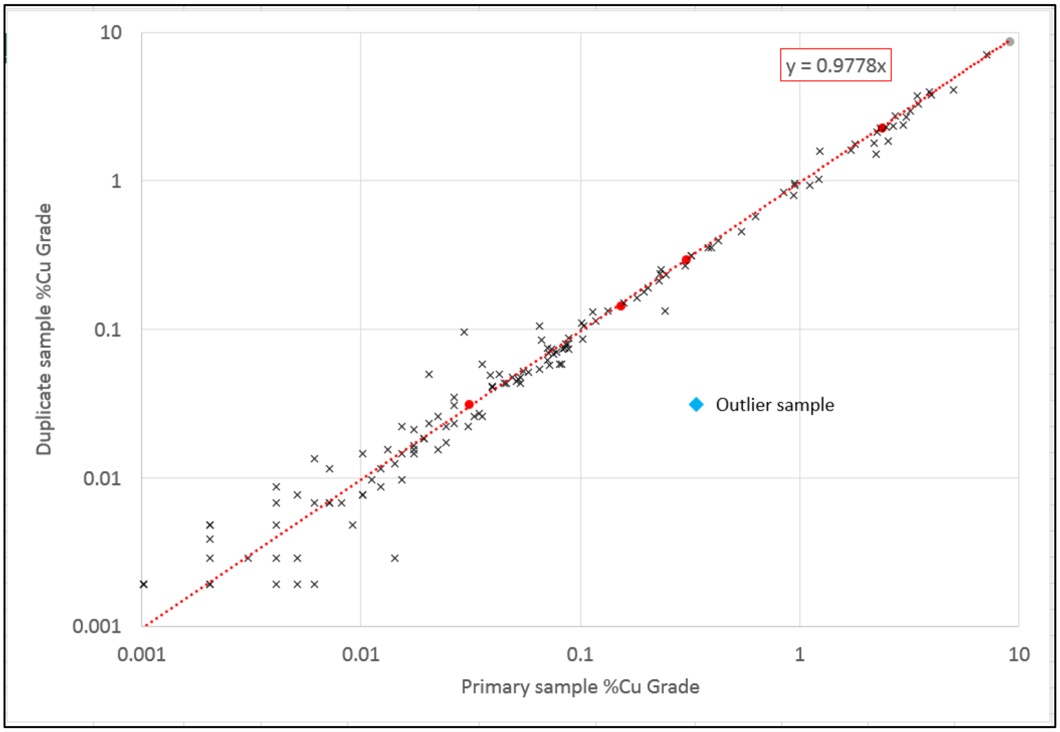


Figure 12.1 - Duplicate Assays by the Geology Department (Noble 2018)

12.1.2 Results of Certified Reference Samples

Four certified reference samples prepared by Geostats Pty Ltd, of O'Connor, WA, Australia and Ore Research and Exploration (OREAS), of Victoria, Australia were used by the Atalaya laboratory to routinely monitor assay quality control. The results of the 2017 and 2018 reference assays, as summarized in Table 12.2, suggest that the Atalaya laboratory copper grades average slightly lower than the reference assays. Although the differences are statistically significant for almost all of the standards, the relative differences are small and do not have practical significance for resource estimation.

Table 12.3 - Summary of Certified Reference Sample Results from the Atalaya Riotinto Laboratory

Year	Sample	Standard Value (%Cu)	Number Atalaya Assays	Atalaya Average (%Cu)	Difference (%Cu)	% Difference	% Below 2 Standard Deviations	% Above 2 Standard Deviations	Statistically Significant Difference
2017	GBM906-10	0.1916	406	0.1851	-0.0065	-3.4%	12.1%	1.7%	YES
2017	OREAS923	0.4246	133	0.4194	-0.0052	-1.2%	0.0%	0.0%	NO
2017	OREAS926	0.8127	279	0.7794	-0.0333	-4.1%	12.2%	0.0%	YES
2017	GBM910-6	10.084	234	0.9909	-0.0175	-1.7%	11.1%	4.6%	YES
2018	GBM906-10	0.1916	1133	0.1971	0.0055	2.8%	0.7%	11.0%	YES
2018	OREAS923	0.4246	1,05	0.4299	0.0053	1.3%	0.0%	1.8%	YES
2018	OREAS926	0.8127	740	0.7933	-0.0194	-2.4%	7.8%	0.1%	YES
2018	GBM910-6	10.084	684	0.9944	-0.0140	-1.4%	6.9%	0.0%	YES
Average/Total		0.5475	4,659	5,413	-0.0062	-1.1%			

12.1.3 Results of External Duplicate Samples

Duplicate samples have been submitted to the ALS (Omac) laboratory in Ireland, the AGQ laboratory in Sevilla, Spain, and the Alex Stewart International laboratory in Bilbao, Spain starting in Dec 2016 through. Six lots were available for review with a total of 452 duplicate samples. Paired statistics for the samples are summarized in Table 12.3. The results are shown graphically in Figure 12.2. These statistics show that all lots are within acceptable tolerances for resource estimation except for the February 2017 lot that was assayed at Alex Stewart. While the overall results including the Feb 2017 anomaly are still acceptable, it is recommended that Atalaya revisit those results to resolve the difference and to determine whether resource drilling is affected during that time.

Table 12.4 – Summary of External Sample Results

Lot	Number Pairs	External Lab %Cu		Riotinto %Cu		Difference			Relative Difference
		Average	Std Dev	Average	Std Dev	Average	Std Dev	t-test	
ASI Dec 2016	40	0.289	0.376	0.289	0.377	0.000	0.016	92.1%	-0.1%
ASI Feb 2017	65	0.234	0.259	0.270	0.275	0.035	0.056	0.0%	15.0%
AGQ Mar 2017	46	0.344	0.705	0.339	0.656	-0.005	0.075	62.4%	-1.6%
ASI Oct 2017	105	0.393	0.437	0.403	0.438	0.010	0.018	0.0%	2.5%
ALS Feb 2018	96	0.242	0.222	0.241	0.214	0.001	0.026	81.1%	0.3%
ALS Apr 2018	100	0.242	0.367	0.251	0.374	-0.009	0.026	0.1%	-3.8%
All Lots	452	0.291	0.399	0.299	0.393	0.005	0.040	1.0%	1.7%
Excluding Feb 2017	387	0.300	0.418	0.304	0.410	0.000	0.034	88.0%	-0.1%

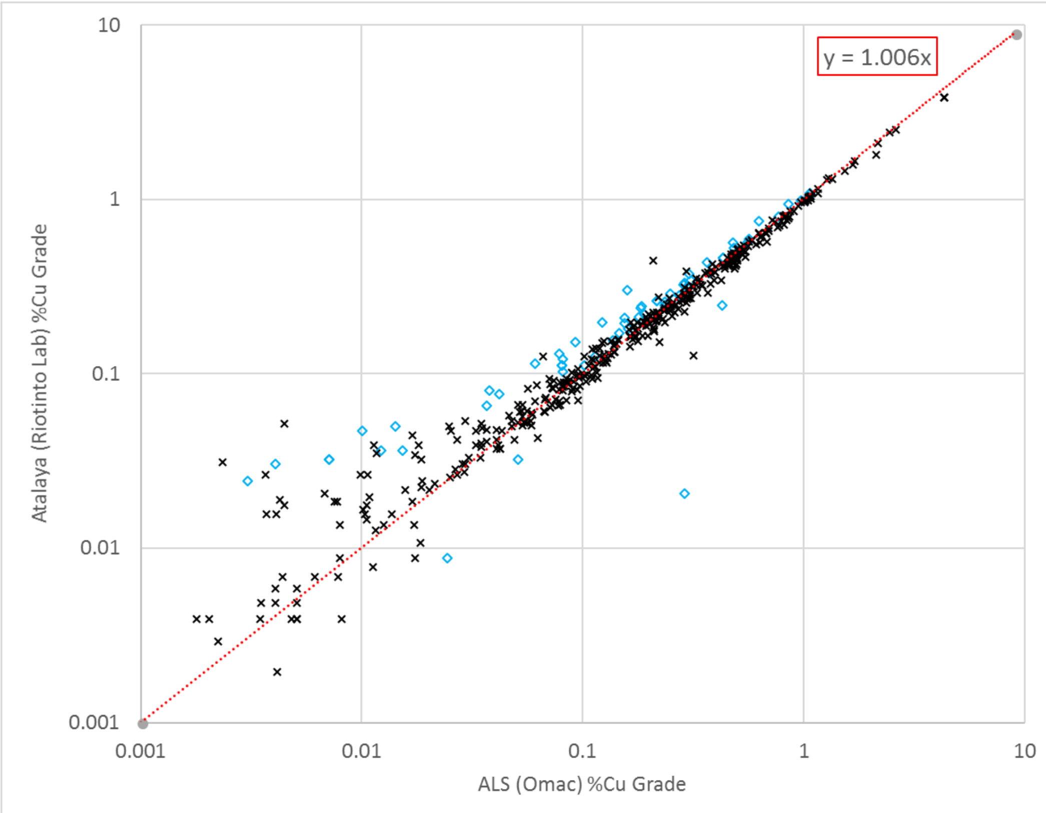


Figure 12.2 – Duplicate Assays at External Labs: Dec 2016 to Apr 2018 (Feb 2017 Assays in Blue) (Noble 2018)

12.2 Geologic 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, down-hole 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 resource estimation system. Data from newer drilling by EMED Tartessus/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 is estimated from sulfur data using a formula established by Riotinto. 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 was provided by Atalaya as an AutoCAD drawing that contained topographic contours and other elevation data. The topographic interpretation is 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. End-of-month topographic data were provided for 31Dec2015, 31Dec2016, and 31Dec2017 for use in this report.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

This section was compiled by Atalaya Mining and Minnovo technical staff and updated by John Fleay 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 of time a total of 23.9 Mt of ore at an average grade of 0.54% Cu was processed. Information generated during that period was used to develop the design criteria and start up plan for the current operation. The old concentrator initially processed 4.5 Mtpa of ore and an expansion increased the concentrator processing capacity to 7.3 Mtpa in 1997; a peak annual throughput of 9 Mtpa 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 (Cerro Colorado West - CCW, Isla, Salomon, Lago and Quebrantahuesos) with different but acceptable metallurgical performance variability when processing it with conventional flotation machines and a mixture of ditiophosphate and thionocarbamate based chemistry at a basic pH of over 10.5. Originally the optimum target P_{80} in the flotation feed was set to 160 microns as a compromise between copper recovery and throughput. Current plant performance indicates an optimum target P_{80} in the flotation feed of 183 microns.

Recently, additional testwork has been commissioned to reduce key areas of technical risk when expanding the capacity of the plant from the current capacity of 9.5 Mtpa to 15 Mtpa of ore. 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. Additional 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;
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 ore from different sections of Cerro Colorado pit 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 Mtpa were based on historical performance, laboratory and pilot plant test-work, and computer simulations.

The 9.5 Mtpa 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 is consistent within the copper ore industry ranging from 11.3 and 19.8 kWh/t, which have been found to be present about 10% of the total operating time. The ore types that exhibit high energy consumption are handled using ore blending techniques at the mine and hence, their impact on processing rate are 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 Mtpa.

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.

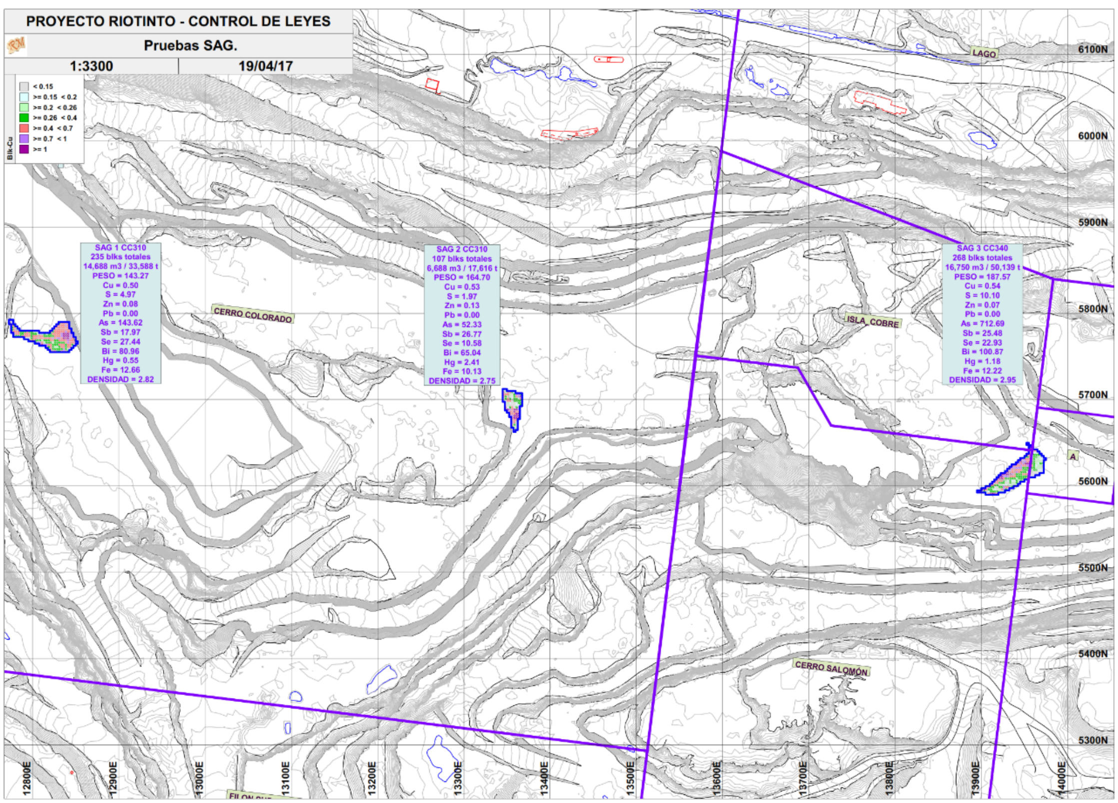


Figure 13.1 – SAG Comminution Sample Selection (Minnovo 2018)

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, June 2017, SMC Test® Report on Two Samples from Proyecto Riotinto Project. JKTech Job No: 17003/P11) and ALS (JKTech, June 2017, SMC Test® Report on Two Samples from Proyecto Riotinto. JKTech Job No: 17003/P38) 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, Bulk Solids Flow Report Riotinto Spain Copper Ore Sample. Report No: A783 Rev0) 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). 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. Although vibrating feeders can be used, their selections are dependent on the -4 mm size fraction and the operating moisture. 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 will be designed with dead boxes, but careful consideration will 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 will be used for sliding applications, although direct impact onto polyurethane liners will 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 can be used. For sliding wear, VRN-500, Hardox-450 or ceramic liners will be considered.

Liner ledges will be minimized and round corners will be installed for transfer chutes. As a general rule, for a bulk stream containing larger lumps and fines, the bulk streams impact angle relative to the impact surface will 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 have been considered and the bulk streams impact angle relative to the impact surface will not be greater than 20˚, unless proved otherwise with chute velocity calculations. A duff or fines chute will 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 (Cerro Colorado West - CCW, Isla, Salomon, Lago and Quebrantahuesos - 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, grindabilty 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 of between 22% and 26% Cu.

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

Production of copper concentrate from the Phase 1 plant commenced in early August 2015 and by November 2015 was operating at steady state treating an equivalent processing rate of 4.8 Mtpa. The Phase 2 plant commenced production in the first quarter of 2016. 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

During 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/m^3	3435 kg/m^3
d_{90} particle size	28.0 µm	28.5 µm
d_{50} 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	
	$K_{BP} = \mu_w + 81.89\ C^{13.12}$	$\tau_y = 225.1 \times 10^3\ C^{15.64}$
Composite 2 U/F	Applicable mass solids concentration range: 46% m < C < 59% m	
	$K_{BP} = \mu_w + 18.37\ C^{9.38}$	$\tau_y = 103.68 \times 10^3\ C^{12.68}$

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

The same design feed solid flux (0.25 $t/h/m^2$) indicated in Table 13.7 was used for the sizing of the Phase 2 and Phase 3 thickening circuit.

13.6 Concentrate Filtration

Concentrate filtration tests are summarized in Table 13.8 and 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/m^3)	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/cm^3)	2.82	2.82
Moisture (%)	16.0	14.5

Both campaigns resulted in 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 13.1 below (Golder, July 31 2015 Technical Memo).

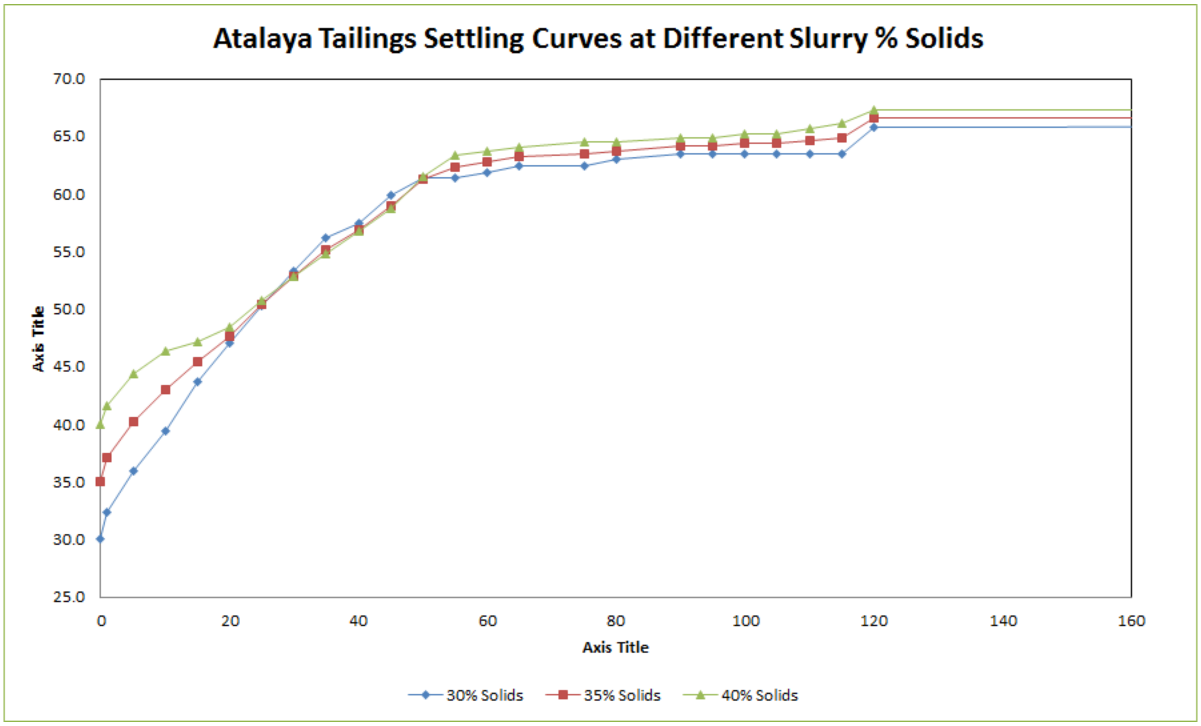


Figure 13.2 – Settling curves and final compacted solids for Atalaya Tailings (Golder 2015)

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 report with reference number C-15-20033-689-2 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/día)	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	$3*10^{-8}$	$1,3*10^2$	50	35	12
Pizarras	26,00	10^{-11}	---	5890	40	200

Table 13.11 (Cont.) – Geotechnical Parameters

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)*	$3*10^{-8}$ *(2,5-3,5$*10^{-8}$)*	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)*	$3*10^{-8}$ *(2,5-3,5$*10^{-8}$)*	33 *(33)*	0 *(0)*

14 MINERAL RESOURCE ESTIMATES

This resource estimate was prepared by Alan C. Noble, P.E. of Ore Reserves Engineering, Lakewood, CO, USA. 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 46 years of experience with resource estimation on over 150 mineral deposits throughout the world. Mr. Noble is independent of Atalaya Mining and Proyecto Riotinto using all the tests of NI 43-101.

14.1 Resource Block Model

The resource model was created as a three-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.

Key items included in the block model 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 and sulfur. 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 copper and sulfur using Nearest-Neighbor-Assignment (NN) and Ordinary Kriging (OK) for additional validation of the IDP estimates. 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 14.1 -Resource Model Size and Location Parameters

	Minimum (ETRS meters)	Maximum (ETRS 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

14.2 Drill Hole Sample Database

14.2.1 Database Content

The drill-hole data were provided by Atalaya engineering and 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 this estimate. Drilling used for the resource estimate includes 80 additional drill holes that were drilled in the 2017 drilling campaign, as summarized in Table 14.2. The new drilling provides significant additional definition of the Filon Sur area, plus infill in other areas throughout the deposit. Underground drill-hole data, underground channel samples, and shallow, close-spaced (investigatory) holes were available but were not used for resource estimation because of concerns regarding the quality of those data.

Table 14.2 - Summary of Drilling used for Resource Estimation

Drill Series	Type	Year	Number Holes	Number Assays	Drilled Length	Average Hole Length	Average Interval Length
RTM (Numbered)	Core	Historical	682	68050	142355.3	208.7	2.09
CCR	RC	2014	12	1444	1480.0	123.3	1.02
ETR & RT	RC	2015	361	18058	28659.2	79.4	1.59
RTD 2017	RC	2017	28	2682	5436.5	194.2	2.03
FS (Filon Sur)	RC	2017	43	2759	10255.1	238.5	3.72
GT (Geotech)	Core	2017	6	847	1170.0	195.0	1.38
ARD	??	2017	3	759	768.9	256.3	1.01
Total			1135	94599	190124.9	167.5	2.01
New 2017			80	7047	17630.5	220.4	2.50

14.3 Bulk Density

14.3.1 Density Studies

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 14.1, demonstrate increasing S.G. with increasing sulfur. While this correlation is significant, the correlation coefficient is only 0.629, so there is still significant variability around the trend.

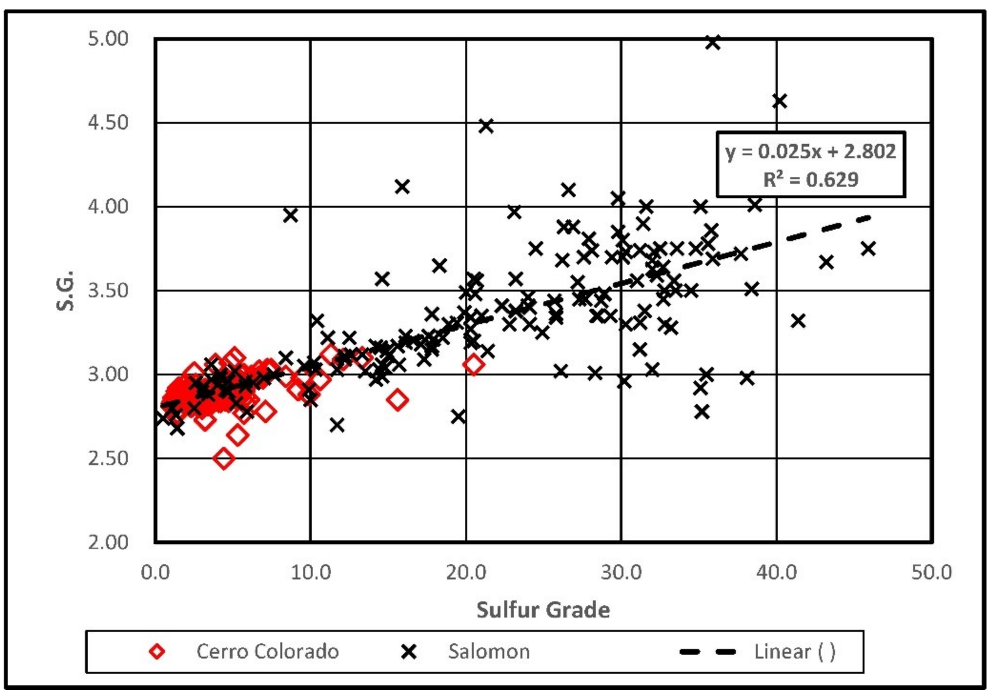


Figure 14.1 - Correlation between Specific Gravity and Sulfur Grade – 2000 Data (Noble 2016)

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 14.2, 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 blasthole 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.

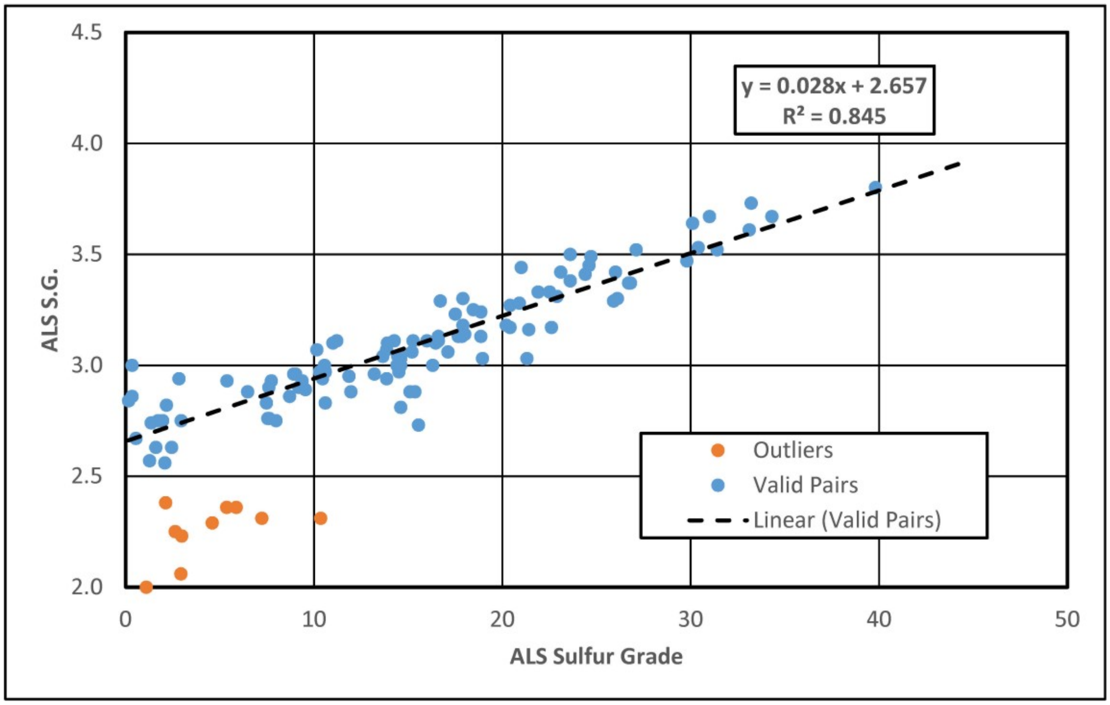


Figure 14.2 - Correlation between Specific Gravity and Sulfur Grade – 2010 Data (Noble 2016)

The Riotinto Project 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 that 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.

14.3.2 Resource Model Density

The Riotinto 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 is thus set to 2.7 t/m^3. Density in fill material, particularly the backfilled Filon 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.

14.4 Topographic Model

Topographic contour data were provided by Atalaya 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. 31Dec2017 – contains the modified topography including mining through the end of December 2017. This is the basis for the resource and reserve estimates.

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

1. Local mine coordinates were translated to ETRS, 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.

14.5 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 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. **Filon Sur Backfill:** Contours of the mined-out and backfilled surface of the Filon Sur open pit were provided by Atalaya to describe that volume. Those contours were converted to a DTM surface, and a block model was created in the 10x10x10-m prototype that defined the volume between the April 2010 topography and the bottom of the Filon Sur pit. All of these blocks are defined as backfill.
3. **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.
4. **2015-2017 Mining:** Current mining from July 2015 through the end of Dec 2017 was defined using end-year topographic models for 2015, 2016, and 2017.
5. **End Dec 2017:** Final resources and reserves are computed using the end of Dec 2017 mine topography as the reporting basis.

14.6 Geologic 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.

14.6.1 Mineralized Zone

In the previous model, two mineralized zones were defined: The Acid Zone and the Basic Zone. Further evaluation of the method has shown that the Acid and Basic mineralized zones could be combined to simplify modeling and to eliminate minor edge effects along the contact between the Acid and Basic zones. The general shapes used for the previous model were used as the basis for the combined mineralized zone model, with minor adjustments to incorporate the 2017 drilling.

14.6.2 Unfolding

The Datamine unfolding tool was used to flatten the anticlinal fold into a geometry that is as close as possible to the original shape of the deposit.

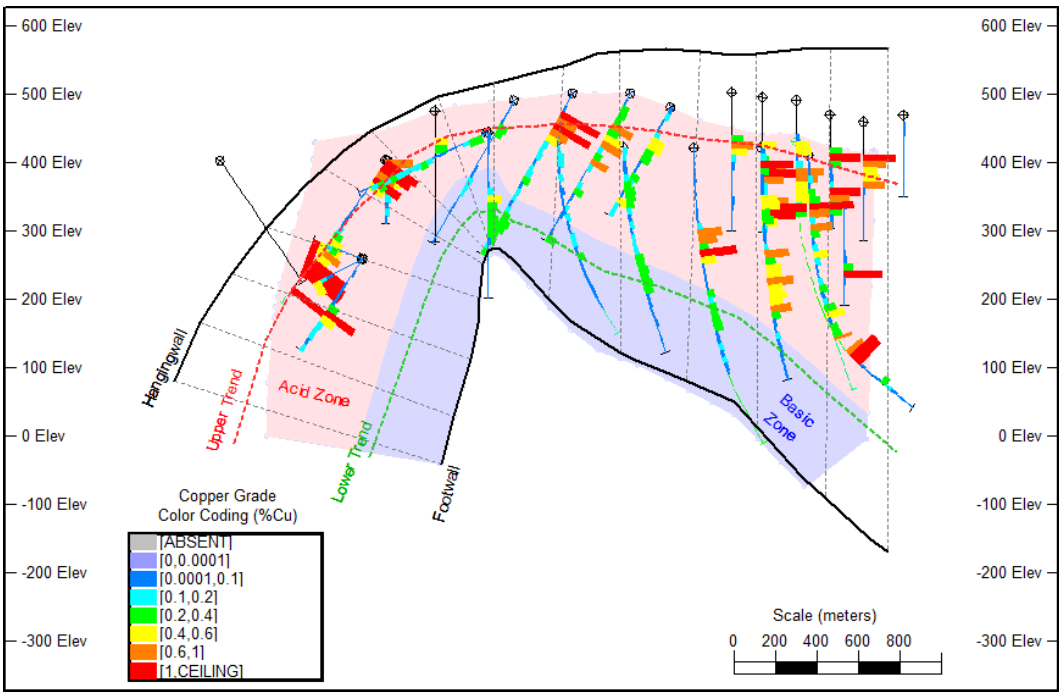


Figure 14.3 – Typical Cross-Section looking N83W, showing Drill Holes, Trends, and Unfolding Strings (Noble 2018)

The procedure for unfolding is as follows:

1. Trend strings were drawn through the two strongest mineralized horizons, as shown in Figure 14.3. 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.

   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.

2. 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.

3. 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.

4. 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 an 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.

5. 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.

14.7 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 the code "MinZ" and intervals outside of the wireframe were assigned the code "NOZN". 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.

14.8 Copper Grade-Zone Models

14.8.1 Copper Grade Distributions

Copper grades were declustered for analysis of the grade distribution using a nearest-neighbor block model inside the mineralized-zone and only those blocks in the measured and indicated resource category. The resulting distribution of copper grade, presented in Figure 14.3 as lognormal cumulative probability and lognormal histogram plots, indicates that copper grade is composed of several lognormal populations.

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.

1. A spike at 0.01% Cu that corresponds to low-grade historical assays rounded off to 0.010. Other rounding spikes are observed at 0.02% Cu and 0.05% Cu, but those were not modeled.

2. A low-grade population averaging 0.03% Cu and containing about half of the total samples. This population is mostly waste but contains a small fraction of ore-grade material.

