EL ROBLE MINE UPDATED MINERAL RESOURCE AND INITIAL MINERAL RESERVE ESTIMATES

El Carmen de Atrato, Chocó Department, Colombia

Report Date: December 28, 2018
Effective Date: June 30, 2018

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1. SUMMARY

1.1. Introduction

This report has been prepared by Atico Mining Corporation (ATICO) and the Andes Colorado Corp. (AC) in accordance with the disclosure requirements of Canadian National Instrument 43-101 (NI 43-101) to disclose recent technical and scientific information in respect to the El Roble mine.

The current technical and scientific information related to the El Roble Mine is as follows:

> Exploratory drilling (outside of the main deposits in production) and infill drilling (to better understand the deposits' geometry and grade and increase the resource categories), especially following December 2015 (date of the previous Mineral Resource estimate).
>
> Mineral Resources and Mineral Reserves are stated as of June 30, 2018.
>
> The Mineral Resource estimate in this report replaces the previous technical report completed on December 7, 2015. The Mineral Reserve estimate in this report is the first Mineral Reserve estimate for El Roble.

1.2. Property Description and Location

The El Roble (El Roble) mine is located in Atrato province, Chocó Department (near the border of Antioquia Department), in the country of Colombia. Carmen de Atrato is the nearest town and is located approximately 3 kilometres south of the mine and is accessed by an improved gravel road. The access road to Carmen de Atrato from the city of Medellin (Antioquia) is 95 percent paved.

The El Roble project consists of mineral concessions totalling approximately 6,355 hectares from which an underground mine and processing facility (El Roble Mine) currently owned and operated by Minera El Roble S.A. (MINER) produces copper and gold concentrates from a volcanic massive sulphide (VMS) mineral deposit. Atico acquired 90 percent of MINER and its assets on November 22, 2013. The assets include all the mining concessions, the exploratory licenses, the underground mine, the plant, the tailings storage facilities, the infrastructure, stockpiles and workshop facilities relating to El Roble. Additionally, several off-site concentrate storage facilites were included in the purchase.

1.3. Geology and Mineralization

The geology of the MINER mineral concessions (including those where MINER is currently conducting underground mining) consist of submarine mafic volcanic rocks, black to grey chert and overlying deep-water sedimentary rocks, consisting of sandstone-shale turbidites that are part of the Cretaceous Cañas Gordas Group. These units can be traced for over 800 kilometers along the western cordillera of Colombia. Within the Cañas Gordas Group the local pillow basalts, tuffs, hyaloclastites, and agglomerates that are believed to be part of the Barroso Formation, while deep-water marine sedimentary rocks that include chert, siltstone and minor limestone belong to the Penderisco Formation. All of these rock units were deformed and metamorphosed during the Late Cretaceous to Tertiary accretion to continental South America, which resulted in both low-angle thrusting and high-angle strike-slip faulting that trend in a generally north-south direction.

The mineral resources reported herein are located in mineralized bodies considered to be volcanic massive sulfides (VMS). These mineralized bodies are stratabound within the black chert unit, and MINER has not been able to identify economic mineralization outside of this stratigraphic unit. The largest of these deposits is Zeus lens or body, which is located at elevations 1,670 and 1,875 masl and has an average thickness of 35 meters.

1.4. Exploration Status

Subsequent to the 2016 amended technical report (REI & RMI, 2016), exploratory drilling was carried out within the operation site but external to the mineralized bodies to determine if any proximal mineralisation occurred near to the mineralized bodies under production. MINER drilled 7,542 meters between July 2015 and June 2018. Infill drilling was also performed for a better determination of the economic mineralization capacity and to increase the Mineral Resource classification, mainly below elevation 1,700 masl. MINER used 2,323 meters of the total meters drilled between July 2015 to June 2018 for the resource estimation.

Continuing brownfield exploration in the mine area will start down plunge from the deeper part of the Zeus body targeting the prospective black chert horizon and will consist of a 2,100-meter core drilling program. Early stage exploration at the Archie area (north east of El Roble Mine) will drill the favourable black chert horizon, and geochemical and geophysical anomalies. The results of this program are pending.

1.5. Mineral Resource and Mineral Reserves

The Mineral Resource estimation uses assay data from channel and core samples, in addition to the underground mine mapping for the construction of three-dimensional wireframe models of the lithology and mineralized bodies. Estimation of grades in the block models only considers samples located inside the wireframe mineralized bodies solids, to which anomalous grade or top cut treatments and further compositing processes have been applied. The model consists of 2m x 2m x 2m blocks, which represent the selective mining unit (SMU). The resource estimation is conducted separately mineralized body by body and element by element (Cu and Au). The methods used for grade estimation are cubic inverse distance (Goliat, Maximus and Maximus Sur mineralized bodies) and Ordinary Kriging (Zeus mineralized body).

Mineral Reserves were estimated by applying the El Roble mine plan to the block model wireframe to determine which blocks in the mine plan fit within the wireframe. These blocks were then diluted using historic information from El Roble, a suitable recovery factor was applied to each block and a break-even cut-off grade applied using historic cost information from El Roble. The blocks inside the wireframe were then rescheduled for the life of the Zeus deposit and a financial projection made; the projection demonstrated robust economic performance. The blocks used in the mine plan were then compiled to make the total Mineral Reserve estimate.

Mineral Resource and Mineral Reserve estimates for the El Roble mine are reported as of June 30, 2018 and detailed in Table 1.1 and Table 1.2.

Table 1.1 Mineral Resources as of June 30, 2018

Category	Tonnes (000)	Cu Eq. (%)	Cu (%)	Au (g/t)	Contained Metal	
					Cu Lbs (000)	Au oz (000)
Measured	1357.1	4.56	3.76	2.24	112,549.0	97.9
Indicated	446.2	4.05	3.24	2.27	31,904.2	32.6
Measured + Indicated	1803.3	4.43	3.63	2.25	144,453.1	130.5
Inferred	23.90	2.06	0.62	4.06	324.4	3.1

Table 1.2 Mineral Reserves as of June 30, 2018.

Category	Tonnes (000)	NSR (US$/t)	Cu (%)	Au (g/t)	Cu_eq (%)
Proven	1,143	241	3.53	1.91	4.21
Probable	324	206	2.93	1.81	3.58
Total	1,467	233	3.40	1.88	4.07

Where:

1. *Mineral Resources and Mineral Reserves are as defined by CIM definition Standards on Mineral Resources and Mineral Reserves 2014.*
2. *Mineral Resources and Mineral Reserves are estimated as of June 30, 2018. No accounting regarding production-related depletion for the period after June 30, 2018 has been included.*
3. *Mineral Reserves are reported using an NSR breakeven cut-off value of US$121.97/t (cost basis January 2017 to June 2018) for the Zeus body.*
4. *Mineral Resources are reported based on an NSR cut-off grade of US$59.55/t (cost basis January to December 2017).*
5. *Metal prices used were US$1,278.56/troy ounce Au and US$ 3.26/t Cu.*
6. *Metallurgical recoveries are based in the historical recovery (El Roble process plant results January 2017 to June 2018): Au is 61.82% and Cu is 94.15%.*
7. *Metal payable recovery used 89.74% for gold and 94.78% for copper (basis January 2017 to June 2018).*
8. *Reserves are based on break-even cut-off grade of 1.93 percent copper equivalent, which is based on actual El Roble operating costs from January 1, 2017-June 30, 2018 along with other factors*
9. *Density was estimated for each ore-body (Goliat = 3.34t/m3, Maximus = 3.50t/m3, Maximus Sur = 3.26t/m3, Zeus = 3.53t/m3).*
10. *Mineral Resources, as reported, are undiluted.*
11. *Mineral Resources are reported to 0.88% CuEq cut-off.*
12. *CuEq for each block was calculated by multiplying one tonne of mass of each block by block grade for both Au and Cu by their average recovery, metal payable recovery and metal price. If the block is higher that CuEq cut-off, the block is included in the estimate (resource or reserve estimate as appropriate).*
13. *Mineral Resources are Inclusive of Mineral Reserves.*
14. *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.*

15. *There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves.*
16. *There are no known legal, political, environmental or other risks that could materially affect the development and mining of the Mineral Reserves in the Zeus deposit;*
17. *Mineral Reserves were reviewed by Mr. Thomas Kelly, RM-SME, president of Andes Colorado Corp., who is a Qualified Person for the estimate and independent of Atico Mining and it's subsidiaries;*
18. *Figures in the table are rounded to reflect estimate precision; small differences are not regarded as material to the estimate;*
19. *Reserves are estimated based on mining material that will be mined, processed and smelted.*

1.6. Mining Operations

MINER continues to successfully manage the operation, mining 269,034 dry metric tonnes (dmt) of ore from underground to produce 20.6 Mlbs of copper and 10.9 koz of gold in 2017 while continuing to improve the mine infrastructure. MINER continues to investigate cost effective ways to improve productivity and reduce costs. MINER is implementing two projects to reduce costs in the transport to the process plant stockpile and crushing/grinding of the ore and improving the cemented rock fill. The first project will be the implementation of a SAG Mill (8' x 6') located at the same elevation and close to the process plant which will replace the uphill haul to the present coarse ore stockpile and replace the present primary crushing and grinding system. The second project, aimed at reducing cemented rock fill usage by applying a mixed fill, will use cemented rock fill with rock only filling in the last levels of a block delimited by safety bridges. These modifications and associated savings in cost and increases in efficiency were not used to estimate Mineral Reources or Mineral Reserves in this report.

1.7. Conclusions and Recommendations

ATICO classified the block model in accordance with the CIM Definition Standards for Mineral Resources and Mineral Reserves;

The conversion of Mineral Resources to Mineral Reserves was made using industry recognized methods, actual operational costs, capital costs, and plant performance data;

Targets located with IP-DAS geophysics should be explored and drilled;

Based on the historic parameters used in the Mineral Reserve Estimate, the mine has positive economic performance over the life of the Zeus deposit.

2. Introduction

This Technical Report has been prepared by Atico Mining Corporation (ATICO) in accordance with the disclosure requirements of Canadian National Instrument 43-101 (NI 43-101) to disclose recent information about the Minera El Roble S.A. (MINER) Property known as the El Roble mine and associated process plant.

This information has resulted from additional underground development and sampling, as well as exploration drilling. The mineral resources have been updated while the mineral reserves are stated for the first time since ATICO assumed control of MINER in November 2013.

Information contained within this section has been reproduced and updated where necessary from previous Technical Reports including REI & RMI ,2013 and 2015; and Greg Smith & Demetrius Pohl, 2012.

The El Roble mine is owned by MINER, of which ATICO controls 90 percent. MINER is a direct subsidiary of Atico Mining Corporation. The remaining 10 percent of MINER is owned by several private entities. ATICO is based in Vancouver, British Columbia with management offices in Lima, Peru. ATICO shares are listed on the TSX Venture Exchange (TSX.V:ATY).

On November 22, 2013, ATICO acquired 90 percent of MINER and its assets, which include the El Roble mining concessions, exploration licenses, the El Roble underground mine, processing facility, and ancillary facilities. The current operation mines the Zeus, Goliat and Maximus deposits. Neither Goliat nor Maximus have sufficiently detailed and closely-spaced technical data to produce a Mineral Reserve statement.

The cut-off date for the drill hole and channel sample information used in the Mineral Resource estimate is June 30, 2018. Technical, production, cost and other data also used a cut-off date of June 30, 2018. Production at El Roble has continued since that time however no depletion of the Mineral Resource or the Mineral Reserve has been included in this report.

Field data was compiled and validated by MINER and ATICO staff. Geological description of the samples, geological interpretations and three-dimensional wireframes of the bodies were completed by MINER and reviewed by ATICO personnel. The June 2018 Mineral Resource estimates were undertaken by ATICO under the technical supervision of the Qualified Person, Mr. Antonio Cruz.

The mine planning, cost estimation and other information used in the Mineral Reserve estimate were undertaken by the Mine Planning/Engineering department of MINER under the technical supervision of the Independent Qualified Person, Mr. Thomas Kelly of Andes Colorado (AC).

The authors of this Technical Report are Qualified Persons as defined by NI 43-101. Mr. Thomas Kelly (Registered Member of SME 1696580) of AC, advisor to the Company and an independent qualified person according to the standards of National Instrument 43-101, is responsible for ensuring that the technical information contained in this technical report is accurate from the original reports and the data provided or developed by Atico and has visited the property on numerous occasions. Mr. Antonio Cruz has been employed by MINER from February 2013 to July 2018, and is currently Mineral Resource Manager for ATICO (since August 2018) and has visited the property on numerous occasions.

Responsibilities for the preparation of the different sections of this Technical Report are shown in Table 2.1 with definitions of terms and acronyms detailed in Table 2.2.

Table 2.1 Authors of Current Report

Author	Company	Area of Responsibility
Thomas Kelly SME, (CP)	Andes Colorado	Principal Reviewer, all the chapters below and Summary. Chapters 1, 2, 13, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27
Antonio Cruz, AIG (CP)	ATICO	Quality Assurance/Quality Control Geology, Mineral Resource Estimate, Geology, Property Description Chapters 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 14, 23, 24, 25, 26, 27

Definitions of terms and acronyms detailed in Table 2.2.

Table 2.2 Acronyms

Acronym	Description	Acronym	Description
Ag	Silver	MVA	megavolt ampere
Au	Gold	MW	megawatt
cfm	cubic foot per minute	NI	national instrument
cm	Centimeters	NN	nearest neighbor
COG	cut-off grade	NSR	net smelter return
Cu	Copper	OK	ordinary kriging
dmt	dry metric tonne		
g	Grams	oz	troy ounce
g/t	grams per dry metric tonne	oz/t	troy ounce per dry metric tonne
ha	Hectares	ppm	parts per million
kg	Kilograms	Pb	lead
km	Kilometers	psi	pounds per square inch
kg/t	kilogram per dry metric tonne	QAQC	quality assurance/quality control
kV	Kilovolts	RMR	rock mass rating
kW	Kilowatts	RQD	rock quality designation
kVA	kilovolt ampere	s	second
lbs	Pounds	t	Dry metric tonne
l	liter	t/m3	Dry metric tonnes per cubic meter

Acronym	Description	Acronym	Description
LOM	life-of-mine	tpd	Dry metric tonnes per day
m	Meters	yd	yard
mm	Milimeters		
Ma	millions of years	yr	year
masl	meters above sea level	Zn	zinc
Moz	million troy ounces	$US/t	United States dollars per tonne
Mn	Manganese	$US/g	United States dollars per gram
Mt	million dry metric tonnes	$US/%	US dollars per percent
		$US_M	United States dallars stated in millions

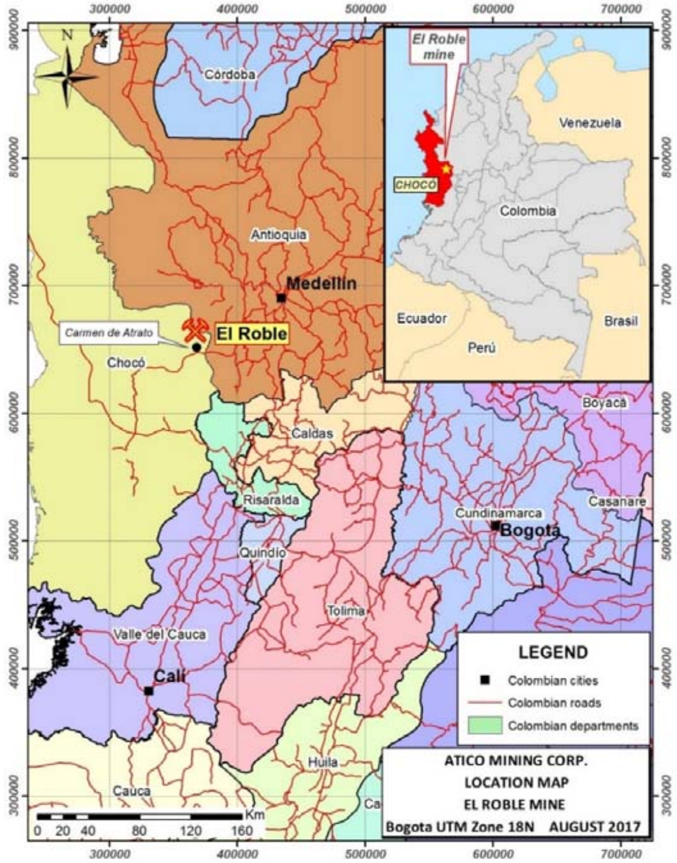
3. Reliance on Other Experts

With respect to the status of the mineral concessions, the Qualified Persons responsible for this amended Technical Report have relied on title opinions provided to them by MINER's legal counsel that confirmed that the mineral concessions were in good standing as of that date.

4. Property Description and Location

The El Roble mine is located in the Carmen de Atrato province, Chocó Department near the border with Antioquia Department, in the country of Colombia (Figure 4.1). The mine site is 3-km by improved gravel oad from the town of Carmen de Atrato; Carmen de Atrato is connected via paved highway to the city of Medellin.

Figure 4.1 Location of the El Roble Mine, Colombia. Source: Agustín Codazzi Geographical Institute of Colombia



4.1. Mineral Tenure

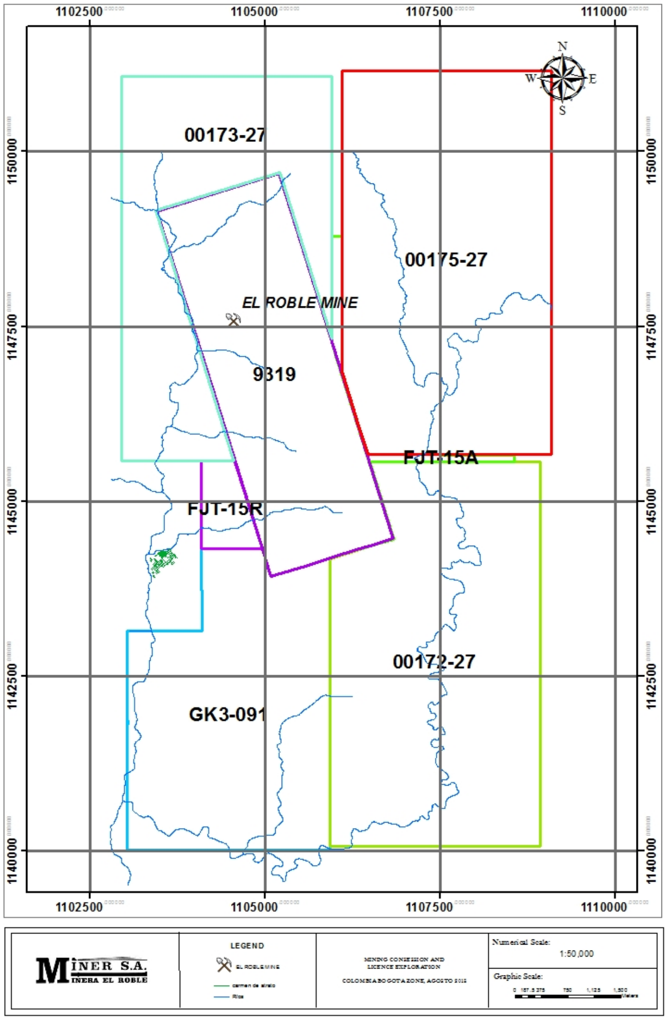
The El Roble Project consists of seven mineral concessions that total 6,355.00 ha, consisting of four valid mining concession contracts (Contract Nos. 9319, GK3-091, FJT-15A, FJT-15R) and three valid exploration licenses (No. 00172-27, No. 00173-27, and No. 00175-27). Table 4.1 summarizes the pertinent aspects of all concessions, the status of which were last confirmed to be in good standing by MINER's legal counsel.

Table 4.1 List of El Roble Mineral Concessions.

Title	Title Holder/Request	Classification	Stage	Area (hectares)	Registration Date	Expiration Date
00172-27	Minera El Roble S.A.	Exploration License	Fifth year of exploration	1,555.27	December 24, 2010	December 24, 2014 License in conversion to Mining Contract
00173-27	Minera El Roble S.A	Exploration License	Fifth year of exploration	952.95	December 23, 2010	December 23, 2012 License in conversion to Mining Contract
00175-27	Minera El Roble S.A	Exploration License	Third year of exploration	1,627.87	March 11, 2013	March 11, 2018 License in conversion to Mining Contract
9319	Minera El Roble S.A.	Mining Concession Contract Minera	Twenty fourth year of exploitation	1000.00	March 20, 1990	January 23, 2022
GK3-091	Minera El Roble S.A.	Mining Concession Contract Minera	Fifth year of exploration	1,085.79	December 17, 2010	December 17, 2040
FJT-15A	Minera El Roble S.A.	Mining Concession Contract Minera	Third year of construction and assembly	49.51	February 11, 2008	February 11, 2038
FJT-15R	Minera El Roble S.A.	Mining Concession Contract Minera	Third year of construction and assembly	84.84	February 11, 2008	February 11, 2038

The locations of all of these concessions are shown in Figure 4.2.

Figure 4.2 Location of Mining Concessions at El Roble Mine.



4.2. Surface Property

MINER owns the surface rights to 420.77 ha in the immediate mine area (within mining concession contract No. 9319 and exploration license 00173-27). Surface ownership on the remaining El Roble Project is divided among multiple individual landowners. Although access to the surface is guaranteed by law, actual exploration activities require negotiations for compensation of the separate owners. Where purchase of permanent surface rights is necessary, the purchase price is negotiated with the surface landowner. However, by Colombian law, the purchase price is based on the fair market value of the surface, irrespective of the potential value of underlying minerals.

4.3. Royalties

There are no encumbrances, back-in rights, or royalties that affect the El Roble mine other than the following:

Royalties owed to the Federal government in accordance with the mining laws of Colombia (Law 865 of 2001 and Law 756 of 2002) which stipulate a 4 percent net smelter return royalty (NSR) on precious metals and a 3 percent NSR on copper. In an April 2018 News Release, ATICO advised that, "On November 18, 2015, the Company announced that the Subsidiary had received notice of a claim from the mining authority in Colombia requesting payment of royalties related to past copper production in the amount of approximately US$2 million. The Claim that the Company has now received from the Tribunal is in the amount of approximately US$5 million plus interest and fees. After exhausting all options to find a resolution at the administrative level, the Company will vigorously defend itself against this action before the Tribunal. The Colombian mining authority is basing its claim on the current mining law, which is subsequent to the prevailing mining law under which the Subsidiary executed the contract regulating its royalty obligations. The current mining law in Colombia explicitly states that it does not affect contracts executed prior to the current mining law entering into force. Therefore, the Company and its Colombian legal counsel's position is that the Claim is not legitimate and that the Company has complied with the royalty payments required under its contractual obligations. The Company has been advised by its Colombian legal counsel that the Claim lacks merit, is in violation of Colombian law, and that such claims may take up to 10 years to reach a resolution."

MINER has pension obligations and severance agreements with respect to its employees who belong to the union, Sintramienergetica.

5. Accessibility, Climate, Local Resources, Infrastructure and Physiography

5.1. Accessibility

The El Roble mine site is easily accessed via paved highway from the city of Medellin, Colombia, to the town of Carmen del Atrato, Department of Chocó (about 140-km, driving time approximately four hours), then north approximately three kilometres via an improved gravel road to the mine operations. During the rainy season, torrential storms can cause minor landslides onto the roads that lead from National Highway 60 to the town of Carmen del Atrato.

5.2. Local Resources and Infrastructure

Readily available process water is drawn from the Atrato river affluents and subsequently discharged back into the river when water balance conditions require. Nearly all mining and process plant personnel come from the nearby town of Carmen del Atrato, where the labour force has proven to be adequate. A five-megawatt substation operated by Isagen (a public company) provides electricity for operating the mine and processing facility under the terms of an existing, long term contract with MINER.

MINER controls 420.77-ha of surface rights in the immediate vicinity of the mine which, as of the effective date of this Technical Report have been sufficient to operate the existing underground mine, process plant and dispose of tailings from the process plant in permitted impoundments. MINER disposes of all tailings from the mine into a tailings impoundment located south of the mine near the town of Carmen del Atrato.

5.3. Climate

The climate in the general project area is tropical with well-defined wet and dry seasons over which relatively constant temperatures range from 18°C to 28°C daily, with little variation over the course of the year. Vegetation around the project site consists of forested mountain slopes and cultivated valleys.

5.4. Physiography

The topography is quite rugged, ranging in elevation from 1600 to 2700 masl. The region around the project site is drained by the River Atrato, which flows from north to south past the mine operations.

The current main underground access for personnel and materials is the 1880 Level or 1880 Adit, located near the process plant at an elevation of approximately 1880 masl.

6. History

This section describes the discovery, exploration and development, and production history of the El Roble mine up to the date, 30 June 2018. Specific details regarding MINER's exploration efforts on the property since April 2011 are described in Chapter 9 Exploration.

6.1. Discovery

Copper mineralization in the El Roble area was first discovered during the early 1970s at the Santa Anita deposit, located six kilometres south of the current El Roble mine operation and within the MINER mineral concession area.

At Santa Anita, a small amount of copper was reportedly produced underground from vein and stockwork mineralization. During this same time, Don Humberto Echavarria (the owner of the Santa Anita mine) reportedly found eroded boulders of massive sulphide mineralization below the current site of the El Roble mine during construction of a road from Carmen de Atrato to the town of Urrao. The source of the boulders was found to be a landslide scarp upslope of the road that exposed an outcrop of oxidized massive sulphide mineralization (gossan). The first company to exploit the El Roble deposit (at a mining rate of 30-tpd) was Minas El Roble, which was incorporated in 1972.