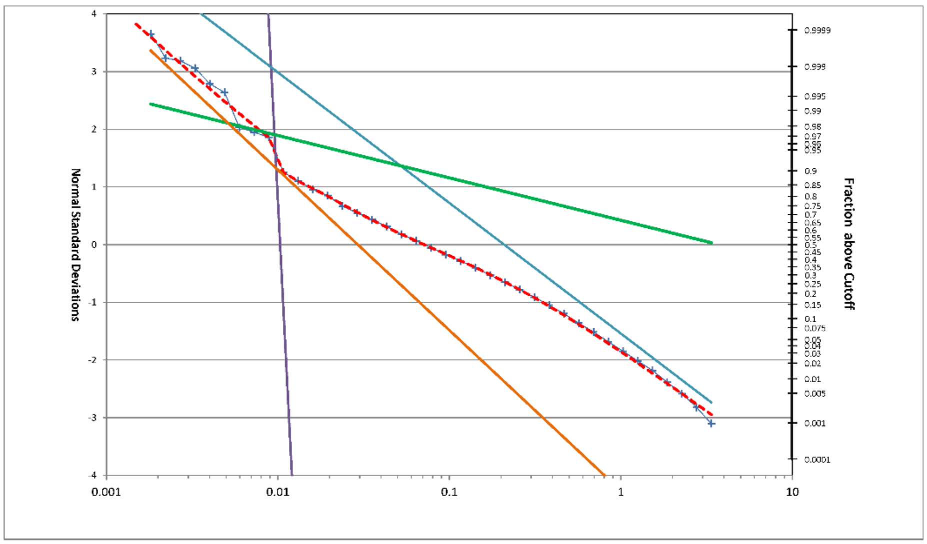
3. A high-grade distribution averaging 0.355% Cu. This population is the primary source of ore grade mineralization, but also contains significant waste-grade mineralization.

4. A very-high-grade distribution that averages over 4% Cu and is composed of high-grade outliers. These high-grade outliers are observed in both drill holes and blastholes and appear to result from narrow vein structures with limited vertical and lateral extent.

There is significant overlap between the low-grade and the high-grade distributions, such that it is very difficult to differentiate between low and high-grade distributions based on grade alone. As shown in Figure 14.4, there is a significant probability that a Cu composite could be in either the low-grade or high-grade population in the grade range between 0.025% Cu to 0.15% Cu.

Probability Fit - Uncapped Cu - Acid + Basic Zones

	Population	Barren	Low Grade	Mid Grade	High Grade	Total				
Mean	0.198652	0.0103	0.0300	0.3489	502.4405	0.199				
Fraction		6.43%	42.0%	51.5%	0.0011%	100.0%	5.7%	39.48%	51.1%	3.7%
Median		0.0103	0.0292	0.2081	3.7267		0.010	0.025805	0.178788	0.966352
Beta		0.040	0.827	1.017	3.132		0.050	0.783	0.950	0.579
Log Mean		-4.5768	-3.5331	-1.5699	1.3155					
Sum of Errors		SSQ	Weight							
%HISTO		0.000660434	1							
Z-Fit		0.182770433	0.001		Hist/Z-fit	0.003613				
FIT		0.000843204								



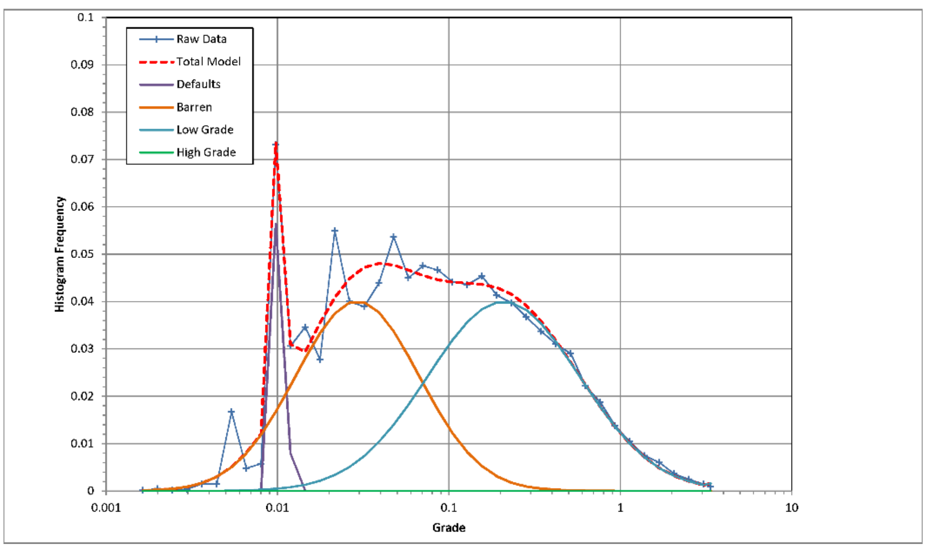


Figure 14.4 – Lognormal probability and histogram plots of Cu grade in the Mineralized Zone (Noble 2018)

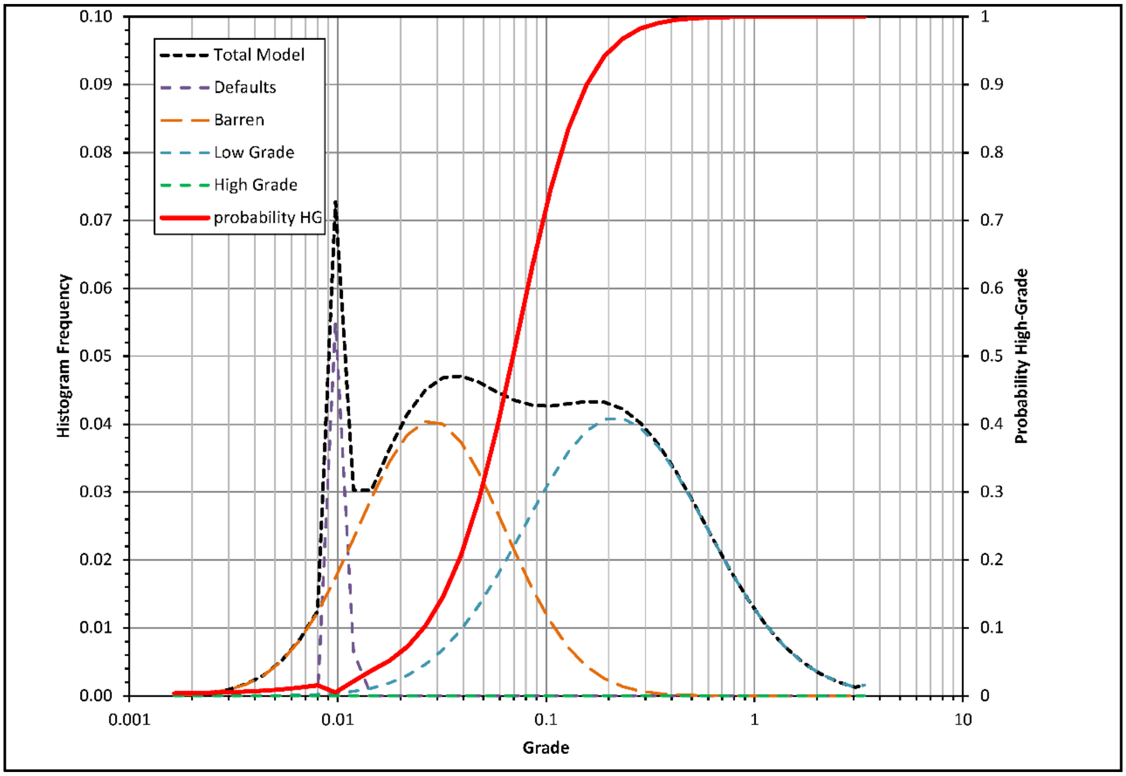


Figure 14.5 - Probability that a Composite is in the High-Grade Population (Noble 2018)

The large overlap between low-grade and high-grade is problematic for resource estimation, since there is no easy way to differentiate the populations. Accordingly, a simple strategy was developed to provide grade-zoning control as follows:

1. A simple nearest-neighbor (NN) model was created for copper grade, and preliminary grade zones were assigned using the grade-range parameters in Table 14.3. Search parameters for the NN model are documented Table 14.4.
2. 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.
3. 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. Composite grade zone parameters are shown in Table 14.3 along with the block model grade-zone parameters. Composite grade-range parameters were optimized during grade interpolation.

Table 14.3 - Grade-Zone Parameters for Block Model and Composites

Zone Code	Description	Block Model Grade Ranges		Composite Grade Ranges	
		Lower	Upper	Lower	Upper
1	Low-Grade	0.00	0.06	0.00	0.10
2	Low/High Overlap	0.06	0.25	0.04	1.00
3	High-Grade	0.25	4.00	0.16	4.00
4	Very High-Grade	4.00	100	0.80	100

Table 14.4 - Grade-Zone NN Search Ellipses

Zone	X'	Y'	Z'
Low-Grade Through High-Grade	35	10	15
Very High-Grade	300	175	70

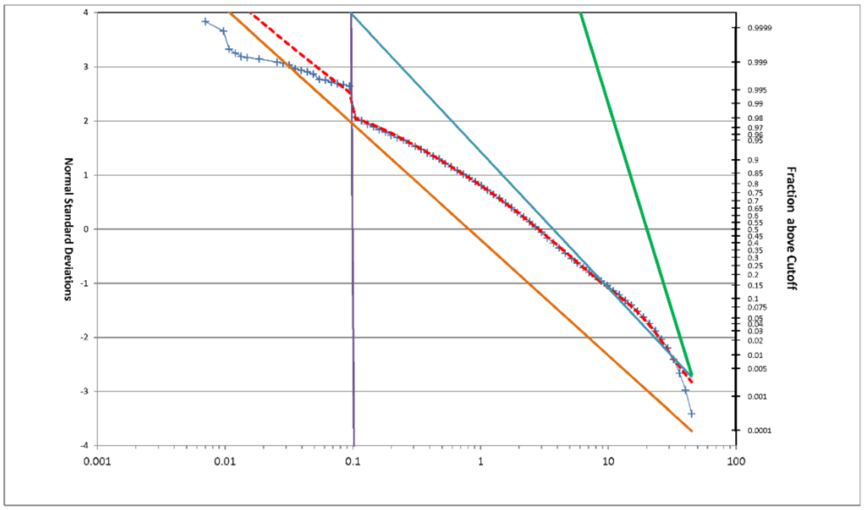
14.9 Sulfur Grade Distribution

The sulfur grade distribution, as shown in Figure 14.5, is dominated by a population of moderate sulfur grade that has an average sulfur grade of 3.69% sulfur and contains 70% of the total data. This population represents stockwork sulfide mineralization that is pervasive in the Mineralized Zone. Approximately 4% of the samples are massive sulfide mineralization averaging over 20% sulfur. A smaller 25% of the samples is represented by a low-sulfur population that averages 1.4% 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.

Probability Fit -Sulfur

	Population	Defaults	Low-Sulfur	High-Sulfur	Massive Sulfide	Total
Mean	5.115	0.1003	1.4399	5.6075	20.9508	5.115
Fraction		1.33%	24.74%	69.94%	3.9848%	100.0%
Median		0.1003	0.8065	3.6924	20.0291	
Beta		0.001	1.077	0.914	0.300	
Log Mean		-2.2993	-0.2151	1.3063	2.9972	
Sum of Errors		SSQ	Weight			
%HISTO		0.000133166	1			
Z-Fit		6.851976173	1.00E-05		Hist/Z-fit	1.94E-05
FIT		0.000201686				



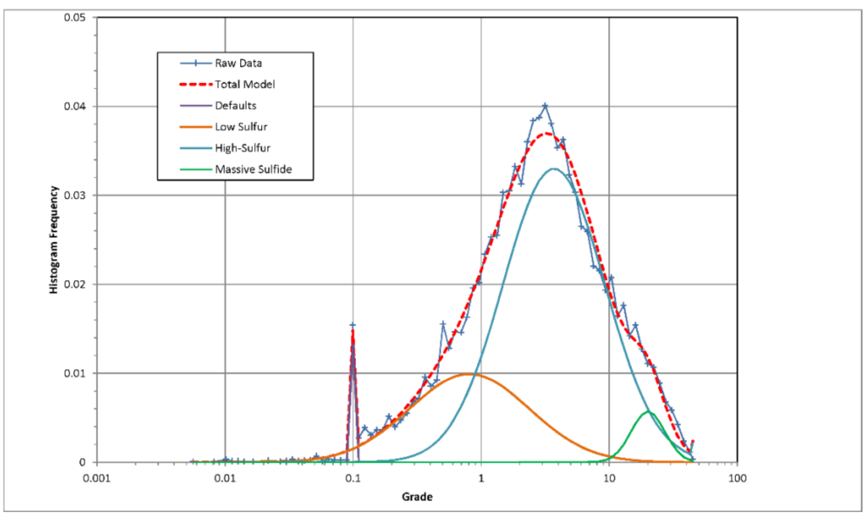


Figure 14.6 – Sulfur Grade Distribution in the Acid Zone (Noble 2018)

14.10 Variograms

Variograms were not redone for this model and the following discussion of variograms is extracted from the 2016 report.

Variograms were computed for copper and sulfur using Sage2001 variography software. Variograms were computed using lognormal transforms and the covariance computation option.

Variograms were computed for copper in both the ETRS coordinate system and in the Unfolded coordinate system. Sulfur variograms were only computed in the Unfolded coordinate system. The results of variogram modeling are summarized in Table 14.5 and are shown graphically in Figure 14.7 through Figure 14.11. 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 two nested exponential variogram structures except for sulfur, which was modeled with a single exponential variogram.

Comparison of the overall (No Grade Zoning) copper variogram in ETRS 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 variogram, confirming that copper mineralization is following parallel to the fold. In the vertical direction, however, the ETRS 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, 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 is added to the general variation within the zones. The relative variance in all of 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, shown in Figure 14.12, 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 14.5 - Summary of Variogram Models

XYZ	Variogram	Copper Grade Range		Relative Variance	Relative Nugget	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
ETRS	Cu-No Zones	0.001	100	6.909	0.691	0.10	35.4	9.9	31.0	0.619	202	81	413	0.281
Unfolded	Cu - No Zones	0.001	100	6.909	0.691	0.10	27.4	27.5	34.7	0.668	259	133	112	0.1
	Cu - Low	0.001	0.14	1.118	0.224	0.20	10.0	22.0	20.0	0.45	132	75	125	0.35
	Cu - Mid	0.04	0.30	0.529	0.143	0.27	10.0	10.0	12.0	0.58	109	61	80	0.15
	Cu - High	0.25	4.00	0.807	0.283	0.35	10.0	10.0	23.0	0.38	110	61	32	0.27
	Sulfur	0.01	100	3.993	0.399	0.10	303	143	185	0.9	-	-	-	-

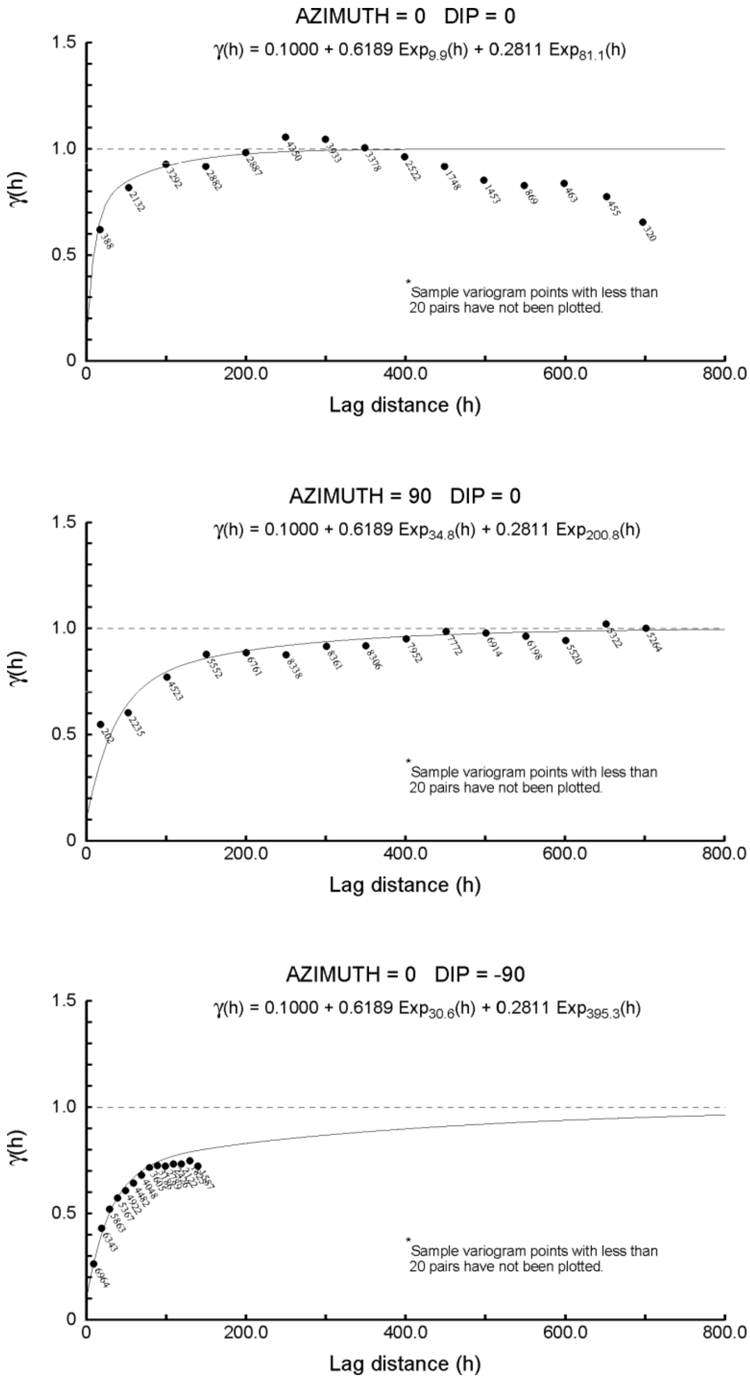


Figure 14.7 – Variograms for Acid-Zone Cu Grade in ETRS Coordinates – All Data (Noble 2018)

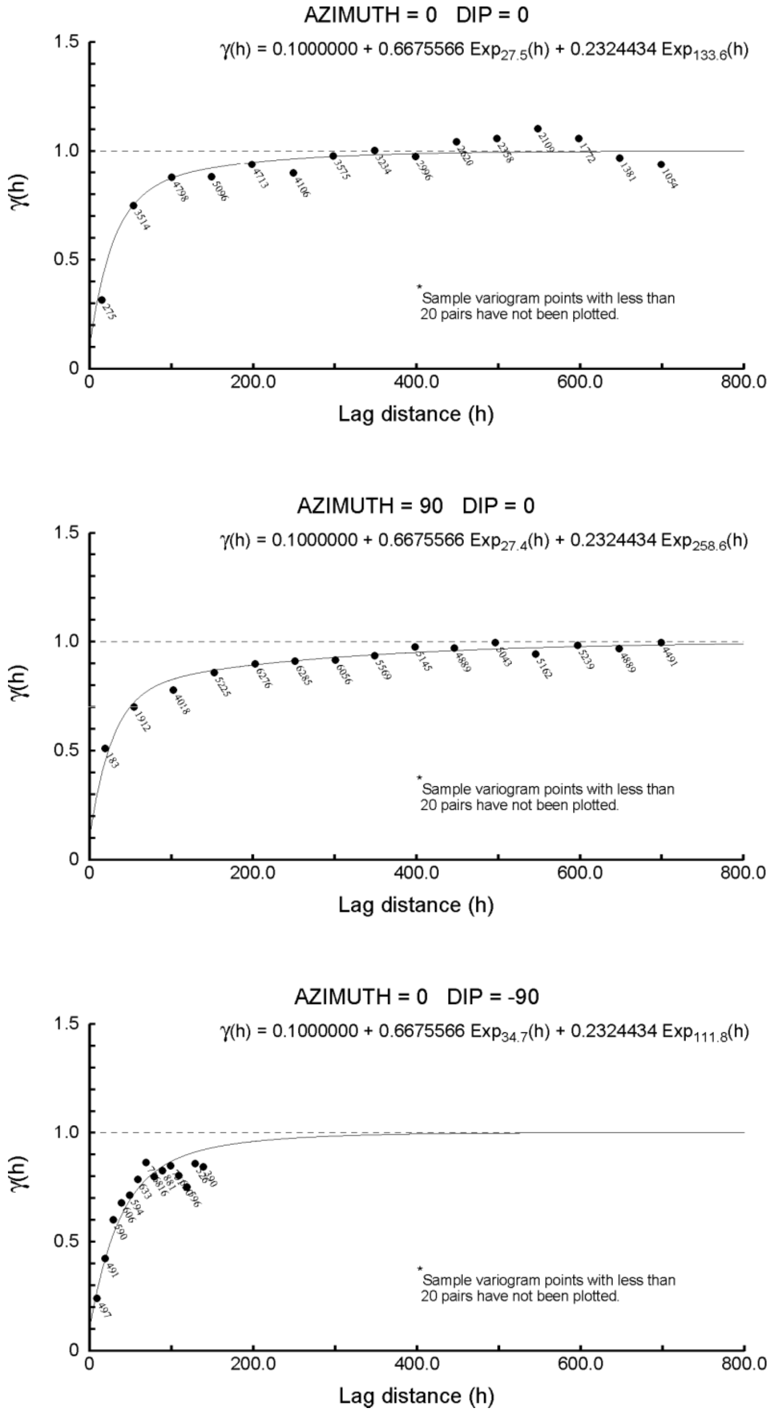


Figure 14.8 – Variograms for Acid-Zone Cu Grade Unfolded Coordinates – All Data (Noble 2018)

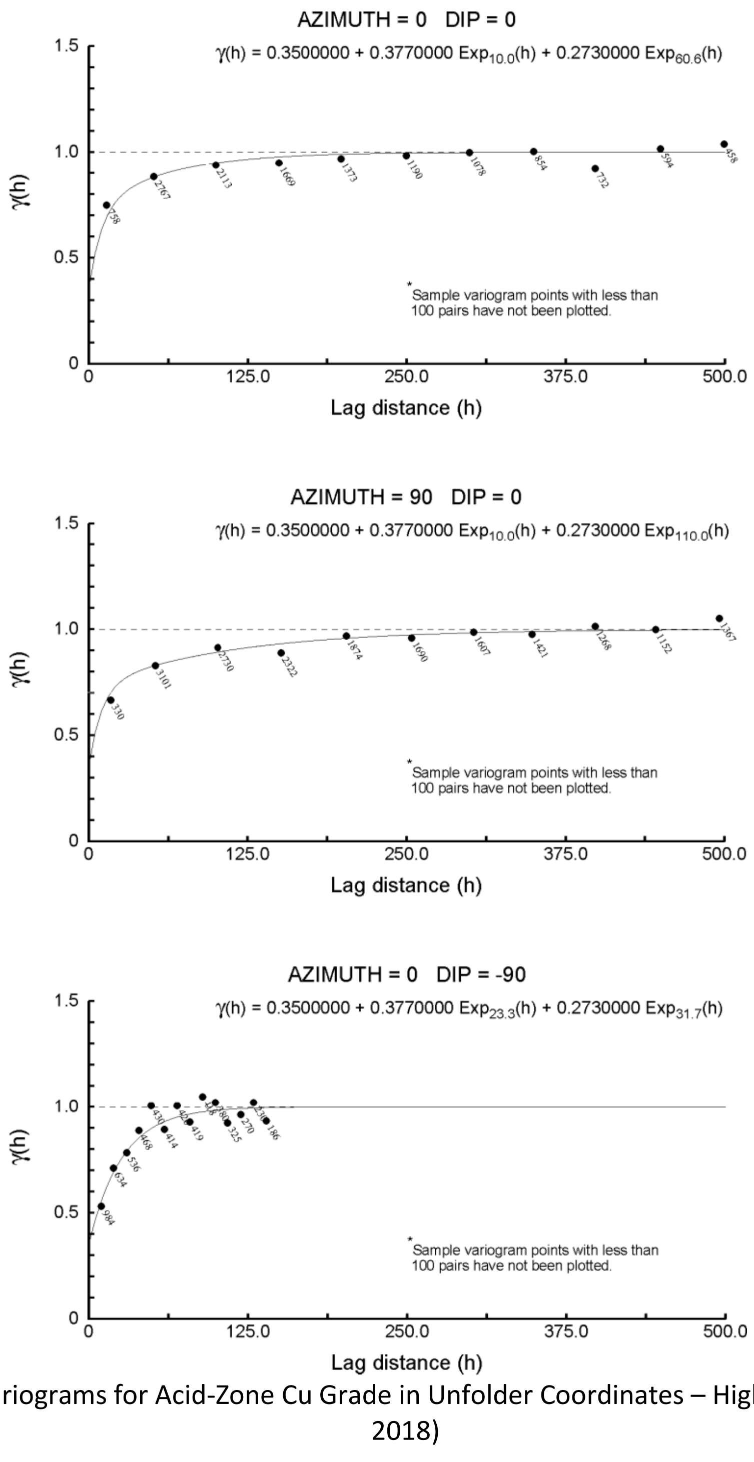


Figure 14.9 – Variograms for Acid-Zone Cu Grade in Unfolder Coordinates – High-Grade Zone (Noble 2018)

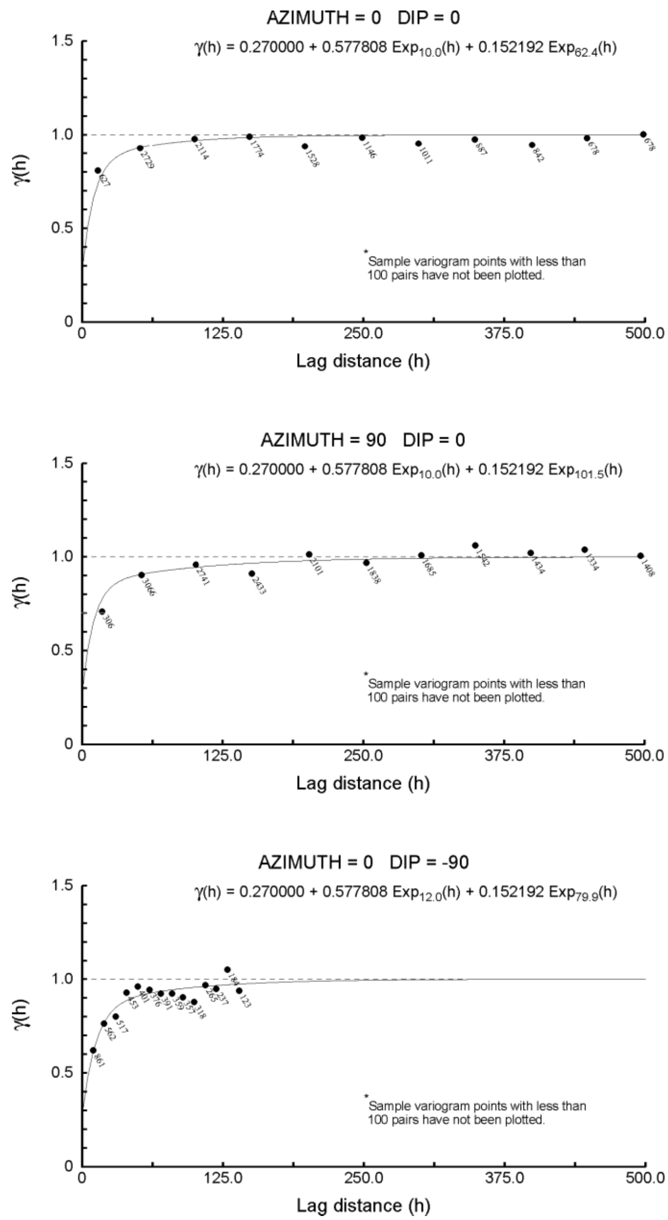


Figure 14.10 – Variograms for Acid-Zone Cu Grade in Unfolded Coordinates – Mid-Grade Zone (Noble 2018)

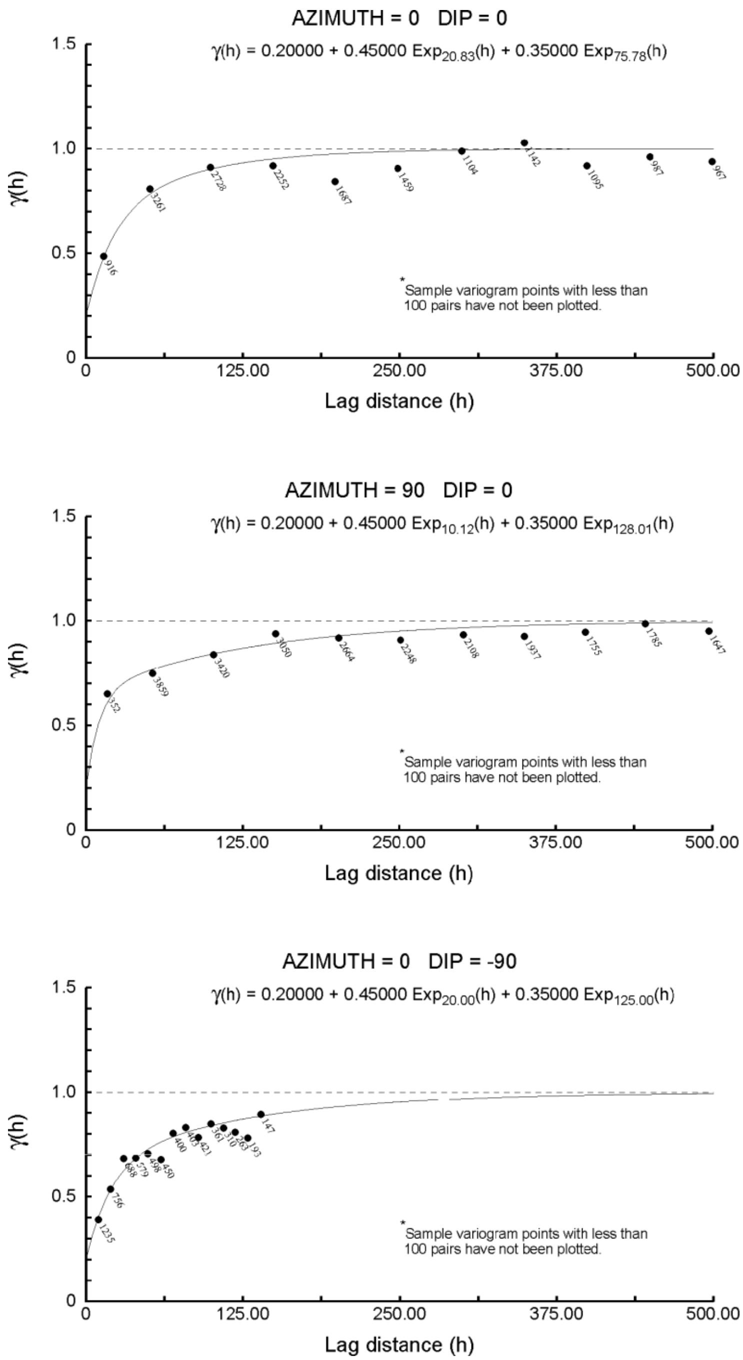


Figure 14.11 – Variograms for Acid-Zone Cu Grade in Unfolder Coordinates – Low Grade Zone (Noble 2018)

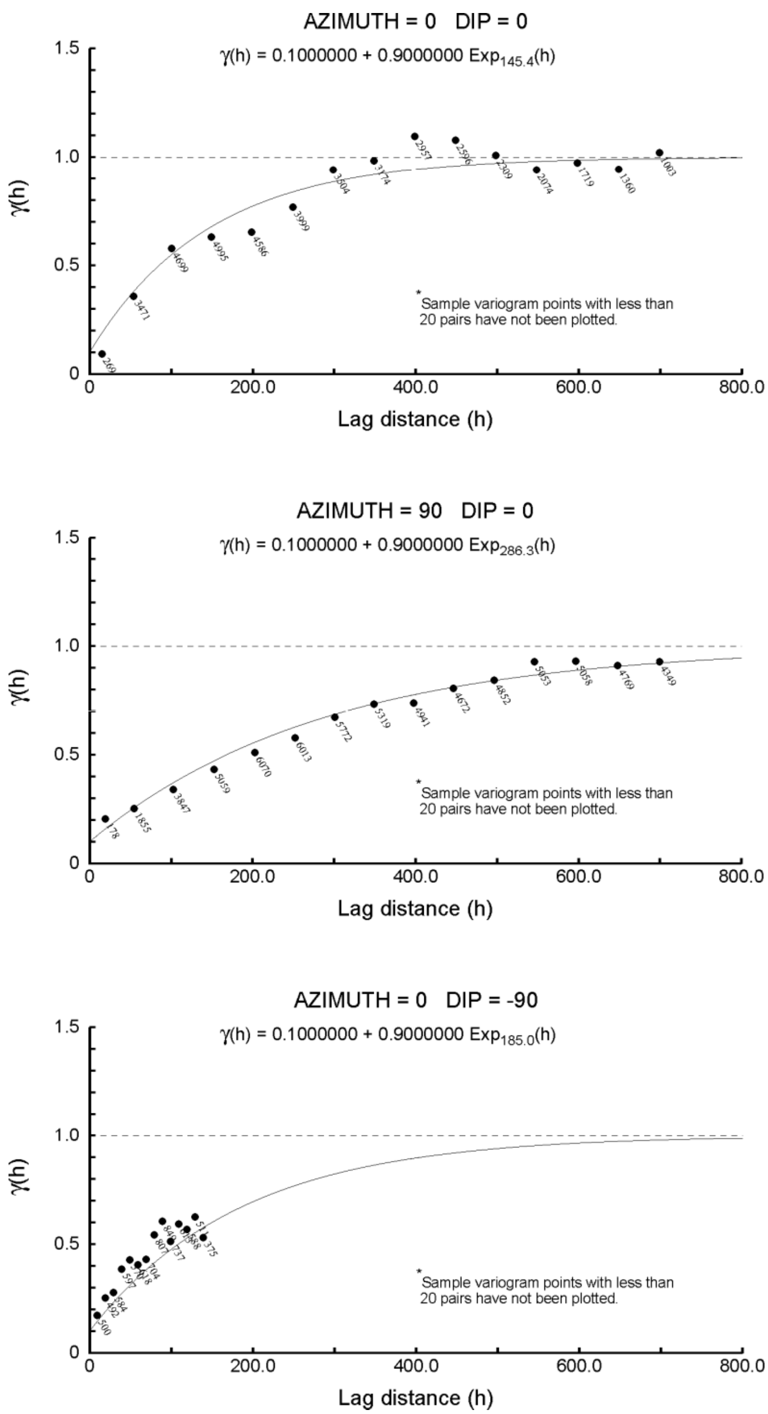


Figure 14.12 – Variograms for Acid-Zone Sulfur Grade in Unfolded Coordinates – No-Grade Zones (Noble 2018)

14.11 Grade Models

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. Sulfur was estimated as a single zone and copper was estimated both with and without grade zones. The boundary between the Acid and Basic Zones was treated as a hard boundary for both copper and sulfur.