6.2. Historic Exploration and Development

Minas El Roble entered a joint venture with Kennecott Copper Company (Kennecott) in 1982. During a two-year period, Kennecott spent approximately US$2M on exploration that included surface mapping and sampling, a ground magnetic survey, and a 22-hole diamond drilling program (holes R-01 through R-22) totalling 2,190-m (averaging just 100-m depth) that identified a historic mineral resource of approximately 1.1Mt. Because this mineral resource did not meet Kennecott's minimum deposit size requirements, the company withdrew from the joint venture.

Following Kennecott's departure, a partnership between Minas El Roble and Nittetsu Mining Company Ltd. of Japan was formed in 1986. As the operator, Nittetsu expanded the area of surface mapping and sampling, conducted induced polarization (IP) and resistivity geophysical surveys, and completed additional drilling that identified and delineated two mineralized zones. One of these, termed the Main zone, measured approximately 80-m along strike by 100-m down-dip by 45-m wide. This zone was reported to contain a historic resource of approximately 700,000 -dmt of "proven plus probable reserves" that averaged 5.48% Cu, 3.06 g/t Au and 9.39 g/t Ag above the 2,225 masl elevation in the mine. The adjacent North zone was reported to have dimensions of approximately 100-m along strike by 80-m down-dip by 15-m in width, containing a historic resource of approximately 273,000 dmt averaging 2.67% Cu, 3.25g/t Au and 10.9g/t Ag. The Qualified Persons responsible for this Technical Report were not able to review any of the tonnage and grade estimates discussed in this paragraph and are of the opinion that it is highly unlikely that these estimates are meet the the standards set out in NI 43-101 and CIM guidelines for Mineral Resources or Mineral Reserves.

In 1987, C. Itoh and Co. of Japan joined the Nittetsu/Minas El Roble partnership to form a new company, EREESA, which began construction of a 96,000 tonnes per year processing plant that was completed in 1990 and began operation at the rate of 380-tpd. Nittetsu continued to be the project operator, completing 66 additional diamond drill holes totalling 7,731-m (averaging 117-

m depth), which increased reported historic "reserves" to approximately 1.2 million tonnes averaging 4.83% Cu, 3.23g/t Au, and 12.4g/t Ag. As with previous historic "reserve" estimates mentioned in this section, the Qualified Persons responsible for this Technical Report were not able to review the tonnage and grade estimates discussed in this paragraph, and are of the opinion that it is highly unlikely that these estimates are meet the standards set out in NI 43-101 and 2014 CIM guidelines for Mineral Resources/Mineral Reserves.

In 1990, twenty additional holes, Holes CR1 to CR-20, totalling 4,638-m were drilled from the surface, along with completion of more IP/Resistivity surveys. Nittetsu and C. Itoh eventually withdrew from the joint venture and left Colombia in 1997, reportedly for security reasons, after which the name of the company was changed to Minera El Roble S.A. (MINER).

Since the departure of the Japanese partners in 1997, the El Roble mine has been operated by MINER, producing copper-gold concentrates and continuing to expand and delineate Mineral Resources in known volcanic massive sulphide (VMS) lenses by in-fill and step-out diamond drilling, and initial diamond drilling to discover new VMS lenses. As of the date of this Technical Report, 230 diamond drill holes totaling 27,645-m have been completed from both surface pads and underground stations. This drilling is summarized in greater detail in Chapter 10.0 of this Technical Report.

On November 22, 2013, ATICO acquired 90 percent of MINER and its assets, which include the El Roble mining concessions, exploration licenses, the El Roble underground mine, processing facility, and ancillary facilities. Underground development, production mining, and processing has continued uninterrupted since ATICO's acquisition of MINER and its assets. Surface and underground exploration programs have also been conducted. In this report, the estimation of mineral reserves is included for the first time in the history of MINER.

6.3. Historic Production, Mining and Processing

6.3.1. Mining and Production

The El Roble mine has been in continuous production since 1991 except for the year 1993 when the mine was closed for security reasons, and for a period of six weeks during March and April of 2013 due to a miners' work stoppage. Prior to ATICO's entering into the option agreement on January 28, 2011 to acquire MINER and its assets, the mine was small in scale, operating at an average production rate of 320 tonnes per day. Except for some additional mineralization discovered during mine development, all mining prior to 2011 took place in VMS mineralization originally identified and defined by Kennecott and the Nittetsu-Itoh joint venture. Up to that point in time, MINER had maintained only rudimentary production records, and without the benefit of a geology/engineering staff had conducted limited exploration. The option agreement between ATICO and MINER included the commitment to explore for new VMS deposits on the MINER concession block.

Total production from the mine from 1990 through 2017 is summarized by year in Table 6.1, which clearly illustrates what were steadily declining copper grades under MINER's former owners, as the Main and North mineralized zones were steadily depleted through 2013. Prior to ATICO's acquisition of the company, MINER did not complete any Mineral Resource or Mineral Reserve estimates that met NI 43-101 or CIM guidelines that were in force during its ownership, nor were any meaningful internal estimates of tonnes and grade made that could have formed the basis for short and long range mine planning.

Table 6.1 Historical El Roble Mine Production (1990 - 2017)

Year	Ore mined (tonnes)	Cu Head grade (%)	Au Head grade (g/t)
1990	4,769	5.33	-
1991	98,256	3.67	-
1992	75,234	3.19	-
1993	No Production		-
1994	86,113	3.2	-
1995	81,204	3.59	-
1996	82,891	2.91	-
1997	76,778	2.53	-
1998	74,878	2.98	-
1999	80,888	2.89	-
2000	79,369	2.74	-
2001	76,256	2.73	-
2002	77,579	2.39	-
2003	72,718	2.06	-
2004	75,706	2.25	2.46
2005	68,696	2.06	1.02
2006	29,684		
2007	49,878	1.63	3.91
2008	61,838	1.88	3.91
2009	73,214	1.77	3.17
2010	71,312	1.14	2.00
2011	76,379	1.19	1.40
2012	69,831	1.21	1.79
2013	69,895	1.07	1.56
2014	133,332	3.37	3.30
2015	178,095	3.26	2.78

Year	Ore mined (tonnes)	Cu Head grade (%)	Au Head grade (g/t)
2016	242,717	3.71	2.17
2017	256,078	3.87	2.10
Total	2,423,588	2.78	2.39

Instead, the approach was to conduct ongoing underground "production" diamond drilling (generally only 30-m to 50-m ahead of the working faces) and to use the results of these drill holes to guide mining on a daily and weekly basis. While MINER did record the coordinates, azimuths inclinations, and total depth of each hole during this period, in general the company did not assay the core from these holes (core recovery was often poor), although the core was retained. Rather, the company used visual evidence provided by the core to determine the limits (contacts) to what it considered to be economic mineralization, and plotted these contacts on working mine maps.

Currently the Zeus deposit provides 90%, and the Maximus and Goliath deposits provide 10% of the total production tonnage of the El Roble mine. As noted in the August 2013 and January 2016 Technical Reports, the hanging wall and the footwall host rocks of the massive sulphide lenses can be sufficiently competent to support stope openings of 5 to 10 meters wide and strike lengths of 15- to 20-m.

6.3.2. Processing and Waste Disposal

The existing processing plant at El Roble has been operated by MINER since 1990 and after recent upgrades by Atico has a rated nominal throughput capacity of 850-tpd. Ore processing consists of conventional crushing, grinding, and flotation to produce a copper-gold concentrate. Grinding is to 80 percent passing 200 mesh for flotation feed. Four banks of six flotation cells each generate concentrates which are subsequently thickened, filtered and stored on site for shipping via highway truck to the Pacific coast port of Buenaventura. Process tailings are deposited in an impoundment facility situated along the banks of the River Atrato next to the processing plant, or in a separate tailings impoundment located downstream of the processing plant. Process waste water is decanted in a series of ponds and then released (at a pH between 7.48 and 8.45) into the River Atrato.

Table 6.2 lists no gold grades prior to 2004, as material mined and processed before that date was not assayed for gold. However, summarizes mine production and concentrate produced from 2004 through 2017, with gold head grade assays for tonnes mined as well as concentrate gold grades.

Table 6.2 El Roble Mine Production Since 2004 (with gold head grades)

Year	Ore Production			Concentrate Production		
	Tonnes	Cu %	Au (g/t)	Tonnes	Cu %	Au (g/t)
2004	75,706	2.25	2.46	7,840	18.2	15.92
2005	68,696	2.06	1.02	6,330	20.76	11.65
2006	29,684	2.03		2,903	19.39	10.83
2007	49,878	1.63	3.91	4,196	18	23.13
2008	61,838	1.88	3.91	5,253	19.5	23.16
2009	73,214	1.77	3.17	5,688	20.8	25.7
2010	71,312	1.14	2	3,916	18.64	21.9
2011	76,379	1.19	1.4	4,042	20.3	15.86
2012	69,831	1.21	1.79	3,760	20.1	20
2013	69,895	1.07	1.56	3,294	19.4	21.7
2014	133,332	3.37	3.3	19,417	21.2	15.3
2015	178,095	3.26	2.78	29,024	18.82	11.78
2016	242,717	3.71	2.17	41,494	20.47	8.36
2017	256,078	3.87	2.1	42,801	21.8	7.9
Total	1,456,655	2.71	2.34	137,157	19.89	13.69

6.4. Historic Operating Costs

MINER's operating costs for the period 2010 through 2017 are provided in US dollars in Table 6.3.

Table 6.3 El Roble Mine Operating Costs (2010 - 2017)

Cost Centre	Unit Cost by Year (US$/tonne)							
	2010	2011	2012	2013	2014	2015	2016	2017
Mine	17.46	16.31	21.48	21.48	30.00	37.91	44.82	38.35
Milling	13.00	13.99	16.69	14.56	12.00	12.90	12.83	11.57
Electricity	7.70	7.36	7.31	7.46	6.45	5.29	5.09	5.91
Mine G&A	4.06	4.96	8.42	5.81	5.00	5.45	5.09	3.71
Shipping	9.45	5.11	4.70	6.42	10.87	13.63	11.94	13.3
Total	51.67	47.73	58.6	55.73	64.32	75.18	79.77	72.84

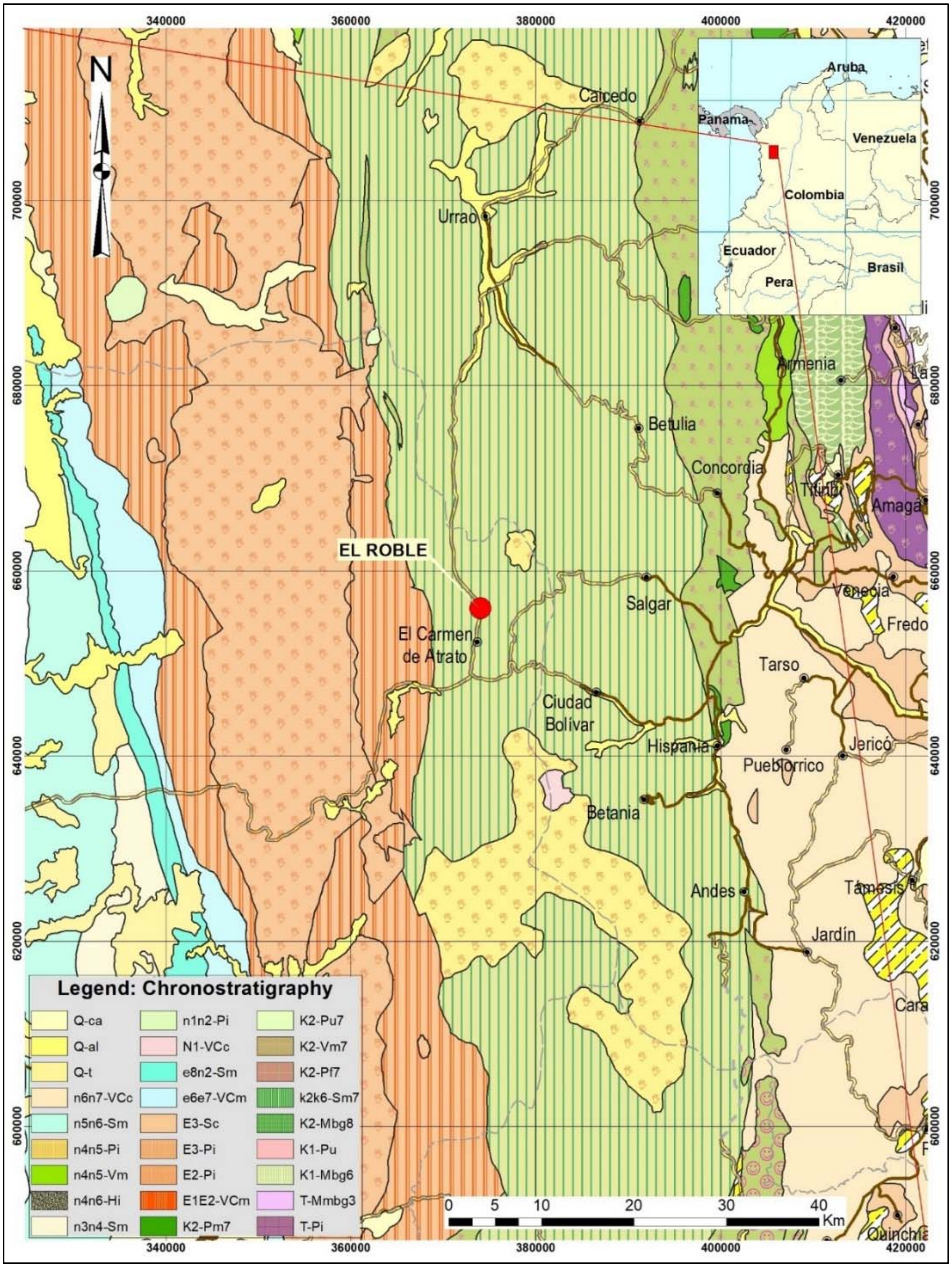
7. Geological Setting and Mineralization

This section summarizes the regional and local geology based on on the following reports and papers: Technical Report, Lechner and Eamest (2016); Atico internal report, Monecke (2016); Atico exploration report, Pratt (2014); Technical Report on the El Roble Project, Chocó Department, Colombia (Smith, 2012);

7.1. Regional Geology

The regional geology of the belt of rocks hosting the El Roble massive sulphide deposit is underlain largely by the Late Cretaceous rocks of the Cañasgordas Group which was accreted onto continental South America during the Miocene. Lechner and Eamest (2016) place, the approximately 30km thick Early Cretaceous Cañasgordas Group of within the Choco Block. The Choco block, an oceanic, exotic terrane with no lithogenetic affinity with South America, accreted and obducted onto the oceanic, Late Jurassic-Early Cretaceous Gorgona and Romeral terranes (Cediel, 2003; Taboada et al., 2000) of the northwestern flanks of the Cordillera Occidental. The Cañasgordas Group can be traced for over 800 kilometres along the western cordillera of Colombia (Figure 7.1). Locally, mafic volcanic rocks including pillow basalts, tuffs, hyaloclastites, and agglomerates are referred to as the Barroso Formation; pelagic sedimentary rocks including chert, siltstone and minor limestone belong to the Penderisco Formation. All of these rock units were deformed and metamorphosed during Late Cretaceous to Tertiary accretion of the Cañasgordas Group to continental South America. Accretionary tectonics resulted in both low-angle thrusting and high-angle strike-slip faulting that trend in a general north-south direction. Strands of a major regional northwest-striking fault offset massive sulfide mineralization at the El Roble mine. This fault is responsible for dismemberment of what was once a a single massive sulfide body into a series of fault-bounded lenses or bodies.

Figure 7.1 Regional Geologic Map, Source Gómez et al., 2015



7.2. Property Geology

Atico geologists and other workers use four major rock classifications to described the geology of El Roble license areas. The lowest unit is a submarine mafic volcanic unit up to several kilometers thick. Whole rock (NaO, K2O, MgO, FeO) analyses reported by Ortiz et al. (1990) place the basalt flows in the tholeiitic field. The mafic volcanic unit is overlain by a "black chert unit" up to 30 m thick and turn these grades upwards into a pelagic sedimentary unit, locally termed the "grey chert" up to 120 m thick. The entire package is topped by a sandstone-mudstone, turbidite unit several kilometers thick. The massive sulfide deposits are hosted in the black chert and grey chert units always occurring within meters of the uppermost mafic volcanic contact. The succession of basalt flows, black to grey chert and overlying pelagic sedimentary rocks and sandstone-shale turbidites sequence has been intruded by andesite and latite dikes which post date and disrupt the massive sulfide mineralization. Within the pelagic, chert mudstones of the "black" and "grey cherts" Pratt (2014) recognized several additional lithologies which are described in detail below and shown in figure 7.2.

7.2.1. Stratigraphy

The stratigraphic units observed in the El Roble license area are described from oldest to youngest below.

Basalts (Kv). The mafic volcanic rock unit consists of massive- to pillowed basalts, with minor hyaloclastites and hyalotuffs. The pillows have chilled, amygdaloidal margins and breadcrust-type fracturing and display excellent variolitic texture in places, typical of quenched, rapidly cooled lava. The pillow margins are dark green and glassy and frequently remarkably unaltered (e.g. in drill hole ATDHR 09). This glassy pillow margins and hyaloclastites became the locus for later shearing; it is common to see sinuous, anastomosing shear zones focused in the glass between pillows. Limestones and cherts are intercalated with the pillow lavas and seem to increase upwards. The basalt section is intruded by large volumes of younger tertiary andesite dykes which may be difficult to distinguish from basalt under field conditions.

Chert (CHE). This unit consists of black graphitic cherts, with thin, intercalated limestones beds locally bleached white by contact metamorphism from andesite dykes. The contact with underlying basalt unit is generally tectonised.

Mudstone (MST). The Mudstone unit consists of black laminated, to massive mudstone with some pyrite-rich layers. It also contains a few black chert layers. It is well preserved in drill holes ATMEI 019 and 21.

Nodular chert (NOD). Unusual light grey nodular cherts, with interbedded mudstones/siltstones, occur above the Mudstone unit (Figure 7.2). The rock consists of chert nodules and black, organic-rich mudstones with abundant pyrite and graphite. The nodular chert commonly breaks up during drilling because of the contrast between hard chert nodules and soft graphitic mudstone; it is therefore easily overlooked or under-reported. Drill holes ATDHR 20 and ATMEI 21 show the best intersections.

Laminated chert (LAM). A very distinctive chert, approximately 1-m thickness, occurs between the basalt and massive sulfide. It has a distinct zebra-type black and white banding. The best examples were observed inin drill hole ATDHR 32.

Dolomitic limestone (DOL). The massive sulphide is underlain in some drill holes by a massive dolomite (± quartz) rock. Frequently with a brecciated appearance, it is widely overprinted by massive or semi-massive sulphide (Pratt & Ponce, 2014). There are two possible explanations for the origin of this rock. Firstly, it was originally a massive limestone, part of the stratigraphic sequence. Limestones and calcarenites are common above the massive sulphide, so the existence of a more massive limestone is not unexpected. The second possibility is that the dolomite rock is entirely hydrothermal.

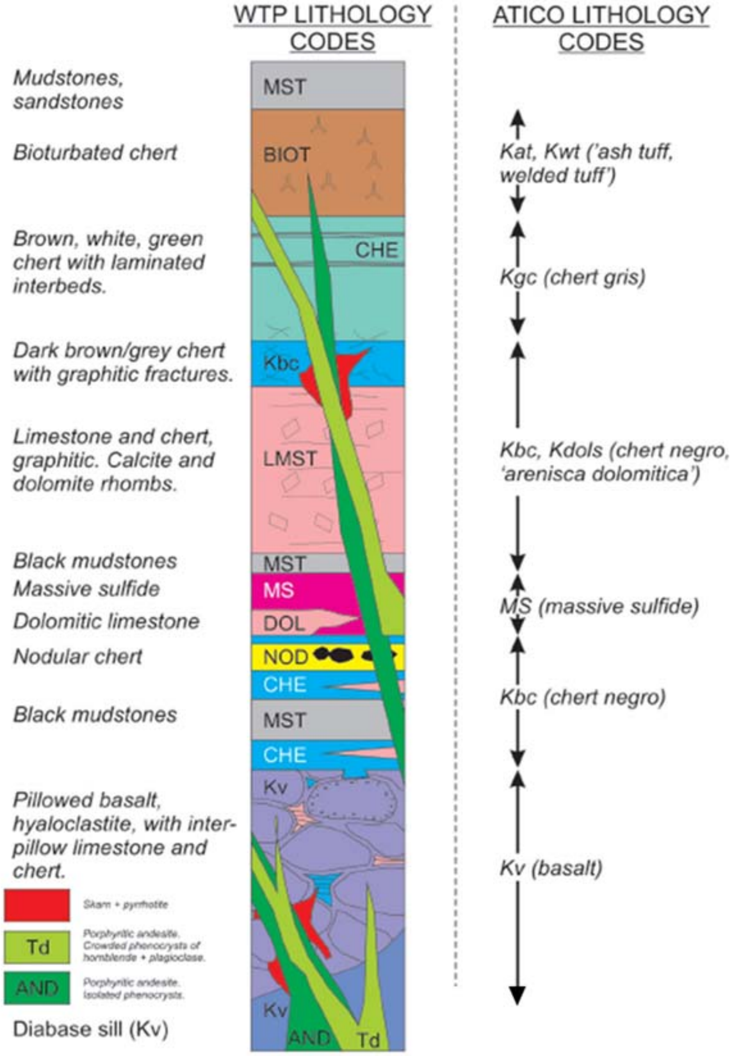
Massive sulphide (MS). The next stratigraphic unit is the massive sulphide, which consists of both massive and semi-massive sulphide. It is described in detail in Pratt & Ponce (2014), who interpret that it mostly replaces limestones.

Mudstone (MST). The top contact of the massive sulphide is well preserved in drill hole ATDHR 23, where it appears less tectonised than in other holes. The top 0.1-m of the massive sulphide comprises crudely banded pyrite. The top 20-mm is a coarse litharenite, partly replaced by pyrite. It is overlain by about 0.5-m (true thickness) of thinly bedded, pyrite black mudstone with pale, sericite-altered beds of fine sandstone. It is not clear if the sulphides represent direct exhalation onto the seafloor or replacement. These mudstones are very similar to the mudstones below the massive sulphide and because of this both have the same lithology code.

Limestones and cherts (LMST). This unit consists of very graphitic, sooty limestones and cherts. The limestones are commonly laminated and overprinted by calcite/dolomite rhombs. (These rhombic limestones are described as 'dolomitic sandstones' by ATICO geologists.) This unit is probably directly equivalent to the 'chert negro' (Kbc) of ATICO. The limestones disappear upwards and pass into black graphitic cherts (CHE). The black cherts become paler upwards. The contact is therefore transitional and slightly subjective. The rocks pass up first into dark brownish to light grey cherts with abundant black graphitic fractures, then they pass into very distinctive brown, cream and light green cherts. These are distinguished by massive chert beds, about 50 – 100-mm thickness, with narrow beds or partings of finely laminated chert.

Bioturbated chert (BIOT). The cherty lithologies pass upwards into a distinctive unit of bedded brown bioturbated chert. This unit is seen in the top of drill holes ATDHR 25 and 29, near the Transformador mineralized body. This is not the main bioturbated chert unit, which occurs much higher in the stratigraphy (Pratt & Ponce, 2014). The upper part of the stratigraphy, and the andesite dykes are more completely described in Pratt & Ponce (2014).

Figure 7.2 Stratigraphic Schemes and Lithology Codes (Pratt, 2014)

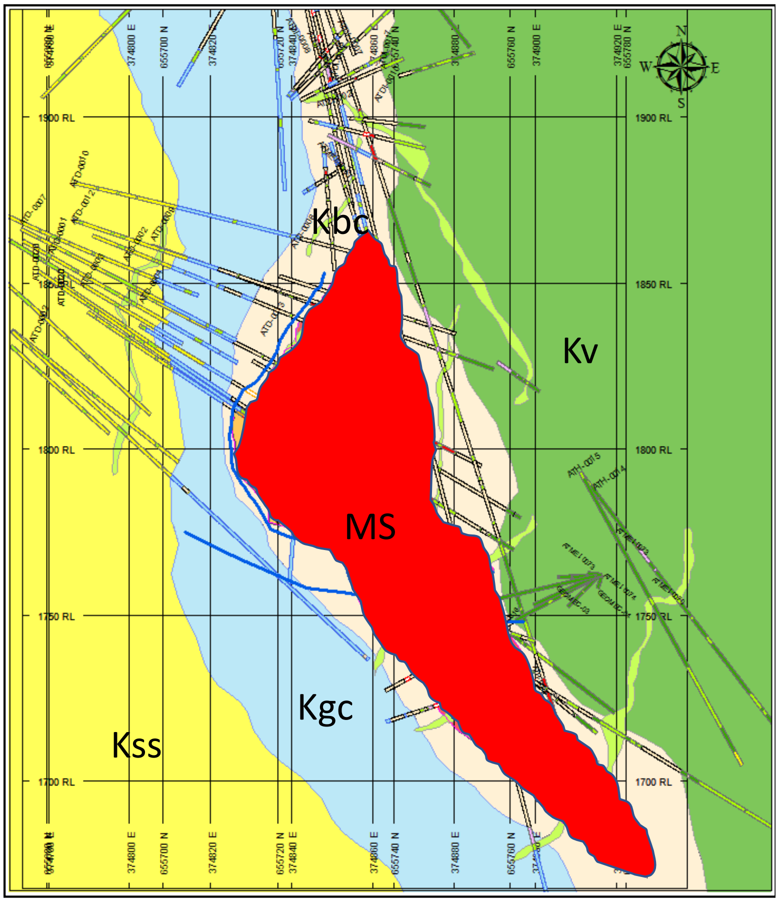


7.3. Mineralization

The El Roble deposit consists a series of massive sulfide lenses, separated by faulting and are the dismembered fragments of once coherent, single, massive sulphide body. The mineral deposit that comprises the El Roble Project consists of mafic-type volcanogenic massive sulfide (VMS) mineralization for which there are numerous examples in the world. The host rocks for the VMS mineralization present on the MINER El Roble mineral concessions consist of basalt flows, black to grey chert and overlying deep-water sedimentary rocks, and sandstone. The deposition of the VMS mineralization is syngenetic with the black chert, which generally forms both the hanging wall and footwall "host" to the mineralization. The portion of the El Roble deposit currently being mined by MINER has been overturned by folding such that it now dips steeply to the east. Based on the drill hole data provided by MINER as of the effective date of this amended Technical Report, the dimensions of the deposit currently are 325 meters along strike by ±600 meters deep and up to 45 meters in thickness. Continuity of the mineralization is locally disrupted by Tertiary andesite and latite dikes up to 10 meters in width that intrude both the VMS mineralization and the host rocks. Strands of one of the major regional northwest-striking faults have resulted in conjugate N-S, E-W NW-SE faults offset the mineralization particularly below the 2100 level of the mine.