14.11.1 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. 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. Search ellipse parameters are summarized in Table 14.6.

Table 14.6 - Search Ellipse Parameters

Estimation Case	Rotation (º)	Search Volume 1					Search Volume 2			Search Volume 3		
		Search Radius (m)			# 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	1	1	1.5	1	1	2	1	1
NN VHG Cu, GZONE	0	35	10	15	1	1						
IDP/OK Cu by GZONE	0	150	80	50	8	10	1.5	8	10	2	5	10
IDP/OK Cu in VHG GZONE	0	60	15	30	5	10	2	5	10	3	1	10

14.11.2 Copper Grade Estimation

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

The IDP model was optimized relative to the NN model and by reconciliation to production, 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. The “mined” copper grade from the IDP model should be as close as possible to the mined Cu grade for the period from July 2015 through September 2017.
3. The parameters were also adjusted to provide an overall grade distribution that matched the blasthole model grade distribution as closely as possible.
4. The optimized IDP powers are shown in Table 14.7. IDP anisotropies are the same as the search ellipse radii.

Table 14.7 - IDP Estimation Powers by Grade Zone

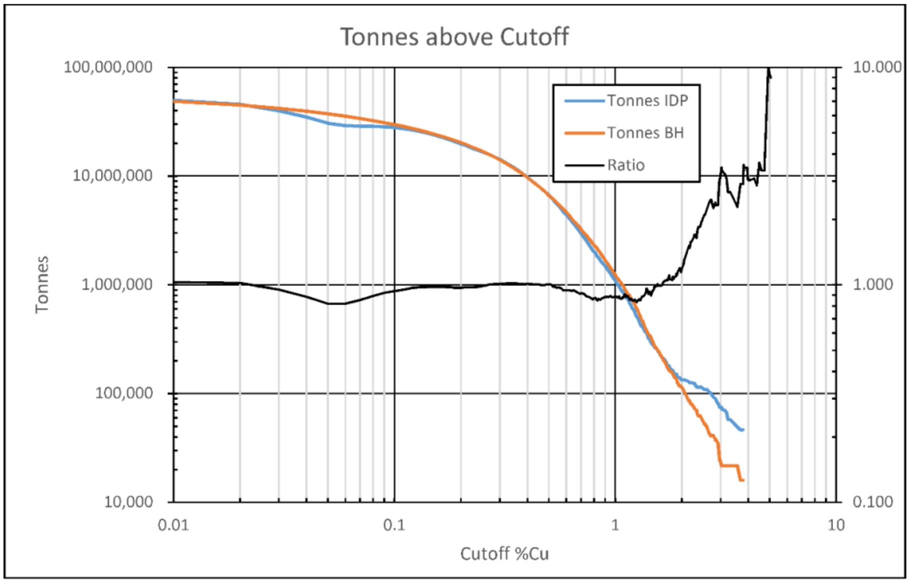
Cu Grade Zone	Power
Low-Grade	2.0
Mid-Grade	1.5
High-Grade	2.0
Very High-Grade	1.0

The comparison of NN and IDP Cu estimates shown in Table 14.8, shows that the overall average of the IDP estimates is only 1.7% higher than the NN estimates, confirming overall non-bias. The variance of the IDP estimates is reduced by 47% compared to the NN estimates, providing significant smoothing to account for mining of a 10-m selective mining unit. IDP grades within individual grade zones are over and underestimated relative to the NN estimates because the IDP estimates use composites with soft boundaries, while the NN estimates use hard boundaries. For example, the Low/High Grade overlap zone looks up to 1.0% Cu for composites used for IDP estimation but has a hard boundary of 0.25% Cu for NN estimation, thus IDP estimates are 44% higher than NN estimates within that grade zone. This overestimation is balanced in the High-Grade Zone, where the IDP estimates look down to 0.16% Cu compared to a hard boundary of 0.25% Cu for NN estimates and the IDP Cu grades are 2% lower than NN Cu grades.

Table 14.8 Comparison of IDP to NN Copper Grade Estimates

Copper Grade Zone	Number Blocks	Average IDP Cu	Relative Variance IDP Cu	Average NN Cu	Relative Variance NN Cu	Ratio Averages	Smoothing Factor
Low Grade	185643	0.032	0.175	0.025	0.372	1.253	0.471
Low/High Grade Overlap	128666	0.188	0.177	0.130	0.169	1.440	1.048
High Grade	88747	0.577	0.285	0.655	0.601	0.881	0.475
Very High Grade	109	3.608	0.108	5.856	0.142	0.616	0.761
All Zones	403165	0.203	1.730	0.199	3.256	1.017	0.531

The IDP model parameters are also adjusted to match the tonnage-grade distribution of the blasthole grade model. For this comparison, blasthole grades were kriged to 10x10x10m blocks, then factored by a multiplier of 0.95 to adjust for bias in drill hole copper grades. The results of this comparison are shown graphically in Figure 14.13. These charts show that the tonnage and grade of the IDP model matches very closely to the Kriged blasthole model from 0.10% Cu up to 0.6% Cu. Within this grade range, the difference in copper grades averages 1.3% low and tonnage averages 0.2% high. An artifact remains above 1% copper, where IDP grades and tonnage are both overestimated. This is not significant for resource and reserve estimation, but it suggests that there may be issues with local estimation in very-high-grade areas.



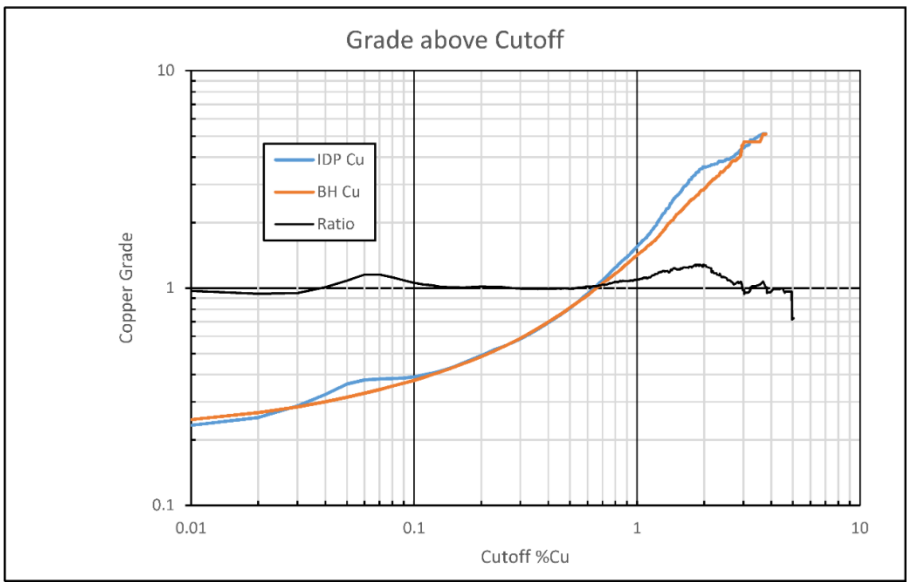


Figure 14.13 – Comparison of IDP copper grade estimates to Kriged Blasthole Estimates (Noble 2018)

The final confirmation of the model is reconciliation of the model to production at the mill. The reconciliation model is based on production from August 2015 through December 2017. These results, summarized in Table 14.9, show excellent results for model tonnage, which is only 0.8% higher than plant tonnage, but model copper grade is 9.7% higher than plant copper grade. Most of the overestimation of copper grade is attributable to 2015 where copper grade is overestimated in the model by 44%. The primary factor in the 2015 Cu grade overestimation is overestimation of the grade for a few high-grade blocks and, if blocks above 2.0% Cu are removed from the estimate, the overestimation of grade in 2015 drops to 16.8% and the 2015-2017 model grade is only 4.8% higher than the plant, which is very good. It is noted that in 2017, where there are very few high-grade blocks, tonnage is within 2.8% and Cu grade within 0.4% even if the high-grade blocks are included.

Table 14.9 – Reconciliation of Model Results to Plant Feed through December 2017

2015 to 2017 Production, Nov 2017 Model, Ore above 0.26% Cu																		
Model				Ending Stockpile			Model to Plant				Plant				%Difference			
YEAR	Tonnes	%Cu	%S	Tonnes	%Cu	%S	Tonnes	%Cu	%S	tonnes Cu	Tonnes	%Cu	%S	tonnes Cu	Tonnes	%Cu	%S	tonnes Cu
2015	1,502	0.727	9.82	182.8	0.500	5.06	1,319	0.759	10.483	10.01	1,348	0.527	10.11	7.10	-2.1%	44.0%	3.7%	41.0%
2016	6,347	0.559	8.33	138.8	0.560	9.43	6,391	0.557	8.22	35.61	6,506	0.483	7.73	31.43	-1.8%	15.3%	6.3%	13.3%
2017	9,098	0.495	6.34	198.1	0.500	12.50	9,039	0.496	6.25	44.86	8,797	0.494	5.84	43.48	2.8%	0.4%	7.1%	3.2%
2015-17	16,947	0.540	7.40	198.1	0.500	12.50	16,749	0.540	7.33	90.47	16,650	0.493	6.92	82.01	0.6%	9.7%	5.9%	10.3%
2016-2017	15,445	0.521	7.16	198.1	0.500	12.50	15,430	0.521	7.07	80.46	15,303	0.490	6.64	74.92	0.8%	6.5%	6.4%	7.4%
2015 to 2017 Production, Nov 2017 Model, Ore above 0.26% Cu and Below 2.0% Cu																		
Model				Ending Stockpile			Model to Plant				Plant				%Difference			
YEAR	Tonnes	%Cu	%S	Tonnes	%Cu	%S	Tonnes	%Cu	%S	tonnes Cu	Tonnes	%Cu	%S	tonnes Cu	Tonnes	%Cu	%S	tonnes Cu
2015	1,441	0.601	9.72	182.8	0.500	5.06	1,258	0.615	10.392	7.74	1,348	0.527	10.11	7.10	-6.7%	16.8%	2.8%	9.0%
2016	6,288	0.529	8.27	138.8	0.560	9.43	6,332	0.528	8.15	33.43	6,506	0.483	7.73	31.43	-2.7%	9.3%	5.4%	6.4%
2017	9,090	0.493	6.34	198.1	0.500	12.50	9,030	0.494	6.25	44.62	8,797	0.494	5.84	43.48	2.7%	-0.1%	7.1%	2.6%
2015-17	16,818	0.516	7.35	198.1	0.500	12.50	16,620	0.516	7.29	85.78	16,650	0.493	6.92	82.01	-0.2%	4.8%	5.3%	4.6%
2016-2017	15,377	0.508	7.13	198.1	0.500	12.50	15,362	0.508	7.03	78.04	15,303	0.490	6.64	74.92	0.4%	3.8%	5.9%	4.2%

Several factors are involved in the overestimation of high-grade, as follows:

- The grade variance is the direct result of a few high-grade copper blocks representing about 1.5% of ore tonnage. When blocks above 2% copper are removed from the tabulation, the grade variance is much improved.
- The tonnage mined in 2015 and early 2016 is a very small tonnage and is associated with the startup of mine production, thus may not be a reliable for prediction of future results.
- Most of the high-grade blocks are closely associated with underground workings. Those blocks may have been mined or disturbed by historical mining and did not report to the plant.
- The plant was in startup mode during 2015 and the plant head grade may not be reliable during that time.

Only about 0.3% of the remaining resource is above 2.0% copper and it is expected that future performance of the model will be more like that in 2016 and 2017.

14.12 Resource Classification

Classification of 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 that have valid copper values and “absent” for composites absent copper values. 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 14.10.

Table 14.10 - Resource Classification Parameters

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	

14.13 Resource Summary

The copper resource was constrained using a Lerchs-Grossmann pit shell that was run using a copper price of $3.20/lb. Cu and all resources including inferred resources. All other slope and economic parameters are the same as those used for design of the open pit for reserve estimation. 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 returns to previous levels that were substantially above $3.20/lb. The resource estimate is summarized in Table 14.11 and Table 14.12.

Table 14.11 - Riotinto Project - Resource Summary - Constrained by the $3.20/lb Cu Pit Shell and 31 December 2017 Topography

Resource Class	Cutoff (% Cu)	Tonnes (millions)	Cu IDP (%)	S IDP (%)
Total Measured	0.15	152.1	0.39	4.95
Total Indicated	0.15	106.1	0.40	5.06
Total M+I	0.15	258.2	0.40	5.00
Total Inferred	0.15	18.1	0.50	7.19

Table 14.12 - Riotinto Project - Resource Summary Using Multiple Cutoffs - Constrained by the $3.20/lb Cu Pit Shell and 31 December 2017 Topography

Cutoff	Measured			Indicated			M+I			Inferred		
Cu %	M tonnes	Cu_IDP	S_IDP	M tonnes	Cu_IDP	S_IDP	M tonnes	Cu_IDP	S_IDP	M tonnes	Cu_IDP	S_IDP
0.15	152.1	0.391	4.95	106.1	0.405	5.06	258.2	0.397	5.00	18.1	0.504	7.19
0.20	122.0	0.445	5.13	88.7	0.450	5.27	210.7	0.447	5.19	15.7	0.552	7.54
0.25	99.2	0.496	5.38	74.2	0.494	5.51	173.4	0.495	5.43	13.8	0.600	7.91
0.30	81.2	0.545	5.60	60.3	0.544	5.76	141.5	0.544	5.67	11.8	0.655	8.29
0.35	65.5	0.597	5.83	47.7	0.603	6.08	113.2	0.600	5.94	10.2	0.705	8.71
0.40	53.0	0.650	6.07	38.3	0.659	6.47	91.3	0.654	6.24	8.7	0.760	9.26
0.45	42.6	0.705	6.29	30.4	0.720	6.98	73.1	0.711	6.58	7.5	0.817	9.96
0.50	33.9	0.765	6.65	24.0	0.787	7.58	57.9	0.774	7.04	6.4	0.878	10.84

14.14 Discussion of Factors Affecting Resources

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

15 MINERAL RESERVE ESTIMATES

The 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 the fall of 2017 (see Section 14). Open pit mining progress through 31 December 2017 was incorporated into this model. Ore processing costs have been estimated for an approximate 58% expansion of the plant throughput capacity to 15 Mtpa from the current 9.5 Mtpa.

A range of economic pit shells were generated using the Lerchs-Grossmann algorithm to help define the likely extents of the open pit and the most favorable development sequence. A pit shell based on a copper price of $2.60/lb was then used to guide the design of the open pit.

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. The following definition is from those standards:

A Mineral Reserve is the economically mineable part of a Measured 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:

A "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.

A "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 Reserve Estimation Parameters

15.2.1 Metallurgical Recoveries

Historical ore processing data indicate that copper (Cu) recovery is reduced with higher sulfur (S) content. The following formula was applied when computing recoverable copper (RCu) grades for each interpolated block in the deposit model:

If S% <= 15.128,   Cu Recovery in % = -0.9998*S% + 90.125;

If S% > 15.128, Cu Recovery = 75%.

Cu recoveries range from 75 to 90%. Sulfur grades for ore grade mineralization in the open pit average about 5.1%, resulting in an average copper recovery of 85%. No other metals contribute to revenues (silver is accounted for as by-product). All backfilled zones in the deposit model were treated as waste with no copper recovery.

15.2.2 Royalties, Payables and Operating Costs

Table 15.1 lists the base economic parameters used in the pit limit analyses and cutoff grades, both internal and breakeven. All costs shown are in U.S. dollars. Conversions from Euro currency were based on a factor of US$1.20 per €1.00. Mining costs were derived from Atalaya's experience through July 2017. Atalaya also provided updated ore processing and plant maintenance cost estimates for post-expansion ore processing rates of about 15 M t/a, and an updated general/administration and laboratory cost.

Table 15.1 - Ore Definition Parameters

Item	Unit	Value
Base Cu price	$/lb Cu payable	2.60
Freight, smelting & refining (FSR) cost	$/lb Cu payable	0.44
Cu payable	%	98.8
Royalties (NSR basis)	%	0.00
Ore mining cost (contractor historical average)	$/t mined	1.81
Waste mining cost (contractor historical average)	$/t mined	1.74
Ore processing & maintenance cost	$/t ore	5.43
General/administration & laboratory cost	$/t ore	0.90
Internal NSR cutoff	NSR $/t	6.40
Breakeven NSR cutoff	NSR $/t	8.14
Internal Cu cutoff	% Cu	0.16
Breakeven Cu cutoff	% Cu	0.20
Internal RCu cutoff	% RCu	0.14
Breakeven RCu cutoff	% RCu	0.17

NSR refers to Net Smelter Return. The FSR and on-site operating costs were derived from Atalaya Mining's historical figures. 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. Cutoffs for Cu% values are based on an average recovery of 85%.

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.

15.2.3 Overall Slope Angles

Blocks in the deposit model were tagged with codes to control the overall slope angles (OSAs) used in the economic pit limit evaluations. The OSAs are derived from Atalaya Mining's operating experience and inter-ramp slope angle (IRA) recommendations from its geotechnical consultants and contain provisions for one to two 26-m-wide haul roads in the pit walls. Five zones were identified and are summarized in Table 15.2 below.

Table 15.2 - Overall Slope Angles Used in Pit Limit Analyses

Slope Code	Zone Description	Pit Walls	OSA, degrees
1	Fresh Rock, Acid Leached	SE & S (az 90-230)	46
2	Fresh Felsic Rock	W, N & E (az 230-90)	44
3	Filon Sur, Rock	SW quadrant	45
4	Filon Sur, Backfill	SW quadrant	33
5	Weathered, to 20 m below topo	All, near surface	30

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 Filon Sur backfill area and a few isolated blocks intersecting underground workings. The rock tonnages are based on interpolated bulk densities, which can reach up to 4.00 t/m^3. Fill zones were assigned a bulk density of 2.00 t/m^3. The average bulk material density, including both rock and fill, in the planned open pit is 2.74 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 was used to analyze economic pit limits based on the recoveries and other parameters previously discussed. 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.

15.3.1 Price Sensitivities

The sensitivities of economic pit limits to copper price were analyzed for a range of Cu prices from $1.25/lb to $4.00/lb in $0.25/lb increments. Runs were also made at the projected long-term Cu price of $2.60/lb and at Cu prices of $2.65 /lb and $2.70 lb. Recoveries, payables, FSR costs, and operating costs are as described in Sections 15.2.1 and 15.2.2. Each analysis included a 1.5%/bench discounting factor applied below the 470 m elevation to account for time value of money impacts to the pit limits. This roughly equates to an annual discount rate of 9-10% based on mining 6-7 benches per annum. Table 15-3 summarizes the results of the LG price sensitivity evaluations. Figure 15.1 illustrates the corresponding tonnage and grade curves.

Table 15.3 -Lerchs-Grossmann Cu Price Sensitivity Analyses

Cu	Ore Grade M&I Resources >= $6.40/t NSR					Waste	Total	Strip
$/lb	Ktonnes	NSR $/t	Cu %	RCu %	S %	ktonnes	ktonnes	Ratio
4.00	307,000	23.35	0.35	0.30	4.81	429,000	736,000	1.40
3.75	297,000	22.08	0.36	0.31	4.82	410,000	707,000	1.38
3.50	281,000	20.91	0.37	0.31	4.83	384,000	665,000	1.37
3.25	261,000	19.80	0.38	0.32	4.85	350,000	611,000	1.34
3.00	239,000	18.77	0.40	0.34	4.86	320,000	559,000	1.34
2.75	212,000	17.71	0.42	0.35	4.86	275,000	487,000	1.30
2.70	207,000	17.46	0.42	0.35	4.88	269,000	476,000	1.30
2.65	203,000	17.24	0.42	0.36	4.89	267,000	470,000	1.32
2.60	197,000	17.01	0.43	0.36	4.88	258,000	455,000	1.31
2.50	183,000	16.69	0.44	0.37	4.92	243,000	426,000	1.32
2.25	150,000	15.74	0.47	0.40	5.16	205,000	355,000	1.36
2.00	107,000	14.90	0.52	0.44	5.36	139,000	246,000	1.30
1.75	74,000	13.88	0.58	0.49	5.54	99,000	173,000	1.33
1.50	37,000	13.01	0.67	0.56	5.70	46,000	83,000	1.23
1.25	12,000	12.87	0.87	0.73	7.04	17,000	29,000	1.42

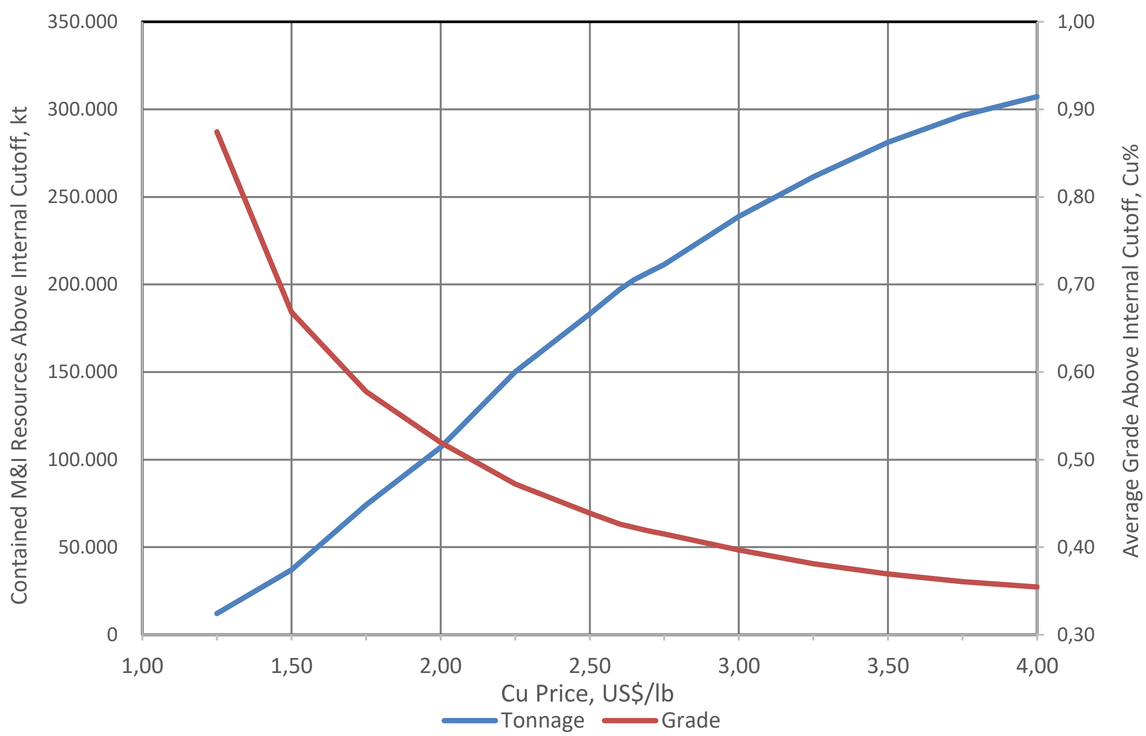


Figure 15.1 - LG Price Sensitivity Tonnage and Cu Grade Curves (Rose 2018)

15.3.2 Operating Cost Sensitivities

Operating cost sensitivities were evaluated at a Cu price of $2.60/lb and using the recoveries, payables, and FSR costs described in Sections 15.2.1 and 15.2.2. Mining, ore processing, maintenance, general/administration, and laboratory costs were varied in 5% increments between +25% and -25% of the base costs presented in Table 15.1. The results of the operating cost sensitivity analyses are summarized in Table 15.4. Figure 15.2 shows the tonnage and Cu grade curves for the operating cost sensitivity.

Table 15.4 - LG Operating Cost Sensitivity Analyses at $2.60/lb Cu

Cost	ICOG*	Ore Grade M&I Resources >= Internal Cutoff					Waste	Total	Strip
Sensitivity	NSR $/t	ktonnes	NSR $/t	Cu %	RCu %	Sul %	ktonnes	ktonnes	Ratio
-25%	4.80	265,000	15.09	0.38	0.32	4.86	352,000	617,000	1.32
-20%	5.12	251,000	15.51	0.39	0.33	4.90	337,000	588,000	1.34
-15%	5.44	237,000	15.89	0.40	0.34	4.87	316,000	553,000	1.34
-10%	5.76	220,000	16.29	0.41	0.35	4.86	283,000	503,000	1.29
-5%	6.08	208,000	16.68	0.42	0.35	4.88	271,000	479,000	1.30
0%	6.40	197,000	17.01	0.43	0.36	4.88	258,000	455,000	1.31
5%	6.72	183,000	17.51	0.44	0.37	4.92	242,000	425,000	1.32
10%	7.04	171,000	17.88	0.45	0.38	4.99	224,000	395,000	1.31
15%	7.36	159,000	18.42	0.46	0.39	5.10	212,000	371,000	1.34
20%	7.68	148,000	18.85	0.47	0.40	5.04	198,000	346,000	1.34
25%	8.00	140,000	19.20	0.48	0.41	5.10	193,000	333,000	1.37

* Internal cutoff grade

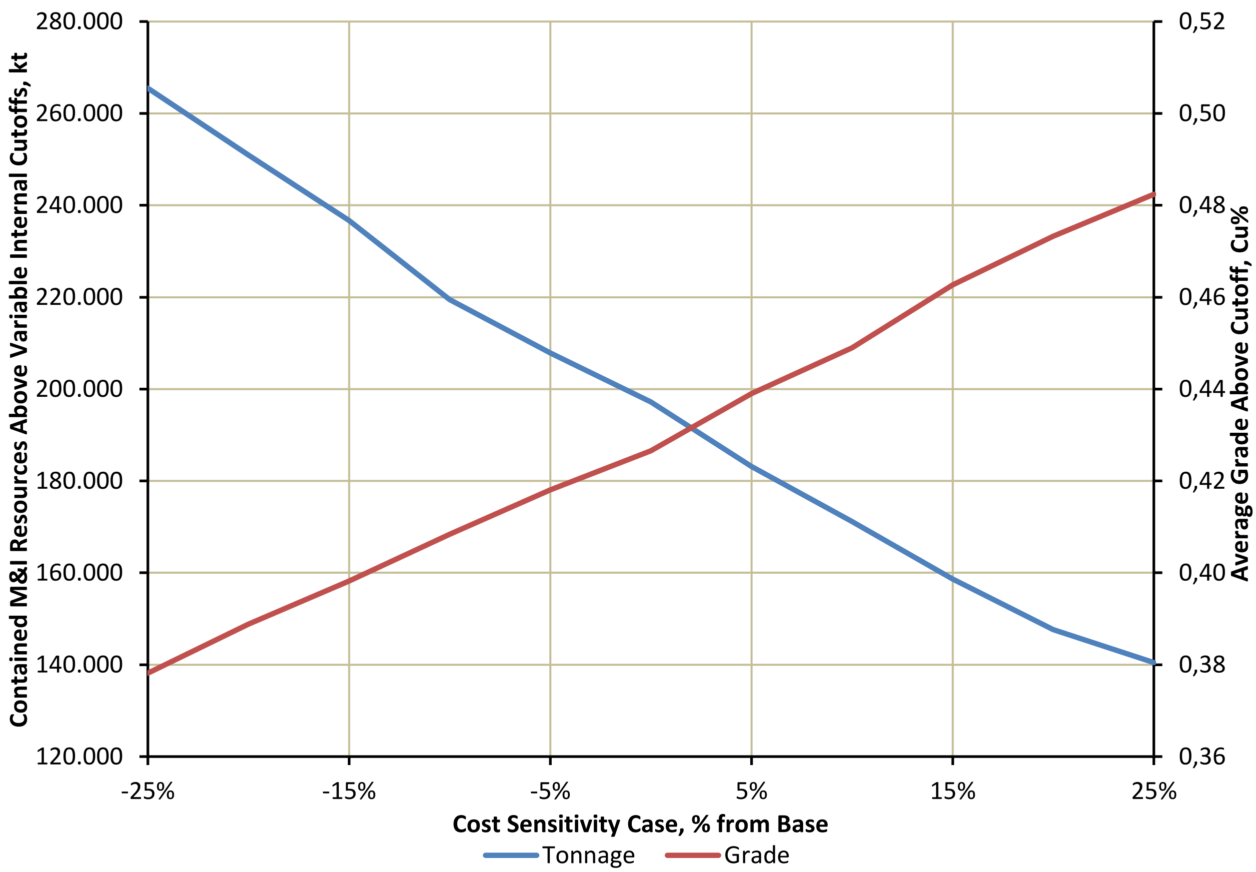


Figure 15.2 - LG Operating Cost Sensitivity Tonnage and Cu Grade Curves at $2.60/lb Cu (Rose 2018)

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 55- to 91-t payload capacities, and appropriately sized support equipment.

15.4.1 Design Parameters

Pit walls were smoothed from the basic $2.60/lb Cu LG shell generated with 1.5% per bench discounting as discussed in Section 15.3.3. The smoothing minimizes or eliminates, where possible, noses and notches that could affect slope stability. Internal haulage ramps were included to allow for truck access to working faces on each level. The basic parameters used in the design of the internal mining phases and ultimate pit are summarized in Table 15.5.

Table 15.5 - Basic Pit Design Parameters

Parameter	Unit	Value
Bench height	m	10
Haul road width (including ditch & safety berm)	m	26
Internal ramp gradient	%	10
Minimum pushback width	m	45

In some cases, short-term haulage ramps near pit bottoms were steepened to gradients of up to 12%. Payloads for trucks operating from these areas will need to be reduced in order for the equipment to safely manage the steep gradients. These areas, however, do not entail significant tonnages. "Good-bye" cuts, up to 6m deep and excavated by backhoes, were also used in many pit bottoms to extract small ore zones where constructing a haulage ramp would be impractical.

Table 15.6 lists the design parameters for pit slopes in the Cerro Colorado pit. IRA refers to inter-ramp angle, BFA refers to bench face angle, CBI refers to catch bench interval (vertical) and CBW refers to catch bench width. Maximum stack heights (i.e., between step-outs or haulage ramps) are 200 m in fresh felsic rock and 150 m in fresh acid-leached rock. The pit design parameters were provided by Atalaya and reflect past operating experience and/or guidance from various geotechnical consultants.

Table 15.6 - Pit Slope Design Parameters

		Angles in Degrees		CBI	CBW
Zone Description	Pit Walls	IRA	BFA	m	m
Fresh Rock, Acid Leached	SE & S (az 90-230)	50	70	20	9.5
Fresh Felsic Rock	W, N & E (az 230-90)	48	70	20	10.7
Filon Sur, Rock	SW quadrant	50	70	20	10.7
Filon Sur, Backfill	SW quadrant	38	50	20	8.8
Weathered, to 20 m below topo	All, near surface	34	45	10	5.0

15.4.2 Ultimate Pit

The Cerro Colorado ultimate pit is illustrated in Figure 15.3. The planned open pit is approximately 2400 m long E-W, 1300 m wide N-S, and is about 330 m deep along the SE wall. The highest pit elevation is about 475 m in the SE wall and the pit bottom in the NW quadrant reaches an elevation of 124 m. Grid lines are shown on 500-m intervals. Total material – ore and waste – contained within the ultimate pit limits is estimated at just over 478 Mt (174 Mm^3).

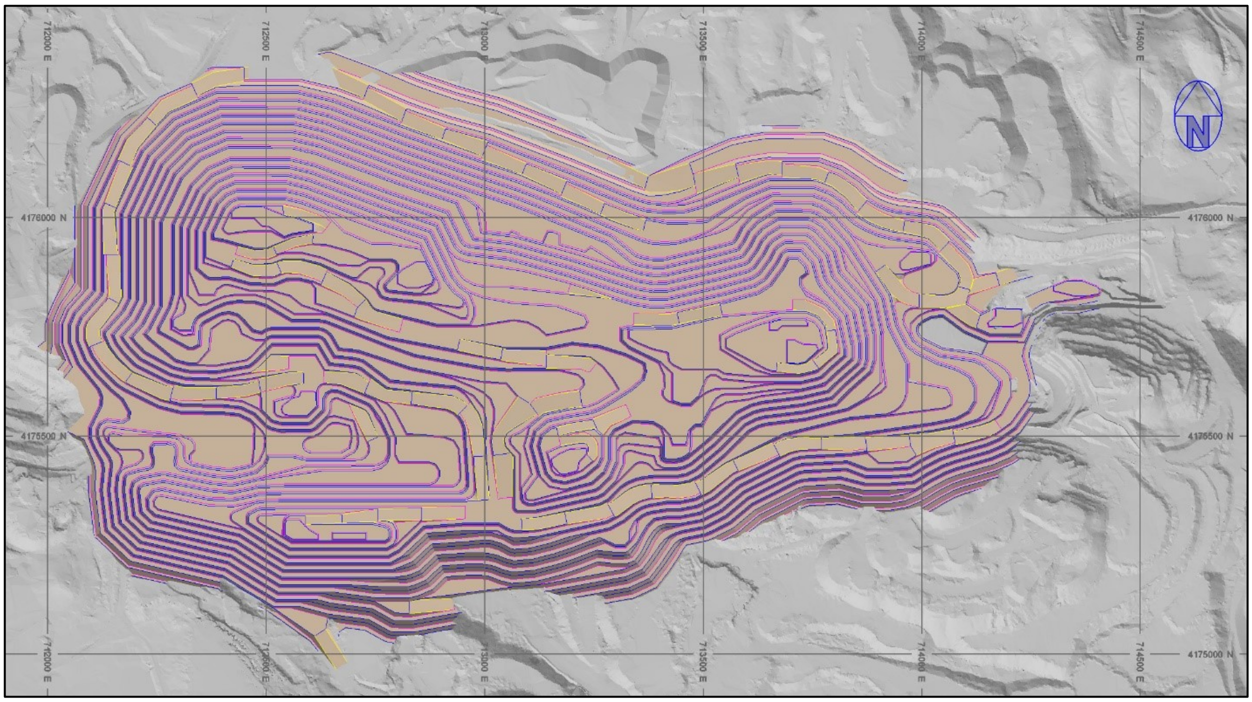


Figure 15.3 - Cerro Colorado Ultimate Pit Plan (Rose 2018)

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 deposit model discussed in Section 14.

15.5.1 Cutoff Grades

Cutoffs for estimating contained mineral resources in the LG pit shells were based on NSR $/t values – incorporating variable copper recoveries as a function of sulfur content. Similarly, the estimates of mineral reserves are based on a fixed internal NSR cutoff of $6.40/t defined by a $2.60/lb Cu price and the cost and recovery parameters presented in Table 15.1. The same estimates can be achieved using an internal RCu (recoverable Cu) cutoff of nearly 0.14%. The internal cutoff grades, whether NSR or RCu, include the differential ore mining cost (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.

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.

Tables 15.7 presents the estimates of proven and probable mineral reserves and the combination of both for the Cerro Colorado open pit. All Filon Sur backfill material and all material classified as inferred mineral resources were treated as waste.

Table 15.7 – Cerro Colorado Pit Mineral Reserve Estimate

	Mineral Reserves >= $6.40/t NSR (or 0.136% RCu)					Waste	Total	Strip
Classification	ktonnes	NSR $/t	Cu%	RCu%	S%	ktonnes	ktonnes	Ratio
Proven	127,964	16.32	0.41	0.35	4.67			
Probable	68,961	17.32	0.44	0.37	4.89			
Proven + Probable	196,925	16.67	0.42	0.35	4.75	281,484	478,409	1.43

Total proven and probable mineral reserves are estimated at nearly 197 Mt grading 0.42% Cu. Contained copper is estimated at 822,000 tonnes. Waste rock and backfill are projected at about 281 Mt, resulting in a stripping ratio of 1.43. All the mineral reserves reported in Table 15.7 are contained within the mineral resources reported in Section 14.

The mineral reserve estimates in this report are effective as of 31 December 2017.

15.5.3 Sensitivity of Reserves to other Factors

Potential sensitivities of mineral reserves to variations in copper price and operating costs are indicated in Sections 15.3.1 and 15.3.2, respectively. Other potential risks to mineral reserves include: a Roman settlement archeological site just outside the current northern pit wall, the present location of national road A-461 that limits the development of the western pit walls, a requirement for the expansion of the mining permit boundary to fit larger pit limits and permitting requirements for expansions to the waste rock storage facility (WRSF) and tailings storage facility (TSF).

Under the production schedule described in Section 16, mining of the Roman archeological site will not occur until 2021. Archeological investigations are presently underway and should be completed in 2019 according to Atalaya. The development of the site will be permitted once archeological surveys have been completed. An LG analysis restricting pit expansion into this site indicates that about 3-4% of the mineral reserves would be at risk should the necessary development permit for this area be denied.

National road A-461 must be relocated prior to the last half of 2021 to prevent interruptions in the mine production schedule. Atalaya is presently planning to have the highway moved to the west of the Atalaya open pit (located along the southwest wall of the ultimate Cerro Colorado pit). This will enhance public safety and allow the development of pushbacks along the entire western wall. Atalaya has begun the permitting process for this road relocation. A LG analysis was performed with a restriction that pit development could not encroach on the existing highway alignment, which indicated that about 10% of the mineral reserves would be at risk if the highway relocation cannot be permitted.

Changing the mining permit boundary to fit a larger open pit footprint is considered a minor permit modification. Atalaya expects that this can be completed in a matter of a few months.

Additional capacity must be added to the tailings storage facility (TSF) due to the expansion of estimated mineral reserves from the previous technical report (September 2016). Capacity in the currently permitted TSF plan is approximately 86 Mt, which will be reached during 2023 under the new development plan. An expansion of the waste rock storage facility (WRSF) must also be permitted to support the new mine plan.

The currently permitted WRSF plans have additional capacity for 95 Mt, which will be reached by mid-2022 under the mine production schedule. Both TSF and WRSF expansions will likely be incorporated into a project expansion permit application, which would also likely require an ESIA. No other mining, metallurgical, infrastructure, or permitting factors are presently known that may materially affect the mineral reserve estimate.

16 MINING METHODS

Mining has been conducted in the Riotinto area episodically since Roman times, and possibly earlier. The Riotinto Company (a British firm) gained mineral rights and surface ownership in 1874 and operated Riotinto Minera until it began divesting its interests in 1954. Operations in the Cerro Colorado open pit, which is the foundation of the Riotinto Project, began in 1968. The Riotinto mine properties were under the ownership of a local cooperative by the end of the 1990s. Mining activities ended at Cerro Colorado and other smaller operations in 2001 due to deteriorating economic conditions. Mining operations at the Riotinto Project site restarted in June 2015. The Cerro Colorado pit is completely open and in good condition.

Continued exploitation of the Cerro Colorado deposit uses 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 blastholes, hydraulic excavators with bucket capacities of 6 to 14 m^3, off-highway trucks with 55- to 91-t payload capacities, 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, which handles earth moving, and Insersa, 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 Hexagon Mining's MineSight® software package, which includes a three-dimensional Lerchs-Grossmann (LG) algorithm for pit optimization and extraction sequence analyses. The Cerro Colorado deposit block model was developed by O.R.E. in the autumn of 2017 for mineral resource estimates (see Section 14) using CAE's Studio 3 software and then converted into a form readable by MineSight. Surface topography in the model was updated to reflect mining progress as of 31 December 2017.

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 Sections 15.2.1, 15.2.2, 15.2.3 and 15.2.4). 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 and are reproduced below for the reader's convenience. Table 16.1 lists the basic design parameters and Table 16.2 presents the pit slopes and catch bench dimensions based on guidance from Atalaya Mining and its geotechnical consultants. IRA refers to inter-ramp angle, BFA refers to bench face angle, CBI refers to catch bench interval (vertical) and CBW refers to catch bench width. Maximum stack heights (i.e., between step-outs or haulage ramps) are 200 m in fresh felsic rock and 150 m in fresh acid-leached rock.

Table 16.1 - Basic Pit Design Parameters

Parameter	Unit	Value
Bench height	m	10
Haul road width (including ditch & safety berm)	m	26
Internal ramp gradient	%	10
Minimum pushback width	m	45

Table 16.2 - Pit Slope Design Parameters

		Angles in Degrees		CBI	CBW
Zone Description	Pit Walls	IRA	BFA	m	m
Fresh Rock, Acid Leached	SE & S (az 90-230)	50	70	20	9.5
Fresh Felsic Rock	W, N & E (az 230-90)	48	70	20	10.7
Filon Sur, Rock	SW quadrant	50	70	20	10.7
Filon Sur, Backfill	SW quadrant	38	50	20	8.8
Weathered, to 20 m below topo	All, near surface	34	45	10	5.0

16.1.2 Internal Mining Phases

The LG price sensitivity analyses described in Section 15.3.1 provided guidance in the design of four internal mining phases. Phase 1 was derived from the $1.50 Cu pit shell, Phase 2 from the $1.75-2.00 Cu shells along the north wall, and Phases 3 and 4 from the $2.60/lb Cu (base case) shell. The intent is to mine the highest grade and lowest stripping ratio material in the initial phase and progress to the next best material in subsequent pushbacks, subject to working room and access considerations.

Figures 16.1 through 16.5 illustrate the phase development sequence for the Cerro Colorado pit. Phase 4 requires a temporary ramp, illustrated in Figure 16.4, to provide access to working faces between the 310 and 240 m elevations. This ramp will be trimmed out and mining will progress downward to finish Phase 4 as shown in Figure 16.5. Grid lines are shown on 500-m intervals. The planned ultimate pit is approximately 2400 m long E-W, 1300 m wide N-S, and is 330 m deep along the SE wall. The highest pit elevation is about 475 m in the SE wall of Phase 3 and the pit bottom in Phase 4 in the NW quadrant reaches a minimum elevation of 124 m.

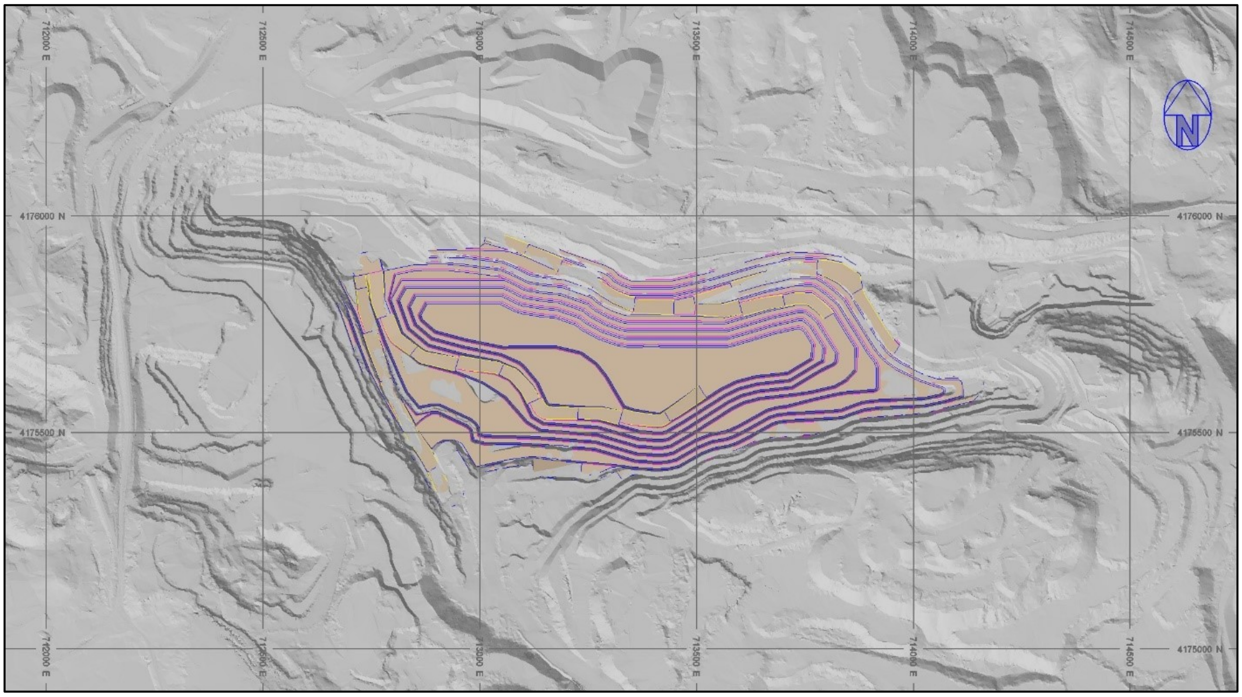


Figure 16.1 - Mining Phase 1 (Rose 2018)

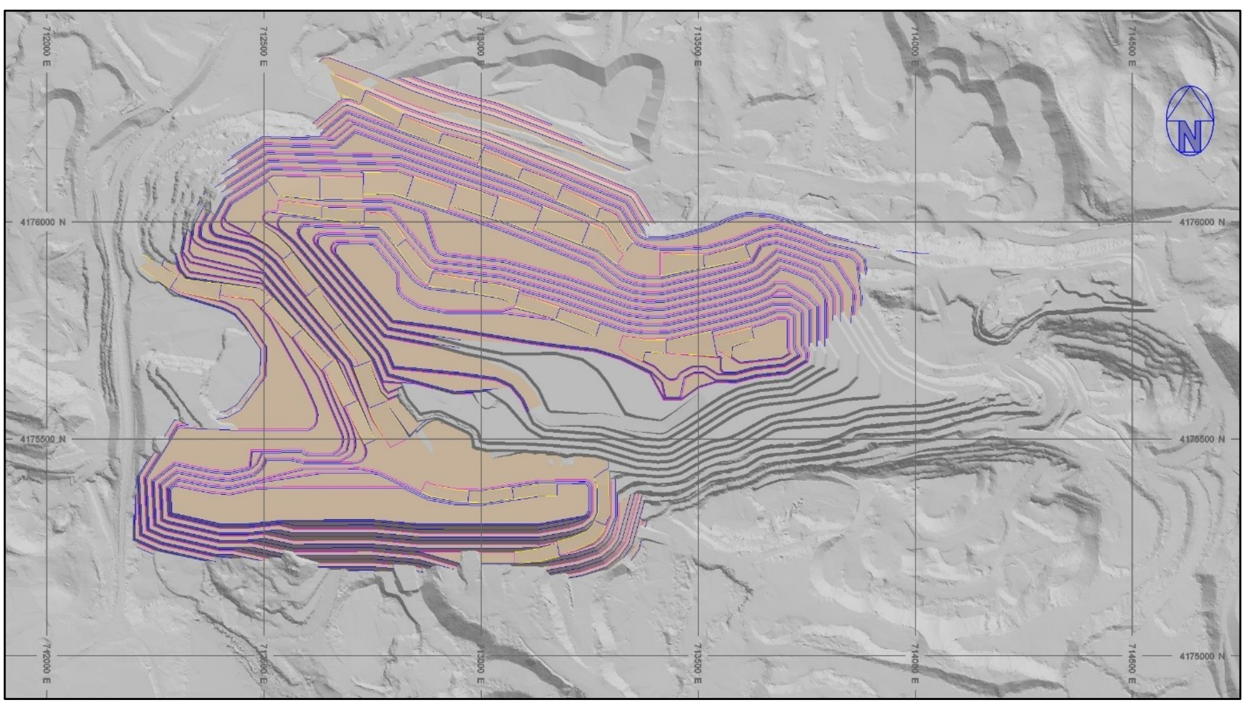


Figure 16.2 - Mining Phase 2 (Rose 2018)

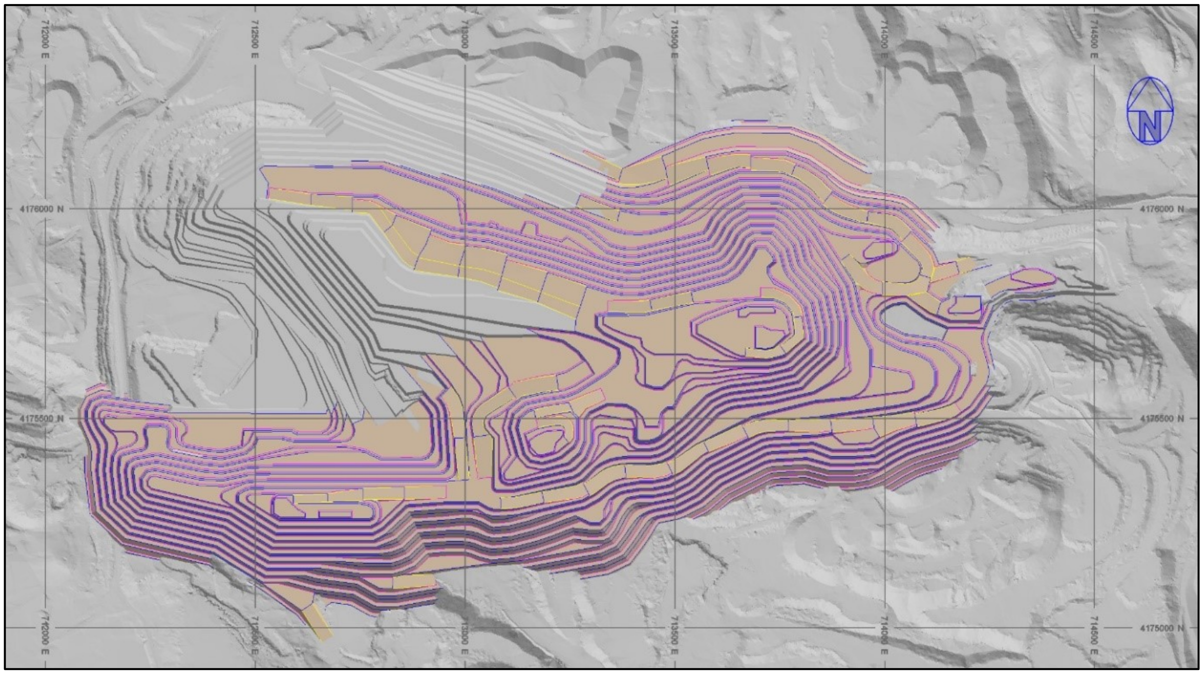


Figure 16.3 - Mining Phase 3 (Rose 2018)

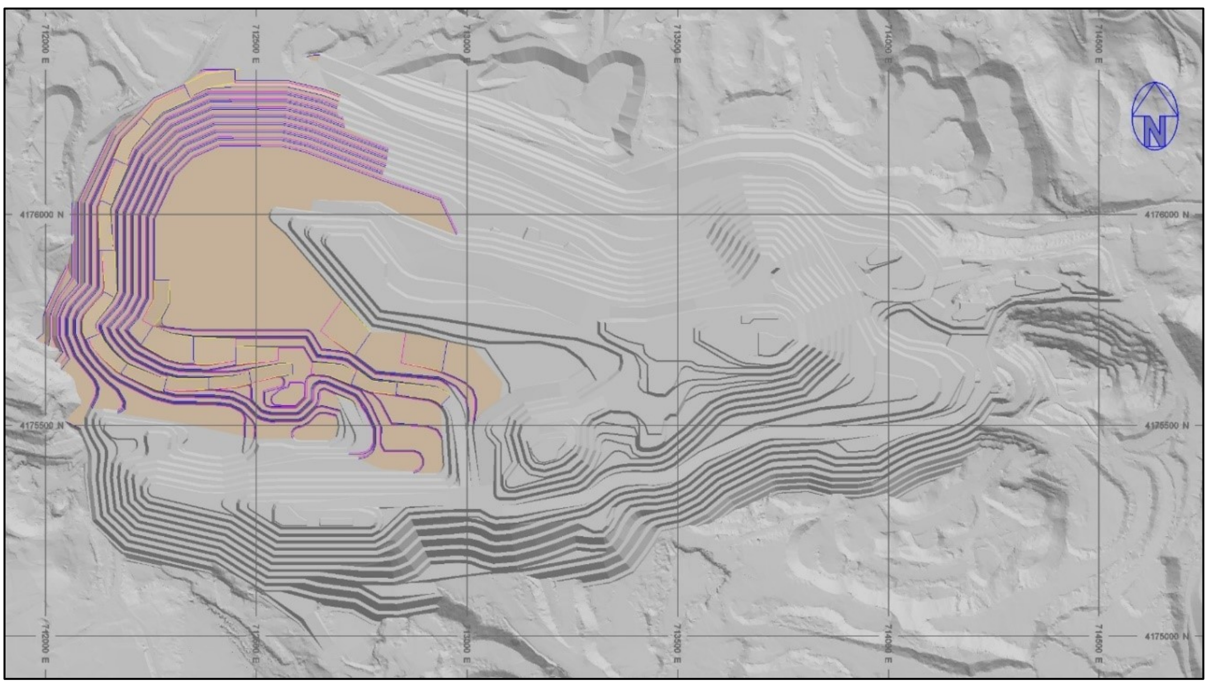


Figure 16.4 - Mining Phase 4a (Rose 2018)

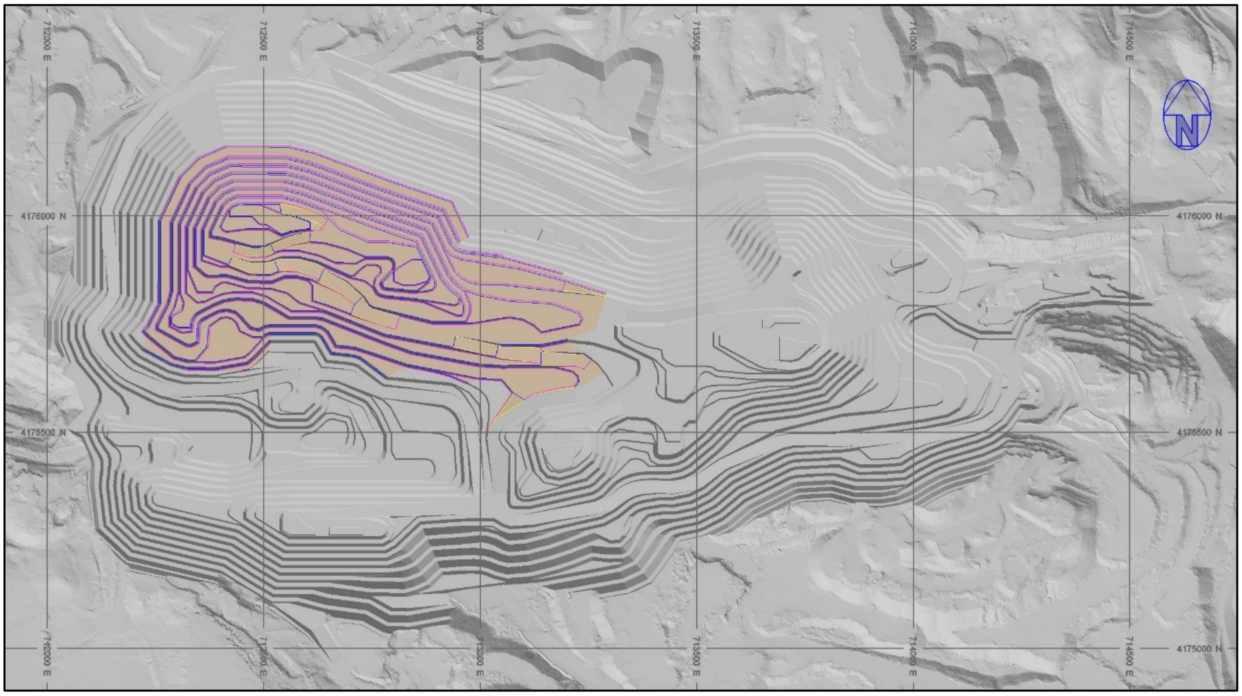


Figure 16.5 - Mining Phase 4b (Rose 2018)

16.1.3 Estimation of Mineral Reserves by Phase

Consistent with the recoveries, economic parameters and cutoff grade calculations described in Section 15.2, combined proven and probable (2P) mineral reserves above a fixed $6.40/t NSR (or 0.136% RCu) cutoff were estimated by bench for each mining phase and are summarized in Table 16.3. These phase reserve estimates, effective 31 December 2017, were then used to generate a mine production schedule.

Table 16.3 – Mineral Reserve Estimates by Mining Phase

	2P* Reserves >= $6.40/t NSR (0.136% RCu)					Waste	Total	Strip
Phase	ktonnes	NSR $/t	Cu %	RCu %	Sul %	ktonnes	ktonnes	Ratio
1	40,850	19.24	0.47	0.41	3.46	15,233	56,083	0.37
2	53,247	16.90	0.43	0.36	5.25	69,48	122,727	1.30
3	43,301	17.50	0.45	0.37	7.79	116,135	159,436	2.68
4a	25,126	12.67	0.31	0.27	3.49	63,360	88,486	2.52
4b	34,403	15.15	0.37	0.32	2.60	17,275	51,678	0.50
Total	196,925	16.67	0.42	0.35	4.75	281,484	478,409	1.43

* Proven and Probable

16.2 Mine Production Schedule

A proprietary open pit mining simulation 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 targets and cutoff grades can both be varied by time period (i.e., year). The program, through additional user controls, computes advanced stripping requirements to ensure sufficient ore exposure throughout the schedule.

16.2.1 Production Scheduling Parameters

Atalaya Mining plans to expand the ore processing plant by about 58% above current throughput rates and supply the ramp-up and long-term mill feed rates that are summarized in Table 16.4.

Table 16.4 - Mill Feed Rates

Year	Mill Feed Mtpa
2018	9 5
2019	11
2020	15

A stripping analysis using a fixed \$6.40/t NSR internal cutoff suggests that an average stripping ratio of nearly 1.64 (tonnes of waste per tonne of ore) will be needed through the first quarter of 2029. Thereafter, waste stripping will decline rapidly as Phase 4b is mined out in 2031.

Sinking rates in each mining phase were limited to about 6-7 benches (60-70 m) per year. Pit bottoms generally did not sink more than three benches per year to allow time for sump construction and pit water removal.

16.2.2 Mine Production Schedule Summary

Numerous production scheduling trials were conducted to smooth long-term stripping rates while meeting mill feed targets for each year. The final production schedule is presented in Table 16.5 and is consistent with the mineral reserve estimates described in Section 15. Waste tonnages have been broken down by rock and Filon Sur (FS) backfill tonnages.

Table 16.5 - Mine Production Schedule

	Mill Feed (2P* Mineral Reserves >= \$6.40/t NSR)					Waste, ktonnes		Total	Strip
Year	ktonnes	NSR \$/t	Cu%	RCu%	S%	Rock	FS Backfill	ktonnes	Ratio
2018	9,500	17.02	0.42	0.36	3.88	16,347	153	26,000	1.74
2019	11,000	18.25	0.46	0.39	4.63	15,312	2,688	29,000	1.64
2020	15,000	18.86	0.48	0.40	5.98	19,939	4,061	39,000	1.60
2021	15,000	20.68	0.52	0.44	4.45	22,431	1,569	39,000	1.60
2022	15,000	16.97	0.42	0.36	4.82	20,960	3,04	39,000	1.60
2023	15,000	16.12	0.40	0.34	5.62	21,312	2,688	39,000	1.60
2024	15,000	16.84	0.42	0.36	5.23	20,566	3,434	39,000	1.60
2025	15,000	17.51	0.46	0.37	7.88	22,746	1,255	39,000	1.60
2026	15,000	17.81	0.46	0.38	6.38	25,100	0	40,100	1.67
2027	15,000	15.24	0.39	0.32	4.74	25,100	0	40,100	1.67
2028	15,000	14.09	0.35	0.30	3.96	25,100	0	40,100	1.67
2029	15,000	12.62	0.31	0.27	3.24	17,062	0	32,062	1.14
2030	15,000	16.30	0.40	0.35	2.66	7,963	0	22,963	0.53
2031	11,425	15.28	0.37	0.33	1.98	2,659	0	14,084	0.23
Total	**196,925**	**16.67**	**0.42**	**0.35**	**4.75**	**262,597**	**18,887**	**478,409**	**1.43**

The first mining phase largely extends prior mining areas and haul roads downward in the existing Cerro Colorado pit; consequently, very little stripping is required and can be performed concurrently with ore mining. Advanced stripping of Phase 2 commences in 2018 and Phase 3 in 2021. Phase 4a stripping will not begin until mid-2026. Phase 4b mines out the temporary ramp beginning in the second quarter of 2029.

Mill head grades during the first five years of operation are projected to average just over 0.46% Cu, which is nearly 11% higher that the life-of-mine average. This is attributable to the mining phase sequence that targets higher grade ore zones in the early years. Total contained copper in the schedule's mill feed is estimated at 822,000 tonnes.

As the production schedule is based on a fixed internal cutoff grade, no low-grade ore stockpiling will be necessary from the standpoint of copper grades. Some short- to medium-term stockpiling will likely be needed to blend higher-level zones of deleterious elements to reduce smelting penalties. Studies are planned to allow estimation of these deleterious elements in the deposit model to assist short-term mine planning.

16.2.3 Projected Mine Life

The life of the mine is estimated at 13.8 years, for a projected completion in the fourth quarter of 2031.

16.3 Waste Rock Storage Facilities

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 backfills in the eastern and southwestern (Filon Sur) portions of the pit will provide supplemental waste storage. Over 281 Mt of waste rock and backfill material are estimated in the mine production schedule.

16.3.1 WRSF Design Parameters

Ex-pit WRSFs will be constructed from the bottom levels upward in 10- to 20-m-high lifts. Drainage systems will be 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 schist to reduce permeability and minimize surface runoff water infiltration. Drainage from the WRSFs will be channeled to sedimentation and water treatment ponds.

WRSF design parameters, excluding in-pit backfills, are summarized in Table 16.6. WRSF faces will be regraded to 2h:1v slopes (i.e., about 26.5°) as lifts are extended to their ultimate limits. Small catch benches at designed for the 360, 420, and 480 m elevations for some limited sediment control within each WRSF.