The massive sulfide mineralization is fine-grained, with only locally evident internal structure or banding, consisting predominantly of fine-grained pyrite and chalcopyrite (Figure 7.3). Pyrite occurs as euhedral and subhedral grains that vary from 0.04 to 0.01 millimeters in diameter. Colloform pyrite textures and crushed pyrite grains are also common. Chalcopyrite typically fills spaces between pyrite grains, along with minor pyrrhotite and sphalerite, no other sulphide minerals have been identified. Gold occurs as electrum in 10- to 100-micron irregular grains in the spaces between pyrite grains. Minor silver is also present, presumably as a component of the electrum. Gangue minerals include quartz and chlorite along with lesser calcite, dolomite and minor hematite and magnetite.

Figure 7.3 Schematic Cross Section of the Zeus body, El Roble Deposit



🟨 Kss – Sediments

🟦 Kgc – Gray Chert

🟥 MS– Massive Sulphide

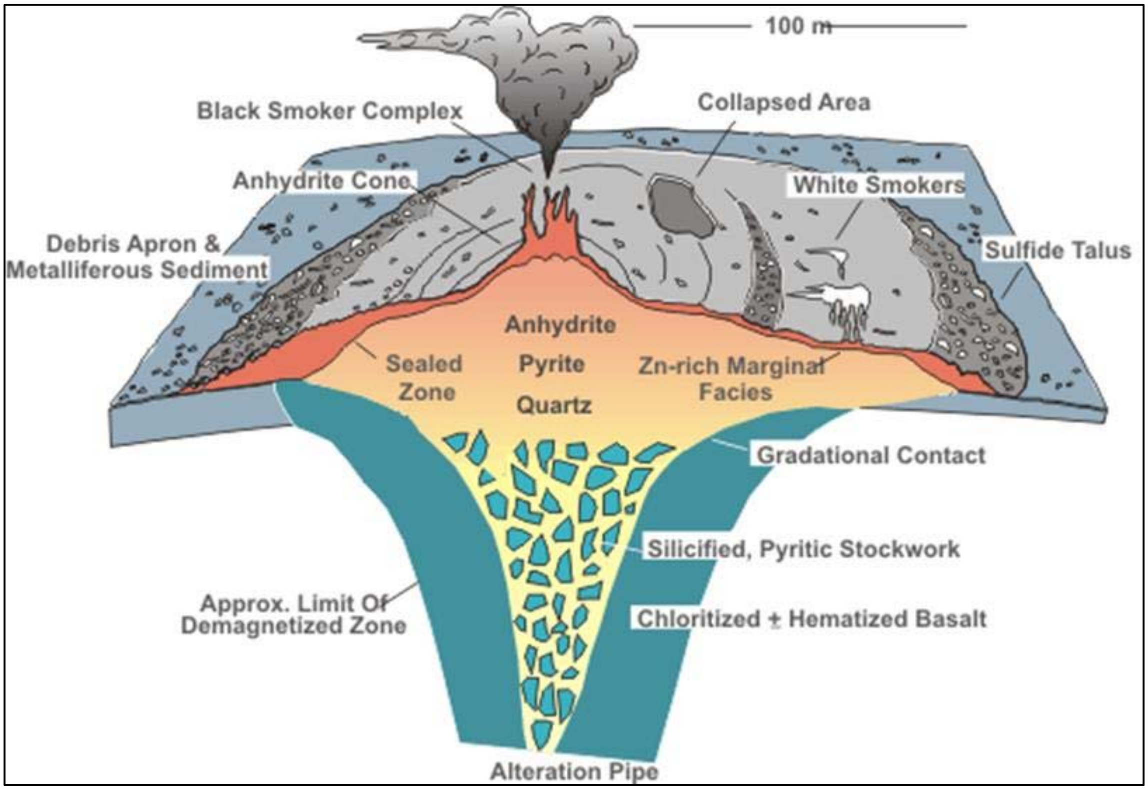
🟧 KBc – Black Chert

🟩 Kv - Basalt

8. Deposit Types

Volcanogenic massive sulphide deposits are defined by Franklin et al., (2005) as “stratabound accumulations of sulphide minerals that precipitated at or near the sea floor in spatial, temporal and genetic association with contemporaneous volcanism.” The El Roble massive sulfide mineralization is classified as the ‘mafic-type volcanogenic massive sulphide type’ These deposits are typified by their association with submarine mafic volcanic rocks, predominantly tholeiite basalts with lesser sedimentary rocks, including chert. Figure 8.1 is a schematic cross section through a VMS deposit taken from Galley et al., 2011.

Figure 8.1 Schematic Cross Section of a VMS Deposit



9. Exploration

Exploration activity at El Roble mine and surroundings dates back to the 1980s, moving gradually from drilling studies, surface mapping, geochemical sampling and geophysical survey, to underground exploration drilling by ATICO beginning in 2012. The exploration programs prior to 2016 are summarized in Technical Report 2016 and Technical Report 2012.

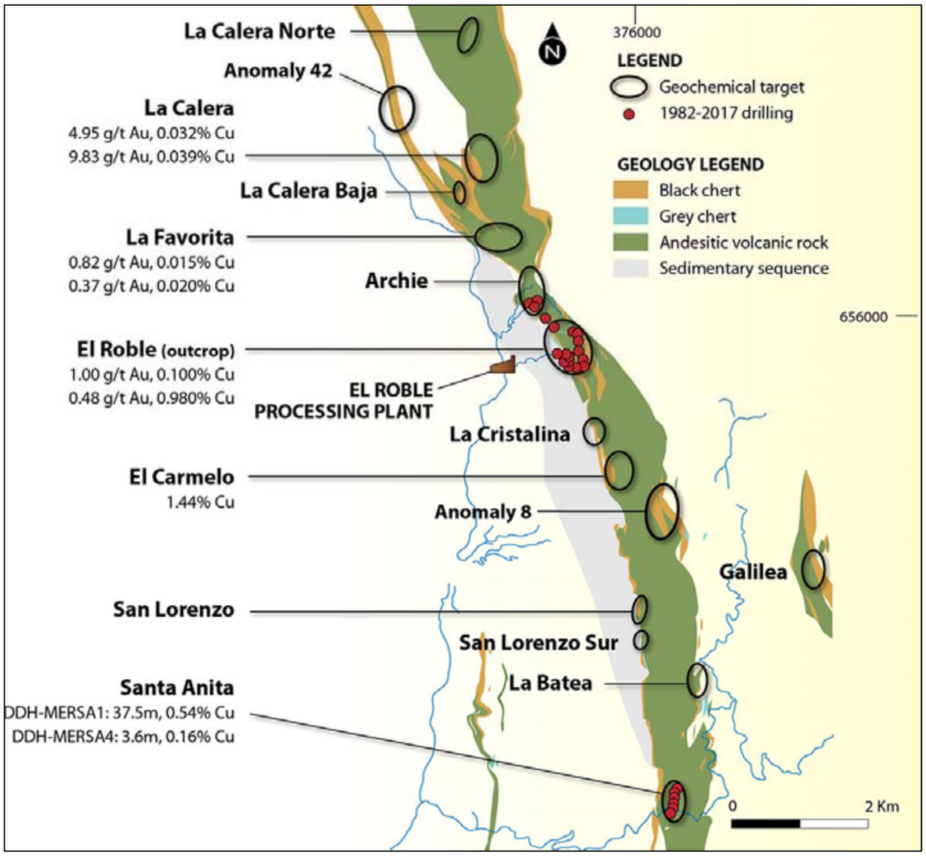
As of June 2018, ATICO's exploration programs are directed at brownfields exploration within and immediately around the El Roble mine. Greenfields exploration covers all activity beyond the mine area and within the El Roble license area. Table 9.1 shows exploration work completed between 2016 and June 2018.

Table 9.1 Exploration Work Completed on MINER Concession 2016-2018

Year	Exploration Work	Brownfields*	Greenfields**
2016	Drilling (meters)	4989.5	
	Soil/Rock geochemistry (number of samples)		146 Rock Samples
	Geophysics(Mag, VTEM, IP, SP)		No Geophysics
	Mapping		No Detailed Mapping
2017	Drilling (meters)	11764.6	
	Soil/Rock geochemistry (number of samples)		184 Rock Samples and 42 Soil Samples
	Geophysics(Mag, VTEM, IP, SP)	IPDAS - 9300 readings-Archie Loop	
	Mapping		1:2000 La Calera Area – Anomaly 28 Target
2018	Drilling (meters)	16995.2	
	Soil/Rock geochemistry (number of samples)		21 Rock Samples
	Geophysics(Mag, VTEM, IP, SP)	IPDAS - 9300 readings-Estrella Loop	
	Mapping		1:2000 La Favorita Area – Gorgonia Target

Brownfield exploration around the mine is continuing since Janurary 2018 with a 5,000-m drill program to investigate the black chert - basalt contact horizon down plunge and below the Zeus lens. Greenfield exploration is ongoing, in the Archie area (northeast of the El Roble mine) with drilling to follow up geochemical and geophysical anomalies from earlier exploration campaigns and to investigate small massive sulphides occurrences drilled by MINER in 2005-2006. Figure 9.1 shows all greenfield exploration prospects in the concession area as well as the El Roble mine.

Figure 9.1 Map of Exploration Targets on MINER Concessions



10. Drilling

Table 10.1 summarizes the El Roble drill hole and channel sample data, company, and year. Between 2011 and 2013, ATICO carried out exploration drilling for mineralization at depth below the then existing workings and MINER drilled in operational sectors of the mine. After ATICO acquired MINER in late 2013, and from 2014 onward, all drilling and channel sampling has been directed and supervised by ATICO and executed by MINER. Since 2016, all drilling on the El Roble license area and within the mine has been executed and/or supervised by in-house ATICO crews. Drilling prior to 2016 is summarized in 2012 and 2016 technical reports.

Table 10.1 Summary of El Roble Drill Hole and Channel sample Data by Type, Company, and Year

Year	Surface Core Drill Holess			Underground Core Drill Holes			Underground Channel Sampling		
	Company	No. Holes	Meters	Company	No. Holes	Meters	Company	No. Holes	Meters
2010	MINER	3	724.0	MINER	5	393.0			
2011	ATICO	2	611.0	MINER	19	1114.0			
2012				ATICO	27	4816.0			
				MINER	14	931.0			
2013	ATICO	5	1801.9	ATICO	54	6662.0			
				MINER	3	137.0			
2014				MINER	57	5024.0	MINER	316	1,090
2015				MINER	46	7233.0	MINER	236	1,296
2016	MINER	7	1807.7	MINER	20	3181.8	MINER	319	2,298
2017	MINER	24	4619.7	MINER	17	2154.6	MINER	578	3,056
2018	MINER	16	4706.4	MINER	7	2893.3	MINER	208	989
Total		57	14,271		269	34,539.70		1657	8,729

MINER drilled approximately 164 underground diamond core boreholes between 1998 and 2010 (Smith G., and Pohl, D., 2012). Many of these boreholes were used for the development and mining of massive sulfide material between the 2,100 and 2,000 levels of the operating mine. Most of this core was BQ- or AX- diameter in size.

Since late 2012, MINER's underground core drilling programs collected primarily HQ- and NQ-diameter core. During the drilling process, core is removed from the core barrels and carefully transferred directly into very sturdy, weather-resistant and termite proof core boxes. Each core box is clearly labelled with the borehole number, from-to interval drilled, and box number.

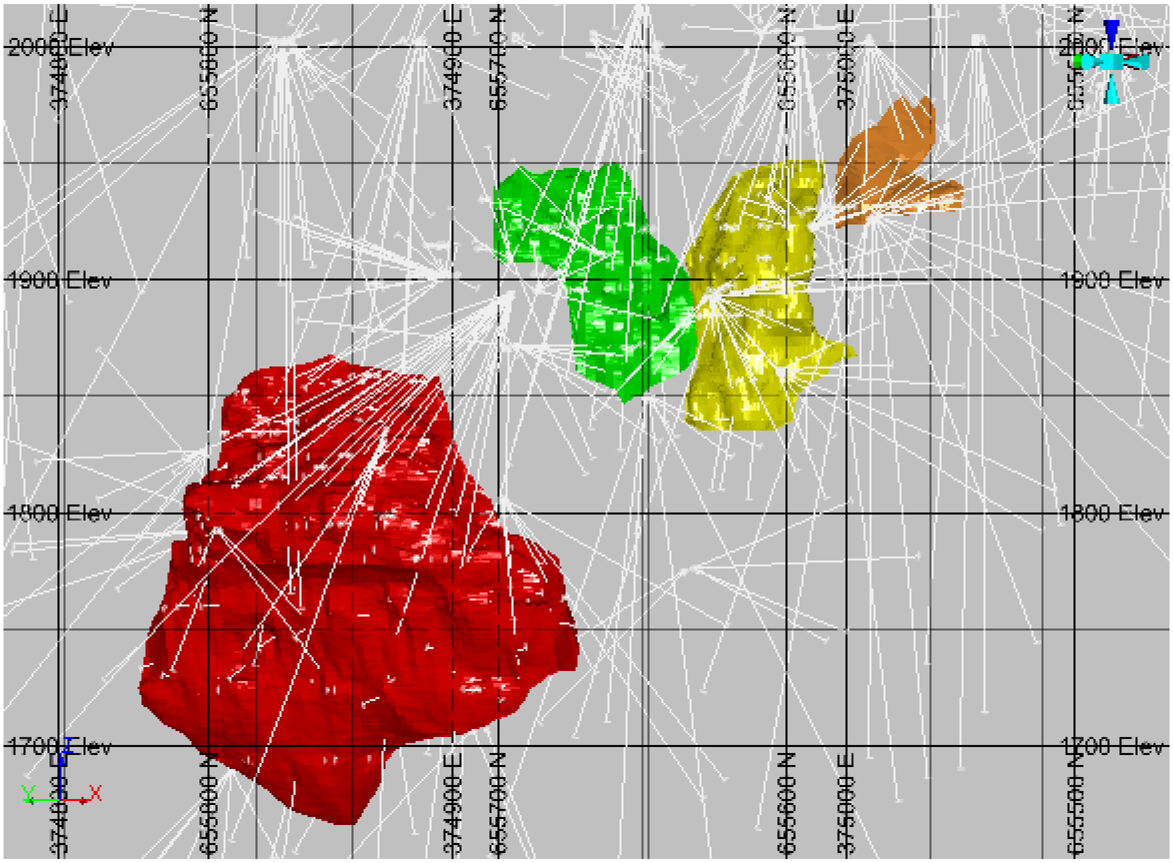
The drillers routinely insert sturdy plastic run blocks in the core boxes at the end of each drilling run that are clearly labelled on top with the down-hole distance in meters in red permanent marker, as well as the beginning and ending hole depth in meters of the drill run, the total meters drilled, and the total meters of core recovered on one side of the run block. The boxes of core are then transported by MINER personnel directly to the core storage warehouse where the dividers in each box are clearly labelled with the borehole number, box number, down-hole meter markers (whole meters and tenth meters), and arrows indicating down-hole direction. Coloured dowels were also inserted in the boxes to indicate sample breaks (from and to) for the technicians responsible for cutting the core for sampling. Samples are collected at intervals that do not exceed 2.5 meters in mineralized core or 10 meters in non-mineralized core.

Based on the drillhole dataset, downhole surveys of the drillholes were collected every 50-m; however, there is no other documentation relating to the survey type or procedures.

After underground core boreholes were completed, white PVC pipes oriented at the azimuths and inclinations that the holes were drilled were installed in the drill hole collars and 0.3- by 0.4-m concrete pads were poured around the PVC collar pipes to monument the hole collars.

Figure 10.1 summarizes the El Roble underground drill hole distribution.

Figure 10.1 Map Showing the Distribution of Drilling



Underground Channel Sampling

MINER routinely collects channel samples during mine development in support of active mining operations. Electric chisels are used to chip out approximately 1-m long samples from approximately a 10-cm by 2- 3-cm slot that can range between 0.25- and 1.50-m in length depending on geologic conditions. These samples are typically collected along the left and right ribs of cross-cuts and drives through the sulfide mineralization.

10.1. Drill Core Recovery

In general, core recovery within the massive sulphide zones was very good. Poor core recoveries with significant core or sample loss are typically associated with hangingwall/footwall contacts of the VMS bodies, narrow structural zones within the mineralized bodies and along latite dyke contacts with other lithologies. Two percent of the MINER drilling data had less than 75 percent of core recovery, 16% of the data had core recoveries in the range of 75 to 95 percent with 82% of the data above 95% recovery.

10.2. True Thickness

Many of the earlier (pre-2014) El Roble drill holes intersect the massive sulphide lenses at steep angles due to a lack of drilling platforms which would allow for more favourable drill hole - mineralization intersection geometries. The drill intersection geometry has been improved with the completion in 2013 of the 1880 adit which allowed drill holes to intersect the steeply plunging massive sulphide zones higher angles to the strike and dip of the VMS pods, thus permitting more accurate determinations of mineralized thickness (true width) and of mineralization continuity. Certain drill intersections (pre-2014) reported are possibly exaggerated because the hole did not cross the mineralized zone along an optimal vector.

11. Sample Preparation, Analyses, and Security

11.1. Sample Preparation and Analyses

11.1.1. Channel Sample Preparation Prior to Dispatch of Samples

The channel samples (chip) are taken from the exposed walls or backs of stopes of the underground workings, mainly from active stopes. The process is under the direct supervision of the mine geology department. The location of each channel is determined from an underground mapping program carried out by geologists. The procedure includes surveyed underground reference points and the sample distance relative to the neareast survey point. The channels are taken at 1.5 meters height from the working floor and sampled horizontally.

The channel sample is nominally 20-cm wide and 2-cm deep. Each channel sample is nominally 0.5-m to 2-m long. Before undertaking the sampling, the stope is washed to observe the mineralization. The sampling is performed using a sledge hammer and a chisel with the cuttings falling onto a clean sheet of plastic or a clean tarp.

Later, the samples are inserted in a polyethylene bag and coded with a control card and sealed for dispatching. Once they are bagged, they are dispatched to surface and control samples are added to the batch before sending them to the MINER laboratory.

11.1.2. Core Handling and Sample Preparation Prior to Dispatch of Samples from the Mine

Drill core is delivered twice a day from the underground drill rigs to the core logging/processing facility, located just down slope from the 1880 Adit portal. The core is washed, photographed, logged for lithology, alteration, mineralization, and geotechnical attributes including RQD (Rock Quality Designation) and core recovery. Logged attributes are entered into Power Builder®, which is a commercial drill hole logging software package.

A mine geologist determines the sections of the core to sampled and marks them on the core. Samples are selected based on lithology and/or mineralization. The minimum sample length is typically 0.5-m with a maximum length of 2-m. The average sample length of the underground core samples is approximately 1.49-m. Samplers remove the marked sections of core from the core box after noting its orientation in the box and split the core along the long axis of the core using a diamond saw. One half of the core is replaced in the core boxe in its original orientation and the other half is broken into pieces that can comfortably fit in a plastic sample bag. The broken half-core is then sealed in a thick-walled polyethylene bag with a sample number ticket and the bags are labelled with the sample number

Geologists determine where to dispatch the samples regarding the analysis type; infill drill cores are dispatched to SGS or MINER laboratories while exploratory drill cores are dispatched to ALS Chemex or SGS.

11.1.3. Off-Site Laboratory Sample Preparation Procedures

Core and channels are prepared and analysed by two laboratories, ALS Chemex Laboratories (Medellin and Lima – ISO 9001:2008 and ISO 17025-), and SGS Laboratories (Medellin-ISO 9001:2008) and MINER laboratory (mine site). ALS is MINER's primary laboratory for the preparation and analysis of drill core samples. SGS is the secondary laboratory for overflow work and also serves as a check assay laboratory. Since the end of 2014, MINER has been operating the El Roble mine assay laboratory primarily analysing underground channel samples and three, daily, mill-head samples. Numerous check samples from the El Roble mine lab have been sent to SGS for QA/QC purposes. No serious discrepancies have been found.

11.1.4. ALS Chemex Sample Preparation

The majority of the drill hole assays that were used to estimate Mineral Resources were prepared and assayed by ALS. The samples were shipped from the El Roble project site via MINER staff in company trucks and delivered to the ALS Chemex laboratory located in Medellin, Colombia where the samples were crushed and pulverized. The prepared pulps were then shipped to the ALS Chemex laboratory in Lima, Peru.

The drill core that is received by ALS (Medellin) is logged and then dried, crushed, split, and pulverized using Chemex's DRY-22, CRU-31, SPL-21, and PUL-31 protocols, respectively. The samples are dried in large ovens with a maximum temperature of 60° C. The samples are then fine crushed (CRU-31) to a nominal 70 percent passing through a 2 milometers screen. Chemex routinely cleans the crushing equipment with compressed air (between each sample), and with barren material between each batch (WSH-21 protocol). The crushed material is then passed through a riffle splitter (SPL-21 protocol) to produce a nominal 250 grams sub-sample. The sub-sample is then pulverized (PUL-31protocol) with a ring and puck pulveriser that results in 85 percent of the sample passing 85 microns. Chemex routinely cleans the pulverizing equipment with compressed air or by vacuuming between each sample and by using barren material between sample batches (WSH-22 protocol).

11.1.5. ALS Chemex Sample Analyses

After samples preparation by ALS Medellin, Colombia, the pulps are shipped to the ALS Lima, Peru, where the samples were analysed for a variety of metals using five separate ALS protocols. Copper, silver, and zinc were analysed by protocol AA62, which uses a four-acid digestion followed by atomic absorption spectrometry (AAS). The digestion acids are HNO3, HCl, HF, and H2SO4. This method requires a minimum sample weight of 0.5-g. Protocol AA62 has a detection range of 0.001 to 50 percent for copper, 1 to 1500 ppm for silver, and 0.001 to 30 percent for zinc.

Gold was analysed by two different ALS protocols (Au-ICP22 and Au-GRA22). Gold was initially analysed by Induced Coupled Plasma (ICP) followed by atomic emission spectrometry (AES). This method requires a 50-grams charge. The Au-ICP22 has a detection limit of 0.001-ppm with an over-limit level of 10-ppm. Samples above a 10-ppm limit were re-analysed by protocol Au-GRA22, which is a fire assay with a gravimetric finish. A 50-g nominal sample charge weight is required for this procedure, which has an over-limit value of 1,000-ppm. Preference was given to gold assays analysed by fire assay with a gravimetric finish.

Trace elements were analysed using protocol ME-MS61, which is a 48-element procedure featuring ICP methods with a mass spectrometer (MS) analysis that uses four acids to digest the sample.

Trace mercury was tested for using protocol Hg-CV41, where the sample was digested with aqua-regia and the cold vapor analysed by AES methods.

11.1.6. SGS Sample Preparation

Drill core, underground channel samples, and previously prepared pulps are shipped by MINER's geologic staff to the SGS laboratory (Medellin). Those samples are weighed and logged into a Laboratory Information Management System (LIMS). The samples are then dried, crushed, split, and pulverized using SGS's PRP91 prep package. Drying is completed in large ovens at temperatures ranging between 60° and 100° C for approximately four to five hours. The samples are then crushed to a nominal 75 percent passing through a 2-mm screen. SGS routinely cleans the crushing equipment with compressed air (between each sample), and with barren material between each batch. Then, this crushed material is passed through a riffle splitter to produce a nominal 500-g sub-sample. The sub-sample is then pulverized with a ring and puck pulveriser that results in 85 percent of the sample passing 75 microns. SGS routinely cleans the pulverizing equipment with compressed air or by vacuuming between each sample and using barren material between sample batches.

11.1.7. SGS Sample Analyses

Samples were analysed by SGS in Medellin using several different methods. Gold was analysed by SGS using their AA515 protocol, which consists of a 50-g fire assay with atomic absorption spectrometry (AAS) finish. The limit of detection for this method ranges between 5- and 10,000-ppb. Samples greater than the AA515 detection limit were re-analysed using SGS protocol FAG505 which is a 50-g fire assay with a gravimetric finish. Copper, base metals, and other trace metals were analysed using either ICP40B or AAS42S protocols. The ICP40B consists of a four-acid digestion of the sample media followed by ICP-AES analysis. The four acids used by SGS include nitric, hydrofluoric, perchloric, and hydrochloric. Over-limit copper and silver samples were re-analysed using the AAS42S protocol which consists of a four-acid digestion followed by AAS analysis. MINER also created a custom SGS package for analysing high-grade silver, copper, and zinc samples using a four-acid digestion followed by AAS analysis.