Table 16.6 - Ex-Pit WRSF Design Parameters

Parameter	Unit	Value
Net swell factor	%	35
WRSF average density	t/m^3	2.04
Lift height	m	oct-20
Regraded slope face angle	degrees	26.5
Maximum overall slope angle	degrees	25
Catch bench vertical interval	m	60
Catch bench width	m	10
Haul road width	m	30
Maximum road gradient	%	10

The in-pit backfills will be constructed from the 260, 340 and 370 m elevations – connecting to haul roads on the south pit wall of the ultimate pit or to an in-pit ridge on the north side of Filon Sur. No regrading of the dump faces, at a 37° angle of repose, is presently planned within the pit limits. The Filon Sur backfill will be stacked upward to the 380 m elevation via an internal ramp. Backfilling in the FS area of the open pit can commence in the latter part of 2027.

16.3.2 Ultimate WRSF Plans

Waste rock will be placed into three locations: the main external WRSF around the northeast, east, and southeast sides of the Cerro Colorado pit; the in-pit backfill areas that become available in or after 2027; and the TSF dam expansions. The WRSF designs with respect to the ultimate pit are shown in Figure 16.6 and are highlighted in brown. In-pit backfills are shown in dark brown. Grid lines are on 1000 m intervals.

The main external WRSF forms an approximately 4 km long arc around the eastern half of the pit. The highest elevation is 520 m in the north area and the lowest is 325 m on the southeast toe. This WRSF has a surface area of nearly 250 ha and a storage capacity of 109 M m^3, or about 222 Mt.

The planned Filon Sur in-pit backfill has a crest elevation of 380 m and a storage capacity of almost 14 Mm^3, or 28 Mt. The upper and lower backfills in the eastern half of the Cerro Colorado pit have crest elevations of 370 and 260 m, respectively, and have a combined storage capacity of about 17 M m^3, or 34 Mt.

Golder Associates have designed TSF dam expansions, shown in green in Figure 16.6, that will increase the tailings capacity to meet the requirements of the mine production schedule. Total embankment fills are estimated at about 22 Mm^3, which will require roughly 47 Mt of waste rock from pit operations through 2029. Additional details regarding the TSF expansion are discussed in Section 18.

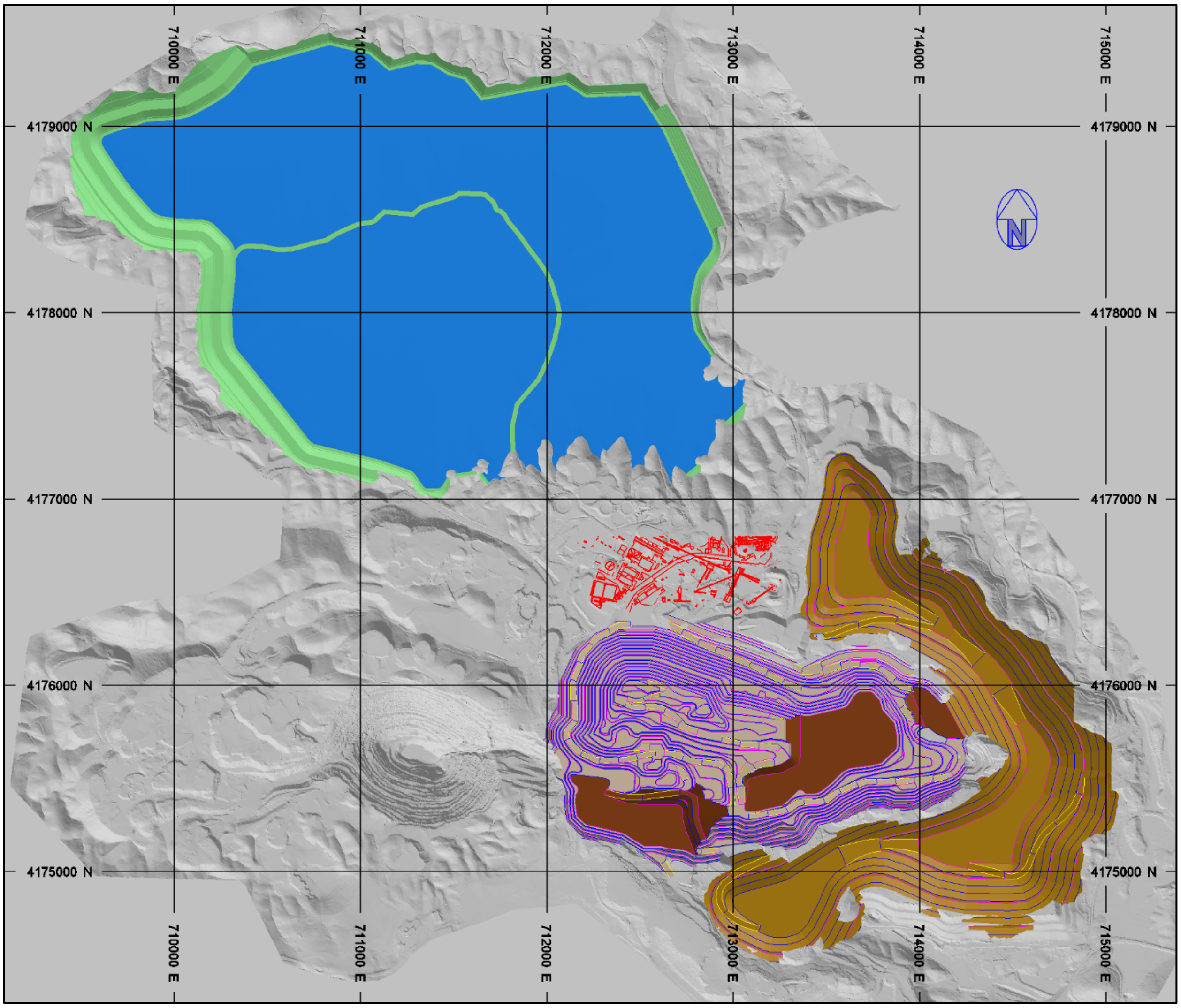


Figure 16.6 - Ultimate WRSF and TSF Plans (Rose 2018)

16.3.3 WRSF Capacity Estimate

The estimated storage capacities for ex-pit WRSFs and backfills are summarized in Table 16.7. An average density (net of swell) of 2.04 t/m^3 was used to calculate tonnages. Total storage capacity is estimated at 331 Mt with the TSF dam expansions and 284 Mt without. The mine production schedule generates just over 281 Mt of waste rock; therefore, sufficient storage capacity should be available provided that the necessary permits can be obtained in a timely manner (see Section 15.5.3).

Table 16.7 - Estimated WRSF and TSF Dam Expansion Capacities

Storage Facility	Volume, Mm^3	Tonnage, Mt
Ex-pit WRSF	109	222
Filon Sur in-pit backfill	14	28
East in-pit backfills	17	34
TSF dam expansions	22	47
Total	162	331

16.4 Mining Equipment

Peak mining rates are projected at 40.1 Mt/a, which equates to nearly 111,400 t/d if 360 working days per year are scheduled or 154,200 t/d if only 260 days per year are worked by the mining contractors. Presently, contractors' operating crews work seven 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.

Tables 16.8 lists the mining contractors' current and post-expansion (i.e., 2020 and thereafter) primary equipment fleet. Similarly, Table 16.9 summarizes the mining contractors' auxiliary mining equipment fleet dedicated to Cerro Colorado pit operations.

Table 16.8 - Primary Mining Fleet

Equipment	Capacity	Current Fleet	Post-Expansion Fleet
Drills:			
Sandvik 1500	114-127 mm diameter	4	6
Sandvik 900	114-127 mm diameter	1	1
Atlas Copco C-5	114-127 mm diameter	1	1
Hydraulic Excavators:			
Komatsu 2000	14 m^3	1	2
Hitachi 1900	14 m^3	0	1
Caterpillar 6015	8.5-10 m3	0	3
Hitachi 1200	7.5 m^3	1	1
Hitachi 890	6 m^3	1	1
Haul Trucks:			
Komatsu 785	91 t	12	29
Komatsu 605	65 t	0	4
Komatsu 465	55 t	10	10

Table 16.9 - Auxiliary Mining Fleet

Equipment	Current Fleet	Post-Expansion Fleet
Caterpillar 824 wheel dozer	2	2
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 16.10 summarizes the estimated levels of mining-related personnel – both current and post-expansion.

Table 16.10 - Mining-Related Personnel

Worker Type	Current	Post-Expansion
Contractor supervision	20	22
Contractor craft labor	102	142
Subtotal contractor personnel	122	164
Owner (Atalaya Mining) personnel	15	18
Total mining personnel	**137**	**182**

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 locations of many of these workings are 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 insure the safety of proximate operations and personnel.

17 RECOVERY METHODS

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.

The ore mined from the Cerro Colorado open pit features different mineralogical characteristics depending on whether it is mined from the Cerro Colorado East (CCE) or the Cerro Colorado West (CCW) areas. The CCE ore has a higher copper content than the CCW ore, historically 0.63 % and 0.40 %, respectively. Likewise, the ore from CCE has higher sulfur content at 12 %, versus 4 % from CCW basically because of pyrite content. Another difference between the two ore types is that ore from CCE has a higher content of penalty elements such as arsenic and antimony. Historically, the CCE ore recovered less copper than the CCW ore. This fact was confirmed during the phase 1 period of the Project.

The ore from CCE requires a finer primary grind than the ore from CCW to achieve the same metallurgical recovery. Also, the CCE ore requires less energy to obtain the same particle size as the ore from CCW.

Relatively coarse primary and secondary grinding, at a P_{80} of approximately 160 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.

Both ore types contain silver but ore from CCE has a higher silver content than ore from CCW. The silver content in the concentrates produced during phase 1 of the operation is between 62 and 150 g/t.

The different properties of the ore are summarized in Table 17.1 below and are based on the historical plant operating records.

Table 17.1 – Summary of CCW and CCE Ore Characteristics (EMED 2013)

Cerro Colorado Pit, Summary of Ores		
Parameter	**CCW**	**CCE**
Mineralogy	6.5% FeS_2, Pyrite	21% FeS_2, Pyrite
	1.2% $CuFeS_2$, Chalcopyrite	1.8% $CuFeS_2$, Chalcopyrite
	0.2% ZnS, Sphalerite	0.3% ZnS, Sphalerite
	91.9% Gangue	76% Gangue
Composition	4% S	12% S
	0.4% Cu	0.63% Cu
	0.13% Zn	0.19% Zn
	0.4 gpt Ag	0.8 gpt Ag
	205 ppm As	500 ppm As
	20 ppm Sb	61 ppm Sb
	11 ppm Bi	29 ppm Bi
Design data		
Bond Work Hardness	16 kWh/t	14 kWh/t
SG, dry ore	3.0	3.5
Flotation Feed target F_{80}	210 µm	160 µm
Con Regrind P_{80}	~45 µm	~ 40 µms
Cu Recovery	87.0%	81.0%
Copper Concentrate Grade	~ 23% Cu, (58 g/t Ag)	~ 21% Cu, (132 g/t Ag)

The Filon Sur Zone (FSUR) located in the Southwest area of Cerro Colorado is considered to be analogous to the CCW ore and requires the same processing parameters.

The processing department staff consists of 84 people, 10 of whom 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 has been successfully expanded to 9.5 Mtpa (Phase 2), and a further expansion to 15 Mtpa (Phase 3) is in progress.

The unitary operating costs have decreased since upon completion of Phase 2 as the production rate has increased, as well as improved equipment efficiency, and also as a result of the economies of scale.

The current energy and water requirements for processing 9.5 Mtpa are presented in Section 18, which also presents the estimated energy and water requirements for 15 Mtpa that will be realized upon completion of the 15 Mtpa upgrade.

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 1960's and 1970's, 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 Mtpa in February 2016.

17.2.2 Phase 2 – Current Configuration

The basic engineering design to increase the plant throughput rate from 5 Mtpa (Phase 1) to 9.5 Mtpa (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 Mtpa, 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 three crushing stages, two ball mill grinding stages, a rougher flotation circuit, one rougher concentrate re-grinding stage, and a three stage cleaner circuit. The process ends with a thickening and filtering stage to obtain a final copper concentrate product.
The Phase 2 design criteria are shown in Table 17.2.

Table 17.2 – Phase 2 Design Criteria

Criteria	Unit	Value
Operating Days per year	d	365
Plant Utilization	%	93
Milling and Flotation Processing rate	t/y	9,500,000
Primary Crusher Transfer Size, 80%	mm	160
Secondary/Tertiary Crusher Transfer Size, 80%	mm	22.5
Primary/Secondary Milling Transfer Size, 80%	µm	160
Crusher Work Index	kWh/t	13
Bond Rod Mill Work Index	kWh/t	14-16
Bond Ball Mill Work Index	kWh/t	14-16
JK Axb		45-60
Specific Energy Consumption in Primary Grinding	kWh/t	13.3-13.5
Rougher Flotation Stage residence time	min	21-23
Specific Energy Consumption in Rougher Concentrate Regrind	kWh/t	19.2
Rougher Concentrate tonnage	t/h	82
Rougher Concentrate Regrind Product Size, 80%	µm	40
First Cleaner + Cleaner Scavenger residence time	min	37
Second Cleaner residence time	min	38
Third Cleaner residence time	min	32
Concentrate Thickener Feed Rate	$t/h/m^2$	0.25
Concentrate Plate Filters Area	m^2	60
Final Tailings Density	%	35-38

After commissioning and operating Phase 2, an additional $300m^3$ cell was installed in a “Pre-Cleaner” duty, and the following flotation banks are only intermittently used as required: Cleaner Scavenger; Second Cleaner; and Third Cleaner.

The Phase 2 flowsheet configuration prior to initiating 15 Mtpa upgrade is shown in Figure 17.1.

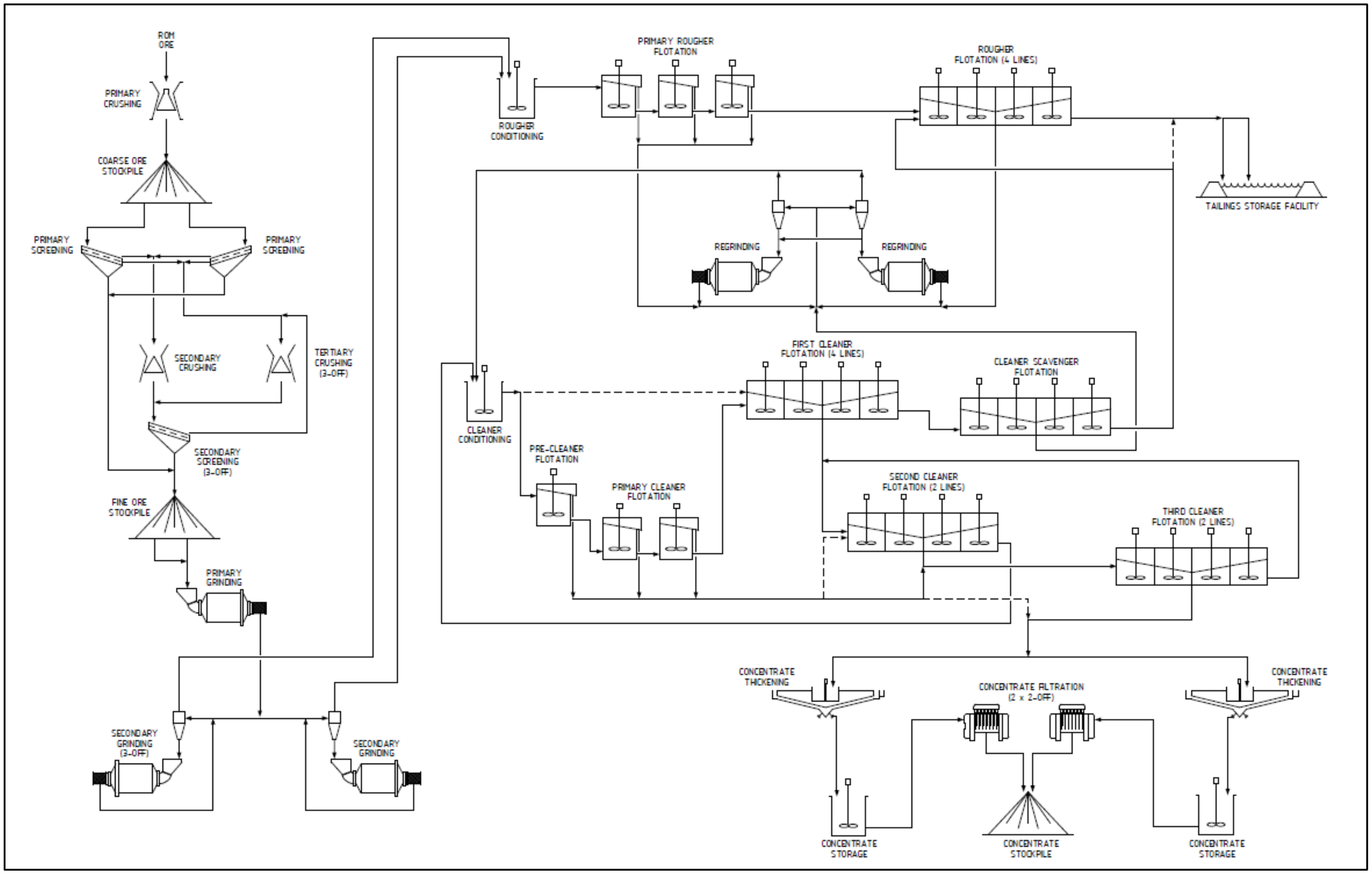


Figure 17.1 - Current Flowsheet (Phase 2 – 9.5 Mtpa)

A description of the current circuit configuration is provided in the following sections.

17.2.2.1 Crushing

Three stage crushing is used to produce a nominal minus 22 mm size feed to the grinding circuit. Run of mine ore, at a size of approximately 480 mm, is fed to a 60" x 89" gyratory crusher with a maximum capacity of 3,200 t/h, which reduces the ore to a minus 165 mm product and is stockpiled.

This primary crushed ore is then fed to a secondary and tertiary crushing and screening circuit. Phase 2 incorporated new reclaim feeders and a new double deck primary screen to increase the capacity of the primary crushing circuit.

The crushed ore stockpile is reclaimed by four variable speed apron feeders, four fixed speed vibrating feeders and two conveyors. Each conveyor is fed by two variable speed apron feeders and two fixed speed vibrating feeders. The reclaimed crushed ore is screened using two double deck vibrating screens. The screen top deck oversize is fed to a 7-ft standard secondary cone crusher while the screen bottom deck oversize is fed to three tertiary short head cone crushers to produce a nominal minus 22 mm ore that is conveyed to a fine ore stockpile.

The discharge from both secondary and tertiary cone crushers is fed to three single deck vibrating screens. The screen oversize is recycled to the tertiary cone crushers and the screen undersize is combined with the undersize from the double deck vibrating screens and conveyed to the fine ore stockpile.

The fine ore stockpile is reclaimed using eight belt feeders and two reclaim conveyors. Each reclaim conveyor is fed by two variable speed belt feeders and two fixed speed belt feeders. The reclaim conveyors discharge onto a mill feed conveyor that in turn feeds a primary ball mill operating in open circuit.

17.2.2.2 Grinding

The Phase 1 grinding circuit operated one primary rod mill and two secondary ball mills to process 5 Mtpa. The Phase 2 expansion added a new 24' x 24' primary ball mill with a 7,600 kW motor operating in open circuit and a new 20' x 30' secondary ball mill, also equipped with a 7,600 kW motor operating in closed circuit with new hydrocyclones.

The Phase 1 14' x 20' rod mill, equipped with an 1,840 kW motor, has been reconfigured as a secondary ball mill. Two existing 15.5' x 21' ball mills, equipped with 2,473 kW motors each, operate in a closed circuit with their respective hydrocyclones. The grinding circuit produces ground mineral slurry with a P_{80} of 210 µm when processing ore from CCW and ground mineral slurry with a P_{80} of 160 µm when ore is fed from CCE.

The cyclone overflow from the Phase 1 grinding circuit and the expansion circuit are combined into a common conditioning tank and fed into the rougher flotation circuits. Primary flotation reagents, consisting of a dithiophosphate and thionocarbamate based chemistry collector, frother and lime, are fed into the conditioning tank. A secondary collector and zinc depressant can be added as needed. The cyclone overflow is sampled by an automatic sampler and is the mill head sample.

17.2.2.3 Flotation

Similar to the grinding and crushing circuits, all of the original flotation equipment continues to be used. In addition, the circuit has been expanded with new equipment to achieve the designed residence times at 9.5 Mtpa.

The flotation circuit receives the ground slurry, containing between 38-40% solids by weight, from a conditioning tank, where it is then sent to a primary roughing circuit consisting of three tank flotation cells of 100 m^3 each (300 m^3 total) operating in series. The primary rougher tailings are fed to a distributor where the pulp is divided to four parallel lines of the rougher circuit. The rougher circuit consists of 500 cubic feet (14 m^3) naturally aspirated flotation cells configured as three lines of 11 flotation cells and one line of 13 cells, for a combined volume of 22,700 cubic feet (644 m^3). The rougher tailings is the final plant tailings and is sent to the tailings management system (TMS).

The primary rougher concentrate and the rougher concentrate are pumped to the re-grinding stage, which has two re-grinding circuits operating in parallel. The first re-grind mill is a 15.5' x 21' (4.75 m x 6.4 m) ball mill with a 2,473 kW motor that operates in a closed circuit with dedicated hydrocyclones. A second 12.5´ x 15´ (3.8 m x 4.6 m) regrind ball mill with an installed power of 920 kW, has been refurbished and operates in a closed circuit with separate dedicated hydrocyclones.

The cyclone overflow from the two re-grinding circuits reports to a conditioning tank, from where it is pumped to the 300m^3 pre-cleaner tank flotation cell. Pre-cleaner tailings report to the first of two 100 m^3 primary cleaner tank flotation cells. The tailings from the primary cleaner reports to the first cleaner circuit. Pre-cleaner and primary cleaner concentrate are fed to the second or third cleaner flotation circuit as required.

The first cleaner consists of four parallel flotation lines, each with eight 14 m^3 naturally aspirated flotation cells for a capacity of 2,400 cubic feet (68 m^3) per line. The first cleaner tails report to the cleaner-scavenger circuit, while the concentrate is pumped to the second cleaner.

The cleaner scavenger consists of a single line of ten 14 m^3 naturally aspirated cells. Cleaner-scavenger tailings are either fed back into the rougher circuit or to the TMS. The cleaner scavenger concentrate is fed to the re-grinding circuit.

The secondary cleaner stage consists of two flotation lines, each with eight 14 m^3 naturally aspirated flotation cells for a volume of 2,400 cubic feet (68 m^3) per line. The concentrate from the second cleaner is pumped to the third cleaner stage and tailings from this stage are re-circulated back to the pre-cleaner feed.

The third cleaner stage consists of two flotation lines, each with seven 14 m^3 naturally aspirated flotation cell, for a volume of 2,100 cubic feet (60 m^3) per line. The concentrate from the third cleaner is the final plant concentrate and reports to the concentrate dewatering circuit. Tailings from this stage are re-circulated back to the second cleaner.

17.2.2.4 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.

17.2.3 Production Data

The Riotinto mine has been in continuous ramp up since August 2015 with the goal of achieving 5.0 Mtpa. 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 Mtpa. In this same period Phase 2 reached 92% completion with final construction activities and tie-ins to existing operations pending.

Riotinto 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 Mtpa to 9.5 Mtpa, was declared as "mechanically complete" the first week of May 2016, ahead of schedule and under budget. Copper production increased by 10% in Q2 2016 to 4,442 tonnes, compared with 4,048 tonnes in Q1 2016. During Q2 2016 1.3 million tonnes of ore were processed compared with 1.1 million tonnes during Q1 2016, representing a 15% increase.

During Q2 2016, the copper grade in final concentrate remained consistent, within design, achieving 21.54% Cu, while recoveries decreased to 79.80% due to the commissioning of the new flotation circuit. Recoveries are as per expectations and averaged over 84% in July 2016.

Table 17.3 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.

While 9.5 Mtpa processing rates are not yet consistently being achieved, the copper recovery trend has increased throughout the year and as a result, copper production is within guidance.

Table 17.3 – LOM Production (Atalaya 2018)

PRODUCTION		2015	2016	2017	2018 YTD	LoM TOTAL
Grinding						
Dry tonnes	t	1,347,778	6,505,883	8,796,715	2,972,787	19,623,163
Availability	%	88.89	87.82	90.44	88.64	89.04
	t/h	413	843	1,110	1,165	915
Plant Head Grade						
Cu	%	0.57	0.48	0.49	0.49	0.49
Ag	ppm	-	-	3.96	4.13	4.04
S	%	10.77	7.73	5.84	4.05	6.53
Zn	%	0.13	0.11	0.09	0.10	0.10
Pb	%	0.05	0.02	0.01	0.01	0.02
Fe	%	13.58	13.50	12.78	11.90	12.94
Concentrate Grade						
Cu	%	17.66	21.41	22.39	22.06	21.63
Ag	ppm	-	-	72.01	67.03	69.35
S	%	34.94	28.80	29.13	30.21	29.67
Zn	%	4.37	4.44	3.49	3.88	3.93
Pb	%	0.60	0.38	0.17	0.17	0.27
Fe	%	29.36	29.16	29.10	29.39	29.18
Concentrate Production						
Concentrate production	t	31,047	122,284	165,965	58,215	377,511
Copper Production	t	5,483	26,179	37,163	12,844	81,669
Copper Recovery						
Total Recovery	%	71.90	83.29	85.46	88.31	84.12

17.2.4 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 system architecture contains 3 main PLCs; the first one controls the dry area (primary, secondary and tertiary crushing), another controls the Phase 1 equipment and the third PLC controls the Phase 2 equipment. These PLCs are receiving information from equipment in the field via profibus and optical link modules (OLMs). All this information is routed to the server room where 2 plant servers, a web server, and a historian server are located. The system is protected with firewalls. The information from the server room is routed via Ethernet to the control room where there are 2 WinCC Clients, the supervisory room engineering system and the video wall client computer.

The engineering firm in charge of the detailed engineering of this project created a comprehensive Process Control Strategy in agreement with what is needed for a 26 kt/d plant. This philosophy was the base for installing equipment and for programing the process control computers. Proper training was provided to the personnel in charge of these activities.

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 stock piles and tanks are fitted with level indication and control.

Where necessary, valves and variable speed drives are used to control levels in critical bins and tanks.
The two thickener rake mechanisms are fitted with no-motion and high torque detection devices. A HIGH torque switch activates an audible siren and flashing light. The rake mechanism will be tripped on activation of the associated HIGH-HIGH torque alarm.

Pressure gauges are installed on critical centrifugal pump discharge lines. Most slurry centrifugal pumps employ gland water seals. The gland water pressure is measured by gauges and controlled by valves on individual gland water lines to each pump. Centrifugal pumps with gland water seals are tripped on low grand water flow or/and pressure.

Each spillage collection pump is fitted with a low level switch that will stop the respective pump on low sump level. Positive displacement pumps are equipped with pressure relief valves installed on the discharge lines.

Pumps and feeders will generally be tripped on activation of a LOW-LOW level alarm in the vessel they are withdrawing material from. Pumps and feeders are tripped on activation of a HIGH-HIGH level alarm in the vessel they are transferring material to.

Mill and conveyor motors have time delayed starts of approximately 10 seconds as well as audible warning sirens that are activated on start-up.

Electrically powered cranes and hoists are equipped with hand control keypads. A dedicated audible siren sounds when the respective crane or hoist is travelling.

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).

Each safety shower is fitted with a flow alarm that will activate an audible siren when flow to the shower is detected. This is done for safety reasons.

Instrumentation and the control philosophy for the new Phase 2 primary ball mill and the secondary ball mill together with the associated lubrication and grease systems was provided by the equipment supplier as part of the vendor package.

Diverse control loops exist in crushing, grinding, flotation, thickening and filtration to protect equipment and to control the process.

A last generation 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.

17.2.4.1 15 Mtpa Expansion

The existing control system will be upgraded to cater for an updated architecture to include the new items. Each area will be allocated a control system remote input output (RIO) panel to capture the instrumentation for the related area. This will be 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.

17.2.5 Production Support

Riotinto 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.

Riotinto 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 returned to the flotation area, which is a short distance away. The process water ponds in the tailings management system have areas where pumps are located to pump process water back to the process water tank in the plant, prior to adjusting pH using lime milk.

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.

17.2.6 Manpower

The plant team is headed by a Plant Superintendent and has 5 crews of operators and supervisors which work in 8 hours 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 17.4.

Table 17.4 – Process Plant Manpower

Description	Existing Manpower	Expansion Manpower
Plant Manager	**1**	
Process Engineer	1	
Metallurgy Team	6	
Plant Operations Superintendent/Supervisor	2	1
Concentrate shipment	5	
Operations Crew	79	20
Maintenance Manager	**1**	
Maintenance staff (Supervisors and millwrights)	59	9
Electrical and Instrumentation Staff	25	3

17.3 Future Process (Phase 3 – 15 Mtpa Upgrade Project)

As part of the Riotinto 15M Upgrade Project, the basic engineering design for the upgrade of the Phase 2 plant in order to further increase the plant throughput rate from 9.5 Mtpa to 15 Mtpa commenced in July

2017. Detailed engineering design and installation activities are currently in progress with the commissioning and ramp-up of the upgraded plant scheduled for the fourth quarter of 2019.

After the installation of modern mechanically aspirated flotation cells during Phase 2, it was observed that acceptable upgrading and recoveries were achievable when only utilizing the new flotation cells on cleaning duty. As a result, the original naturally aspirated cells on cleaning and cleaner-scavenger duties were regularly bypassed during operations. The Phase 3 flotation design leverages off this observation and only has two stages of cleaning utilizing modern flotation cells.

A summary of the Phase 3 design criteria and its comparison with the existing facility is shown in Table 17.5.

Table 17.5 – Design Criteria for Existing Facility and 15 Mtpa Expansion

	Unit	Existing	15 Mtpa		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		
Crushing Plant	%	59	65		Existing case includes 22% downtime due to mining.
Rest of Plant	%	85	85		
Crushing Plant			Parallel Trains		
			Re-tasked	New	
Configuration		3 Stage Crushing	2 Stage Crushing	1 Stage Crushing	
Operating Hours	h	5,694	5,694	5,694	
Crusher Plant Feed	t/a	9,500,000	10,000,000	5,000,000	Combined throughput of 15 Mtpa
	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	SABC + 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

Table 17.6 – Design Criteria for Existing Facility and 15 Mtpa Expansion (Continued)

	Unit	**Existing**	**15 Mtpa**	**Comments**
Concentrate Regrind				
Configuration		Ball	Parallel Ball	
Open/Closed Circuit		Closed	Closed	
Regrind Mill 1		2.4MW Ball	2.4MW Ball	Increase ball charge to draw max power
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	Expansion fully utilises available power
Power Available	kW	1,567	3,000	draw from existing mills
Flotation				
Rougher Vol.	m^3	944	1,500	Re-tasked 300 m^3 + four new 300 m^3 cells
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	120	Decommissioned	
Rougher 1 Res. Time	min	20	18.4	
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	
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	

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 Mtpa. 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 17.7 and Table 17.8 respectively.

Table 17.7 – New Equipment Summary for 15 Mtpa Upgrade

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 Mtpa 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 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 17.8 – Equipment Modifications Summary for 15 Mtpa Upgrade

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 flowsheet for the 15 Mtpa upgrade including color coding to what equipment is new, existing, or has a modified duty compared to Phase 2. In addition, the general arrangement of the expansion has been provided in Figure 17.3.

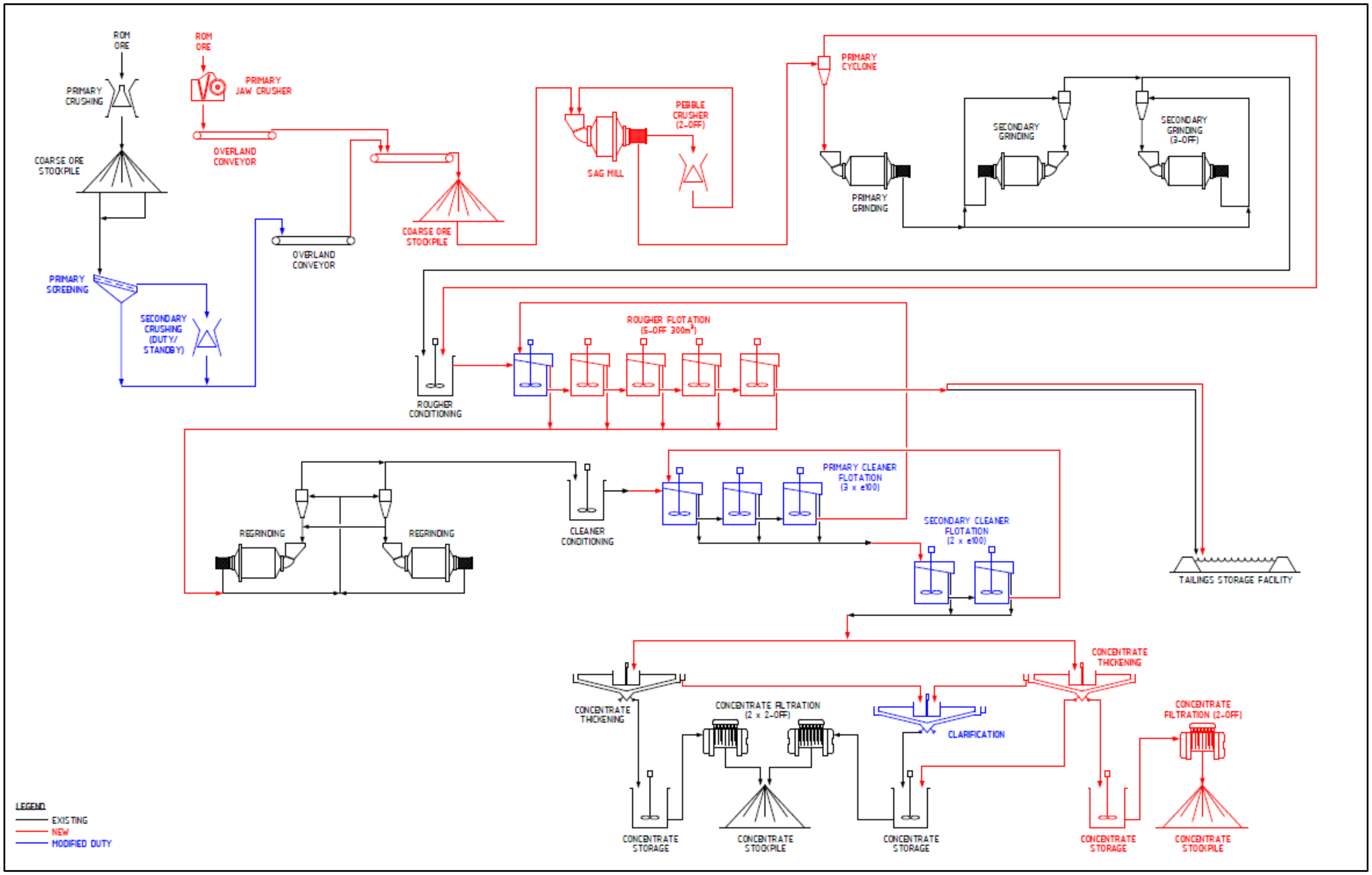


Figure 17.2 - Simplified Flowsheet for 15 Mtpa Expansion (Minnovo 2017)

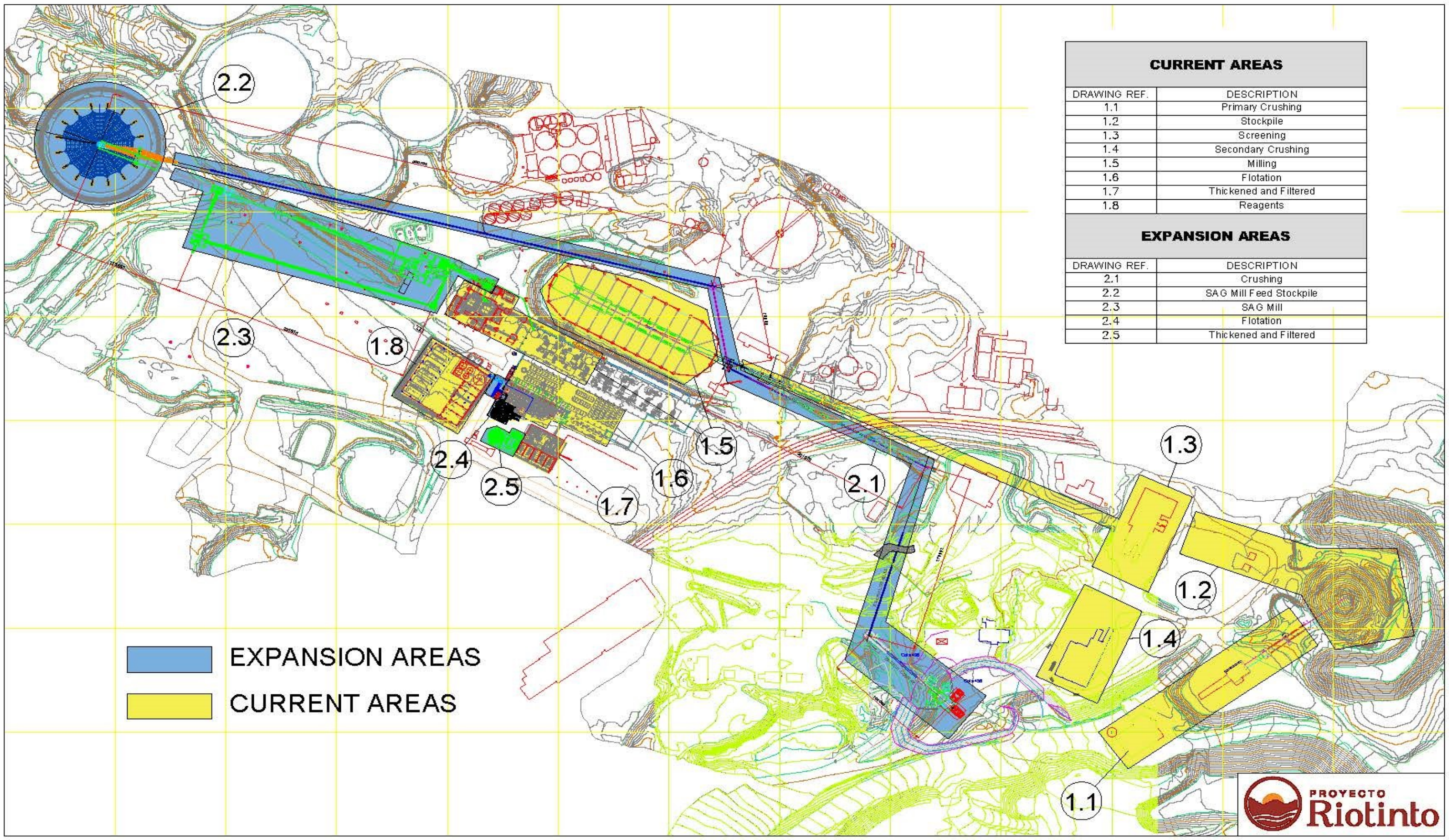


Figure 17.3 – Plant Expansion General Arrangement (Atalaya 2018)

In summary, the flowsheet modifications allow the expansion to 15 Mtpa with optimal use of existing/available equipment by:

1. Installing a SAG mill with a pebble crushing circuit, that is capable of grinding 15 Mtpa of coarsely crushed product to the extent where a proportion of the ground product is sufficiently fine to report directly to flotation (cyclone overflow), and the coarser component (cyclone underflow) is suitable to feed the existing milling circuit.
2. The installation of the SAG mill effectively re-distributes the power balance away from high cost secondary and tertiary crushing, yet retains the ability to achieve comparable grind product specification with sufficient ball milling capacity.
3. Fully re-utilizing the existing crushing circuit on ROM ore, so that a parallel 5 Mtpa crushing line with a single 250 kW jaw crusher is sufficient to increase overall crushing capacity from 9.5 Mtpa to 15 Mtpa. Compared to the 9.5 Mtpa scenario, the crushed product is coarser, but suitable for SAG milling.
4. The portion of SAG mill discharge reporting to the primary cyclone underflow is of a similar particle size distribution and tonnage as the existing ball milling circuit feed. As such, the existing circuit will achieve the required grind product P_{80} of 183 µm with 15 Mtpa of plant feed;
5. Installing additional rougher flotation capacity, re-tasking recently installed modern tank cells (Phase 2) and de-commissioning older naturally aspirated (Wemco) cell technology to finish with a simpler flotation circuit with sufficient capacity to achieve comparable metallurgical performance.
6. Incremental expansion of concentrate and tailing handling facilities by the installation of a 14 m diameter high rate thickener and two 62 m^2 vertical filter presses to cope with additional product as well as one tailings pump and an extra tailings line for the tailings generated from the expanded operation.

The control philosophy and production support infrastructure will remain consistent with the current facility.

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 round trips per day. This fleet has 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.

The layout of the national road that runs through the vicinity of the mine is planned to be modified in order to facilitate expanded mining operations in the future. A scenario analysis recommended re-routing of the existing national road around Corta Atalaya on the western side of the property.

18.2 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:

- Transformer 1 - 32 MVA 132/6,3 kV
- Transformer 2 - 20 MVA 132/6,3 kV – to be replaced by a brand new 32 MVA 132/6,3 kV
- Transformer 3 - 20 MVA 132/6,3 kV – to be replaced by a brand new 50 MVA 132/20 kV

These transformers have been completely repaired and checked as per regulations (dielectric oil analysis). There is a condenser battery system to correct power factor which has been repaired and updated with a capacity of 9.6 MVAr currently working at 0.98 cos ϕ. Protection equipment were 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 protections and communication systems.

Phase 1 production (5.0 Mtpa) utilizes Transformer 1 and demands 15 MW of power while an additional 24 MW (from both Transformer 1 and 2) was available to test new equipment for the phase 2 expansion. Phase 2 expanded production (9.5 Mtpa) 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 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 at 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 1 600 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.

18.3 Water Systems

Process water is supplied from the Gossan Dam from where it is pumped, at a rate of approximately 1,200 m^3/h, into two steel tanks with capacities of 4,000 and 3,675 m^3.

The 9.5 Mtpa phase 2 expansion included the installation of a new DN-800 process water pipe and a new pumping system located at the Gossan Dam. Two new pumps, with a flow rate of 1,500m^3/h each, will pump water to an intermediate storage reservoir that has a capacity of approximately 3,100 m^3, and booster pumping system that pumps water to the process water tanks at a flow rate of 3,000 m^3/h.

The 15 Mtpa phase 3 expansion comprises the installation of a two new DN-800 process water pipes and a new pumping system located at the Cobre Dam. Three new pumps with a flow rate of 1,500m^3/h each, will pump water to an intermediate storage reservoir (old gold plant thickener) with capacity of approximately 31,000 m^3, and booster pumping system that pumps water to the process water tanks at a flow rate of 3,600 m^3/h.

Fresh water, is supplied from the Campofrio Dam by three pumps with a flow rate of 250 m^3/h each, two operating and one standby. Water is delivered through a HDPE DN-355 PN-16 pipe to the fresh water tank, ensuring supply at any stage in production. Fresh water supply from the Odiel reservoir upstream from the Campofrio Dam will soon be incorporated to the system as an additional reserve of fresh water, increasing the reserves by 7.5 hm^3. A new pumping system with a capacity of 240m^3/h and a distribution line of 6.5 km is under construction.

The fresh water storage tank has a capacity of 1,900 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 block. Water is distributed to the entire operation via a pipeline system made of high density polyethylene as well as carbon steel. Before commissioning, the existing tanks were re-conditioned with proper surface treatment, thicknesses were checked, and worn piping and valves replaced or repaired. This fresh water distribution system is shown in Figure 18.1.

Figure 18.1 – Fresh Water Distribution System (Atalaya 2018)

Potable water is supplied by the utility company (GIASA) that manages the water system for the municipality of Minas de Riotinto. It is stored in a new 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 in from the Cerro Colorado and Corta Atalaya pits and waste heap leachates, is pumped through new piping and pumping systems to the new water treatment plant and onto the process water storage tank.

Five Pachuca tanks from the old gold processing plant were rehabilitated for the new water treatment plant. In addition, one of the existing thickeners was rehabilitated, and new pumping equipment, pipelines, electrical wiring, and instrumentation were installed. All of the old non-usable equipment were dismantled and removed. The water treatment plant has a capacity of 200 m^3/h and the treated water is reused as process water.

18.4 Tailings Management Facility

The Tailings Management Facility (TMF) consists of three adjacent impoundments referred to as Cobre, Aguzadera and the Gossan facilities. Cobre and Gossan facilities were first constructed in the early 1970's to contain 70 Mt of tailings and later, Aguzadera facility, was constructed in the late 1980's, to provide a total of 86 Mt of tailings storage.

Currently there are two tailings facilities in operation, Cobre and Aguzadera and both facilities have available storage capacity to original design elevation of 381.8 masl and 374.8 masl respectively. The Gossan facility acts as a contact water reservoir where the tailings reclaimed water from Cobre and Aguzadera is treated and pumped back to the plant site.

The tailings facilities have been constructed from a starter dam comprising of a core of gossan. Gossan was mine waste material consisting of a variety of particle sizes ranging from boulders and gravels to sands and clayey silts, with an average maximum size of 200 mm to 400 mm. The facility has been raised with the coarse fraction of cycloned tailings using the upstream method. The coarse tailings (sands) are separated by cycloning and deposited as underflow to form the dam walls, while the overflow consisting of the fine tailings fraction (slimes) is deposited within the basin area. The ponded water is also located away from the dam walls.

The dam walls are supported by a substantial downstream buttress consisting of rock fill/mine waste which has resulted in a substantial width of berm that is in some places in excess of 50 m wide on the external walls.

Stability assessments based on extensive geotechnical characterization and monitoring carried out by Eptisa shows a current safe and stable condition for the Cobre and Aguzadera dams. Typical factors of safety are between 1.5 and 1.7 for static and pseudo static stability analysis. Seismicity in the area is relatively low with a design base earthquake characterized by a peak ground acceleration of 0.07 g and a maximum credible earthquake characterized by a peak ground acceleration of 0.14 g. This follows the Spanish code NCSE-02 for seismic design of structures.

Dam instrumentation installed in Cobre and Aguzadera includes surveying prisms (34), inclinometers (6) and piezometers (35). Monitoring of the instrumentation is carried out by Atalaya on a regular basis and the results indicate some vertical and lateral movements within the accuracy of the measurements. Certain sections of the dams were observed with elevated phreatic levels and a rock fill buttress with drainage was subsequently constructed which extended the existing rock fill buttress discussed previously. The general layout of the tailings management facility is shown in Figures 18.2 and 18.3.

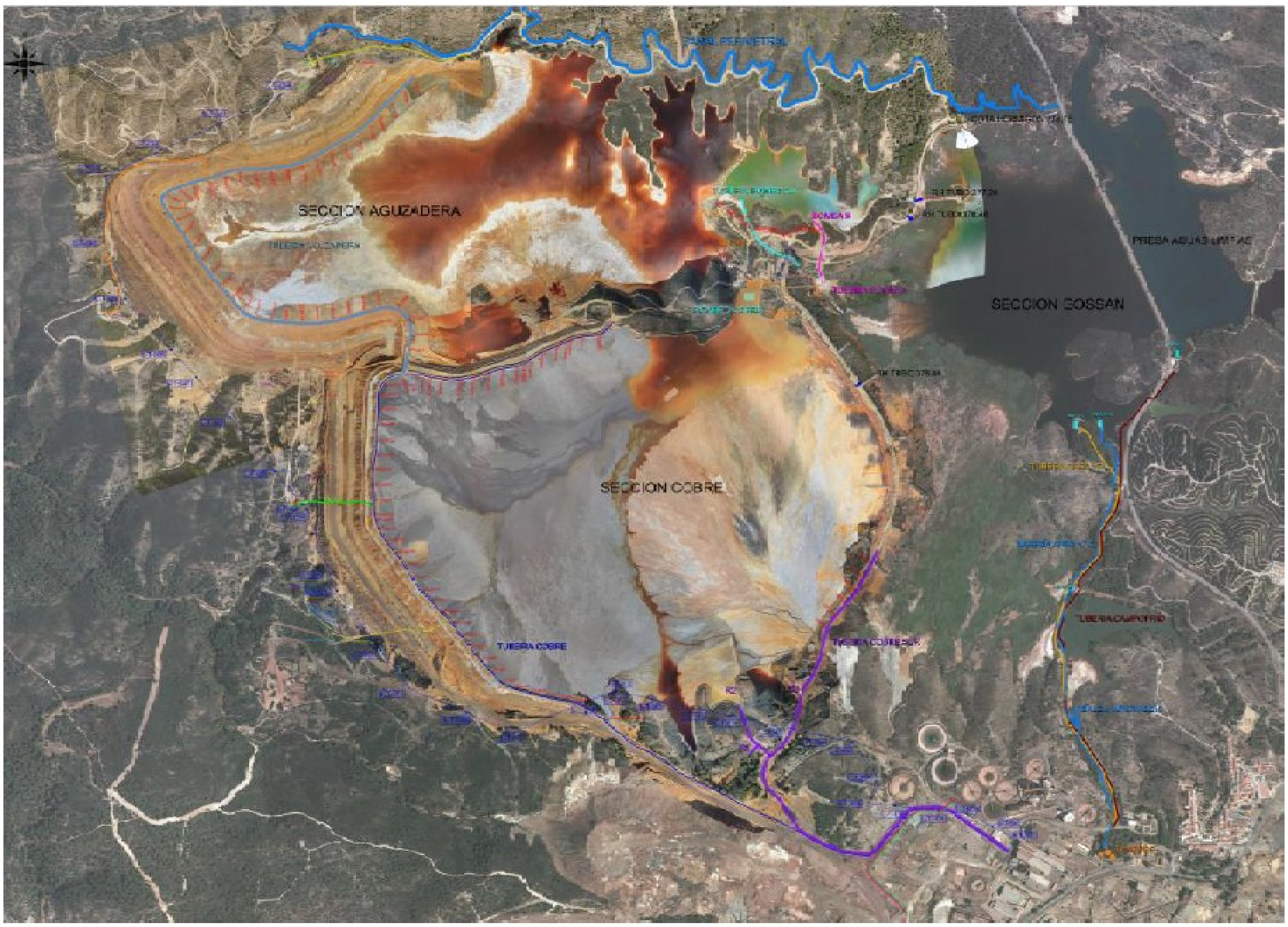


Figure 18.2 – Layout of Tailings Management Facility (Golder 2016)

Figure 18.3 – Tailings Management Facility (Atalaya 2018)

The facilities are located on a low permeability shale formation with extremely low hydraulic conductivities. The Eduardo fault which traverses in a NW-SE direction was studied by Eptisa (the company responsible for the original design of the facility) and it was determined that it also possessed a low hydraulic conductivity and does not represent a potential seepage path from the facility. Seepage is controlled at four seepage collection ponds (two for each dam) located within the main valleys, and is continuously pumped back to the impoundment.

As part of the submissions for the integrated environmental permit (AAU), a detailed design study was carried out by Eptisa, which included raising of the existing Aguzadera and Cobre facilities to the original design elevation, which provided additional capacity of 32.8 Mt (originally 4 years of operation) followed by an additional upstream raise of the Cobre facility to store the total production of 123 Mt.

Nevertheless, after an updated design study carried out by Golder Associates SA, to store 123 Mt of mineable reserves, the preferred option was to raise the perimeter walls with mine waste rock fill, that connects with the existing rock fill reinforcement toe, using the centreline method in Cobre to an elevation of 405 masl which will store 85 Mt of tailings, and then, to raise using also waste mine rock fill by the upstream method to an elevation of 415 masl to accommodate the balance to 123 Mt.

The assessment indicated that neither the raise nor the use of conventional tailings does not adversely affect the dam stability within the facility, because the center line construction with rockfill is more robust given the original configuration with substantial rockfill buttress (than a systematic thickened tailings upstream method) and given the rate of rise, the thin lift deposition and the climate, the effect of thickening at the beaches is not relevant, having the 30% solid content tailings discharges surficial in-situ dry densities about 1.5 to 1.6 t/m^3.

An update has been studied by Golder Associates considering 197 Mt of mineral reserves and the original annual production of tailings increased from the current 9.5 Mtpa to 15 Mtpa (i.e. to 41,000 tpd).

As the storage required is more than the original capacity of the center line impoundment considered at Cobre, and the tailings daily throughput increased by about 67%. One method to accommodate these changes is to increase the area by combining the three existing tailings impoundments. This was considered the first option, rather than changing the current conventional tailings deposition technology (thickened, paste and filter cake) or adopting a new site. In this way, Golder were able to reduce the rate of raising the impoundments from 3 m/year to 2 m/year and also preserving the original dam center line raise height of 30 m in accordance with the updated mineral reserve estimate.

Additional geotechnical characterization of the zone near the north diversion canal (construction of the canal has provided preliminary information) and of the existing dam near the national road will be developed and the plan is to progress to detailed engineering during 2018.

18.5 Fire Protection

The fire protection system was completely renovated as required by the Spanish Royal Decree 1389/1997, of 5 September 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.

18.6 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.

18.7 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 3 computer connections to the general administration system.

18.8 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 18 July 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.

18.9 Rehabilitation Program

Phase 1 capital program mainly consisted of rehabilitation of existing mechanical equipment with electrical, control and instrumentation equipment newly installed. Phase 2 and 3 are uniquely developed with new equipment.

19 MARKET STUDIES AND CONTRACTS

19.1 Introduction

Atalaya has been actively marketing the copper concentrate product to global consumers. Currently, concentrate production is committed to three companies through offtake agreements that average for life of mine reserves as reported in the Technical Report on EMED´s Rio Tinto Copper Project dated February 2013:

- IXM (Louis Dreyfus Company Metals S. A.) – 49.12%
- Trafigura PTE Limited – 19.34%
- Transamine Trading S. A. – 31.54%

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 and currency exchange rates.

19.2 Supply and Demand

It is expected that short term global supplies of Cu continue to rise even with LME and COMEX inventories at the highest since 2003. China's copper concentrate imports for Q1 2018 have reached record levels. This is due to China's ban on most types of scrap imports. Worries over supply disruptions in Chile and Peru due to labor issues have also resulted in a build-up of stock piles.

The renewable energy sector will have the largest impact on Copper demand over the short term. This would include power generating systems from solar and wind as well as an increasing demand for electrical vehicles. Estimates indicate that the growth in Cu demand projections will be greater than 3% for the next 3-5 years. Although current copper pricing is in the range of $3.20/lb and is likely to remain constant through 2018, pricing will also grow with demand estimates until they reach equilibrium with the market. A mid-term 7-10% increase in pricing would not be unreasonable.

A deficit in copper supplies is likely to occur toward the beginning of the next decade and will likely push copper pricing to peak levels. Estimates suggest that pricing forecasts for the next eight years and long term are consistent with this this supply/demand projection (World Bank 2016).

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 2016 to 2018. It is based on processing all Cerro Colorado ores.

Table 19.1 – Copper concentrate typical assay

Element	Unit	Value
Cu	%	21 – 24
Pb	%	0.1 - 0.2
Zn	%	3.0 - 4.0
S	%	26 - 32
Fe	%	28 - 33
As	ppm	1200 - 2800
Sb	ppm	1800 - 2300
Bi	ppm	270 – 310
Hg	ppm	20 - 30
Co	ppm	300 - 500
Au	ppm	0.7 - 1.5
Ag	ppm	80 - 150

The mine plan contemplates expanding the mining of the Cerro Colorado pit in order to meet the expanded mill feed targets as described in Chapter 16. Mill head grades during the first five years of operation are projected to average just over 0.46% Cu, which is nearly 11% higher that the life-of-mine average. This is attributable to the mining phase sequence that targets higher grade ore zones in the early years. Total contained copper in the schedule's mill feed is estimated at 822,000 tonnes.

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 which can be taken by certain smelters. The concentrates from the mine have traditionally been delivered to the Atlantic Copper smelter in Huelva and other smelters within Europe. Concentrates produced during 2016 to 2018 were also 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 sections 21 and 22 of this report.

Table 19.2 – Copper Production and Realized Copper Price

		2016	2017	2018 thru Q1
Copper sold	tonnes	26,179	37,164	9,441
Realized Copper Price	$/lb	2.25	2.66	3.03

20 ENVIRONMENTAL STUDIES, PERMITTING, SOCIAL AND COMMUNITY IMPACTS

20.1 Environmental Status & Legacy

Mining and mineral processing activities have been taking place 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. As a result of this and the fact that much of the waste material has a high acid generating potential, the Riotinto Project area is an environmentally degraded site with significant environmental legacy issues. One of the main issues, as is the case in many mine sites that host potentially high acid generating materials, is related to Acid Mine Drainage (AMD) and the mitigation and control in an environmentally, technically, and financially sustainable manner. Atalaya Mining's environmental policy, environmental management system, and operating and final closure plans have been developed in order to address this, other legacy, and future issues in a sustainable manner.

20.2 Environmental Management System

In June 2008, an international mining environmental consultant conducted an ISO 14001 environmental audit of the site and the planned operational areas (Thirtle, 2008a). This report produced recommendations for the implementation and improvements to infrastructure, and procedures and practices to reflect European and World Bank best available practices. Atalaya has been implementing some of the recommendations included in this audit and it is envisaged that all recommendations will be completed. As a result of the audit and the implementation of Atalaya's environmental policy, a set of 17 Environmental Management Plans (EMP's) (Thirtle, EMED Tartessus S.L.U. PRT Feasibility Study Report 2008b) have been developed to address known and potential environmental and community issues arising from operating a large mine in the proximity to urban areas.

These plans, when fully implemented, will reflect global best industry practice and are based on the ISO 14001 system. As part of the Environmental Management System (EMS), these plans will be regularly checked in order to monitor performance and to ensure that Atalaya's environmental targets and objectives are being met with regular compliance reviews by management. These reviews will also make recommendations for continual improvement of the EMS. Continual improvement of the EMS will address three core issues related to the expansion, enrichment, and upgrading of the EMS within Atalaya. An independent audit of the EMS was performed in March 2018 with a view to further refine recommendations. The plan is to have the EMS certified under ISO 14001 by 2018 year-end.

20.3 Applicable Legislation

At the national level, the environment is administered by the Ministerio de Agricultura, Alimentación y Medio Ambiente. The Ministerio de Agricultura, Alimentación y Medio Ambiente is responsible for setting policy and enacting into legislation EU policy. At the regional level, the environment is administered by the Consejería de Medio Ambiente y Ordenación del Territorio. The Consejería de Medio Ambiente y Ordenación del Territorio is responsible for ensuring that national policy is implemented and also has auditing responsibilities. Additionally, the Consejería de Medio Ambiente y Ordenación del Territorio has authority to issue environmental permits.

There are both generic and specific (Water, Air Quality, Biodiversity, Protected Spaces, Forests, Wastes & Dangerous Substances and, Restoration) national and regional environmental legislation applicable at Riotinto during refurbishment, operations, final restoration and post closure including the development of final restoration plans.

A list of the general environmental laws is shown below. There are also many federal and regional laws regulating water and air quality, biodiversity, protected lands, forests, wastes and dangerous substances, and restoration.

Generic Legislation

- Order AAA/1601/2012 of 26 June, which dictate instructions on the application in the Department of the law 27/2006 of 18 July, which regulate the rights of access to the information of public hearings and access to the justice in environmental matters.
- Real Decree 17/2012 of 4 May, establishes environmental terms.
- Royal Decree 1494/2011 of 24 October, which regulates petrol in a sustainable economy.
- Law 6/2010 of 24 March, modification of the revised text for law of evaluation of environmental impacts, approved by Royal Legislative Decree 1/2008 of 11 January.
- Royal Decree 2090/2008 of 22 December, which approves the regulation of partial development of law 26/2007 of 23 October, environmental responsibility.
- Royal Legislative Decree 1/2008 of 11 January, which approves the revised text for law on evaluation of environmental impact.
- Law 26/2007 of 23 October, environmental responsibility.
- Royal Decree 509/2007 of 20 April, which approves the regulation for the development and execution of law 16/2002 of 1 July, integrated pollution prevention and control.
- Royal Decree 508/2007 of 20 April, which regulates the provision of information on emissions of the E-PRTR regulation and the integrated environmental permits.
- Law 27/2006 of 18 July, which regulates the rights of access to information of public participation and access to justice in environmental matters.
- Law 9/2006 of 28 April, on assessment of the effects of certain plans and programs on the environment.
- Law 16/2002 July 1, integrated pollution prevention and control.

20.4 Environmental & Cultural Approvals

In order to start mining, processing and waste disposal activities, Atalaya has received the following approvals:

- The Autorización Ambiental Unificada (AAU) or Unified Environmental Authorization,
- The Final Restoration Plan (FRP) and,
- Cultural approvals.

20.5 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 Medio Ambiente y Ordenación del Territorio of the Junta de Andalucía.

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 Natura 2000.
- An application for authorization to discharge water to the public domain including proposed 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.
- 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).

Atalaya has submitted the relevant documentation and applications for processing and approval.

20.6 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 of providing continual observation and compliance of 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.

20.7 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 in order 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 facility (WRSF) sites are located to the northeast, east, and southeast of the Cerro Colorado open pit. In-pit backfills in the eastern portion of the pit will provide supplemental waste storage. Nearly 478 Mt of waste rock, Filon Sur backfill, and low grade material are estimated in the mine production schedule.

Waste rock will be placed into three 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 after completion of mining Phase 3 in the last half of Year 12. The combined capacity of the designed waste dumps provides enough storage space for planned operations.

The new 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 spread to cover the slope to aid revegetation with mixed local species, reduce infiltration and prevent erosion.

The original waste dump studies and design proposals required separation of waste materials by sulfur content, higher acid-generating wastes being encapsulated with lower sulfur material to reduce acid mine drainage (AMD) impacts. The geochemical stability study included sampling the various geological units contributing to waste materials at Proyecto Riotinto. The sulfur content and acid-base accounting (ABA) analyses were used to identify rock types suitable for encapsulating material to aid mine waste scheduling. Sulfur content was therefore to be part of the pit grade-control system. The design required a final cover and progressive revegetation.

However, some changes have been required by the Spanish regulators, who preferred complete and continuous covering of the waste rock with suitable material rather than separation of waste rock by sulfur content and encapsulation. Subsequently, availability and volumes of suitable material have been identified and the costs factored in, including possible processing requirements for the capping. Some characterization studies and material testing have also been undertaken and are underway at experimental level.

Drainage channels are incorporated into the WRSF designs to reduce the amount of water that can infiltrate the dumps and minimize AMD. 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. However, this is subject to on-going debate (see below). Studies have looked at the long-term stability of the waste dump facilities and the development of suitable emergency management plans.

Atalaya is in negotiations for rehabilitation of other old waste-rock dumps at Riotinto, including those not covered by the mining rights area. This restoration commitment does not include any liabilities. 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 increase of the Project footprint. However, this approach will result in an improved outcome after final site restoration at closure.

20.8 Tailings Management Facility

The Tailings Management Facility (TMF), as previously described in Chapter 18, consists of three adjacent impoundments referred to as Cobre, Aguzadera and the Gossan facilities. Cobre and Gossan facilities were first constructed in the early 1970's to contain 70 Mt of tailings and later, the Aguzadera facility, was constructed in the late 1980's, to provide a total of 86 Mt of tailings storage.

Currently there are two tailings facilities in operation, Cobre and Aguzadera and both facilities have available storage capacity up to the original design elevation of 381.8 masl and 374.8 masl respectively. The Gossan facility 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.

The tailings facilities have been constructed from a starter dam comprising of a core of gossan. Gossan was mine waste material consisting of a variety of particle sizes ranging from boulders and gravels to sands and clayey silts, with an average maximum size of 200 mm to 400 mm. The facility has been raised with the coarse fraction of cycloned tailings using the upstream method. The coarse tailings (sands) are separated by cycloning and deposited as underflow to form the dam walls, while the overflow consisting of the fine tailings fraction (slimes) is deposited within the basin area. The ponded water is also located away from the dam walls.