11.1.8. El Roble Mine Laboratory - Sample Preparation

Samples are delivered to the El Roble mine laboratory by MINER staff. The samples are dried at approximately 105°C for about four hours, if the samples are not completely dried, they are send back to the oven for 30 more minutes. The dried samples are then processed through a jaw crusher to produce material passing a 10-mesh (about 2-mm). The jaw crusher is cleaned between every sample by processing barren quartz rock material and through the use of compressed air. The crushed sample material is passed through a riffle splitter several times to produce a sub-sample in the range of 250- to 500-g. That sub-sample is then further reduced in size by a ring and puck pulveriser which produces a 200-mesh product. The pulveriser is also cleaned between samples with quartz sand and compressed air.

11.1.9. El Roble Mine Laboratory Sample Analyses

Gold are analysed by fire assay methods (aqua regia digestion and AAS finish) using 30-g charges. Copper are assayed using a two-acid digestion (nitric and hydrochloric) followed by atomic absorption. The AA machine is calibrated between each sample with one of five standards.

11.1.10. Sample Security

MINER's drill core samples were always in the control of company personnel in sealed, heavy wall plastic bags while at the project site or during transportation to the ALS Chemex and SGS facilities located in Medellin.

The geology department keeps the custody of the channel and drill core pulps. These are stored in sealed plastic bags in a warehouse located 300-m from the MINER laboratory. The reject samples are stored in a separate warehouse located at the surface apron on the 2000 Level, 200 meters from the main adit of the extraction zones (approximate elevation of 2,000 to 2,050 masl).

The pulps of the drill cores undertaken around the operation are under the custody of the exploration department within the core shack zone, located 500 meters from the tailings storage facility.

All samples are retained according to the corporate policy to retain samples (Sample Retention Manual, ATICO Mining).

11.2. Specific Gravity Data

Specific gravity samples have been sourced from drill core and channels and have been tested by various laboratories; the analyses are detailed in Table 11.1.

Table 11.1 Density Analyses

	Mineralized Body	No of Samples	Mean (t/m3)	Minimum (t/m3)	Maximum (t/m3)	Variance (t/m3)
ALS	Goliat	33	3.49	2.59	4.3	0.24
	Maximus	83	3.6	2.62	4.72	0.28
	Maximus Sur	3	3.25	2.65	3.59	0.27
	Zeus	277	3.52	2.53	4.86	0.3
SGS	Zeus	43	3.59	1.08	4.49	0.48
Miner	Goliat	86	3.28	2.32	4.24	0.22
	Maximus	178	3.45	1.44	4.65	0.27
	Maximus Sur	26	3.26	2.44	4.56	0.38
	Zeus	1,580	3.44	2.07	5.56	0.276

ALS Chemex laboratory use the OAGRA09 methodology. This test consists of coating the core sample in paraffin wax, measuring the sample weight in air then suspending the sample in water and measuring the weight again. The density is calculated using the following equation:

$$Density = \frac{A}{B - C - \left((B - A)/Dwax\right)} \times Density\ of\ water\ at\ temperature\ (°C)$$

Where:

A = weight of sample in air

B = weight of waxed sample in air

C = weight of waxed sample suspended in water

D = density of wax

MINER’s staff follow the sample procedure manual and take the a measurement of dry weight followed by suspending the same sample in water to measure the volume. The density is calculated using the following equation:

$$Density = \frac{A}{V}$$

Where:

A = weight of sample in air

V = volume of water displaced by the sample

11.3. Quality Assurance and Quality Control Programs

MINER has implemented a quality assurance/quality control (QAQC) program which complies with current industry best practices and involves establishing appropriate procedures and the routine insertion of certified reference materials, blanks, and duplicates to monitor the sampling, sample preparation and analytical processes since 2013.

MINER routinely submitted quality assurance/quality control (QAQC) samples with the drill hole samples that were sent to ALS and SGS. The control samples that were submitted to analysed, are delivered to MINER, ALS and SGS laboratories.

MINER laboratory carries out the analysis of underground channels samples and uses as part of the internal control reference material generated in ACTLABS COLOMBIA S.A.S. based the El Roble’s material.

11.3.1. Verifications of Analytical Quality Control Data

The El Roble mine has historical data and information through 2018, the present QA/QC program was implemented in 2014 and has been maintained to date. The number of samples and controls submitted is provided in Table 11.2.

Table 11.2 Summary of Analytical Quality Control Data Produced by El Roble

		DDH	Channel
		Until 2018 Total	Until 2018 Total
Blank		480	621
	Blank coarse	480	621
Duplicate		942	2767
	Field	234	758
	Fine	320	1033
	Coarse	388	976
Standard Reference Material		350	491
	Oreas_110	43	-
	Oreas_113	92	131
	Oreas_600	42	23
	Oreas_602	5	96
	Oreas_603	-	67
	Oreas_605	5	97
	Oreas_623	-	55
	Oreas_66ª	112	1
	Oreas_68ª	51	21
	CM-1	-	26
Total QC Samples		1,772	3,879

Table 11.3 shows the submission rate of quality control samples for El Roble mine since 2013 to June 30, 2018.

Table 11.3 Submission Rate for Control Samples

Sample Type	Quality Control	2013- June 30, 2018		
		Total Samples Analyzed	No. of Control	Submission Rate (%)
Core Drill	SRM1	5841	357	6.1%
	Blanks2	5841	480	8.2%
	Field Duplicates3	5841	234	4.0%
	Reject assays4	5841	388	6.6%
	Check assays5	5841	320	5.5%
Channel	SRM1	8664	491	5.7%
	Blanks2	8664	621	7.2%
	Field Duplicates3	8664	758	8.7%
	Reject assays4	8664	976	11.3%
	Check assays5	8664	1033	11.9%

1. Standard references material, 2. Field blanks, 3. Field duplicate, 4. Duplicate coarse and 5. Duplicate fine.

11.3.2. Standard Reference Material Performance

Standard reference material (SRM) are samples that are used to measure the accuracy of analytical processes. They are composed of material that has been thoroughly analysed to accurately determine its grade within known error limits. SRMs were inserted by technicians trained in quality control procedures.

MINER purchased nine certified standard reference materials (SRM's) from Ore Research & Exploration Pty. Ltd (Oreas). Five SRM's were for the analysis of the drill core samples and eight were for analysis of the channel samples.

The samples were routinely submitted with drill core samples and pulps/rejects that were sent to ALS, SGS and MINER laboratories.

Into the database, 5,841 core drilling samples with 357 standards (a submission rate of 1 in 16 samples) were submitted from 2012 to June 30, 2018, and 8,664 channel samples with 491 standards (a submission rate of 1 in 18 samples) were submitted between 2013 and 2018.

The grade characteristics of the nine different SRM’s used since 2013 in the El Roble mine site, and the assaying methodology used are detailed in Table 11.4.

Table 11.4 Standard Reference Materials Inserted by ATICO for the El Roble Mine (MINER, SGS and ALS laboratories).

Standard	Level	Method	Cu (%)		Method	Au (ppm)	
			Certified value	Std Dev		Certified value	Std Dev
Oreas_66a	Low	INNA	0.0121	0.007	INAA	1.237	0.054
Oreas_68a	Low	INNA	0.0392	0.0015	INAA	3.89	0.15
Oreas_600	Low	Four acid digestion (AAS, ICP-MS or ICP-OES)	0.0482	0.00226	Fire assay (AAS or ICP-OES)	0.2	0.006
Oreas_110	Medium	Four acid digestion (AAS, ICP-MS or ICP-OES)	0.162	0.006	n/a	n/a	n/a
Oreas_602	Medium	Four acid digestion (AAS, ICP-MS or ICP-OES)	0.515	0.017	Fire assay (AAS or ICP-OES)	1.95	0.066
Oreas_603	High	Four acid digestion (AAS, ICP-MS or ICP-OES)	1	0.034	Fire assay (AAS or ICP-OES)	5.18	0.151
Oreas_623	High	Four acid digestion (AAS, ICP-MS or ICP-OES)	1.73	0.064	Fire assay (AAS or ICP-OES)	0.827	0.039
Oreas_605	High	Four acid digestion (AAS, ICP-MS or ICP-OES)	5.02	0.152	Fire assay (AAS or ICP-OES)	1.67	0.086
Oreas_113	High	Four acid digestion (AAS, ICP-MS or ICP-OES)	13.5	0.4	n/a	n/a	n/a

Results submitted for the standard SRM core drilling samples are detailed in Table 11.5.

Table 11.5 Results for Standards Inserted with Core Drilling Samples

Laboratory	Metal	Standard	N° Submitted	N° Fails	Pass % #
MINER	Au (ppm)	Oreas_66a	18	0	100
		Oreas_68a	8	0	100
		Total	26	0	100
	Cu (%)	Oras_110	8	0	100
		Oreas_113	23	0	100
		Oreas_66a	5	0	100
		Oreas_68a	8	0	100
		Total	44	0	100
SGS	Au (ppm)	Oreas_66a	18	0	100
		Oreas_68a	8	0	100
		Total	26	0	100
	Cu (%)	Oras_110	8	0	100
		Oreas_113	23	0	100
		Oreas_66a	5	0	100
		Oreas_68a	8	0	100
		Total	44	0	100
ALS	Au (ppm)	Oreas_600	32	0	100
		Oreas_66a	93	0	100
		Oreas_68a	40	0	100
		Total	165	0	100
	Cu (%)	Oreas_110	36	0	100
		Oreas_113	64	1	98
		Oreas_600	34	0	100
		Oreas_66a	91	1	99
		Oreas_68a	43	0	100
		Total	268	2	99

Table 11.6 shows results of standards inserted with channel samples.

Table 11.6 Results for Standards Inserted with Channel Samples

Laboratory	Metal	Standard	N° Submitted	N° Fails	Pass % #
MINER	Au (ppm)	Oreas_600	25	15	40
		Oreas_602	98	1	99
		Oreas_603	65	4	94
		Oreas_605	96	0	100
		Oreas_623	55	1	98
		Oreas_66a	1	0	100
		Oreas_68a	20	2	90
		Total	360	23	94
	Cu (%)	Oreas_113	131	2	98
		Oreas_600	25	1	96
		Oreas_602	98	2	98
		Oreas_603	65	0	100
		Oreas_605	96	1	99
		Oreas_623	55	0	100
		Oreas_66a	1	0	100
		Oreas_68a	20	1	95
		Total	491	7	99
SGS	Au (ppm)	Oreas_602	4	0	100
		Oreas_603	8	0	100
		Oreas_605	6	0	100
		Oreas_623	4	0	100
		Oreas_68a	3	0	100
		Total	25	0	100
	Cu (%)	Oreas_113	14	0	100
		Oreas_602	5	0	100
		Oreas_603	8	0	100
		Oreas_605	8	0	100
		Oreas_623	4	0	100
		Oreas_68a	3	0	100
		Total	42	0	100

Fail being a reported value > +/- 3 standard desviations from SRM Certified value (both tables).

Pass rates reported for standards submitted to MINER's laboratory with core drilling samples for gold is 100 percent and copper is 100 percent; to SGS laboratory, for gold is 100 percent and copper is 100 percent; finally, SRM delivered to ALS laboratory for gold is 100 percent and copper is 99 percent. The accuracy levels for gold and copper can be regarded as acceptable.

Pass rates reported for standards submitted to MINER's laboratory with channel samples for gold is 94 percent and copper is 99 percent, except standard Oreas_600, it has a value of 40 percent and it is beyond acceptable levels. SRM delivered to SGS laboratory for gold is 100 percent and copper is 100 percent. The accuracy levels for gold in the MINER laboratory can be regarded as below acceptable level, in the case of levels for gold (MINER laboratory) and SGS lab (gold and copper) can be regarded as acceptable level.

11.3.3. Blank Performance

Field blank samples are composed of material that is known to contain grades that are less than the detection limit of the analytical method in use. Blank sample analysis is a method of determining sample switching and cross-contamination of samples during the sample preparation or analysis processes.

MINER used commercially prepared blanks consisting of quartz gangue that were purchased from SGS (Medellin). During 2014 and 2015, MINER bought gangue from a local quarry and sent 10 samples of this material to Acme Labs ltd, (Vancouver, BC) to prove the existence of values below the detection limit, after that, this material was used as control sample.

The analysis for blanks inserted with the core drilling samples focuses on the submission of 480 blanks with 5,841 core drilling samples from 2012 to June 30, 2018 (a submission rate of 1 in 12 samples). Results of the blanks submitted indicate that cross contamination and mislabeling are not material issues at the MINER's laboratory. The results show a pass rate greater than 90 percent. However, it is observed contamination problems in copper grade for blank samples delivered to SGS and ALS laboratories, where there are blank samples that are below 90 percent as shown in Table 11.7. This result was discussed in the last technical report (REI, 2016).

Table 11.7 Results for Blanks Inserted with core Drilling Samples

Laboratory	Metal	N°Analyzed (Accumulated Total)	N° Fails	Pass % #
SGS	Au	128	2	98
SGS	Cu (AA)	102	32	69
SGS	Cu (ICP)	26	18	31
ALS	Au	316	5	98
ALS	Cu	316	189	40
MINER	Au	36	0	100
MINER	Cu	36	1	97

The analysis for blanks with channel samples focuses on the submission of 621 blanks with 8,664 channel samples since 2012 to June 30, 2018 (a submission rate of 1 in 14 samples). Results of the blanks submitted indicate that cross contamination and mislabelling are not material issues at the MINER laboratory. The results also show a pass rate greater than 90 percent. However, it is observed that contamination problems have existed at the SGS laboratory (2018) for copper grade as shown Table 11.8.

Table 11.8 Results for Blanks Inserted with Channels Samples

Laboratory	Metal	N° Analysed (Accumulated Total)	N° Fails	Pass % #
SGS	Au	33	2	94
SGS	Cu	51	19	63
MINER	Au	614	1	100
MINER	Cu	621	7	99

11.3.4. Duplicate Performance

The precision of sampling and analytical results can be measured by re-analyzing the same sample using the same methodology. The variance between the original and the duplicate assays is a measure of the assays' precision. Precision is affected by mineralogical factors such as grain size and distribution and inconsistencies in the sample preparation and analysis processes. There are a number of different duplicate sample types which can be used to determine the precision for the entire sampling process, sample preparation, and analytical process.

Numerous plots and graphs are used on a monthly basis to monitor precision and bias levels. A brief description of the plots employed in the analysis of El Roble duplicate data, is described below:

Scatter plot: assesses the degree of scatter of the duplicate result plotted against the original value, which allows for bias characterization and regression calculations.

Ranked half absolute relative difference (HARD) of samples plotted against their rank % value. The HARD is calculated using the following equation:

$$HARD = \frac{(O - D)}{(O + D)}$$

Where

O = value of original sample

D = value of duplicate sample

Duplicates were submitted with channel samples and drill core samples. If both the original and duplicate results returned a value less than two times the detection limit the result was disregarded for the HARD analysis due to distortion in the precision levels at very low grade close to the limits at which the instrumentation can measure. These very low values are not seen as material and can distort more meaningful results if they are not removed.

A description of the different types of duplicates used by ATICO is provided in Table 11.9.

Table 11.9 Duplicate Types Used by MINER

Duplicate	Description
Field	Sample generated by another sampling operation at the same collection point. Includes a second channel or core sample taken in the same place to the first or the second half of channel or core sample and submitted in the same or separate batch to the same (primary) laboratory.
Reject Assay	Second sample obtained from splitting the coarse crushed rock during sample preparation and submitted blind to the same or different laboratory that assayed the original sample.
Duplicate Assay	Second sample obtained from splitting the pulverized material during sample preparation and submitted blind at a later date to the same laboratory that assayed the original pulp.
Check Assay	Second sample obtained from the pulverized material during sample preparation and sent to an umpire laboratory for analysis.

The El Roble mine inserts field duplicates with core drilling samples and channel samples as part of QAQC program. Half absolute relative difference (HARD) results for duplicates of core drill samples used to assess the MINER, SGS and ALS laboratory are displayed in Table 11.10.

Table 11.10 Duplicate Results for Core Drilling Samples

Laboratory	Type of Duplicate	Metal	No. of duplicates analysed	*HARD value at 90th percentile
MINER	Field Duplicate1	Au (ppm)	14	27.5
		Cu (%)	15	23.2
SGS	Field Duplicate1	Au (ppm)	25	52.4
		Cu (%)	26	27
	Check Assay3	Au (ppm)	180	17.7
		Cu (%)	183	13.1
	Reject Assay2	Au (ppm)	97	62
		Cu (%)	97	33.4
ALS	Field Duplicate1	Au (ppm)	189	35.7
		Cu (%)	193	22.9
	Reject Assay2	Au (ppm)	290	24.6
		Cu (%)	291	11
	Check Assay3	Au (ppm)	137	22.2
		Cu (%)	137	8

**HARD = Half Absolute Relative Difference*

1. Acceptable HARD value for field duplicates is < 30%

2. Acceptable HARD value for duplicate coarse is < 20%

3. Acceptable HARD value for duplicate fine is < 10 %

Table 11.11 shows the original and duplicate means for core drilling samples.

Table 11.11 Original and Duplicate Mean for Core Drilling Samples

Laboratory	Type of Duplicate	Metal	Original Mean	Duplicate Mean
MINER	Field Duplicate1	Au (ppm)	1.41	1.46
		Cu (%)	2.41	2.28
SGS	Field Duplicate1	Au (ppm)	1.15	1.48
		Cu (%)	2.35	2.22
	Check Assay3	Au (ppm)	1.65	1.49
		Cu (%)	2.37	2.49
	Reject Assay2	Au (ppm)	3.17	2.96
		Cu (%)	3.92	4.15
ALS	Field Duplicate1	Au (ppm)	1.89	1.53
		Cu (%)	2.18	2.14
	Reject Assay2	Au (ppm)	1.5	1.49
		Cu (%)	1.6	1.53
	Check Assay3	Au (ppm)	2.26	2.26
		Cu (%)	2.71	2.56

Precision levels of core drill sample for field duplicate of MINER laboratory are inside of the acceptable limits. The duplicate samples for SGS laboratory and ALS laboratory (gold) are close of the acceptable limits. It is important to note that there are duplicate samples sent to SGS laboratory (gold) beyond the acceptable limits (62 of HARD value).

Precision levels for field duplicate in the channels samples are inside of the acceptable limit. Duplicate fine results for gold (MINER lab and SGS lab) are slightly out of acceptable limits (Table 11.12).

Table 11.12 Duplicate Results for Channel Samples

Laboratory	Type of Duplicate	Metal	No. of duplicates analyzed	*HARD value at 90th percentile
MINER	Field Duplicate1	Au (ppm)	728	19.30
		Cu (%)	714	23.90
	Duplicate Assay3	Au (ppm)	295	16.20
		Cu (%)	265	13.50
	Reject Assay2	Au (ppm)	321	13.30
		Cu (%)	287	6.30
SGS	Check Assay3	Au (ppm)	294	16.50
		Cu (%)	320	10.80
	Reject Assay2	Au (ppm)	326	15.00
		Cu (%)	344	8.26

**HARD = Half Absolute Relative Difference*

1. Acceptable HARD value for field duplicates is < 30%

2. Acceptable HARD value for duplicate coarse is < 20%

3. Acceptable HARD value for duplicate fine is < 10 %

12. Data Verification

Data used for mineral resources estimation are stored in two data bases, one data base relating to the channels results and the other for storage of drilling results. Both databases are in Access database format.

The process of recording information and transferring data is completed automated, such data-entry procedures are at low risk of potentially introducing errors. In 2013 and 2015 REI & RMI validated the database before the issuance of the Technical Report, Lechner and Eamest (2016) and Greg Smith & Demetrius Pohl, 2012.of the El Roble Mine.

El Roble mine site staff adhere to a stringent set of protocols for data storage and validation, performing verification of its data on a monthly basis. The operation employs a Database Administrator who is responsible for oversight of data entry, verification and database maintenance.

Members of ATICO geology staff perform on a regular basis (3 months) an internal audit, which consists of the revision of inconsistencies regarding the channel and drill core data stored in the BD (collar, survey, assay, lithology, mineralization, etc.). This audit consists of reviewing and verifying the following:

- Sampling of drill-core and channel samples procedures, and the storing of drill-core and channel sample chips;
- Mine site assay laboratory (operated by MINER), and the QAQC procedures in the areas of sample preparation and the insertion of QAQC samples;
- Randomly selecting assay data from the databases and comparing the stored grades to the original assay certificates
- Procedures implemented relating to the capture and download of data, as well as the validation, modification, and database storage.
- A small percentage of inconsistencies have identified and these pertain mostly to recoverable and correctable errors in “from-to” data and in coding of lithologies.

12.1. Core and Channel Sample Data

The sample data that has been used to estimate the Mineral Resources, that are the subject of this Technical Report, were obtained by ATICO as either underground diamond core or underground channel samples.

Sample data collected during the historic Kennecott and Nittetsu drilling programmes have been excluded (poor quality) from this study work as it relates to material at a higher elevation to that discussed and which has subsequently been exploited and as such immaterial in this study work.

Diamond drill core assays represent well over 90 percent of the data used to estimate Mineral Resources for the various VMS bodies. The remainder of the assay data used are from channel samples collected by MINER's geologic mine staff.

Data from these samples were used, in addition to the underground core samples, to estimate Mineral Resources. As mentioned above, the underground channel samples represent less than 10 percent of the samples that were used to estimate Mineral Resources.

12.2. El Roble Sample Results

Table 12.1 tabulates continuous mineralized drill hole and channel sample intervals that are greater than five meters in length and are above a 5% Cu cut-off grade. These intervals are restricted to the VMS wireframes used to generate the Mineral Resources that are the subject of this Technical Report. The data in the table is sorted from longest to shortest sample (boreholes and channels drilled from January 2016 to June 30, 2018).

Table 12.1 El Roble Drill Hole Intercepts

Drill Hole/Channel	From Depth (m)	To Depth (m)	Length (m)	Cu (%)	Au (g/t)	VMS	Type
ATD-0014	164.50	248.15	58.75	9.69	1.80	Zeus	*UG Core
ATDHR-17	71.80	160.50	50.40	7.93	2.02	Maximus	*UG Core
ATD-0004	173.65	225.75	48.95	8.08	1.35	Zeus	*UG Core
ATDHR-26	147.80	238.00	44.23	12.41	7.92	Zeus	*UG Core
ATD-0003	194.90	231.55	36.65	8.79	1.63	Zeus	*UG Core
ATD-0013	157.60	203.65	35.55	7.72	1.59	Zeus	*UG Core
ATD-0017	203.30	235.60	32.30	9.86	0.65	Zeus	*UG Core
ATDHR-01	109.25	139.00	25.75	8.68	2.53	Goliat	*UG Core
ATD-0002	184.20	212.50	23.10	10.98	1.56	Zeus	*UG Core
ATDHR-38	67.80	133.20	21.95	7.50	4.46	Maximus	*UG Core
ATD-0012	188.80	210.50	21.70	10.15	4.39	Zeus	*UG Core
ATDHR-28	259.46	281.00	16.91	7.43	1.72	Zeus	*UG Core
ATD-0009	168.20	184.20	16.00	9.81	5.72	Zeus	*UG Core
ATDHR-12	113.90	128.00	14.10	12.43	2.58	Goliat	*UG Core
ATDHR-04	81.00	95.00	14.00	14.49	7.26	Maximus	*UG Core
ATD-0001	205.80	217.05	11.25	10.20	0.83	Zeus	*UG Core
6298	1.84	12.29	10.45	6.89	3.63	Zeus	Channel
ATMEI-0018	84.70	95.00	10.30	10.89	5.12	Goliat	*UG Core
ATD-0007	209.00	234.10	10.30	8.82	1.79	Zeus	*UG Core
7773	0.00	8.95	8.95	10.75	6.06	Zeus	Channel
ATMEI-0047	61.85	70.50	8.65	12.61	3.08	Maximus	*UG Core
ATD-0016	169.10	177.05	7.95	10.42	1.66	Zeus	*UG Core
ATMEI-0019	74.80	82.60	7.80	4.99	0.52	Goliat	*UG Core

Drill Hole/Channel	From Depth (m)	To Depth (m)	Length (m)	Cu (%)	Au (g/t)	VMS	Type
571	0.00	7.70	7.70	8.06	4.80	Maximus	Channel
7028	0.00	7.32	7.32	8.98	2.16	Zeus	Channel
ATDI-0020	23.10	29.30	6.20	10.69	4.91	Goliat	*UG Core
3877	0.00	6.19	6.19	6.93	1.57	Maximus	Channel
ATD-0008	166.35	172.50	6.15	13.10	5.44	Zeus	*UG Core
ATDHR-35	119.90	126.05	6.15	12.61	1.32	Goliat	*UG Core
ATMEI-0050	40.75	46.60	5.85	6.37	4.32	Maximus	*UG Core
5425	0.00	5.60	5.60	14.34	1.80	Maximus	Channel
5353	0.00	5.60	5.60	23.47	16.83	Maximus	Channel
3872	0.00	5.05	5.05	13.16	1.21	Maximus	Channel
8084	0.70	5.75	5.05	8.35	9.89	Zeus	Channel
1375	0.00	5.00	5.00	10.96	1.05	Goliat	Channel
9545	0.00	7.00	7.00	7.10	8.23	Maximus	Channel
9348	0.00	20.17	20.17	0.54	4.83	Maximus	Channel
7773	0.00	18.65	18.65	6.26	6.69	Zeus	Channel
19998	0.00	9.35	9.35	16.22	2.06	Zeus	Channel
23751	0.00	7.45	7.45	15.82	4.02	Zeus	Channel
19998	0.00	9.35	9.35	16.22	2.06	Zeus	Channel
23751	0.00	7.45	7.45	15.82	4.02	Zeus	Channel
20115	0.00	3.60	3.60	11.30	15.68	Zeus	Channel
21135	0.00	12.95	12.95	9.53	2.04	Zeus	Channel
ATMEI-0069	151.10	172.60	21.50	7.49	1.71	Zeus	*UG Core
ATH-0012	80.90	99.90	19.00	9.10	1.16	Zeus	*UG Core
38141	0.00	4.40	4.40	5.93	1.12	Zeus	Channel
41126	0.00	3.50	3.50	5.09	5.30	Zeus	Channel
41485	0.00	13.08	13.08	9.17	3.57	Zeus	Channel

13. Mineral Processing and Metallurgical Testing

The existing processing plant at El Roble has a rated nominal through put capacity of 850-dmt per day. The processing methods consist of conventional crushing, grinding, and flotation to produce a copper-gold concentrate.