As part of previous submissions for the integrated environmental permit (AAU), a detailed design study was carried out by Eptisa (the Company responsible for the original design of the facility), which has included raising of the existing Aguzadera and Cobre facilities to the original design elevation, which provides additional capacity of 32.8 Mt followed by an additional upstream raise of the Cobre facility, with thickened tailings, to store the total production of 123 Mt.

The facilities are designed as a closed system, with no discharge to the environment. Currently the excess water from the tailings discharged into the Cobre facility overflows into Aguzadera facility and into a water treatment reservoir where it is treated with lime to reduce the pH and precipitate metals. From the treatment reservoir, the water is then pumped to Gossan. Process water is also treated in Gossan with lime to reduce the pH and precipitate metals. Excess water in Gossan overflows back to the water treatment reservoir where it is further treated with lime. There is also another emergency spillway, to accommodate storm events, at a higher elevation on Gossan, which if operated would discharge into the diversion channel to the north of the facilities and into the environment. Adjacent to Gossan and separated by a dam supporting a public road, there is a non-contact water reservoir, Presa Aguas Limpias. The overflow for this structure is discharged into the northern diversion channel.

20.9 Other Wastes

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 Water Systems

The water distribution 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 to increase storage on the site.

All of the 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 either 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 is 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.

20.11 Air, Noise, and Vibration

Areas and activities of noise generation have been identified and are monitored, and noise reduction methods are 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.

20.12 Ecology

Fauna, flora and habitats 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, an aggressive and robust grass naturally colonize inhospitable locations on the site, including the surface of mine tailings and on waste rock material, out-competing local species and potentially restricting diversity.

20.13 Cultural Heritage

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, 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” head frame; and
- Building a large-scale model of the disused gold processing plant.

There is an understanding with the Rio Tinto Mining Museum regarding the donation of any artifacts encountered during restart, refurbishment and operations.

There is a historical and archaeological value of 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 a responsibility and duty of care while operating at Riotinto.

Comprehensive management plans for the protection of cultural heritage on and around the site have been implemented. Any activities affecting items listed in the Heritage Register require detailed documentation and prior authorization of the Department of Culture and Heritage. In addition, a 100 m fenced exclusion zone must be put in place around all conservation sites.

20.14 Final Restoration Plan (FRP)

Final restoration is an integral part of the Riotinto Project and both the operating and final restoration plans (FRP) have been developed to make them compatible with each other and to ensure that the final restoration can be completed as soon as possible after the cessation of mining, processing and waste disposal operations. The objectives of Atalaya’s FRP are to:

- Protect the environment,
- Minimize any long term negative environmental impacts of the Project,
- Guarantee the chemical stability of waters discharging from the Riotinto,
- Ensure the physical stability of any soils is maintained,
- Recover any soils that will be disturbed during mining operations and reuse them appropriately,
- Recover the natural vegetation in a manner that is compatible with the surrounding habitat,
- Reduce the contamination to external areas by dust or other emissions,
- Preserve and maintain the mining heritage in the Riotinto area and,
- Minimize social impacts as a result of the mine closure at the end of its life.

In accordance with current applicable legislation, Atalaya has submitted for approval an FRP as part of the Project approvals process. The FRP (Eygema, 2012b) is submitted as part of the AAU to the Consejería de Medio Ambiente y Ordenación del Territorio for review and approval including a period of public consultation. After approval of the AAU, the FRP, with any amendments brought about as a result of the approvals process is submitted along with the final reclamation bonding deposits to the Consejeria de Economia, Innovacion, Ciencia y Empleo for final approval. Again this process includes a period of public consultation.

One year prior to the completion of mining, or tailings deposition activates, Atalaya must submit, for approval, an application for the authorization to abandon the mine, waste dumps, TSF, and site infrastructure. Currently these applications must be made to the Consejeria de Economia, Innovacion, Ciencia y Empleo for approval.

20.14.1 Scope

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 which Atalaya is responsible for rehabilitating (for example the Marginal Waste Dump).
- Areas already disturbed not required for the planned Project and which Atalaya is not responsible for rehabilitating (for example the eastern section of the Corta Atalaya Waste Dumps).
- Areas already disturbed not required for the planned Project and a third party is responsible for rehabilitating (for example the western section of the Corta Atalaya Waste Dumps).

In addition to rehabilitating the areas that Atalaya is responsible for, as part of its commitments made to the Junta de Andalucía, Atalaya has opened negotiations with respect to rehabilitating some of those areas that they are not responsible for rehabilitating (for example the Corta Atalaya Waste Dumps).

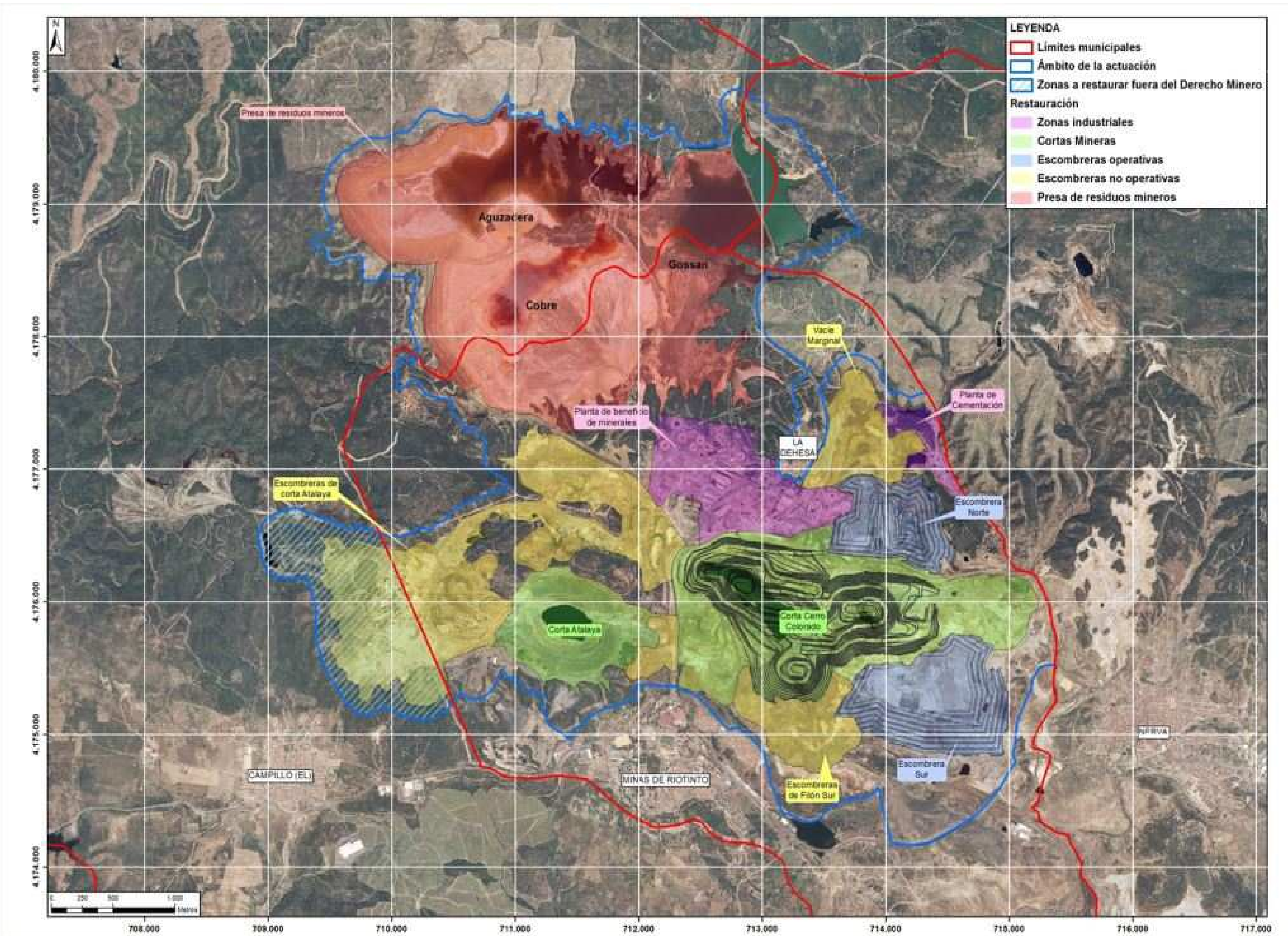


Figure 20.1 – Project Restoration Boundary (EMED 2013)

Atalaya has not committed to rehabilitating areas that third parties are responsible for. Atalaya is in negotiations with third parties with respect to the costs associated with rehabilitating these areas. Although Atalaya has not committed to rehabilitating these areas, they have been included in the water management and final restoration plans. 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.

This FRP has been developed in order 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 is based on an initial 14.2-year mine life and includes post closure monitoring and maintenance. It has been completed in accordance with current regulatory requirements and EU best available techniques for management and closure of waste disposal facilities (European Commission, 2009). This FRP will be updated before the end of the 4th year of mining to include the new 17-year mine plan discussed in this report. Years 1 through 4 have already been approved.

20.15 Reclamation Plan

Atalaya will ensure that its approach to mine closure 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 review and revise the closure plans in accordance with changes to the regulatory framework and any changes to the LOM operating plan.
- Consult 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, 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 potentially 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 tailings 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.

With the exception of 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. On-going 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 be used primarily 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, to protect 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.

20.16 15 Mtpa Expansion

The 15 Mtpa expansion will require permitting the various components of the Project according to the Spanish regulatory framework.

The mill expansion is considered a minor modification to the existing permit since it only requires updating the existing equipment with minimal increase in the affected area. The permit to begin mill construction was granted in early 2018 and the operating permit will be obtained within 30 days after the completion of construction.

The remaining components will be divided into a number of separate permit applications: relocation of the Federal road, A-461; expanding the current open pit footprint; expanding the waste rock storage facility (WRSF), the tailing storage facility (TSF), and the supporting infrastructure.

These permit applications will be submitted in parallel in order to expedite the approval process. Only the national road relocation, the WRSF, TSF, and infrastructure expansions will require the submittal of an ESIA. All regulatory approvals are expected to be received prior to their respective start-up requirement.

20.17 Health and Safety

Occupational risk prevention, as an activity that is performed within the Company, is being included in the general management system, which includes all activities at all hierarchical levels with the implementation and application of an occupational risk prevention plan.

An Occupational Risk Prevention Plan was established in 2014 as a tool to integrate the Company's risk prevention activities into the general management system. The Occupational Risk Prevention Plan was approved by Company management and was then assumed by the entire organizational structure, and is known by all workers.

Resources to perform safety activities are organized as 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 the 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; evaluate the risk factors that may affect the workers' safety and health; prevention activities 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 deriving from their jobs.

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, an 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.

The effectiveness of the prevention system in preventing, identifying, evaluating, correcting and controlling occupational risks in all phases of Company activities is evaluated.

The objective is to establish an integrated system based on OSHA 18001, which validates the management system.

20.18 Human Resources

Employment is one of the main drivers behind the support and promotion for mining activities at the Riotinto mine. Unemployment is approximately 19% in Huelva, and in the areas near the mine.

The workforce needed for the Project is approximately 520 people, approximately 361 of which are Atalaya employees and the remaining people are contractors. The contractors include mining and service companies, which are all under the management of Atalaya.

The personnel needed to operate at 9.5 Mtpa is currently covered, less a few exceptions. The breakdown is as follows:

General and Administration	52
Technical personnel	62
Operational personnel	247
TOTAL	362

20.19 Contracting and Training

Atalaya has developed policies and procedures related to selecting and hiring personnel. The objective of preferentially hiring personnel from the area near the Project is to guarantee that the local communities benefit from the economic activity. This objective has been developed through a collaboration program between the Company and the 7 municipalities in the mining area. Local personnel currently represent 65% of the staff at this time. 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 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.

At the same time, 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.

Contractors require qualifications as established by the law.

20.20 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.

20.21 Public Relations

Atalaya Mining promotes the establishment of extensive communication channels and actively seeks opportunities for dialogue with its stakeholders, in order to ensure its business objectives are in line with the needs found in society and 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 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 integrated within its environment and local community.

This is based on maintaining excellent relations with the media and institutions which lead 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.

Finally, Atalaya Mining has implemented social responsibility programs through its foundation in order to cover the Company objectives beyond the business, leading to a positive reputation for the Company.

21 CAPITAL AND OPERATING COSTS

The capital and operating costs provided in the following tables are reported on a 100% project basis and were extracted from the financial analysis prepared by Atalaya which is referenced in Chapter 22. All Euro-based costs have been converted to 2017 US dollars using an average life-of-mine exchange rate of €1:$1.18. Quantities and values are presented in both metric and U.S. customary units as specified. No escalation has been applied to capital or operating costs. All costs have not been adjusted for inflation.

21.1 Assumptions

The parameters used in the analysis are shown in Table 21.1. These parameters are based upon current market conditions, vendor quotes, design criteria developed by Atalaya personnel, and benchmarks against similar existing projects.

Table 21.1 – Assumptions

Description	Parameter	Unit
General Assumptions		
Mine Life	14	Years – back calculated
Operating Days	365	days/year
Production - throughput	9.5-15.0M	tonnes/year
Market Assumptions		
Cu	$3.00	per pound, average life of mine
Ag	$18.00	per ounce, average life of mine
Concentrate Production (Dry)		
Weight, total life of mine	3,221.2	Kt
Cu Grade	21.7	%, average life of mine
Ag Grade	99.2	g/t, average life of mine
Treatment Charge		
Cu	$85	per t wet concentrate
Refinery Charge		
Cu	$0.085	per pound payable
Ag	$0.40	per ounce payable
Smelter Losses	0.2	%
Freight	$42.8	per t wet concentrate
Penalties		Standard penalty charges apply
Financial Assumptions		
Discount Rate	8	%
Mining Tax, Net Deduction	23.1	%
Technical Assumptions		
Diesel Fuel	0.57	$/liter
Power Cost	0.073	$/kWh
Recovery		
Cu	84.7	%

The revenue from the sale of copper concentrate containing silver credits is based on an average life-of-mine copper price of $3.00 per pound of contained copper and $18.00 per ounce of contained silver. As discussed previously in Chapter 19, Atalaya has committed 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. After deducting all refining and treatment charges, penalties and freight and other smelter deductions, Atalaya will realize a net smelter return of approximately 86% of the gross concentrate value.

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, and a further expansion to 15 Mtpa is planned for completion in 2019. The ore reserve discussed in Chapter 15 is estimated at 197 M tonnes averaging 0.42% Cu. Production over the life of mine is summarized in Table 21.2.

Table 21.2 – Life of Mine Production (total)

Waste	281.5	M tonnes
Ore	196.9	M tonnes
Grade Cu	0.42	%
Contained Metal in concentrate, Cu	696.5	k tonnes
Payable Metal, Cu	664.2	k tonnes

21.3 Life of Mine Capital Costs

Life of Mine capital costs for the overall capital program including expansion to 15 Mtpa, sustaining and tailings capital are estimated to be $178.9M. Including the tailings dam, sustaining capital ranges from $11.8M in 2019 to $7.3M in 2023, and $6.3M in 2028, with a total expenditure of $83.9M. Development capital spent to date (April 2018) by unit area is shown in Table 21.3.

Table 21.3 – Development Capital Expenditure to Date

	Actual Cumulative to Date	Actual Committed to Date	Forecast to Completion
Occupational Health and Safety	$2,121	$3,334	$151,914
Exploration and Geology	$0	$0	$123,430
Mining	$40,533	$403,665	$196,824
Processing	$7,337,216	$3,1435,997	$5,1087,424
Infrastructure	$710,550	$1,873,325	$6,102,921
Engineering	$3,285,008	$64,097	$6,997,816
Construction Management	$239,620	$1,759,241	$25,215,422
Owners Costs	$59,276	$0	$1,898,925
Permitting	$130,932	$0	$481,651
Insurance	$0	$0	$858,371
Contingency	$0	$0	$1,831,539
Capital Expenditure Total	**$11,805,257**	**$35,539,660**	**$94,946,236**

Capital requirements are shown below:

Sustaining Capital	$9.9 M	Total, life-of-mine
Sustaining Capital Tailings Dam	$74.1 M	Total, life-of-mine
Development Capital	$94.9 M	15Mtpa expansion
Overall Capital Programs	$178.9 M	Total, life-of-mine

21.4 Life of Mine Operating Costs

Life of mine operating costs are based on the current Riotinto operating budget for 2018. Both fixed and variable costs have been estimated for the life of mine operating and are summarized in Table 21.4.

Table 21.4 - Life of Mine Operating Costs

Site Operating Costs	Unit Cost ($/t-ore)	Unit Cost ($/t-waste)	Unit Cost ($/t mined material)
OH&S	0.09	0.06	0.04
Exploration & Geology	0.15	0.10	0.06
Mining	4.23	2.96	1.74
Fixed Processing	0.43	0.30	0.18
Variable Processing	4.83	3.38	1.99
Laboratory	0.26	0.18	0.11
Fixed Maintenance	0.37	0.26	0.15
Variable Maintenance	1.09	0.76	0.45
Fixed Technical Services	0.15	0.10	0.06
Variable Technical Services	0.71	0.50	0.29
Additional Tailings Cost (Expansion)	0.02	0.01	0.01
Environmental	0.13	0.09	0.05
HR	0.04	0.03	0.02
Administration	0.63	0.44	0.26
Land Freight Transport Cost	0.19	0.13	0.08
Total Site Operating Costs	13.29	9.30	5.47
Total per pound Copper Sold	1.79		

Mining costs, inclusive of those capitalized, are equivalent to an average unit cost of $4.23 per tonne of ore. The average unit processing cost is $5.26 per tonne of ore. Silver by-product credits assume 9.4M ounces sold at $18.0/oz life of mine. Site Operating Costs average the equivalent of $1.79 per pound of copper sold.

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 1st January 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. Tax losses are allowed to be carried forward; up to 60% of previous year's losses can be offset against the current tax year taxable profit.

Specifically, the mining industry in Spain has certain tax benefits such as 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 which contributes to a fund which subsequently is allocated to new exploration-research works in order to foster mining activity.

22 ECONOMIC ANALYSIS

Atalaya has developed a financial model for the Riotinto Project that incorporates the updated reserve estimate. On the basis of the latest update of that model, the summary financial forecast for the project is shown in Table 22.1 below. The assumptions for price and financial factors utilized in the financial model and resultant forecasts are as follows:

- All amounts are in constant 2018 US dollars (US$).
- Amounts in Euros (€) were converted to US$ at an average life of mine exchange rate of €1.00:US$1.18.
- Copper production is sold at average life of mine copper price of US$3.00/lb.
- Corporate income tax rate of 25%.

This financial forecast shows that after tax, net cash flows, inclusive of capital expenditures, and closure costs, will total $1,206.7M over the life of the project for an NPV of $511.8M at an 8% discount rate. The overall project cash costs (C1), net of silver credits is US$2.10 per pound of copper sold increasing to US$2.22 per pound of copper sold, net of silver credits, adjusting for the sustaining costs (AISC).

It is noted that the production schedule incorporated into the financial model (refer Table 22.1) was based on mining progress through to 31 December 2017 which predicted copper production of 34.2kt in 2018. Since then the company has updated its short-term mine planning and budget forecast for 2018. The company is currently targeting to produce between 37kt-40kt copper in 2018 which is as per guidance provided to the market. This increase in 2018 production is not considered to have a material impact on the balance of the life of mine production schedule and project economics and consequently the more conservative production schedule derived from 2017 year-end mining progress was retained in the financial model and economic analysis.

Table 22.1 – Cash Flow Forecast

Year Ended December 31		Total / Avg.	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
ECONOMIC PARAMETERS																		
Copper	(US$/lb)	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00	$3,00
Silver	(US$/oz)	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00	$18,00
EUR:USD Exchange Rate	(EUR:USD)		$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18	$1,18

RESERVES & RESOURCES (AS AT JULY 2018)	Tonnes	Grade Copper	Contained Metal Copper
	(kt)	(%)	(kt)
P&P Reserves	196.925	0,42%	822
M&I Resources (incl. P&P Reserves)	258.200	0,40%	1.033
Inferred Resource	18.100	0,50%	91
Total Reserves & Resources	**276.300**	**0,41%**	**1.123**

		Total / Avg.	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
PRODUCTION SCHEDULE																		
MINING																		
Ore Mined	(kt)	196.925	9.500	11.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	11.425	--	--
Waste Mined	(kt)	281.484	16.500	18.000	24.000	24.000	24.000	24.000	24.000	24.000	25.100	25.100	25.100	17.062	7.963	2.659	--	--
Total Material Mined	(kt)	478.409	26.000	29.000	39.000	39.000	39.000	39.000	39.000	39.000	40.100	40.100	40.100	32.062	22.963	14.084	--	--
Strip Ratio (Waste:Ore)	(ratio)	1,43	1,7	1,6	1,6	1,6	1,6	1,6	1,6	1,6	1,7	1,7	1,7	1,1	0,5	0,2	--	--
ROM Grade Copper	(%)	0,42%	0,42%	0,46%	0,48%	0,52%	0,42%	0,40%	0,42%	0,46%	0,46%	0,39%	0,35%	0,31%	0,40%	0,37%	--	--
PROCESSING																		
Ore to Mill	(kt)	196.925	9.500	11.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	11.425,30	--	--
Mill Grade Copper	(%)	0,42%	0,42%	0,46%	0,48%	0,52%	0,42%	0,40%	0,42%	0,46%	0,46%	0,39%	0,35%	0,31%	0,40%	0,37%		
Copper Recovery	(%)	84,7%	85,68%	84,41%	84,20%	84,35%	85,14%	84,37%	84,20%	81,87%	82,37%	88,72%	88,03%	84,45%	85,02%	84,51%	--	--
Copper Recovered	(kt)	696,459	34,2	42,2	60,7	65,2	54,1	51,1	53,4	55,9	56,5	51,2	46,1	39,3	50,8	35,7	--	--
COPPER CONCENTRATE PRODUCTION																		
Copper Concentrate (Dry)	(kt)	3.221,2	156,3	196,0	282,6	302,6	249,1	237,4	248,5	267,3	268,5	226,2	205,1	182,1	233,8	165,6	--	--
Copper Grade in Copper Concentrate	(%)	--	21,9%	21,6%	21,5%	21,5%	21,7%	21,5%	21,5%	20,9%	21,0%	22,7%	22,5%	21,6%	21,7%	21,6%	--	--
Silver Grade in Copper Concentrate	(g/t)	--	99,8	108,1	114,3	122,4	100,8	96,0	100,5	108,1	108,6	91,5	82,9	73,7	94,6	87,9	--	--
Copper Payable	(kt)	664,2	32,6	40,3	57,9	62,1	51,7	48,8	50,9	53,2	53,8	49,0	44,0	37,4	48,4	34,1	--	--
Silver Payable	(koz)	9.401,3	451,4	613,4	934,8	1.071,7	726,4	659,5	723,0	836,5	843,9	598,9	492,1	388,3	640,0	421,3	--	--
GROSS REVENUE																		
Copper Revenue	(US$ mm)	$4.364,0	$214,2	$264,6	$380,4	$408,0	$339,2	$320,2	$334,5	$349,3	$353,2	$322,3	$289,8	$246,4	$318,2	$223,7	--	--
Silver Credits	(US$ mm)	$169,2	$8,1	$11,0	$16,8	$19,3	$13,1	$11,9	$13,0	$15,1	$15,2	$10,8	$8,9	$7,0	$11,5	$7,6	--	--
Total Gross Revenue	(US$ mm)	$4.533,2	$222,4	$275,6	$397,2	$427,3	$352,3	$332,0	$347,5	$364,4	$368,4	$333,1	$298,7	$253,4	$329,7	$231,3	--	--
NET REVENUE																		
Gross Revenue	(US$ mm)	$4.533,2	$222,4	$275,6	$397,2	$427,3	$352,3	$332,0	$347,5	$364,4	$368,4	$333,1	$298,7	$253,4	$329,7	$231,3	--	--
Offsite Costs	(US$ mm)	($564,0)	($29,2)	($34,2)	($49,3)	($52,8)	($43,5)	($41,4)	($43,3)	($46,3)	($46,6)	($39,9)	($36,1)	($31,7)	($40,8)	($28,9)	--	--
Penalties	(US$ mm)	($86,8)	($5,3)	($6,2)	($8,7)	($9,0)	($7,2)	($6,6)	($6,7)	($7,0)	($6,8)	($5,6)	($4,9)	($4,2)	($5,2)	($3,6)	--	--
Net Smelter Return	(US$ mm)	$3.882,4	$188,0	$235,2	$339,2	$365,5	$301,6	$284,0	$297,5	$311,1	$315,0	$287,6	$257,7	$217,5	$283,7	$198,9	--	--
OPERATING COSTS																		
Site Operating Costs	(US$ mm)	$2.617,6	$139,0	$154,2	$203,2	$203,4	$202,8	$202,7	$202,8	$203,0	$204,3	$203,2	$202,3	$188,1	$174,8	$133,7	--	--
Off-Site Costs	(US$ mm)	$650,9	$34,4	$40,4	$58,0	$61,8	$50,7	$48,0	$50,0	$53,3	$53,4	$45,5	$41,0	$35,9	$46,0	$32,4	--	--
Total Operating Costs	(US$ mm)	$3.326,6	$178,2	$200,7	$269,9	$273,3	$260,1	$257,0	$259,4	$263,4	$261,5	$248,7	$243,3	$224,0	$220,8	$166,2	--	--
C1 Cash Costs (net silver credits)	(US$ / lb Cu)	$2,10	$2,26	$2,04	$1,89	$1,78	$2,09	$2,20	$2,11	$2,04	$2,03	$2,19	$2,41	$2,62	$1,94	$2,08	--	--
AISC (net silver credits)	(US$ / lb Cu)	$2,22	$2,43	$2,27	$2,06	$1,91	$2,24	$2,35	$2,26	$2,17	$2,14	$2,26	$2,48	$2,67	$1,96	$2,11	--	--
UNLEVERED FREE CASH FLOW																		
EBITDA	(US$ mm)	$1.206,7	$44,2	$74,9	$127,3	$154,0	$92,1	$75,1	$88,1	$101,0	$106,9	$84,4	$55,3	$29,4	$108,9	$65,1	--	--
Corporate Tax	(US$ mm)	($222,7)	--	--	($9,3)	($30,7)	($20,4)	($16,5)	($19,6)	($22,6)	($23,8)	($18,9)	($12,3)	($7,2)	($25,8)	($15,7)	--	--
Reclamation	(US$ mm)	($13,5)	($0,1)	($0,2)	($0,3)	($0,2)	($0,4)	($0,3)	($0,1)	($0,1)	($2,2)	($1,6)	($1,5)	($3,9)	--	($0,9)	($0,9)	($0,9)
Capital Expenditures	(US$ mm)	($178,9)	($42,7)	($68,8)	($9,5)	($7,6)	($7,3)	($7,3)	($6,9)	($6,3)	($6,8)	($6,2)	($6,3)	($3,2)	--	--	--	--
Changes in Working Capital	(US$ mm)	($0,0)	($16,2)	($0,3)	$1,0	($1,2)	$2,7	$0,7	($0,6)	($0,5)	($0,4)	$0,7	$1,3	$0,3	($4,5)	($0,7)	($5,7)	--
Unlevered FCF	(US$ mm)	$791,5	($14,8)	$5,6	$109,1	$114,2	$66,8	$51,7	$60,9	$71,4	$73,7	$58,4	$36,5	$15,5	$78,6	$47,9	($6,5)	($0,9)
NPV (8%)	(US$ mm)	**$511,8**	($0,0)	$5,4	$97,2	$94,2	$51,0	$36,5	$39,9	$43,3	$41,4	$30,4	$17,6	$6,9	$32,4	$18,3	($2,3)	($0,3)

22.1 Forecast Results and Sensitivities

Table 22.1 shows that the net cash flow for the life of the Project of $791.5M and an NPV of $511.8 M at a discount rate of 8%. The Project's key economic performance parameters are presented below in Table 22.2

Table 22.2 - Key Performance Parameters

Parameter	Units	Value
Total Attributable Production	t Cu in concentrate	696,500
Mine Life	Years	14
Operating Cash Cost	US$/lb Cu sold	2.10
NPV after Tax @ 8 %	US$M	511.8
Copper Price	US$/lb	3.00

Sensitivity analyses on the project NPV were performed using ±5% increments to ±20% variation of copper pricing, exchange rate for the Euro to US dollar, operating costs (onsite), sustaining capital and development capital. As expected, the copper price variation has the greatest impact on the project NPV, positive and negative. However, the project NPV remains positive regardless of the decreased copper price or increase in operating costs and exchange rate differential (Figure 22.1).

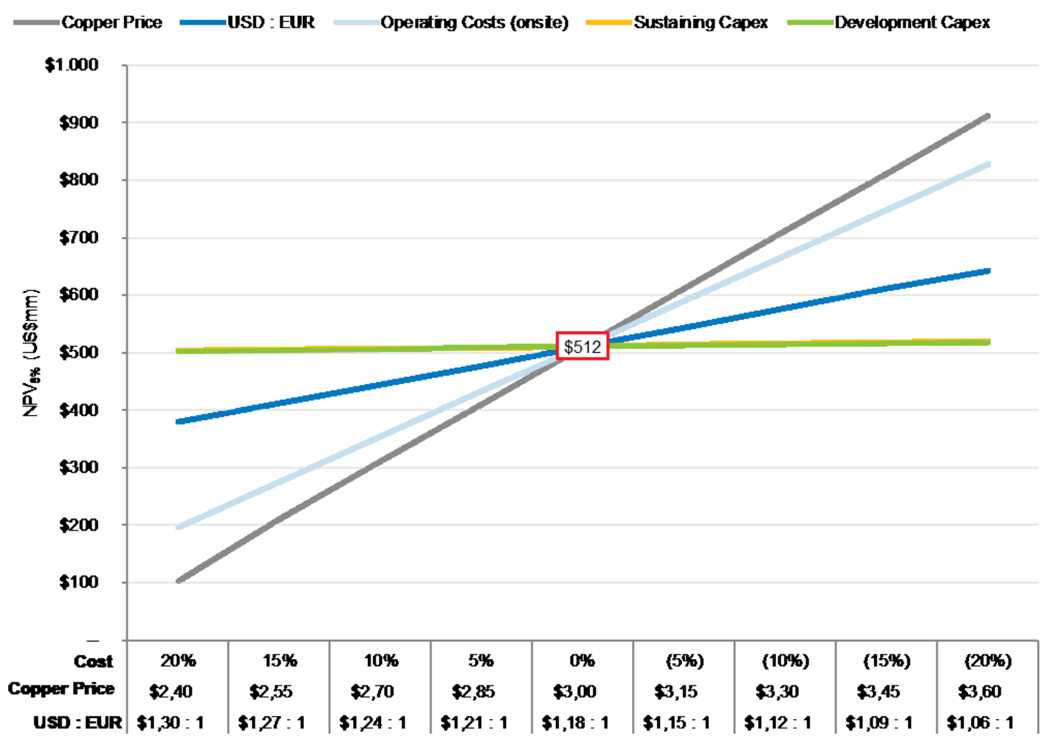


Figure 22.1 – NPV at 8% Sensitivity Analyses (Atalaya 2018)

23 ADJACENT PROPERTIES

23.1 Other Deposits within the Riotinto Concession

There are mineral deposits other than the Cerro Colorado deposit within the Riotinto Mining Concession area. Atalaya Mining has completed a thorough data review and has identified exploration potential for mineralization, recoverable by open-pit and underground mining methods, in the following locations:

- San Dionisio deposit
- Filón Sur deposit (partly now included in the current resource estimate)
- Planes-San Antonio deposit

23.1.1 San Dionisio Deposit

The San Dionisio deposit, located about 1 km west of the Cerro Colorado pit, was exploited by the Corta Atalaya open-pit and the Pozo Alfredo underground mine, which worked two different types of mineralization.

The San Dionisio deposit occurs as a massive sulfide lens within the core of a syncline with a copper-rich stockwork zone along the eastern (footwall) portion of the syncline (Alfredo Cloritas Zone). The San Dionisio massive sulfide was mined for sulfur by underground and open-pit methods from the late 1800s until 1992. The Alfredo Cloritas zone was mined for copper by underground methods until 1986. From 1977 until 1986, Riotinto Minera SA (RTM SA) undertook considerable exploration drilling (1,080 underground drill holes) and feasibility studies for bulk mining both the massive sulfides and the Alfredo Cloritas zone by underground methods at a combined rate of 1.2 Mtpa. That work was discontinued in 1986 due to the prevailing low metal prices.