Grinding is to 80 percent passing 200 mesh for flotation feed. Four banks of six flotation cells each generate concentrates which are subsequently thickened, filtered and stored on site for shipping via highway truck to the Pacific coast port of Buenaventura. Process tailings are deposited in an impoundment facility situated along the banks of the Rio Atrato located downstream of the processing plant. Process waste water is decanted in a tailings dam and then released (at a pH between 7.48 to 8.45) into the Rio Atrato.

The process recovery in the last 18 months (January 2016 to June 2018) averaged 94.15 percent for copper and 61.82 percent for gold. Concentrate grades for the last 18 months averaged 21.87 percent Cu and 7.85 grams per tonne Au. The only penalty metal known to the Qualified Person responsible for this portion of the Technical Report that occasionally exceeds maximum limits is mercury. Current smelter charges are US$101.75 per dry metric tonne. Refining charges are US$0.10175 per payable pound of copper, 0.75 percent of gold price subject to a minimum of US$8.00 per payable ounce of gold, and US$0.35 per payable ounce of silver. Payables are specified in the concentrate sales contract as the copper content minus 1.1 percent, 95 percent of the contained gold and 95 percent of the contained silver.

The current sales contract specifies that copper concentrate grades must be maintained between 18 and 24 percent Cu, gold grades between 4 and 20 grams per tonnes, and silver grades between 5 and 60 grams per tonne. Concentrates high in mercury are mixed with concentrates low in mercury to make an acceptable level of mercury in the shipped concentrate.

No new metallurgical testwork was deemed necessary nor done in relation to this report due to the long, satisfactory operation record of the plant. This report relies upon the reported results of the operation.

14. Mineral Resource Estimates

14.1. Introduction

The Mineral Resource Statement presented herein represents a mineral resource evaluation prepared for the El Roble Mine in accordance with the Canadian Securities Administrators' National Instrument 43-101

The Mineral Resource model prepared by MINER considers 622 core boreholes drilled by various third-party contractors and MINER, 1,657 channel samples collected by MINER (ATICO) personnel during the period of 2014 to 2018. The resource estimation work was completed by Antonio Cruz Bermudez, MAIG (CP, Number 7065) an appropriate "qualified person" as this term is defined in National Instrument 43-101. The effective date of the resource statement is June 30th, 2018.

This section describes the resource estimation methodology and summarizes the key assumptions considered by MINER. The resource evaluation reported herein is a reasonable representation of the global copper and gold Mineral Resources hosted at the El Roble at the current level of sampling. The Mineral Resources have been estimated in conformity with generally accepted CIM "Estimation of Mineral Resource and Mineral Reserves Best Practices" guidelines and are reported in accordance with the Canadian Securities Administrators' National Instrument 43-101.

14.2. Sample Data

The Qualified Person responsible for this section was given access to the digital drill hole and channel sample data for the El Roble deposit. These data (drill hole collars, down-hole surveys, assays, lithology, density, etc.) were provided in ASCII and CSV formats. The underlying Microsoft Access databases, one for diamond drill holes and another for the channel samples were also provided. The drill hole and channel sample files were imported into Datamine®, a commercial geological modelling and mine planning software package.

Details about the drill hole and channel sample data will be discussed in next Items. All of this data was collected by ATICO personnel prior to and after their acquisition of the El Roble project from MINER.

14.3. Geological Interpretation and Domaining

MINER carried out a process through which the geological domains were determined, based on the lithology and mineralization logged in the drill holes. MINER defined four lithological domains in the mine sector:

Basalt: comprising basaltic volcanic rocks representing the bedrock of the sequence;

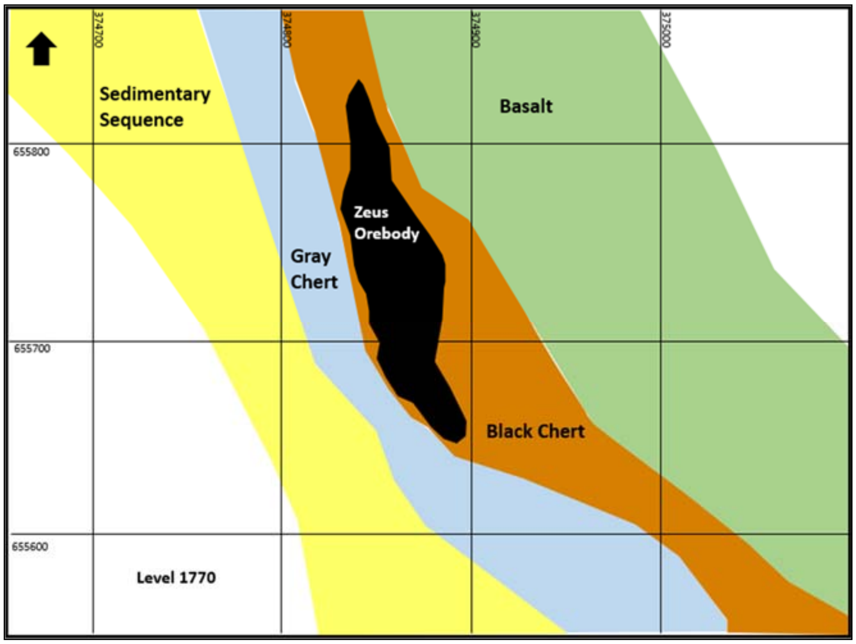
Black Chert: this domain defines the black chert, deposited on the bedrock within the sequence;

Grey Chert: this domain consists of grey chart, deposited above the black chert within the sedimentary sequence;

Sedimentary Sequence: consisting of terrigenous sediments that are the uppermost part of the sequence.

The mineralized bodies are within the lithological domain referred to as Black Chert. The bodies consist of pyrite and chalcopyrite and locally, accessory magnetite and pyrrhotite are observed. In the case of the Zeus and Maximus bodies, both are constrained by a continuous, gouge-filled footwall fault. Both the lithology solids and faults were developed in the Datamine® software. Figure 14.1 shows the location of the fault with respect to the body.

Figure 14.1 Geological Model of the Lithological Units of El Roble Mine



Solids for the mineralized bodies were developed in the CAE Datamine© software. The geological contacts of the mineralized bodies are not always clear and therefore, MINER developed the modeling solids based on two criteria; 1) a geological criterion; all mineralized bodies must be within the Black Chert and the drill hole interval or the mapped area must have a sulphide content greater than 10 percent by volume, 2) the minimum Au or Cu cut-off grade must be 0.5 g/t or 0.5%, respectively.

Figure 14.2 shows the copper grade distribution within Zeus mineralized body solid.

Figure 14.2 Copper Grade Distribution in Zeus Mineralized body Solid

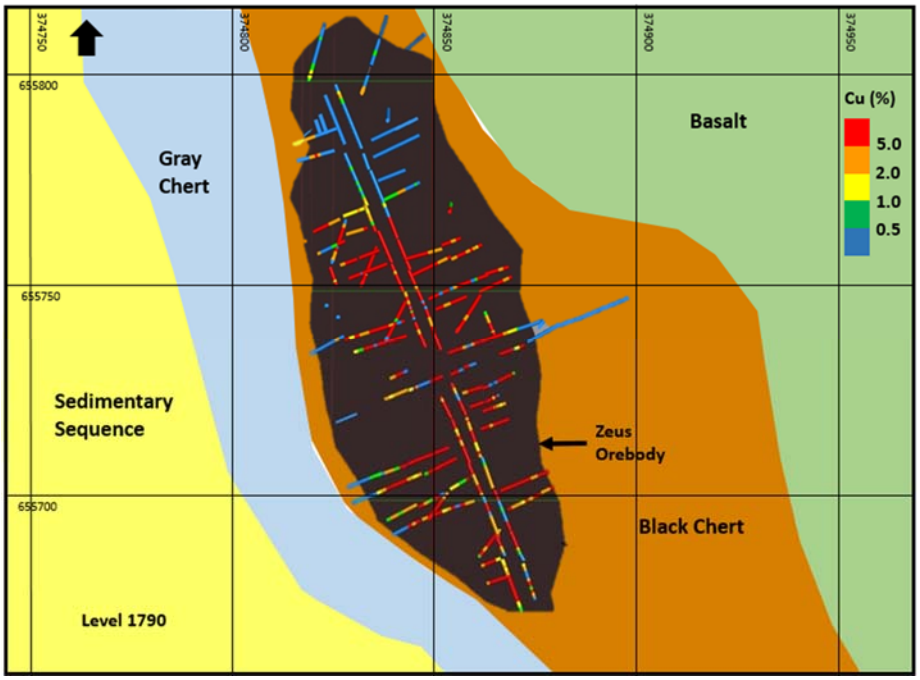
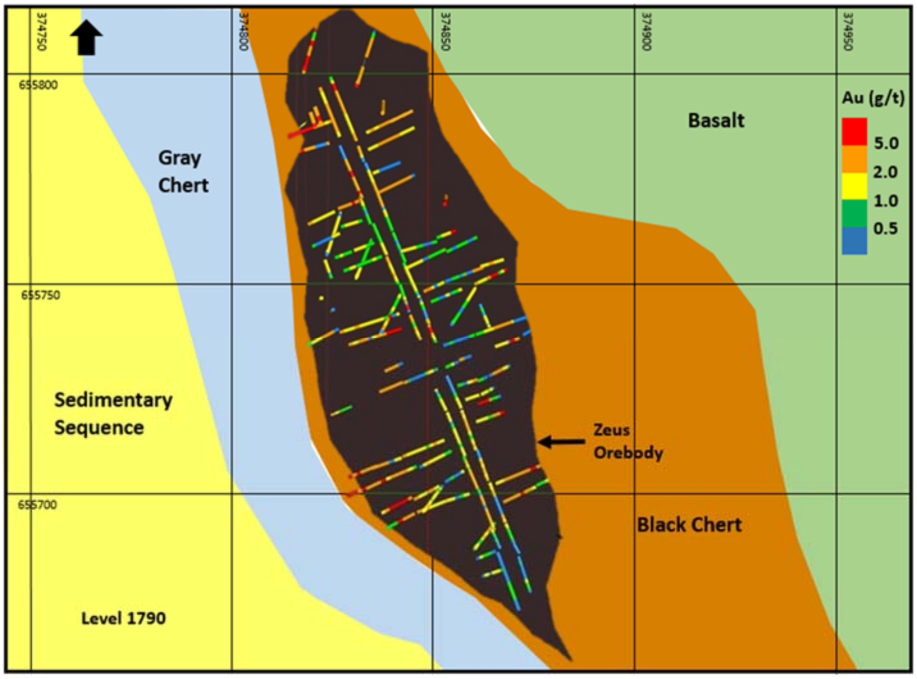


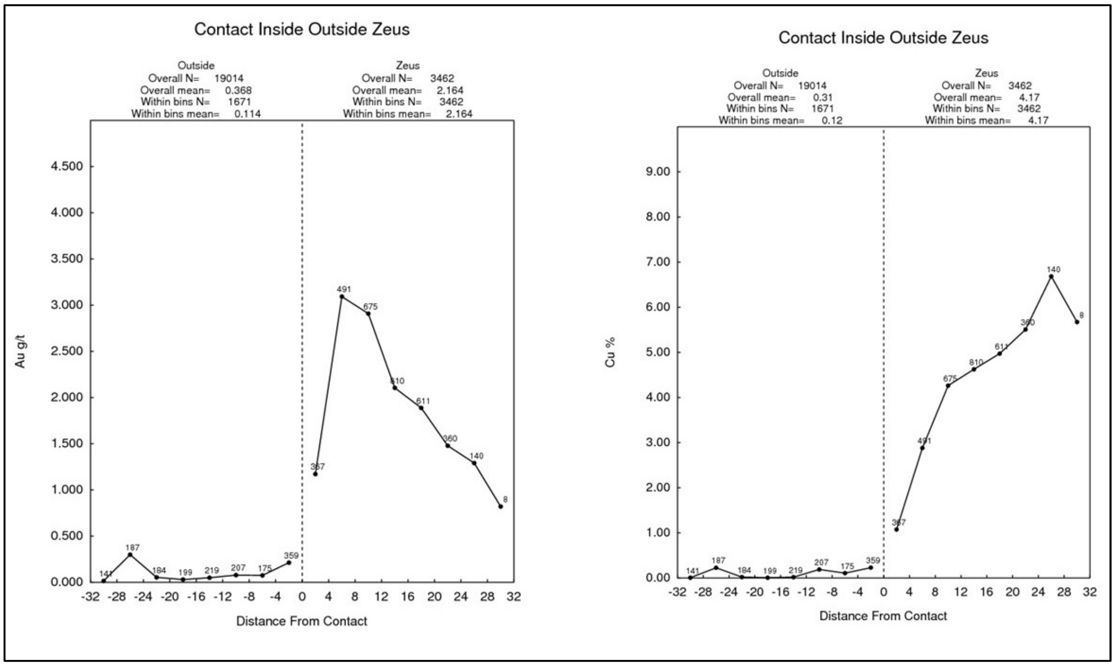
Figure 14.3 shows the gold grade distribution within Zeus mineralized body solid.

Figure 14.3 Gold Grade Distribution in Zeus Mineralized Body Solid



MINER assessed the Au (g/t) and Cu (%) cut-off grade both within and outside the solids through contact analysis. Figure 14.4 shows the contact analysis for both Au and Cu for the samples located within and outside the Zeus solid. As can be seen, the average grade for Au (g/t) and Cu (%) for samples outside the solid is 0.38 and 0.31, respectively, while the average grade for Au (g/t) and Cu (%) within the solid is 2.16 and 4.17, respectively. While it is difficult to draw the border between ore and gangue, the process followed by MINER makes it possible to define an accurate solid for the estimation of mineral resources of the deposit.

Figure 14.4 Contact plot – Samples Outside & Inside the Zeus Mineralized Body



The following solids were used for the estimation:

- Zeus Mineralized Body, located between levels 1,666 and 1,868;
- Goliat Mineralized Body, located between levels 1,846 and 1,950;
- Maximus Mineralized Body, located between levels 1,835 and 1,955;
- Maximus Sur Mineralized Body, located between levels 1,670 and 1,875.

Table 14.1 shows the volume corresponding to each body solid. As shown in the Table, almost 85.74 percent of the volume of the deposit ore is in the Zeus mineralized body.

Table 14.1 Wireframe volume by Mineralized bodies

Mineralised Body	Volume (m3)	% of Volume
Zeus	670,509	85.74%
Maximus	71,317	9.12%
Goliat	31,035	3.97%
Maximus Sur	9,151	1.17%
Total	782,012	100.00%

14.4. Exploration Data Analysis

For the estimation process, only the drill core and/or channel samples within solids of the mineralized bodies were considered. Various statistical analyses of the drill core and channel sample data of four VMS mineralized bodies at the El Roble mine were evaluated by MINER to determine their validity. Basic length weighted assay statistics for copper, gold, and silver are tabulated in Table 14.2 for several mineralized bodies.

Table 14.2 Statistics of Raw Assay Data by Mineralized Body

Mineralised Body	Grade	Count	Minimum	Maximum	Mean	Variance	Std. Dev.	Coef. Var.
Goliat	Cu	1003	0.002	27.61	4.42	27.23	5.22	1.18
	Au	1003	0.001	62.96	1.88	11.77	3.43	1.82
Maximus	Cu	1,579	0.002	27.27	3.64	26.22	5.12	1.41
	Au	1,579	0.001	250.00	5.16	174.98	13.23	2.57
Maximus Sur	Cu	216	0.002	15.53	1.12	7.68	2.77	2.48
	Au	216	0.001	10.63	1.82	5.67	2.38	1.31
Zeus	Cu	10,198	0.002	23.86	4.27	21.42	4.63	1.08
	Au	10,198	0.001	80.03	2.28	10.30	3.21	1.41

The data in Table 14.2 show that the coefficient of variation for the Maximus and Goliat mineraliezed bodies is greater than 1.5 for gold, for Copper the coefficient of variation is greater than 1.5 in Maximus Sur.

14.5. Extreme Value Treatment

MINER examined cumulative probability plots of the original sample data in determining reasonable capping limits for copper and gold for each orebody. Figure 14.5 shows examples of cumulative probability plots for copper and gold, respectively, for the Zeus body. Top cuts of extreme grade values present over-estimation in domains due to disproportionately high-grade samples (capping was done on the assays). Whenever the domain contains an extreme grade value, this extreme grade will overly influence the estimate grade. The shape of the distribution curves is influenced by the inclusion of lower grade material, mainly around the lower limit used in the delimitation of the mineralized bodies (see item before).

Figure 14.5 Probability Plot of Gold and Copper Grade for Zeus Mineralized Body

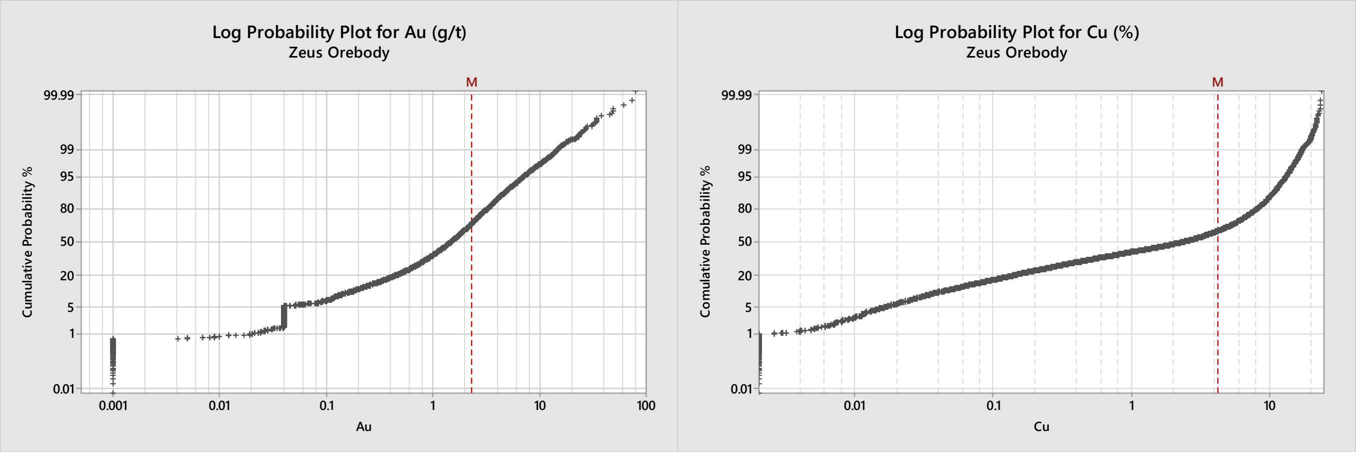


Table 14.3 summarizes the grade capping limits that were established.

Table 14.3 Grade Capping Limits by VMS Body

Mineralized Body	Au (g/t)	Cu (%)
Goliat	7	-
Maximus	40	20
Maximus Sur	9	4
Zeus	14	14

14.6. Compositing of Assay Intervals

The compositing of samples according to length is based on assumption that a similar sample support is required when conducting the estimation. The compositing is done in both the channel samples and the drill holes samples within the modelled ore body solid.

The size defined for the compositing of samples is two meters along the sampling direction. MINER determined that composites would be most suitable for estimating block grades for the various VMS bodies.

Table 14.4 provides statistical description of Au and Cu for the four orebodies of the deposit. As can be seen in Table 14.4, Au has a high coefficient of variation in the Maximus mineralized body and in the case of Cu, the Maximus Sur orebody has a coefficient of variation greater than 2.00.

Table 14.4 Statistical Description of Composites by Element and Body of El Roble Mine

Mineralized Body	Grade	Count	Minimum	Maximum	Mean	Variance	Std. Dev.	Coef. Var.
Goliat	Cu	382	0.002	22.22	4.48	20.05	4.48	1.00
	Au	382	0.001	31.81	1.87	5.99	2.45	1.31
Maximus	Cu	672	0.002	27.01	3.68	21.71	4.66	1.27
	Au	672	0.001	147.78	5.13	103.64	10.18	1.99
Maximus Sur	Cu	81	0.002	10.53	1.17	5.49	2.34	2.00
	Au	81	0.033	9.94	1.91	5.13	2.26	1.19
Zeus	Cu	4603	0.002	21.48	4.28	17.30	4.16	0.97
	Au	4603	0.001	62.37	2.28	7.70	2.78	1.22

14.7. Massive Sulphide Variography

Continuity analysis refers to the analysis of the spatial correlation of a grade value between simple pairs to determine the major axis of spatial continuity. The variograms tended to be a poor in quality, for this reason all the composited data was transformed into a normal score distribution for continuity analysis.

Continuity analysis confirmed that Maximus Sur has insufficient data to allow variogram modelling.

MINER generated a number of grade variograms for the various El Roble massive sulphide zones. Table 14.5 summarizes key variogram parameters as interpreted by MINER for three of the VMS mineralized bodies for which reasonable variograms could be generated. The parameters shown in Table 14.5 were used in the estimate of block grades.

Table 14.5 Variogram Parameters by VMS Body

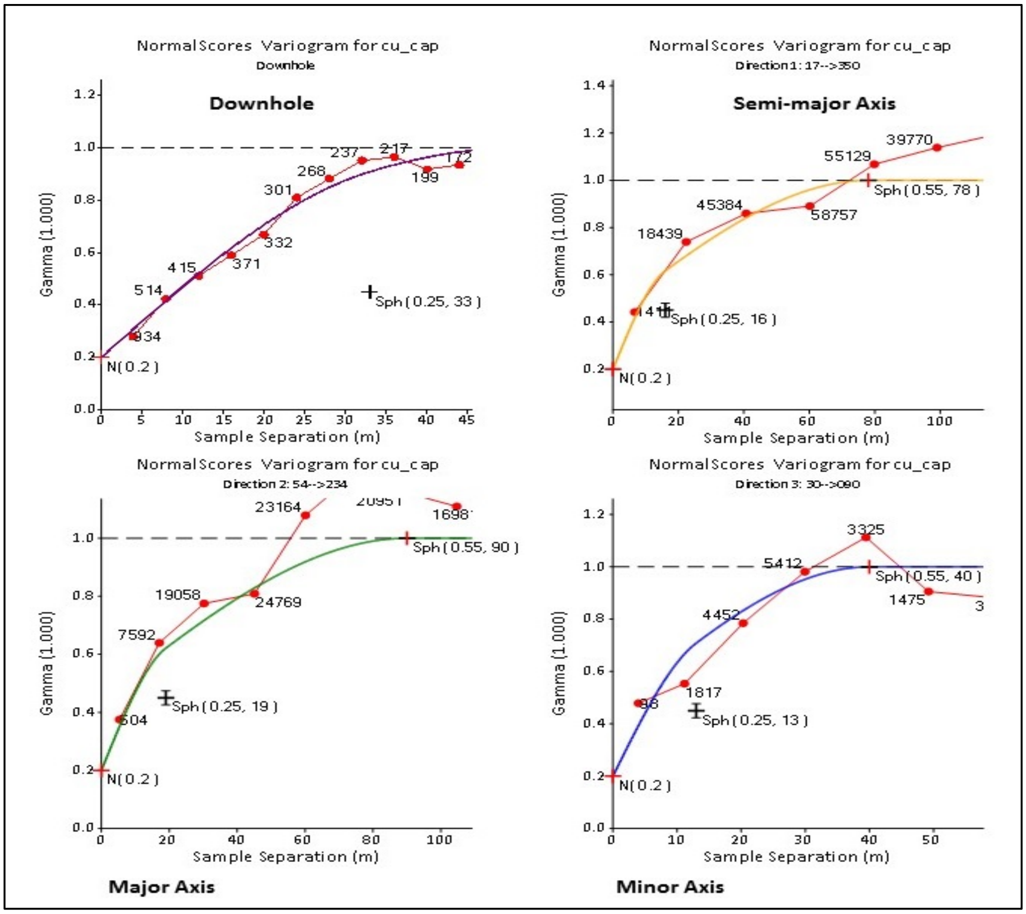
Mineralized Body	Metal	Major axis orientation	C0	C1	Ranges	C2	Ranges	C3	Ranges
Goliat	Cu	133°	0.3	0.2	8,6,6	0.2	51,9,8	0.2	54,14,10
	Au	136°	0.2	0.2	1,1,6	0.5	11,4,10	0.2	50,10,12
Maximus	Cu	250°	0.2	0.8	30,27,15				
	Au	324°	0.5	0.3	33,9,8	0.2	53,42,26		
Zeus	Cu	55° → 234°	0.2	0.3	19,16,13	0.5	90,78,40		
	Au	55°→90°	0.2	0.4	13,11,19	0.4	64,56,53		

Note: the variances have been normalized to a total of one; the ranges for major, semi-major, and minor axes, respectively; structures are modelled with a spherical model.

C0: nugget, C1, C2 & C3: components of nested structure models. Sill=C1 + C2 + C3

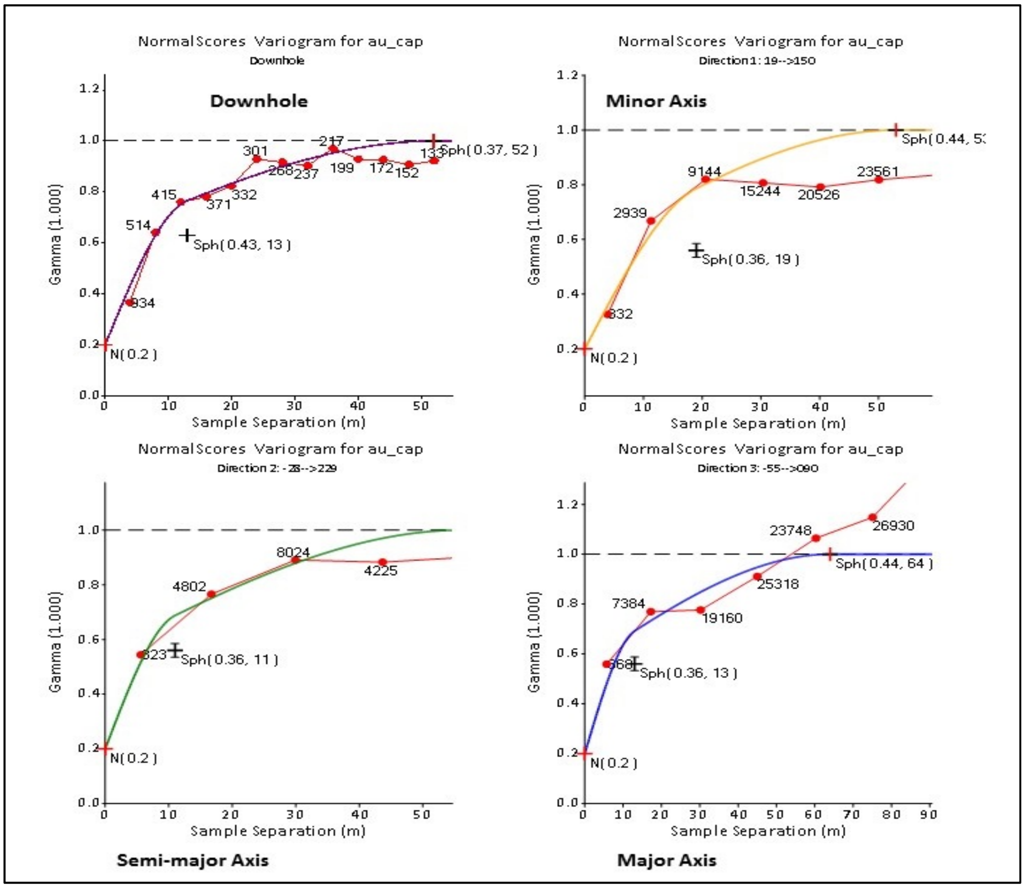
An example of a normalized variogram plots for copper shown in Figure 14.6. Major (direction 1), semi-major (direction 2), and minor axis (direction 3) variogram plots are shown along with contoured variance of the major axis vector in each of the figures.

Figure 14.6 Zeus Copper Variograms



An example of a normalized variogram plots for gold shown in Figure 14.7. Major (direction 1), semi-major (direction 2), and minor axis (direction 3) variogram plots are shown along with contoured variance of the major axis vector in each of the figures.

Figure 14.7 Zeus Gold Variograms



14.8. Block Model Grade Estimation

MINER constructed four individual block models in Datamine (version. 3.26.19) for each of the currently identified VMS body. Those models were rotated so the new Y-axis of the model approximated the strike azimuth of the steeply plunging VMS bodies. Rotation about Z is clockwise in Datamine.

Table 14.6 tabulates the orientation of the various Datamine block models and show that MINER used the 2.0 m x 2.0 m x 2.0 m block size in all the orebody block models. Block size was selected mainly based on mineralized domain geometry and the mining method, each orebody has been block-modelled separately with care taken to ensure that overlapping blocks do not exist.

Table 14.6 El Roble Block Model Orientations

Mineralized Body	Rotation	Direction	Minimum	Maximum	Size (m)
Goliat	45	X	374,907	374,968	2
		Y	655,634	655,704	2
		Z	1,847	1,950	2
Maximus	60	X	374,950	374,995	2
		Y	655,570	655,642	2
		Z	1,835	1,955	2
Maximus Sur	35	X	374,985	375,025	2
		Y	655,525	655,580	2
		Z	1,915	1,980	2
Zeus	65	X	374,801	374,930	2
		Y	655,652	655,852	2
		Z	1,666	1,868	2

14.9. Sample Search Parameter

MINER completed a quantitative kriging neighborhood analysis (QKNA) on the various El Roble VMS bodies in order to determine optimal search parameters for estimating block grades. Those studies resulted in the following generalized observations:

A search range of approximately 20 to 35 meters along strike and down dip were indicated with a shorter (10 to 15 meters) search perpendicular to strike;

The search ellipsoid used to define the extents of the search neighborhoods tend to have the same orientation as the continuity vectors observed in modeling variograms.

MINER elected to use a three-pass estimation strategy that used successively longer search ellipsoid. Once a block was estimated it was flagged and ineligible to be estimated by subsequent passes. Ordinary kriging and inverse distance (third power) estimation methods were used by MINER. Table 14.7 summarizes which estimation method was used for each of the VMS bodies. Only in the Zeus mineralized body MINER estimated the gold and copper grade using ordinary kriging.

Table 14.7 Estimation Methods by VMS Body

Mineralized Body	Au (g/t)	Cu (%)
Goliat	Inverse Distance (power = 3)	Inverse Distance (power = 3)
Maximus	Inverse Distance (power = 3)	Inverse Distance (power = 3)
Maximus Sur	Inverse Distance (power = 3)	Inverse Distance (power = 3)
Zeus	Ordinary Kriging	Ordinary Kriging

As mentioned above, a three-pass interpolation plan was used for each VMS body. The estimation parameters (ranges, min/max number of composites, etc.) for each estimation pass are summarized for copper in Table 14-8 (Range refers to the search radius).

Table 14.8 Cu Estimation Parameters by VMS Body

Mineralized Body	Direc.	First Search			Second Search			Third Search			Min Octant	Max Comps per Octant	Max Comps per hole
		Range (m)	Min Comps	Max Comps	Range (m)	Min Comps	Max Comps	Range (m)	Min Comps	Max Comps			
Goliat	1	35	3	7	70	3	9	105	3	14	3	3	2
	2	20	3	7	40	3	9	60	3	14	3	3	2
	3	15	3	7	30	3	9	45	3	14	3	3	2
Maximus	1	20	3	7	40	3	9	60	3	12	3	3	2
	2	20	3	7	40	3	9	60	3	12	3	3	2
	3	15	3	7	30	3	9	45	3	12	3	3	2
Maximus Sur	1	25	3	6	50	3	9	100	3	12	3	3	2
	2	20	3	6	40	3	9	80	3	12	3	3	2
	3	15	3	6	30	3	9	60	3	12	3	3	2
Zeus	1	25	3	6	50	3	9	75	3	14	2	3	2
	2	25	3	6	50	3	9	75	3	14	2	3	2
	3	20	3	6	40	3	9	60	3	14	2	3	2

The estimation parameters (ranges, min/max number of composites, etc.) for each estimation pass are summarized for gold in Table 14-9 (Range refers to the search radius).

Table 14.9 Au Estimation Parameters by VMS Body

Mineralized Body	Direc.	First Search			Second Search			Third Search			Min Octant	Max Comps per Octant	Max Comps per Hole
		Range (m)	Min Comps	Max Comps	Range (m)	Min Comps	Max Comps	Range (m)	Min Comps	Max Comps			
Goliat	1	35	3	7	70	3	9	105	3	12	3	3	2
	2	20	3	7	40	3	9	60	3	12	3	3	2
	3	15	3	7	30	3	9	45	3	12	3	3	2
Maximus	1	20	3	5	40	3	7	60	3	9	3	3	2
	2	15	3	5	30	3	7	45	3	9	3	3	2
	3	10	3	5	20	3	7	30	3	9	3	3	2
Maximus Sur	1	25	3	6	50	3	9	100	3	12	3	3	2
	2	20	3	6	40	3	9	80	3	12	3	3	2
	3	15	3	6	30	3	9	60	3	12	3	3	2
Zeus	1	25	3	6	50	3	9	75	3	14	2	3	2
	2	25	3	6	50	3	9	75	3	14	2	3	2
	3	15	3	6	40	3	9	60	3	14	2	3	2

The VMS wireframes, model blocks, and drill hole samples were sub-divided into two parts, reflecting hangingwall and footwall domains. It has been long recognized that higher grade mineralization within the El Roble VMS bodies is often localized along either the footwall and/or hangingwall contacts. MINER incorporated that sub-domaining into the grade estimation plan which allowed blocks located along the main contacts to be informed by composites located along the same contact area.

14.10. High-Grade Copper and Gold Zones

MINER assessed the distribution of anomalous values for both copper and gold within the Zeus orebody and could determine that the high grade zones are split. For that reason, MINER deems appropriate to apply a methodology that will make it possible to restrict high grades to specific sectors, where treatment of anomalous grades may be more permissible.

The method considers generating indicator values (0 or 1), which allow the delimitation of anomalous sectors based on likelihood. For high grade sectors, any sample with a grade greater than the “grade indicator” receives the value 1, and any sample with a lower grade is set to 0. The likelihood is defined between both values, depending on the contact analysis, the aim of which is to confirm that the sample population with average grade and high grade are completely different and their respective influence throughout the mineralized body.

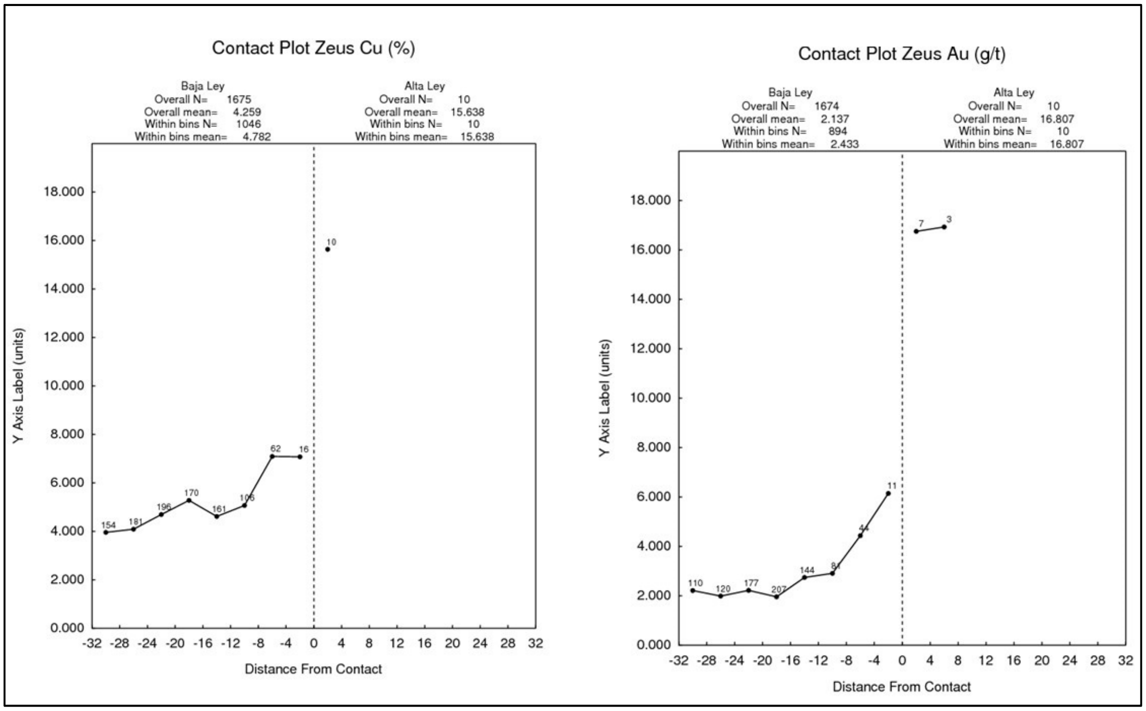
The methodology used to select the acceptable level of likelihood was validated through contact analysis. Table 14.10 shows the grade indicator, the likelihood used and the top cut to be used in samples from this sector for both Au (g/t) and Cu (%), based on which a likelihood interval is defined for the Zeus body.

Table 14.10 Indicator Parameters for Au and Cu in Zeus Mineralized Body

Mineralized Body	Au (g/t)			Cu (%)		
	Grade Indicator	Top Cut	Probability	Grade Indicator	Top Cut	Probability
Zeus	14	30	0.45	15	25	0.35

Figure 14.8 shows the contact analysis conducted among the samples located in the low grade (LG) and high grade (HG) areas for Au (g/t) and Cu (%) in the Zeus ore body. As can be seen, the average grade of the samples in the HG domain is higher than in the LG domain.

Figure 14.8 Contact Plot for Threshold (LG) and High-grade (HG) in Zeus Mineralized Body



By applying this methodology, MINER seeks to restrict the high-grade sectors and not to overestimate the Au and Cu grades. Table 14.11 shows the search neighborhoods used in the estimation of Au and Cu within the high-grade areas for both variables.

Table 14.11 Au and Cu Estimation Parameters for Indicator Estimation in Zeus Mineralized Body

Element	Direc.	First Search			Second Search			Third Search			Min Octant	Max Comps per Octant	Max Comps per hole
		Range (m)	Min Comps	Max Comps	Range (m)	Min Comps	Max Comps	Range (m)	Min Comps	Max Comps			
Au (g/t)	1	20	3	6	40	2	9	60	3	12	3	3	2
	2	20	3	6	40	2	9	60	3	12	3	3	2
	3	15	3	6	30	2	9	45	3	12	3	3	2
Cu (%)	1	20	2	6	40	3	9	60	3	12	3	3	2
	2	20	2	6	40	3	9	60	3	12	3	3	2
	3	10	2	6	20	3	9	30	3	12	3	3	2

The trend of the search volumes (anisotropic axes) has been defined as a function of the major, semi-major and minor axes of Au and Cu in Zeus (Table 14.5).

14.11. Density

There has been a total of 2,150 density measurements taken by MINER as of June 30, 2018. Of these 367 samples were performed in ALS laboratory Colombia by paraffin method taken from 2013 to December 2015, 41 samples were performed in SGS laboratory Colombia by paraffin method taken from January to June 2018. The others 1,742 density samples were tested in MINER using volumetric differences.

MINER conducted density measurements of drill cores sent to ALS for density measuring (Figure 14.9) shows the good correlation between samples with measurements in ALS and MINER at the same time, so it is accepted the density measurement conducted by MINER and considered them as valid when estimating the average density for each ore body.

Figure 14.9 Correlation between Samples Density Measurements in ALS and Miner

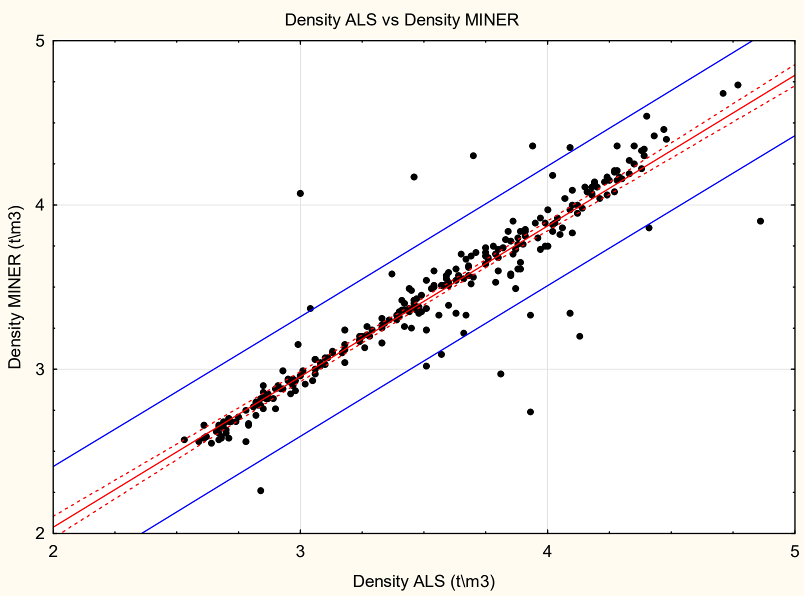


Table 14.12 shows statistics of the samples measured by ALS, SGS and the samples measurements in MINER by mineralized body.

Table 14.12 Statistics for Density Measurements by Laboratory

	Mineralized Body	No of Samples	Mean	Minimum	Maximum	Variance
ALS	Goliat	33	3.49	2.59	4.30	0.24
	Maximus	83	3.60	2.62	4.72	0.28
	Maximus Sur	3	3.25	2.65	3.59	0.27
	Zeus	248	3.57	2.53	4.86	0.30
SGS	Zeus	41	3.71	2.77	4.49	0.48
Miner	Goliat	86	3.28	2.32	4.24	0.22
	Maximus	178	3.45	1.44	4.65	0.27
	Maximus Sur	26	3.26	2.44	4.56	0.38
	Zeus	1,452	3.52	2.07	5.56	0.28

Due to the insufficient spatial coverage of the density measurements, density estimation was regarded as inappropriate. Next, each mineralized body mean density value has been applied to all blocks in the orebody. The Table 14.13 shows the density assigned to the block model by mineralized body (weight average between ALS and Miner measurements).

Table 14.13 Density Assigned for the 2018 Models

Mineralized Body	Density assignment for 2018 models (t/m3)
Goliat	3.34
Maximus	3.50
Maximus Sur	3.26
Zeus	3.53

14.12. Model Validation

The techniques for validation of estimated tonnes and grades included visual inspection of block model and samples in section or plan; cross validation; global bias and local estimate validation through the generation of slice validation (swath) plots.

14.12.1. Visual Validation

The first validation was a plan view and cross-section visual assessment to ensure that the distribution of grades in the blocks is consistent with the average grade of the composites. This ensures that the data used for the estimation has a direct bearing on the local variance of the estimated grades.

Figure 14.10 shows the distribution of the Au grade (g/t) in both the channels and the block model of the Zeus body.

Figure 14.10 Visual Validation Au (g/t) in Zeus Mineralized Body

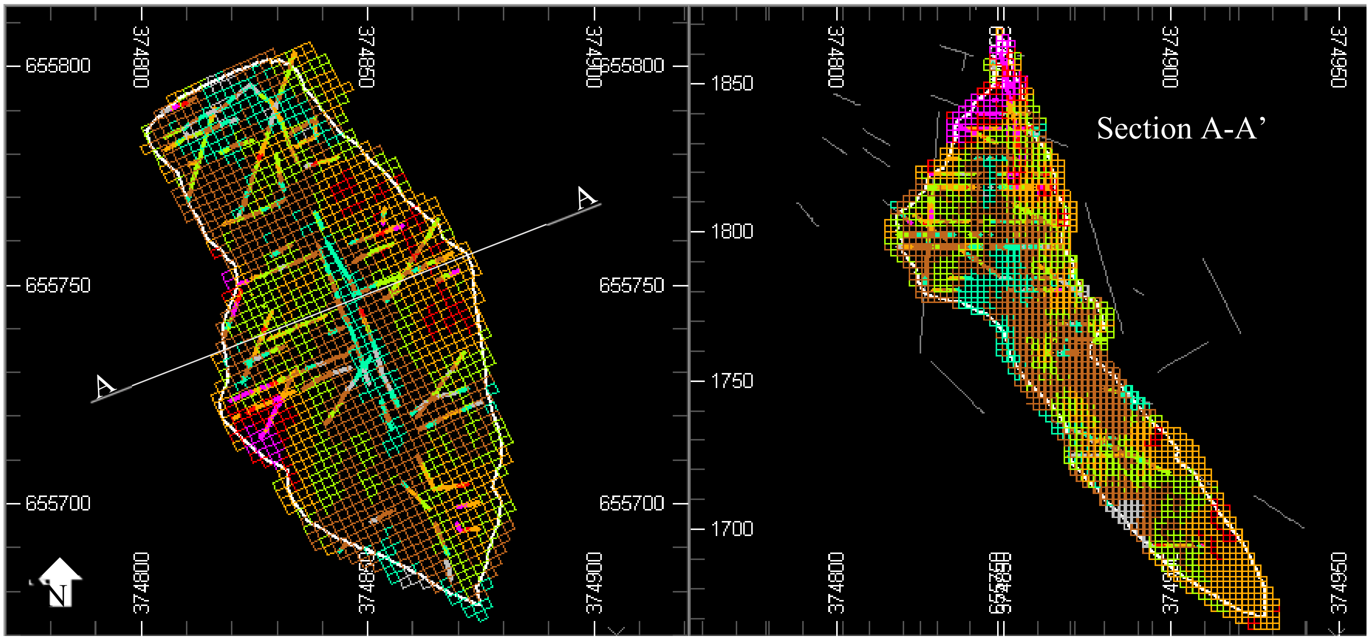
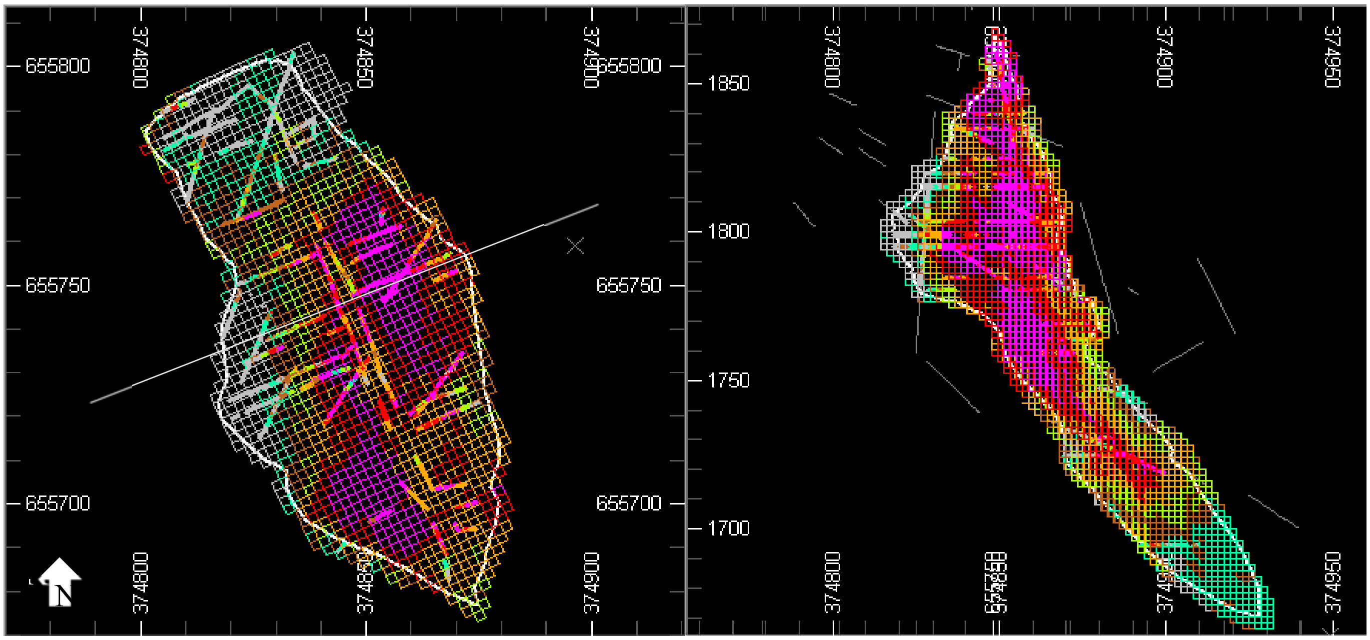


Figure 14.11 shows the distribution of Cu grades (%) in both the channels and the block model of the Zeus body. The figure shows the consistency between the estimated grades and the composite grades.

Figure 14.11 Visual validation Cu (%) in Zeus Mineralized Body



14.12.2. Cross Validation

In order to optimize the modelled variograms and the search neighbourhoods MINER performed cross validation. This technique involves excluding a sample point and estimating a grade in its place using the remaining composites. MINER tested in this process two estimation methods for gold and copper, these techniques are inverse distance power 3 (IDW) and ordinary kriging (OK). Table 14.14 display the estimated mean values for copper and gold, as compared to the composite mean (Mean).

Table 14.14 Cross Validation Results by Mineralized Body

	Au (g/t)			Cu (%)		
Mineralized Body	OK	IDW	Mean	OK	IDW	Mean
Goliat	1.71	1.72	1.69	3.2	3.2	3.15
Maximus	4.41	4.44	4.46	3.59	3.68	3.68
Maximus Sur	1.94	2.00	1.89	1.11	1.13	1.06
Zeus	2.20	2.21	2.19	4.25	4.29	4.24

14.12.3. Global estimation validation

Nearest neighbour models for copper and gold, were generated by MINER. These models were used to validate the grade model and to check for possible grade biases in the block model. The ordinary kriged and nearest neighbour grades were compared for all estimated blocks inside of the Zeus wireframe at a zero-cut-off grade. In the other mineralized bodies, the grade was estimated by inverse distance power 3. Table 14.15 compares MINER's ordinary kriging grades against their nearest neighbour grade (NN).

Table 14.15 El Roble Global Bias Check

	Au (g/t)			Cu (%)		
Mineralized Body	IDW/OK	NN	% diff	IDW/OK	NN	% diff
Goliat	1.75	1.76	1	3.10	3.07	-1
Maximus	4.05	4.01	-1	4.03	4.07	1
Maximus Sur	2.15	2.03	-6	1.06	0.95	-12
Zeus	2.18	2.15	-1	3.62	3.61	0

Zeus body ordinary kriging copper grade is about 1 percent greater than the nearest neighbour grade and the gold estimated by ordinary kriging is about 0 percent greater than the nearest neighbour grades. The percent differences between the the inverse distance and nearest neighbour grades are within reasonable tolerances for the Goliat and Maximus bodies. Maximus Sur body the the inverse distance copper grade is about 12 percent greater than the nearest neighbour grade and the gold estimated by the inverse distance is about 6 percent greater than the nearest neighbour grades, this due to the erratic distribution of copper and gold.