Corta Atalaya was one of the largest open-pit mines in Europe with approximate dimensions 1,200 m long, 906 m wide and 330 m deep. The Corta Atalaya open-pit was started in 1907 to mine the upper stratiform massive sulfides (pyrite) part of the San Dionisio orebody, which is 1200 m long and 50 to 60 m thick. As mined, the ore contained 48% S and 0.8% Cu. Marginal grade material averaging 0.15% to 0.25% Cu was leached to produce some 1,500 to 2,500 t/y Cu, as well as 4 t/y Au and 50 t/y Ag from dump material and the gossans, with the latter containing about 90 Mt at 0.85g/t Au and 45 to 50 g/t Ag.

At the deepest level of the pit, a connecting tunnel and access ramp led to the workings of the Pozo Alfredo underground mine, which mined the underlying stockwork part of the San Dionisio deposit that extends for a distance of 600 to 700 m in an east-west direction, is 200 m thick and 600 m deep. Annual production from Pozo Alfredo was about 250,000 t of ore material at an average grade of 1.35% Cu. Primary crushing, to less than 200 mm, was carried out in the same crushing plant as the ore from Corta Atalaya, but was processed by a separate circuit in the plant. Both open-pit and underground copper ore were treated in a single concentrator. The underground mine was closed in 1987. This deposit is shown in Figure 23.1

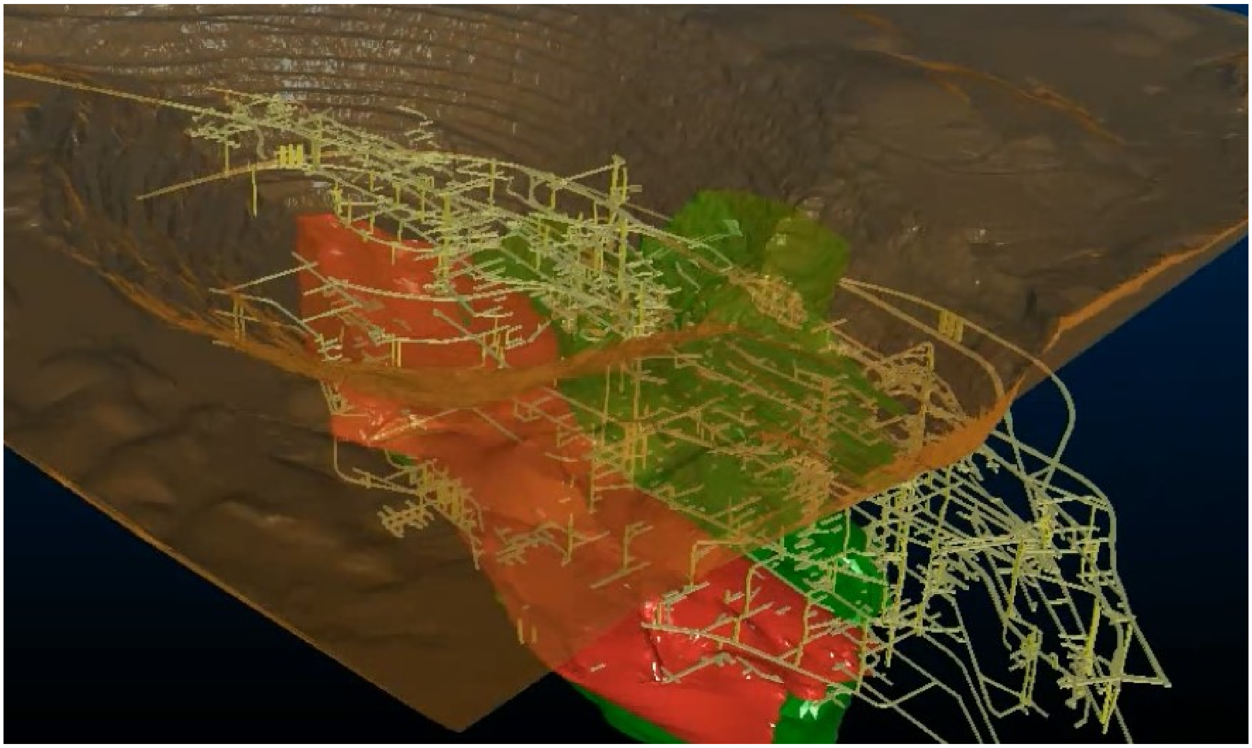


Figure 23.1 – Pozo Alfredo underground mine (Atalaya 2016)

23.1.2 Filón Sur Deposit

The Filón Sur massive sulfide was mined for sulfur by both underground and open-cut methods. Underground production from 1873 to 1967 was 18.2 Mt of ore and open-cut production between 1874 and 1949 was 24.2 Mt of ore. As all of this material was mined for sulfur; the base-metal and precious-metal contents were not systematically recorded. Filón Sur deposit is partially included in the resource estimate described in Chapter 14.

23.1.3 Planes-San Antonio Deposit

The Planes-San Antonio deposit is located at the eastern end of Cerro Salomon deposit. The Planes mine was worked intermittently from Roman times up to 1950, when mining became uneconomic. In1962, a geophysical survey and exploratory drilling program located an extension of the mineralization 600 m to the east of Planes, which was named San Antonio.

The Planes vein-stockwork mineralization appears to have been a feeder pipe underlying the layered (stratiform) pyrite of the San Antonio deposit that was precipitated on the sea-bed. The brecciation of the colloform pyrite, the presence of slumping structures and the re-deposited pyrite material in the San Antonio deposit, all point to intra-formational erosion and transport of a large part of the massive stratiform sulfides for several hundred meters from the top of the source feeder pipe at Planes down the side of the volcano into a depression on the sea-bed.

The San Antonio massive sulfide deposit is shallow (150m to 300m below surface), lenticular in shape, dipping to the east at 30 degrees and is 250m in length and 20m thick. Exploration of this deposit was undertaken in the mid-1960s to the mid-1970s by sinking of a shaft, development of 2 levels from this shaft and drilling of 183 underground drill holes. Other than exploratory development, no mining has been carried out on this deposit. Figure 23.2 is an S-N drill cross section through the western side of the Planes-San Antonio deposit.

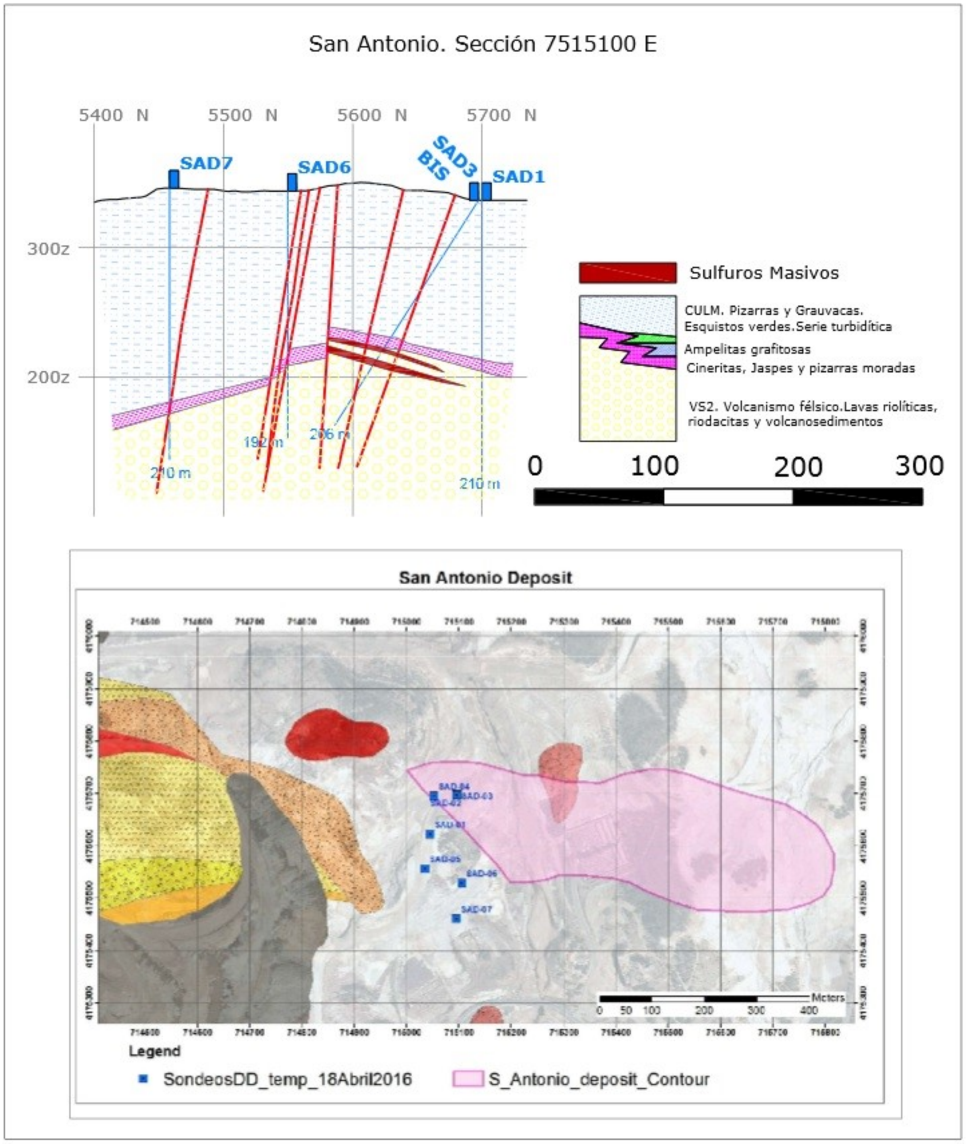


Figure 23.2 – S-N cross-section through the Planes-San-Antonio deposit (Atalaya 2016)

23.2 Adjacent Properties

Beside the Riotinto permit which is a Mining or Exploitation Concession (CE), Atalaya Mining owns other Exploitation Concessions and Exploration Permits (PI) near the Riotinto Project area. These are presented in Table 23.1 below.

Table 23.1 – Adjacent Properties

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
Chaparrita	CE	Under ownership change
Poderosa	CE	Under ownership change
El Villar	PI	Active
Valle Redondo	PI	Active
Socavón	PI	Under application

There are 3 major deposits nearby the Atalaya Mining properties. These are Aguas Teñidas, Magdalena and Concepcion, which belongs to MATSA (Trafigura). The locations of these and the Atalaya Mining Properties are presented in Figure 23.3 below.

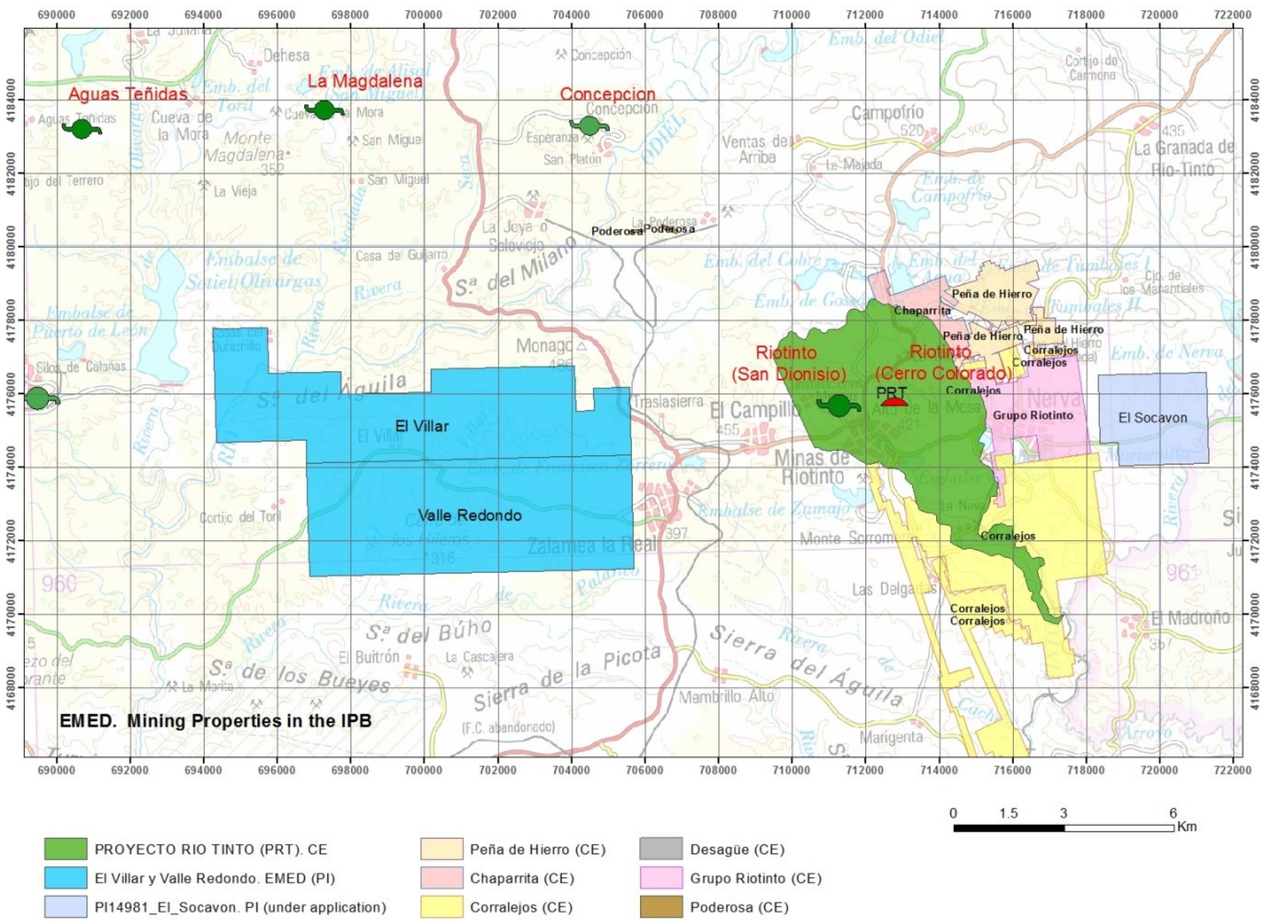


Figure 23.3 – Adjacent Properties (Atalaya 2016)

24 OTHER RELEVANT DATA AND INFORMATION

Atalaya Mining plc (AIM:ATYM, TSX:AYM) announced on 27 March 2018 its audited consolidated financial statements for the year ended 31 December 2017, and on 24 May 2018 its unaudited, condensed, interim consolidated financial statements for the three months ended 31 March 2018, and a notice of the Company Annual General Meeting for 2018 which was held on 27 June 2018.

The Company 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 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 2018. 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, therefore, 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.

The primary resource opportunity is that some blocks of inferred mineralization are included inside the ultimate pit. If those blocks of inferred mineralization are upgraded to measured and indicated resource, the proven and probable reserve would automatically increase and waste mining would decrease by the tonnage upgrade from inferred. In addition, small blocks of resource are present outside the northern and southern boundaries of the mineralized zone, where resources are not estimated because of lack of drilling. Previous mining has demonstrated that mineralization is present outside the fault limits, which could increase ore tonnage slightly.

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 $6.40/t NSR (or nearly 0.14% RCu) will be employed to maximize the total cash flow of the mining schedule based on an initial ore processing rate of 9.5 Mtpa in 2018, expanding to 15 Mtpa in 2020 and thereafter. At a Cu price of $2.60/lb, total proven and probable mineral reserves are estimated at nearly 197 Mt grading 0.42% Cu and containing about 822,000 tonnes of Cu metal. Waste rock, including backfill in old workings, totals about 281 Mt for an average stripping ratio of 1.43. The mine's life is estimated at 13.8 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 15.3.2, indicates that lowering the Cu price nearly 14% from $2.60/lb to $2.25/lb. would lower the amount of potentially economic measured and indicated (M&I) resources by nearly 24% in terms of tonnes above an internal cutoff. Similarly, a 15% increase in operating costs would reduce economic M&I resource tonnages by about 19%.

A Roman archeological site located immediately north of mining phase 1 could potentially reduce mineral reserves by 3-4% should Atalaya Mining be denied permission to develop the site. This would impact phase 3 stripping, which is scheduled to commence in 2021. Archeological surveys are in progress and Atalaya Mining does not anticipate any problems with securing the necessary permits.

National road A-461 presently lies along the western edge of the Cerro Colorado pit and potentially impacts the development of phase 3, initial stripping for which is scheduled for the last half 2021. 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) and has begun the permitting process for its relocation. Failure to relocate the road would likely reduce mineral reserves by about 10%, based on an LG analysis in which any mining that disturbs the existing highway corridor was prohibited.

The currently permitted WRSFs have a remaining storage capacity of about 95 Mt, which will be reached in 2022. Similarly, the currently permitted TSF can hold about 123 Mt, which will be reached in 2023 operating at 15 Mtpa. New designs have been completed for a large ex-pit WRSF that merges the old permitted North and South WRSFs around the NE, E and south sides of the Cerro Colorado pit. Some in-pit backfilling of up to 62 Mt can be accommodated by the pit development plan. TSF expansion studies are in progress and a preliminary analysis by Golder Associates indicates a potential TSF capacity to hold all the tailings for the planned 197 Mt of ore. Permits for these expansions must be secured in a timely fashion to avoid interruptions in production and/or a reduction in mineral reserves.

25.2.2 Opportunities

Higher commodity prices could increase mineral reserves through both lower cutoff grades and potentially larger pit limits. An LG analysis indicates that a 15% increase in Cu price, from $2.60/lb to $3.00/lb., could increase mineral reserve tonnages above an internal cutoff by 21%.

In-fill drilling could convert some inferred mineral resources to a higher classification. Approximately 7.4 Mt of inferred mineral resources above an internal $6.40/t NSR cutoff (at $2.60/lb Cu) and grading 0.59% Cu are presently estimated and treated as waste within the designed ultimate pit. It should be remembered, however, that inferred mineral resources are too speculative geologically to have economic considerations applied to them that would enable them to be categorized as mineral reserves. There is no certainty that inferred mineral resources will be upgraded to a higher classification.

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. Mineral reserves are estimated to provide a project life of nearly 14 years at expanded ore processing rates of up to 15 Mtpa. In addition, Lerchs-Grossman analysis of the mineral resource indicates that with a 15% increase in copper price, from the base case $2.60/lb to $3.00/lb, the reserve tonnage could increase by approximately 21%.

While no major work programs are suggested, the recommendations that follow are meant to improve operations and/or the economics of the Riotinto Project. Most of these can be evaluated by Atalaya's in-house management and technical staff and do not require expenditures outside the normal operating and capital budgets.

- The mine has been making progress transitioning to recoverable copper (RCu) cutoffs for short-term planning. Additional investigations of Cu recovery and deleterious element correlations are warranted. Arsenic and antimony are being included in grade control assaying and, if possible, should be included in future updates to the deposit model as both metals have significant concentrations in the Cerro Colorado deposit that can trigger higher treatment charges and/or reduced payables at the smelter. A net smelter return (NSR) cutoff is recommended, which could account for both variable Cu recoveries and charges associated with deleterious metals. Statistical studies are presently underway to support this work.

- Additional drilling is recommended along the Filon Sur area to move inferred and undrilled portions to measured and indicated resource classes. Core drilling is recommended for at least on-half of this drilling to recover samples for metallurgical testing. The estimated cost for 3,500m of drilling is US$320,000.

- Continue development drilling in the Cerro Colorado zones to better define deep stockwork zones. The estimated cost for 2,600m of drilling is US$210,000.

- Continue to optimize processing operations in order to increase production rates and increase product quality. This can be accomplished by conducting debottleneck analysis to increase throughput and installing added flexibility in production lines. Install the ability/flexibility to dedicate a grinding line with a flotation train so that various ore types and reagents can be independently evaluated.

- Continue evaluation of possible bias in the blast hole samples used for grade control. This study is in progress.

- Set up automatic sampling of 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 and reagents, mill steel, and energy.

- Develop additional geotechnical characterization of the zone near the north diversion channel of the TSF and the existing dam near the national road.

- It is recommended that structured project controls and regular status reporting be administered during implementation of Phase 3 – 15 Mtpa upgrade to manage and deliver the project scope in accordance with approved budget and schedule constraints.

- From a scheduling perspective it is envisaged several shutdowns will be required to bring the 15 Mtpa upgrade on stream. Engineering design should consider constructability of new facilities in proximity to operating facilities, and tie-ins should be designed to be installed with minimal disruption to ongoing operations. Where possible, tie-ins should be scheduled to be performed during planned maintenance shutdowns in the existing plant during construction of and prior to commissioning of the new 15 Mtpa facilities.

- The 15 Mtpa upgrade includes new and modified crushing, materials handling, milling, flotation and concentrate dewatering facilities. Of these, particular attention should be given to engineering and construction quality control of critical structures and systems associated with the primary crusher building, the new stockpile reclaim area, and the SAG mill respectively. The primary crusher facility and the stockpile reclaim tunnel are large concrete structures involving significant loads onto the subsoil. The in-situ geotechnical conditions under these structures should be tested to determine maximum allowable load bearing characteristics and expected consolidation parameters and ground improvements should be made where required. The reclaim tunnel slots should be sized for material flow characteristics to avoid bridging and arching in stockpile. Construction quality control of the SAG mill and gearless drive system should be administered by technically competent personnel to ensure construction and commissioning of the new SAG mill and drive system complies with the supplier's recommended installation, operating and maintenance procedures. It is recommended that mill and gearless motor vendor representatives are present on site during construction and commissioning of the SAG mill to verify assembly and commissioning of the mill.

- Furthermore, it is recommended that key operations and maintenance personnel are familiarized with the 15 Mtpa expansion design during the design development, procurement and construction phases and that they participate in operational readiness planning well in advance of commissioning so that Atalaya personnel can be trained accordingly. Sufficient inventory of operational and insurance spares should be procured and delivered into the mine site warehouse prior to commencement of commissioning. Additional commissioning personnel are recommended to assist with preparation of commissioning plans and procedures to bring new facilities on line and to provide technical support to the Owner's operations team during commissioning and ramp up phases and to assist with implementing any commissioning modifications and/or de-bottlenecking that may be required.

- 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 home. Make environmental compliance equal to safety and production.

27 REFERENCES

Feasibility Study Report, EMED Mining Limited, EMED Tartessus S.L.U. Proyecto Rio Tinto, October 2013

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NI43-101 Technical Report on EMED's Rio Tinto Copper Project, Huelva Province, Spain. Behre Dolbear International Ltd., February 2013

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Presentation – "El gigante se pone en forma", Proyecto de reapertura de la mina de Riotinto, EMED Tartessus, October 2015

Process Control Philosophy – Doc. No. SP0584-0000-1D0-002 Rev 1, Riotinto Expansion Project, SENET, 28 August, 2015

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Informes Técnicos IGME Nº8, Characterization of Geological structures from Gravity and Magnetic data of Riotinto, Iberian Pyrite Belt (Huelva, Spain), 2013

Atalaya Department of Geology 2016, geological figures

NI43-101 Technical Report on the Mineral Resources and Reserves of the Riotinto Coper Project, Huelva Province, Spain, Ore Reserves Engineering, et al., September 2016

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, 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 AUTHOR

Alan C Noble, P.E.
Ore Reserves Engineering
12254 Applewood Knolls Drive
Lakewood, Colorado 80215

Telephone: +1 303 237 8271
Email: a.noble@comcast.net

I, Alan C Noble, do hereby certify that:

I am a self-employed Mining Engineer working as Ore Reserves Engineering at 12254 Applewood Knolls Drive, Lakewood, Colorado 80215 and have carried out this assignment as overall author/reviewer.

1. This certificate applies to the Technical Report titled "Technical Report Update on the Mineral Resources and Reserves of the Riotinto Copper Project, Located in Huelva Province, Spain (the "Technical Report"), and dated July, 2018 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 48 years. During that time, I worked on mineral resource estimates and mine planning for over 156 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 for preparation of Chapters 7 through and 13 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, and most recently on May 7 – 10, 2018. I have had prior involvement with the property as an author of the previous Technical Report dated September 2016.
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 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, Technical Report contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

I consent of the filing of the Technical Report with any Canadian stock exchange and consent other securities regulatory authority and any publication by them for regulatory purposes of the technical report.

Dated the 18th day of July 2018

"Signed and Sealed, Alan C. Noble, P.E."

Alan C. Noble, P.E. 26122

CERTIFICATE OF QUALIFIED PERSON

Jaye T Pickarts, P.E.
9792 West Unser Avenue
Littleton, Colorado 80128

Telephone: 303 570 3370
Email: jtpick2@msn.com

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 Update on the Mineral Resources and Reserves of the Riotinto Copper Project, Located in Huelva Province, Spain (the “Technical Report”), dated July, 2018 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 preparation of 1, 2, 3, 4, 5, 6, 19, 20, 23, 24, and portions of Chapters 12, 18, 25, 26, and 27 Chapters of the Technical Report.
7. I have visited the property from February 19 - 26, 2016, November 8 – 10, 2016, and most recently on May 7 – 10, 2018. I have had prior involvement with the property as a Qualified Person of the previous Technical Report dated September 2016. .
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, 3, 4, 5, 6, 19, 20, 23, 24, and portions of Chapters 12, 18, 25, 26, and 27 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, 3, 4, 5, 6, 19, 20, 23, 24, and portions of Chapters 12, 18, 25, 26, and 27 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 18 day of July 2018
.

“Signed and Sealed, Jaye T. Pickarts, P.E.

Jaye T. Pickarts, P.E. 37268/13891/020893

WILLIAM L. ROSE, P.E.
CERTIFICATE OF QUALIFIED PERSON

I, William L. Rose, P.E., do hereby certify that:

1. I am the Principal Mining Engineer of:

   WLR Consulting, Inc.
   9386 West Iowa Avenue, Lakewood, Colorado 80232-6441, USA

2. I graduated from the Colorado School of Mines with a Bachelor of Science degree in Mining Engineering in 1977.

3. I am a Registered Professional Engineer in the State of Colorado (No. 19296), a Registered Professional Engineer in the State of Arizona (No. 15055) and a Registered Member of the Society for Mining, Metallurgy and Exploration, Inc. (No. 2762350RM) (all in good standing).

4. I have practiced my profession as a mining engineer continuously for 41 years since my graduation from college. I have been involved in open pit mine operations in both management and engineering positions, and have extensive experience in mine design and planning. I have conducted estimations of mineral resources and reserves, mine production schedules, equipment and workforce requirements, and capital and operating costs for numerous projects in North, Central and South America, Europe, Africa and Asia.

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, 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 preparation of Item 15 and portions of Item 16 (subsections 16.1, 16.2, and 16.3) of the technical report titled “Technical Report Update on the Mineral Resources and Reserves of the Riotinto Copper Project”, effective date July 2018 (the “Technical Report”).

7. I have visited the subject property on November 8-10, 2016 and again on May 7-10, 2018. The duration of my most recent visit was four days, during which I inspected the open pit, waste rock storage facilities, and the tailings storage facility perimeter and met with project staff to review mine planning, grade control and permitting efforts.

8. I have had prior involvement with the property that is the subject of the Technical Report. I was a co-author of “Technical Report on the Mineral Resources and Reserves of the Riotinto Copper Project”, effective April 30, 2016.

9. As of the effective date of the Technical Report, to the best of my knowledge, information and belief, Item 15 and portions of Item 16 (subsections 16.1, 16.2, and 16.3) of the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

10. I am independent of the issuer, Atalaya Mining PLC, applying all of the tests in Section 1.5 of NI 43-101.

11. I have read NI 43-101 and Form 43-101F1, and the Technical Report has been prepared in compliance with that instrument and form.

Dated this 18th day of July, 2018.

Original signed and sealed by

Signed, William L. Rose, P.E. 19296

CERTIFICATE OF QUALIFIED PERSON

John Darryl Fleay
Level 8, 256 Adelaide Tce,
Perth, Western Australia
6000

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Email: john.fleay@minnovo.com.au

I, John Darryl Fleay, do hereby certify that:

I am employed as Process Manager at Minnovo Pty Ltd, Level 8, 256 Adelaide Terrace, Perth, Western Australia, 6000

1. This certificate applies to the Technical Report titled "Technical Report Update on the Mineral Resources and Reserves of the Riotinto Copper Project, located in Huelva Province, Spain (the "Technical Report"), dated July 2018 for Atalaya Mining Plc."
2. I graduated from Curtin University (Western Australian School of Mines), Kalgoorlie, Western Australia, with a Bachelor of Engineering Degree in Minerals Engineering in 1986.
3. I am a Fellow of Australian Institute of Minerals and Mining (FAusIMM(CP)) – Member Number 320872.
4. I have practiced my profession continuously since 1992, and have been involved in design, construction, commissioning and operation of mineral processing projects for a total of 25 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, 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 preparation of Chapter 13 and 17 of the Technical Report.
7. I visited the property between 8th and 11th October 2016.
8. I have had prior involvement with the property that is the subject of the Technical Report.
9. I am independent of the issuer as described in Section 1.5 of NI 43-101.
10. I have read NI 43-101 and Form 43-101F1, and Chapter 13 and 17 of the Technical Report has 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, Chapter 13 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 18 day of July 2018.

Signed and Sealed,

John Darryl Fleay, FAusIMM(CP) # 320872.

CERTIFICATE OF QUALIFIED PERSON

Matthew James Langridge
Level 1, 256 Adelaide Terrace
Perth, Western Australia
6000

Telephone: +61 400 202 793
Email: matt.langridge@minnovo.com.au

I, Matthew James Langridge, do hereby certify that:

I am employed as Manager Projects at Minnovo Pty Ltd, Level 8, 256 Adelaide Terrace, Perth, Western Australia, 6000.

1. This certificate applies to the Technical Report titled "Technical Report Update on the Mineral Resources and Reserves of the Riotinto Copper Project, Located in Huelva Province, Spain (the "Technical Report"),dated July, 2018 for Atalaya Mining Plc."
2. I graduated from Curtin University, Perth, Western Australia, with a Bachelor of Science Degree in Civil Engineering in 1986.
3. I am a Fellow of Australian Institute of Minerals and Mining (FAusIMM(CP)) – Member Number 323727.
4. I have practiced my profession continuously since 1987, and have been involved in design and construction of mineral processing projects for a total of 30 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, 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 preparation of Chapters 21, 22, and a portion of 26 of the Technical Report.
7. I visited the property between 8th to 11th October, 2016.
8. I have had prior involvement with the property that is the subject of the Technical Report.
9. I am independent of the issuer as described in Section 1.5 of NI 43-101.
10. I have read NI 43-101 and Form 43-101F1, and Chapters 21, 22, and a portion of 26 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 17, 21, 22 and the portion of 26 of the Technical Report prepared by myself contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Dated the 18 day of July 2018.

Signed and Sealed,

Matthew J Langridge, FAusIMM(CP) #323727

CERTIFICATE OF QUALIFIED PERSON

Roger White
Bourne End
Buckinghamshire, 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 Update on the Mineral Resources and Reserves of the Riotinto Copper Project, located in Huelva Province, Spain (the "Technical Report"), dated Ju/y 2018 for Atalaya Mining Plc.
2. I am a Principal Tailings Engineer with Golder Associates (UK) Ltd located at Cavendish House, Bourne End Business Park, Cores End Road, Bourne End, Buckinghamshire, SL8 5AS, United Kingdom.
3. I graduated with a BSc degree in Mining Geology from the Royal School of Mines, Imperial College, 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 Associates (UK) Ltd since 1984.
4. I am an engineer with over 40 years' experience of which 35 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 fulfil 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 Technical Reports compiled by Golder Associates and I am responsible for the preparation of Chapters 18.4, and 20.8 of the Technical Report, and portions of Chapter 26 in relation to the Tailings Management 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 Chapters 18.4 and 20.8 of the Technical Report, and portions of Chapter 26 in relation to the Tailings Management 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, Chapters 18.4 and 20.8 of the Technical Report, and portions of Chapter 26 in relation to the Tailings Management Facilities, contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

Effective Date: June 25th, 2018
Signed Date: June 25th, 2018

Roger White, ARSM, BSc, MSc, CEng MIMMM