14.12.4. Local estimation validation

MINER checked for local biases by creating a series of slices or "swaths" through MINER's grade models by columns (eastings), rows (northings), and levels (elevations) comparing the ordinary kriging and nearest neighbour grades. Figure 14.12 is an example of a swath plot that shows the local variation in grade between the ordinary kriging and nearest neighbour copper models at a zero-cut-off grade by elevation. The ordinary kriging grade (CuPOR) is shown in black, the nearest neighbour grade (Cu_NN) is shown in cyan.

Figure 14.12 Zeus Block Model Copper Swath Plot – Elevation

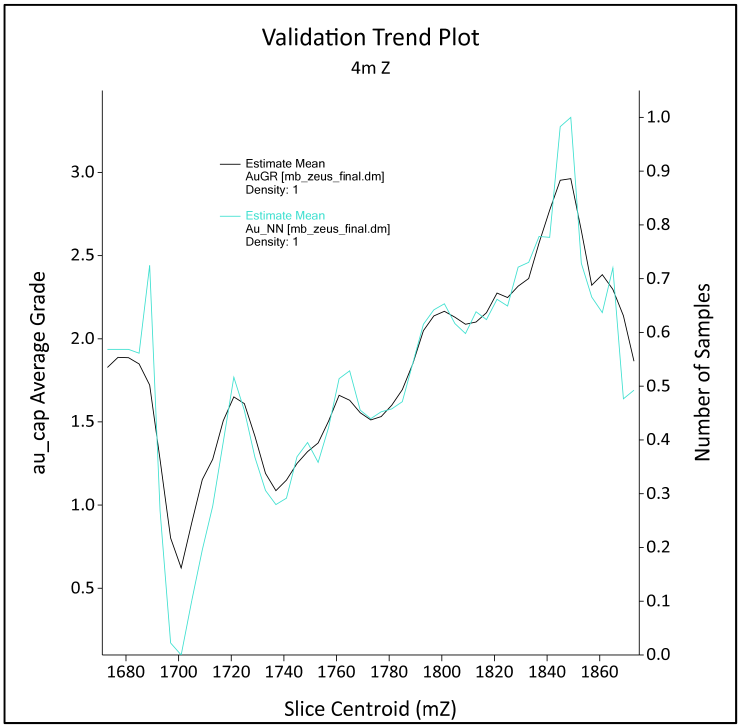
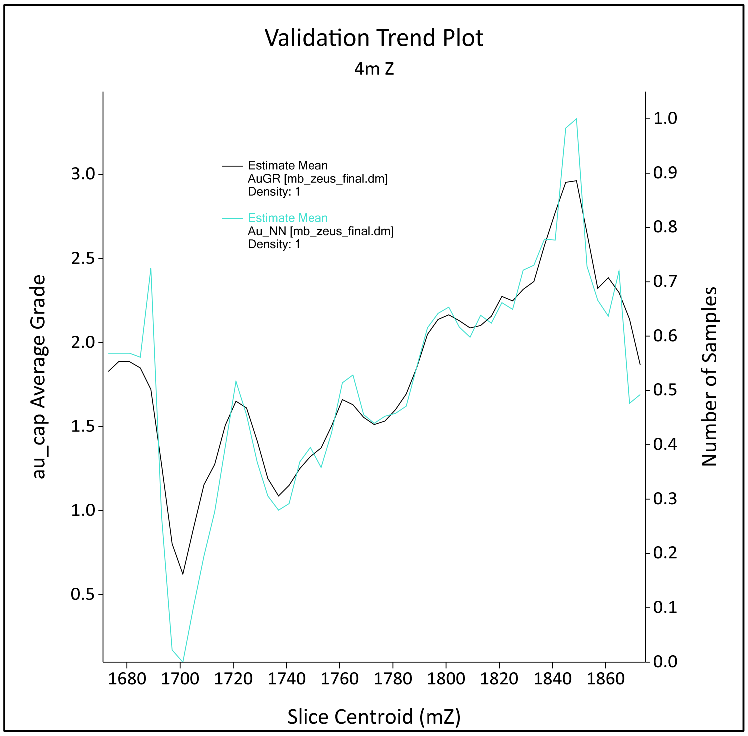


Figure 14.13 is a similar swath plot that compares ordinary kriging gold (Au_OK) and nearest neighbour gold (Au_NN).

Figure 14.13 Zeus Block Model Gold Swath Plot



The swath plots presented as Figure 14.12 and Figure 14.13 show that there is a reasonable comparison between the inverse distance and nearest neighbour grades. Usually where the two grades vary significantly there are a limited number of blocks.

Based on a visual examination and comparisons with a nearest neighbour model, the MINER's grade models are globally unbiased and represents a reasonable estimate of undiluted in-situ resources.

14.13. Mineral Resource Reconciliation

The ultimate validation of the block model is to compare actual grades to predicted grades using the established estimation parameters. Table 14.16 shows the comparison of mineral in situ against block model and the percentage error between tonnes and grade.

Table 14.16 Reconciliation of the Mineral Resources Estimate Against Mineral In-situ Extracted Through June 30, 2018

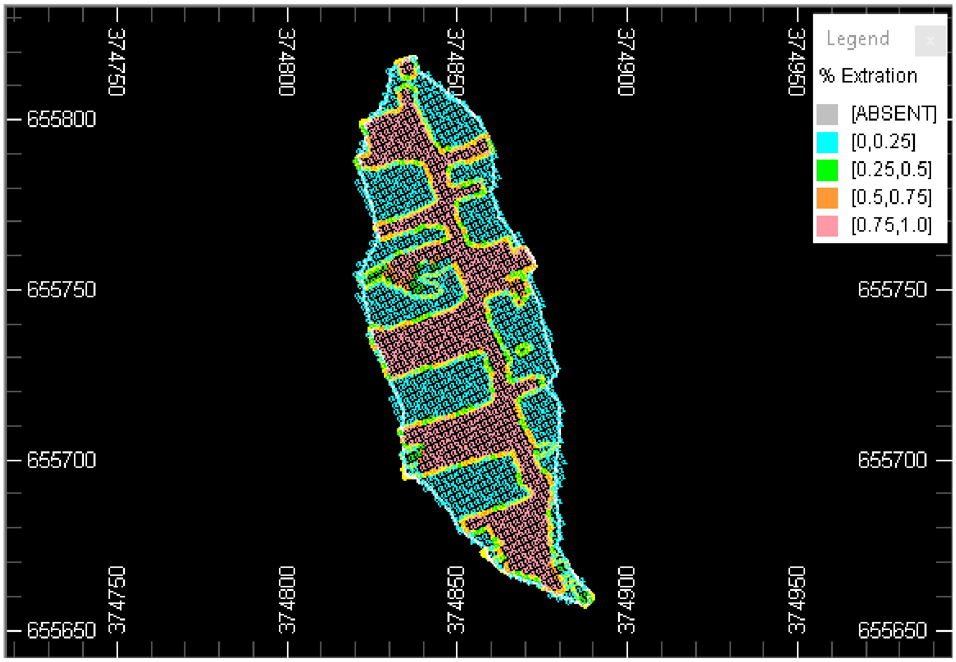
Mineralized Body	Mineral In situ			Block Model			% Error		
	Tonnes (t)	Cu (%)	Au (g/t)	Tonnes (t)	Cu (%)	Au (g/t)	Tonnes	Cu	Au
Goliat	62,747	3.06	1.59	56,355	3.44	1.62	10	-12	-2
Maximus	163,460	3.63	4.40	156,087	3.90	4.01	5	-8	9
Maximus Sur	1,260	0.66	1.40	1,224	0.74	1.48	3	-12	-6
Zeus	620,093	4.56	2.21	629,895	4.53	2.31	-2	1	-4
Total	847,560	4.26	2.58	843,562	4.34	2.58	0	-2	0

The results suggest that the estimates are providing a good representation of what is being encountered underground during production. The tonnes average difference for all the mineralized bodies is 0%, for the copper grade the differences are -2% and for gold grade the differences is 0%; however individual measurements vary from -12% to +9%.

Mineral Resources Depletion

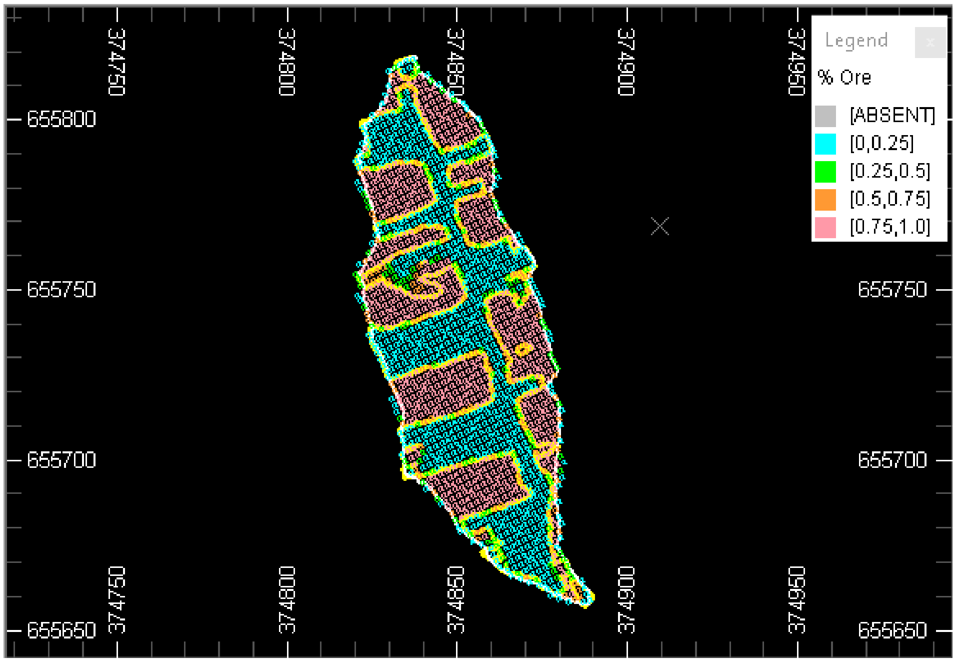
All underground workings (development works and operating pits) have been identified in the block model. MINER used the solids of the mining workings as of June 2018 and defined the field % EXT in the model as an identifier of the percentage of works within each regular block. Figure 14.14: shows the contour of the mineralized body and mining workings at level 1,797 masl. As shown in the figure, the percentage of extraction (% EXT) in the blocks within the contour of the workings is close to 1 (represent 100%).

Figure 14.14 Extracted Areas Identified in Zeus Block Model



MINER defined within the block model the field % ORE, which represents the ore that has not been extracted yet or has been partially extracted. Figure 14.15 shows the block distribution with the legend "intact ore". Outside the underground workings, it can be seen that the blocks have values close to 1 (represent 100%).

Figure 14.15 In situ mineral areas identified in Zeus block model



14.14. Mineral Resource Classification

To carry out the classification of the estimated resources, MINER considers the evaluation of the following key aspects:

- How representative the data used for the estimation is.
- Lithological and structural controls, as well as the mineralization continuity.
- Proximity of the composites to the blocks to estimate.
- Estimation quality.

Representativeness and quantity of the data used for the estimation

For the resource estimation, MINER used channels and drill holes data. MINER carries out both (mostly) underground drilling and surface drilling in the mine. During years 2012 and 2013, MINER performed drillings with a strike parallel to the Goliat, Maximus and Zeus orebody, after this and after developing the bottom ramp, MINER carried out drillings perpendicular to Zeus orebody during 2014 and 2016.

MINER also performs the channel sampling inside the bodies and at various levels within each body.

It is important to have good representative data since the geological certainty and estimation quality is related to the quantity/quality of the data used.

Lithological and Structural Controls

These controls delimit both the extension and the geometry of the mineralized bodies, MINER prepared the three-dimensional model of the Black Chert layer, which contains massive sulphides.

The copper and gold mineralization continuity was evaluated with variograms. The variogram modelling help define the directions and scopes with major continuity, based on parameters obtained it is possible to direct and define the size of the studied surroundings.

Proximity of composites to blocks to be estimated

Evaluation of the distance of the composites towards the blocks to estimate, the ordinary kriging and the cubic inverse distance used for this process, determine weights based on the separation between the composite and the block. MINER considers the distance of the nearest composite to the block since the latter will have a higher weight relative to another composite located within the neighbourhood studied.

Estimation Quality

This is directly related to the variogram, the estimation scale and composite arrangement around the block. MINER evaluates the data quality through the regression slope estimation (ZZ) in each block. The process used begins generating a longitudinal section of each body taking the ZZ value and comparing it with the position of the composites used for estimation.

Classification

MINER categorized the resources in the ore bodies of El Roble project based on three criteria. The first criterion considers the number of composites used in the estimation of each block. The second criterion is the distance from the centroid to the nearest composite. The third criterion evaluates the quality of the estimation through the regression slope (ZZ).

This value is estimated in each block and mainly evaluates the optimization condition of the lagrangian and how large or small is in relation to the Kringing variance and block variance. The absolute value of a large lagrangian indicates that there is a significant bias for the arrangement of composites around the point to be estimated; for example, when the absolute value of the lagrangian is small in relation to the block variance and kriging variance, the ZZ value approaches 1.

Conducted an evaluation of the regression slope (ZZ) in each model block of the Zeus body in order to use a guide for the definition of categories.

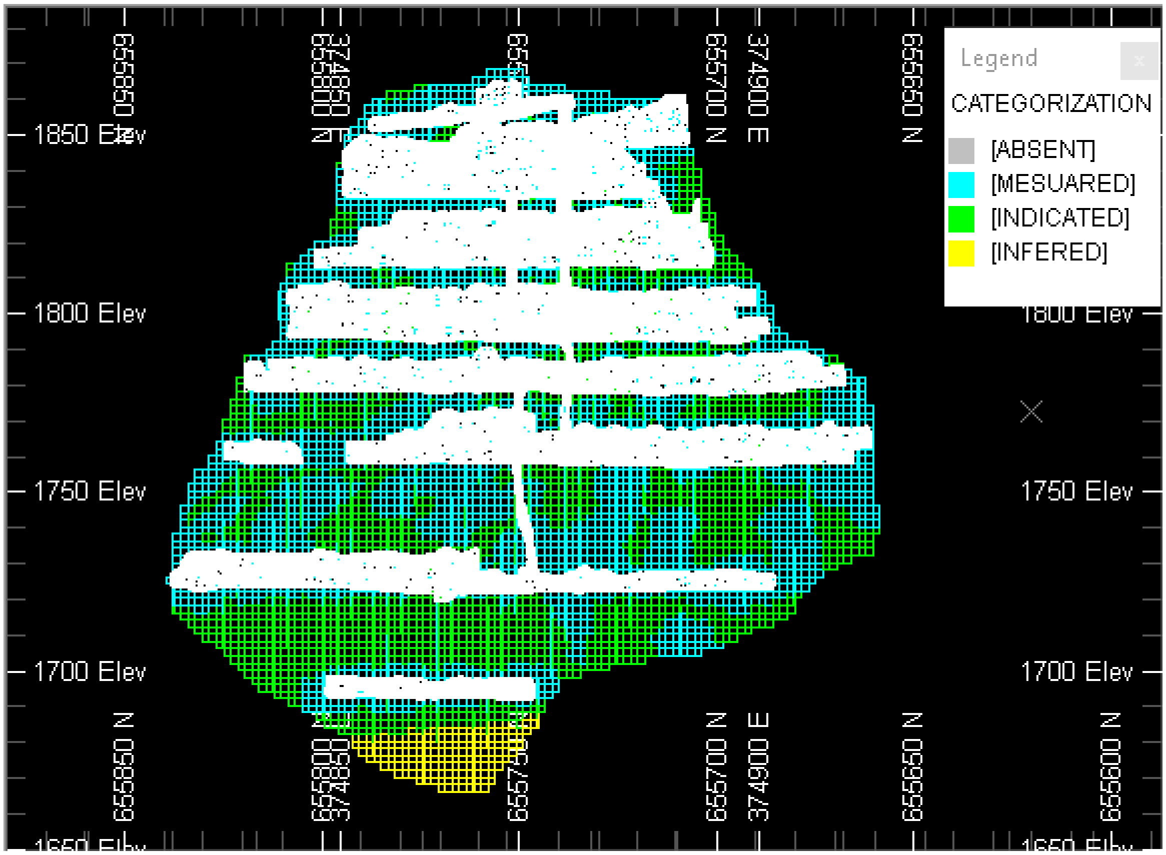
Table 14.17 shows the initial considerations used to estimate the resource category. Based on these criteria, also performed a manual delimitation of the sectors considered as measured, indicated and inferred resources, to avoid inconsistencies when categorizing.

Table 14.17 Classification Criteria for MINER Mineralized Bodies

Category	Number of composites	Distance to nearest sample	Slope of regression (ZZ)
Measured	>6	<0.4 Major axis range	0.80 - 1
Indicated	>4	<0.8 Major axis range	0.60 - 0.8
Inferred	>2	All estimated blocks	0.30 - 0.60

An example of the resource categorization used in the Zeus mineralized body is shown in Figure 14.16:

Figure 14.16 Longitudinal Section Showing Mineral Resources Classification for the Zeus Mineralized Body



14.15. Mineral Resource Statement

The Mineral Resources have been reported using an equivalent copper cut-off based on recoveries obtained from the plant metallurgical balance in the last 18 months (Cu =94.15% and Au=61.82%), value of the payable metal recovery (Cu=94.78% and Au=89.74%) and long-term metal prices (Cu = 3.26 US$/lb or 0.00717 US$/g and Au=1,278.56 US$/oz or 41.11 US$/g) as shown in the following formula:

$$CuEq\ (\%) = Cu\ (\%) + (Au\ (g/t))*((41.11/0.00717)*(94.15/61.82)*(89.74/94.78))$$

The price of metals was defined by the ATICO finance department based on standard industry long term predictions. The proposed prices were validated and reviewed by the Independent Qualified Persons.

The cut-off value used to report mineral resources is supported by the average of total costs of the year 2017, since it represents a complete period of operation, for the Mine, Geology and Laboratory budgets, the cut-off is 59.55 US$/t, the following table (Table 14.18) shows detailed costs for each budget:

Table 14.18 Mineral Resource Cut-off 2017

Items	Average last year (US$/t)
Mine	40.72
BACKFILL	16.39
SUPPORTING	6.42
HAUL AND LOAD	5.05
AUXILIARY SERVICES	1.82
PREPARATION	2.29
MINE SUPERVISION	0.67
TRANSPORTATION	2.39
EXPLOITATION	3.17
MINE POWER	2.37
MINE INFRASTRUCTE WORKINGS	0.16
Plant	15.11
PLANT AND MILL	11.57
POWER	3.54
G & A	3.71
Cut-off 2018	59.55

The June 30, 2018 cut-off converted to a value of CuEq is 0.88 percent.

Mineral resources have been reported at different CuEq (%) cut-off ranges to compare the metal variance with different cut-off levels (Table 14.19). The cut-off grade used for resources is 0.88 percent CuEq.

Table 14.19 Mineral Resources as of June 30, 2018 reported at a range of CuEq, cut-off grades

Category	Cutoff CuEq (%)	Tonnes (000)	CuEq (%)	Cu (%)	Au (g/t)	Cu Lbs	Au Oz
Measured Resources	0.25	1420	4.39	3.60	2.20	112,867,331	100,260
	0.50	1407	4.42	3.64	2.21	112,828,140	99,952
	0.60	1397	4.45	3.66	2.22	112,786,112	99,637
	0.70	1385	4.48	3.69	2.23	112,721,671	99,213
	0.88	1357	4.56	3.76	2.24	112,548,952	97,881
	1.00	1331	4.63	3.83	2.25	112,365,339	96,438
	1.50	1199	5.00	4.20	2.27	110,926,536	87,430
	2.00	1074	5.38	4.58	2.25	108,475,653	77,661
	3.00	865	6.09	5.31	2.17	101,299,377	60,490
Indicated Resources	0.25	460	3.95	3.16	2.23	31,985,368	33,017
	0.50	457	3.97	3.17	2.24	31,972,248	32,971
	0.60	455	3.99	3.19	2.25	31,956,669	32,920
	0.70	452	4.01	3.20	2.26	31,940,926	32,842
	0.88	446	4.05	3.24	2.27	31,904,185	32,565
	1.00	440	4.10	3.29	2.28	31,865,269	32,193
	1.50	377	4.57	3.77	2.25	31,294,140	27,261
	2.00	321	5.07	4.30	2.15	30,380,008	22,201
	3.00	251	5.79	5.09	1.98	28,165,445	16,017
Measured + Indicated	0.88	1803	4.43	3.63	2.25	144,453,137	130,446
Inferred Resources	0.25	24	2.06	0.62	4.06	324,387	3,119
	0.50	24	2.06	0.62	4.06	324,387	3,119
	0.60	24	2.06	0.62	4.06	324,387	3,119
	0.70	24	2.06	0.62	4.06	324,387	3,119
	0.88	24	2.06	0.62	4.06	324,387	3,119
	1.00	24	2.07	0.62	4.07	324,089	3,113
	1.50	22	2.12	0.64	4.17	309,594	2,950
	2.00	16	2.26	0.69	4.41	239,703	2,247
	3.00	0	3.09	1.04	5.75	121	1

Where:

- *Mineral Resources are as defined by CIM definition Standards on Mineral Resources and Mineral Reserves 2014.*
- *Mineral Resources have an effective date of June 30, 2017. Antonio Cruz, an ATICO employee, is the Qualified Person responsible for the Mineral Resource estimate.*
- *Mineral Resources are Inclusive of Mineral Reserves.*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.*
- *There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves.*
- *Mineral Resources are reported to 0.88% CuEq cut-off*
- *CuEq for each block was calculated by multiplying one tonne of mass of block each by block grade by its average recovery, metal payable recovery and metal price. If the block is higher that CuEq cut-off, the block is included in the resource estimate.*
- *Metal prices considered were US$ 1,278.56/t Au and US$ 3.26/t Cu.*
- *Metallurgical recoveries are based in the historical recovery (January 2017 to June 2018): Au is 61.82% and Cu is 94.15%.*
- *Metal payable recovery used 89.74% for gold and 94.78% for copper*
- *Mineral Resources, as reported, are undiluted.*
- *Density was calculated on each ore-body (Goliat = 3.34t/m3, , Maximus = 3.50t/m3, Maximus Sur = 3.26t/m3, Zeus = 3.53t/m3)*
- *Mineral Resource tonnage and contained metal have been rounded to reflect the accuracy of the estimate and numbers may not add up.*

MINER generated the grade tonnage curves using the data from Table 14.19 – grade at different CuEq (%) cut-offs (Figure 14.17: Grade, Figure 14.18: Grade and Figure 14.19: Grade)

Figure 14.17 Grade (CuEq) Tonnage Curves of Measured Resources in El Roble Mine

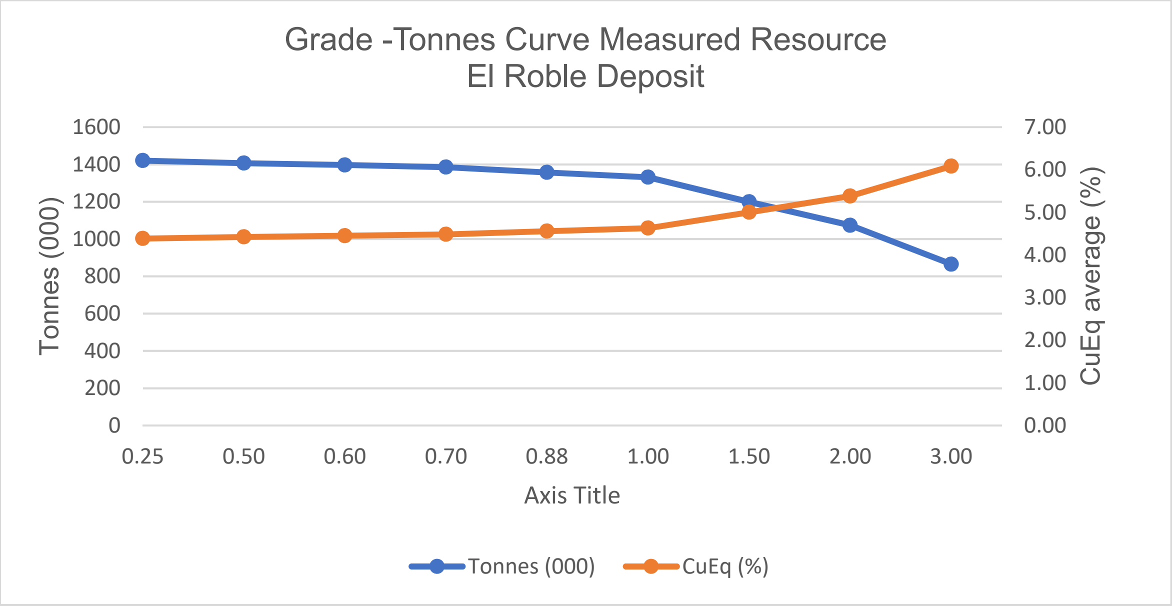


Figure 14.18 Grade (CuEq) Tonnage Curves of Indicated Resources in El Roble Mine

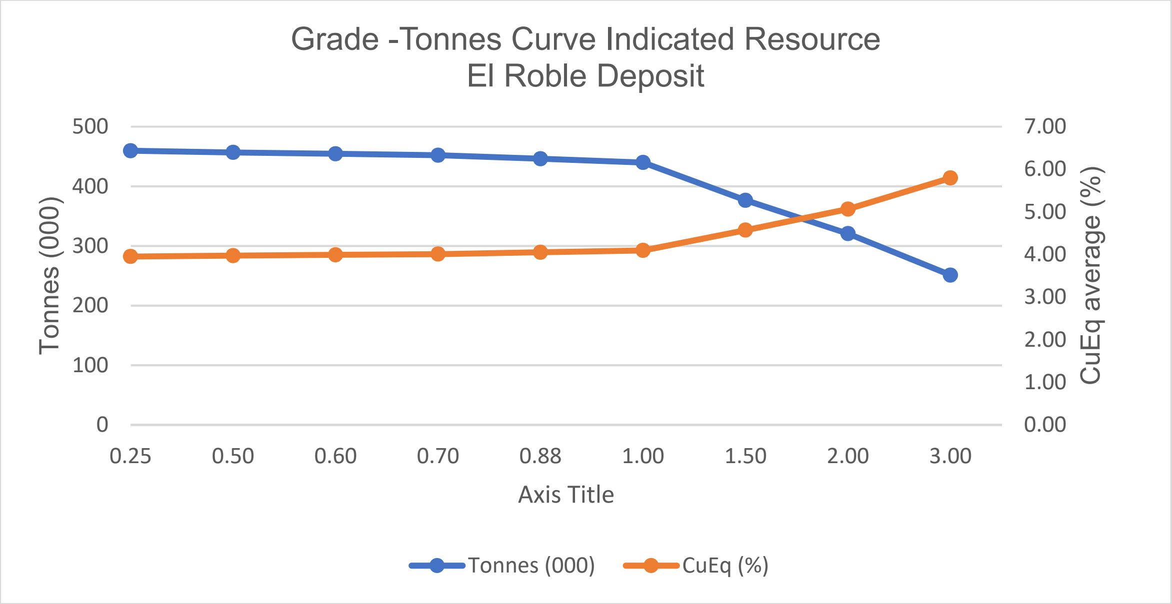
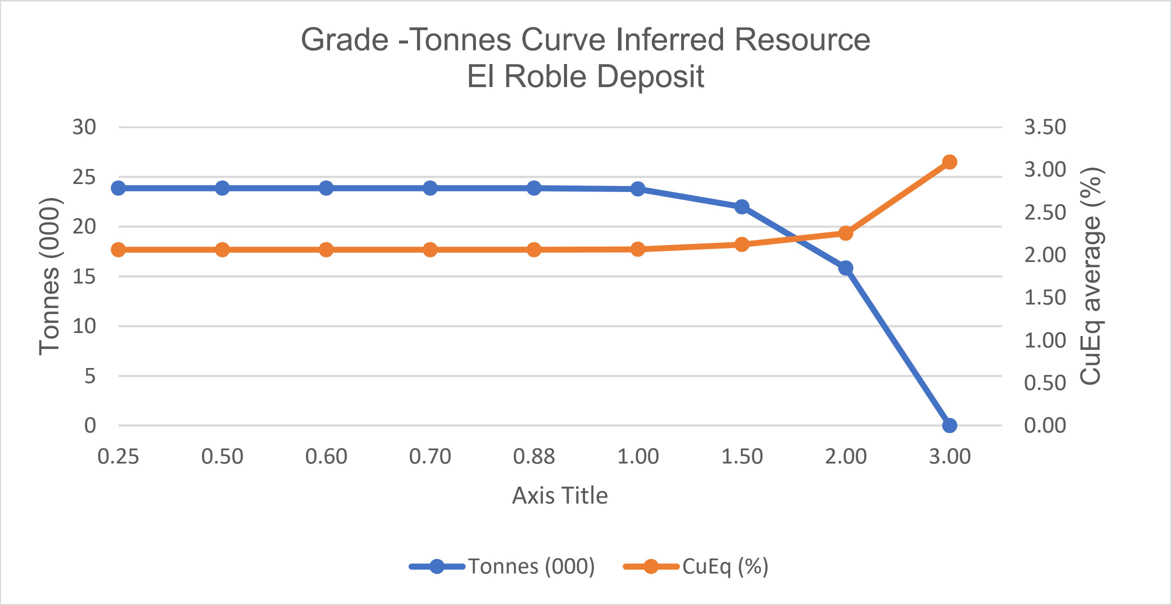


Figure 14.19 Grade (CuEq) Tonnage Curves of Inferred Resources in El Roble Mine



The Mineral Resources can be further assessed by examining the tonnes and grade associated with each mineralized-body at the reported cut-off grade (Table 14.20).

Table 14.20 Mineral Resource as of June 30, 2018

Category	Mineralized body	Tonnes (000)	CuEq (%)	Cu (%)	Au (g/t)	Cu Lbs (000)	Au oz (000)
Measured	Goliat	43.1	3.84	3.13	1.98	2,976	2.7
	Maximus	68.0	5.60	4.05	4.35	6,082	9.5
	Maximus Sur	17.4	2.69	1.65	2.91	635	1.6
	Zeus	1,228.5	4.55	3.80	2.13	102,856	84.0
Total Measured Resources		1,357.1	4.56	3.76	2.24	112,549	97.9
Indicated	Goliat	0.1	3.01	2.43	1.63	7	0.0
	Maximus	20.1	5.73	4.26	4.12	1889	2.7
	Maximus Sur	2.4	2.49	1.56	2.59	84	0.2
	Zeus	423.5	3.98	3.20	2.18	29,924	29.7
Total Indicated Resources		446.2	4.05	3.24	2.27	31,904	32.6
Total Measured + Indicated		1,803.3	4.43	3.63	2.25	144,453	130.5
Inferred	Zeus	23.9	2.06	0.62	4.06	324	3.1
Total Inferred Resources		23.9	2.06	0.62	4.06	324	3.1

Where:

- *Mineral Resources are as defined by CIM definition Standards on Mineral Resources and Mineral Reserves 2014.*
- *Mineral Resources have an effective date of June 30, 2017. Antonio Cruz, an ATICO employee, is the Qualified Person responsible for the Mineral Resource estimate.*
- *Mineral Resources are Inclusive of Mineral Reserves.*
- *Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability.*
- *There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves.*
- *Mineral Resources are reported to 0.88% CuEq cut-off*
- *CuEq for each block was calculated by multiplying one tonne of mass of each by block grade by its average recovery, metal payable recovery and metal price. If the block is higher that CuEq cut-off, the block is included in the resource estimate.*
- *Metal prices considered were US$ 1,278.56/t Au and US$ 3.26/t Cu.*
- *Metallurgical recoveries are based in the historical recovery (January 2017 to June 2018): Au is 61.82% and Cu is 94.15%.*
- *Metal payable recovery used 89.74% for gold and 94.78% for copper.*
- *Mineral Resources, as reported, are undiluted.*
- *Density was calculated on each ore-body (Goliat = 3.34t/m3, , Maximus = 3.50t/m3, Maximus Sur = 3.26t/m3, Zeus = 3.53t/m3)*
- *Mineral Resource tonnage and contained metal have been rounded to reflect the accuracy of the estimate and numbers may not add up.*

14.16. Comparison to Previous Estimate

The technical report prepared by REI & RMI provides information on mineral resources with effective date, December 7, 2015, however the cut date information was June 30, 2015 (Table 14.21). The equivalent copper grade (CuEq) was estimated based on long-term metal prices of US$ 2.8/lb Cu and US$ 1,200/oz Au, the metallurgical recovery used was 93.5% for Cu and 73% for Au. Payable metal recoveries were assumed to be 96% and 95% for copper and gold, respectively. This resulted in CuEq (%) = Cu (%) + Au(g/t)*0.4829, very close to the one used for this estimation.

Table 14.21 Comparison Between Actual and Previous Mineral Resources

Year	Category	Tonnes (000)	Cu Eq. (%)	Cu (%)	Au (g/t)	Contained Metal	
						Cu Lbs (000)	Au oz (000)
2018	Measured	1357	4.56	3.76	2.24	112,549.0	97.9
	Indicated	446	4.05	3.24	2.27	31,904.2	32.6
	Measured + Indicated	1,803	4.43	3.63	2.25	144,453.1	130.5
	Inferred	24	2.06	0.62	4.06	324.4	3.1
2015	Measured	791	4.94	3.68	2.61	64,189.0	66.0
	Indicated	1,074	4.27	3.29	2.02	78,023.0	70.0
	Measured + Indicated	1,865	4.55	3.46	2.27	142,212.0	136.0
	Inferred	255	4.10	4.10	1.34	23,042.0	11.0

Measured Resources increased from 791 Kt to 1,357 Kt, copper grade increased from 3.68 to 3.76 percent, however, gold grade decreased from 2.61 g/t to 2.24 g/t. Indicated Resource decreased from 1,074 Kt to 446 Kt, the copper grade decreased from 3.29 to 3.24 percent, but the gold grade increased from 2.02 g/t to 2.27 g/t. Inferred Resources decreased from 255 Kt to 24 Kt. Most of the previous Inferred Resources have been converted to Indicated Resources.

15. Ore Reserve Estimation

15.1. Introduction

The CIM Definitions Standards (CIM 2014) define a mineral reserve as follows:

A Mineral Reserve is the economically mineable part of a Measured or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified.

The CIM Definitions Standards (CIM 2014) further state that:

Mineral Reserves are those parts of Mineral Resources which, after the application of all mining factors, result in an estimated tonnage and grade which, in the opinion of the Qualified Person(s) making the estimates, is the basis of an economically viable project after taking account of all relevant Modifying Factors. Mineral Reserves are inclusive of diluting material that will be mined in conjunction with the Mineral Reserves and delivered to the treatment plant or equivalent facility. The term "Mineral Reserve" need not necessarily signify that extraction facilities are in place or operative or that all governmental approvals have been received. It does signify that there are reasonable expectations of such approvals.

Mr. Thomas Kelly, RM-SME is the owner of Andes Colorado Corp., is a Qualified Person as defined by NI 43-101 and is an independent advisor to Atico. The mineral reserve estimate for the El Roble Mine, Carmen de Atrato, Choco Province, Colombia was completed in accordance with NI 43-101 and based on all data available as of June 30, 2018. Ore is processed at the El Roble process plant facility; the plant has a nominal capacity of 850-dmt ore per day.

The El Roble operation established a number of industry-standard practices for reporting mineral resources when the project was acquired by Atico in 2013, among them independent QA/QC for all laboratory analytic results, reconciliation of metals from the smelter back to the mineral resource in the block model, drill core handling/logging procedures and other policies and procedures. The practices have produced two previous NI 43-101 compliant mineral resource estimates; this report contains the first ore reserve estimate completed for El Roble. It is noted that previous owners completed several non-NI 43-101 compliant estimates of reserves for earlier operations, none of these reports or the data used to perform mineral reserve estimates in those reports is included in this report.

The Mineral Resources estimate reported in Chapter 14 are the basis for the Mineral Reserve Estimate. The Mineral Resources have been reported in three categories, Measured, Indicated and Inferred. Only Measured and Indicated Resources are deemed to have sufficient confidence to be used for the Mineral Reserve estimate. Measured Resources are the basis for the estimate of Proven Mineral Reserves and Indicated Resources are the basis for the estimate of Probable Mineral Reserves.

The conversion to mineral reserves depends upon the material in the two resource classifications (Measured and Indicated Resources) meeting certain conditions such as each block average grade meeting or exceeding the break-even cut-off grade. After checking that each block met the grade and other conditions the blocks were added to the mine plan. The summation of the Measured and Indicated Resources within active mining areas and in areas adjacent to active mining areas for which mining is planned was then aggregated to become the Proven and Probable Mineral Reserve. An operations/financial model using actual El Roble technical inputs (process plant recoveries, productivities, etc.) and costs was then prepared; the financial model used the mine plan containing the Proven and Probable Mineral Reserve blocks from the block model and showed that the project was profitable. This meets NI 43-101 standards.

15.2. Mineral Reserve Estimation Methodology

The Mineral Reserve estimation methodology used for the El Roble Mineral Reserve estimate follows the steps below:

- Review of the geology and grade distribution within the Measured and Indicated Resource blocks in the El Roble block model and confirmation that the present mining method is a suitable method going forward;
- Review of past metal reconciliations of mineral resources from the smelter back to the block model;
- The break-even cut-of grade (US$/dmt) is estimated using the actual operation costs for mining, processing, general and administrative costs and sales costs;
- Identification of Measured and Indicated Mineral Resource blocks in the block model that may be mined using the present methodology; permanent pillars, inaccessible areas within the block model and other areas where no mining is planned in the future are also identified;
- Measured and Indicated Resource blocks that will not be mined for any reason are removed from the block model to be used for reserve estimation, along with all Inferred Resource blocks;
- A dilution factor is estimated and the dilution is applied to the block model blocks left in the ore reserve block model;
- A value for each block remaining in the ore reserve block model is estimated using the diluted tonnage and grade for that block; value estimation also includes projected metals prices, metallurgical recovery of metal to concentrate and the commercial terms under which the concentrate is sold;
- A three-dimensional mineable shape (stope outline) is placed around each block in the block model;
- A recovery factor is estimated for each block within the ore reserve block model utilizing the mineable shape for each block; the recovery factor is then applied to each block;
- The break-even cut-off grade is applied to each block within the diluted and recoverable blocks within the ore reserve block model. If the block value exceeds the break-even cut-off grade value the block is added to the ore reserve block model as a mineable reserve in either the Proven or Probable category, depending upon it's resource classification;
- The ore reserve block model is reviewed and any blocks deemed non-mineable are removed. Blocks may exceed the break-even cut-off grade and not be included in the ore reserve if they are outside reasonable mining shapes or other reasons;
- The mining sequence for all of the blocks is planned and a production schedule is made from the sequence;

- A financial model is made utilizing the production sequence and schedule, the operations costs, capital spending estimates, commercial terms for the concentrate sales and other inputs;
- If the financial model shows the mine sequence is profitable the blocks within the ore reserve block model used to project the financial model cash flow are considered ore reserves and included in the Ore Reserve Statement.
- CuEq for each block was calculated by multiplying one tonne of mass of each block by block grade for both Au and Cu by their average recovery, metal payable recovery and metal price. If the block is higher that CuEq cut-off, the block is included in the reserve estimate.

15.3. Mineral Resources Used to Estimate Mineral Reserves

The Mineral Resources reported in Chapte 14 are made of three categories: Measured, Indicated and Inferred. Table 14-20 shows the three categories as they have been estimated for four deposits (Zeus, Goliat, Maximus and Maximus Sur) at El Roble. All of the mineral resources in the Goliat, Maximus and Maximus Sur deposits have been excluded for categorization as Mineral Reserves due to the uncertainty regarding dilution, accessibility, recoverability and other factors. Only mineralized blocks classified as Measured or Indicated from the Zeus block model have been used in estimating the El Roble Mineral Reserve. Table 15.1 shows the Zeus Mineral Resources.

Table 15.1 Zeus Mineral Resources

Category	Orebody	Tonnes (000)	Cu_eq (%)	Cu (%)	Au (g/t)	Cu lb (000)	Au oz (000)
Measured	Zeus	1,229	4.55	3.80	2.13	102,828	84.0
Indicated	Zeus	424	3.98	3.20	2.18	29,916	29.7
Total Measured and Indicated		1,652	4.41	3.65	2.14	132,744	113.7

15.4. Recovery of Mineral Resources within the Mineral Reserve Estimate

The recovery of measured and indicated mineral resources within the block model has been estimated considering several technical aspects including continued use of the drift-and-fill mining method, mine design requirements, geotechnical considerations and historic performance of the mining system within the Zeus deposit. The historic performance is well documented through continuous surveys of the stopes, continuous and reasonable geologic mapping and sampling practices and records, the application of geotechnical policies to limit wall failures and dilution and comparison of planned versus actual stope plans to improve safe recovery of mineral while limiting dilution. The resource estimation geologist also completes a monthly reconciliation of smelter metal recoveries back through the process plant, mine plan and the block model.

Mining recovery of the mineral resource in the Zeus deposit has been impacted by five main aspects:

- A total of 106,913 dmt were removed from the Mineral Resources as they form horizontal safety pillars between the blocks of working stopes. It is noted that at least some portion of these pillars may be extracted at the end of the deposit’s life, however for mineral reserve reporting purposes the policy of assuming no pillars will be extracted has been adopted;

- A total of 29,270 dmt were removed from the Mineral Resources as they form protective pillars around infrastructure within the deposit and cannot be mined;
- A total of 31,522 dmt were removed from the Mineral Resource as the tonnes are in inaccessible areas;
- A total of 26,479 dmt were removed from the Mineral Resource as they are in areas that have either failed geotechnically or are in a near-failure state, rendering them unsafe to mine;
- A total of 74,531 dmt were removed from the Mineral Resource as they are not economic to mine.

Table 15.2 shows the tabulation of tonnage removed for each of the aspects mentioned above.

Table 15.2 Resource Tonnage Removed from Zeus Resource Block Model

Mineral Resource Tonnage Deducted - Zeus Resource Block Model	
Horizontal safety pillars	106,913 dmt
Infrastructure pillars	29,270 dmt
Inaccessible	31,522 dmt
Collapsed or unsafe areas	26,479 dmt
Uneconomic	74,531 dmt
	268,714 dmt

The present mining method is well understood, adapts to the minor changes in Zeus geometry and provides very high recovery of resources within the mineable shapes projected by the mine planning group. No other tonnage deductions are necessary to estimate the recovery of mineral resources to mineral reserves. Table 15.3 shows the tonnage of mineral resources available for mineral reserve estimation purposes after the deductions mentioned above and the percentage recovery of mineral resources to mineral reserves.

Table 15.3 Zeus Mineral Reserve Tonnage Available for Mineral Reserve Estimation

Recovery of Zeus Mineral Resources to Mineral Reserves	
Total Mineral Resource	1,652,064 dmt
Total Mineral Resource Available for Reserve Estimate	1,383,350 dmt
Recovery of Mineral Resources to Mineral Reserves	83.7%

Recovery of mineral resources within stope blocks is assumed to be 100 percent based on stope block reconciliations and stope surveys. A minor amount may be lost while performing the final stope mucking before backfill but the loss amount is negligible. Since the mined material is loaded directly into trucks that haul to surface stockpiles there are no losses in handling the material multiple times.

15.5. Dilution

Dilution in the Zeus deposit is of several types:

- Stope Access and Primary Stope Block dilution, associated with the ends of stope accesses and primary stope blocks overshooting the contact with the black chert host rock;
- Secondary Stope dilution, associated with rockfill and/or shotcrete falling into active stopes during the mucking cycles and reporting to the process plant along with the mineralized material.

15.5.1. Stope Access and Primary Stope Block Dilution

Stope access dilution results from the stope access crossing the contact between the black chert and the massive sulfides with the Zeus deposit. The dilution is the result of the irregular contact which maybe carried in the face of the access drift for several rounds before entering full-face massive sulfide conditions. As the stope access exits the massive sulfides in the opposite contact a similar condition may occur, resulting in carrying several rounds of mixed sulfides and black chert. If the face shows high-grade sulfide mineralization in at least 25 percent of the face area the material is shipped for ore. Consequently, one or two rounds from each stope access drift may carry high dilution rates; however, the overall dilution rate remains small.

As stopes are cross-cut from the main stope access to the hanging wall and the foot wall the ends of the stopes intersect black chert. As with the dilution mentioned in the paragraph above, if there is more than 25 percent sulfide mineralization in the cross-cut face the material is shipped as ore. This practice leads to high dilution for one or two rounds at the end of the stope cross-cut but is well within industry standards for stope mining dilution.

Shotcrete from ground support work occasionally falls intop active stopes and is mucked with the ore. Additionally, some spall of cemented rock fill from the cemented stopes adjacent to the stope(s) being mined results in dilution. Both of these dilution sources are considered minimal in primary stopes.

Dilution due to mucking rock fill along with the ore is considered to be minimal as the mucking gradient is controlled by survey lines. Mucking below the elevation of the surveyed stope floor is strictly controlled, resulting in smooth stope floors with little or no trenching of the rock fill accompanied by resultant dilution.

Dilution from stope access and primary stope block dilution is estimated to be approximately four and one-half percent overall. The dilution is estimated from stope surveys, estimates of shotcrete loss and other practices such as stope block grade reconciliations.

15.5.2. Secondary Stope Block Dilution

Secondary stope block diltion results spalling of fill from the primary stopes as well as filled adjacent secondary stopes falling into active stope blocks. Additional dilution from failing shotcrete is also a source of dilution in the secondary stopes. The El Roble staff also believes additional dilution is warranted in secondary stopes near the upper contact of the deposit to address the potentially weaker condition of the black chert in the contact area after primary stopping has been completed. This is a reasonable assumption.

Dilution due to mucking rock fill along with the ore is considered to be minimal as the mucking gradient is controlled by survey lines. Mucking below the elevation of the surveyed stope floor is strictly controlled, resulting in smooth stope floors with little or no trenching of the rock fill accompanied by resultant dilution.

Overall diltuion in secondary stopes is estimated by the El Roble staff to be approximately seven per cent. The dilution is estimated from stope surveys, estimates of shotcrete loss and other practices such as stope block grade reconciliations.

15.6. Reconciliation Methodology

Since 2014 El Roble has practiced detailed monthly metal reconciliation from estimated resources to metal shipped to smelters. The work of accumulating information and data to be used in the reconciliations is performed by professional, trained staff personnel. Work includes defining sample areas in stope faces, stope backs and stope walls, taking the samples under supervision of a geologist to conform to quality control standards and best practices, measuring excavated volumes with standard three-dimensional survey equipment to estimate volumes accurately, detailed sampling of surface stockpiles of ore, detailed process plant controls (sampling and weighing), and detailed control of material reporting to the concentrate stockpile and the tailings impoundments. In addition, an independent quality control/quality assurance program checks the accuracy and reliability of all metal analyses and the site analytical laboratory to maintain a high level of confidence in the results.

The general flow of the reconciliation methodology is as follows:

1. In situ material is estimated in the block model using only Measured and Indicated resources, this is compared to mineralized material planned for mining in stopes and stope access within Zeus to confirm that all material planned for mining is also contained in the Measured and Indicated Resources;

2. The mined material is compared to the material planned for mining in both tonnage and grade mined;
3. Mined material is compared to transported material (material delivered to stockpile areas is held as truck lots until sampled and weighed);
4. Transported material is compared to plant feed (process plant feed is systematically sampled and weighed);
5. Plant feed is compared to concentrate produced and material reporting to the tailings impoundments (metallurgical balance);
6. Metal in concentrate in stockpiles at the process plant is compared to metal in concentrate shipped from the port facility of Atico located at Buenaventura, Colombia. Concentrate at the port is sampled by an independent sampling company and sealed samples are provided to Atico and to the smelter purchasing the concentrate.

As described earlier in this section the work of documenting each step follows standard industry practices and best practices for quality control and quality assurance. El Roble reports that the reconciliation shows an average positive variance of 2.25 per cent regarding tonnage, 3.23 per cent positive variance in copper grade and 6.10 per cent positive variance with gold grade over the 18-month period over which data was collected to make this mineral reserve estimate. Andes Colorado believes the small variance indicates the resource estimation has been well-done and the information used to estimate the mineral reserve is of good quality.

15.7. Metals Prices

The prices for copper and gold used in the estimate were an arithmetic average of the consensus FactSet Research Systems Inc., Bloomberg L.P., BMO Capital Markets Economics, Canaccord Genuity and Eight Capital Corp. copper and gold metal price projections through 2021 or longer. Table 15.4 shows the arithmetic average of the prices, this average was used for mineral reserve estimation purposes.

Table 15.4 Consensus Metals Prices Used for Mineral Reserve Estimation

Metal	Average Price
Gold ($/ oz)	1,278.56
Copper ($/t)	7,176.80
Copper ($/lb)	3.26

15.8. Metallurgical Recovery

The metallurgical recoveries of gold and copper used for this mineral reserve estimate are the actual results obtained while processing mined material from Zeus from January 2018 through June 2018. El Roble routinely collects samples that are reduced, composited and analyzed following industry standard practices. The sample results are then used to calculate a monthly and year-to-date metallurgical balance using standard metallurgical balance techniques. All sample results for head grades, tailings grades and concentrate grades are independently checked by SGS Colombia S.A., an independent analytical laboratory. Comparative analyes of SGS results and El Roble laboratory results demonstrate a satisfactory level of agreement between the two laboratories; however, El Roble uses the SGS results for month end metallurgical balances as a guarantee of independent analytical quality. Table 15.5 shows the average metallurgical recovery used for the mineral reserve estimate.

Table 15.5 Average Metallurgical Recovery Used for Mineral Reserve Estimation

Metal	Recovery to Concentrate
Copper	94.15%
Gold	61.82%

15.9. NSR Value

The Net Smelter Return (NSR) values for both copper and gold have been estimated using operations and commercial results over the period January 2017 through June 2018. The NSR depends upon a variety of factors such as metals prices, commercial terms, recovery of metals in the smelting and refining processes and other terms. The NSR is the value of the material paid back to the operation after deductions for treatment (smelting and refining charges), transportation to the smelter, insurance and any deductions for penalty elements contained in the shipped and smelted concentrate. It is noted that commercial terms are negotiated annually and will vary from the terms used in this estimate. Given the recent history of consistent commercial terms at El Roble it is reasonable to believe that year-on-year terms will not change significantly, the present NSR values are representative of terms going forward.

The NSR values used for the Mineral Reserve estimate are:

- Copper (US Dollars/% Contained Cu) - $56.30
- Gold (US Dollars/Gram Contained Au) - $21.88
- Copper Recovery to Payable Metal from the Smelter is 95%

15.10. Operations Costs and Break-Even Cut-Off Grade

El Roble has an accounting system in place that tracks costs by department. The system has been in use for many years and is the basis for reporting quarterly and annual financial results as per prevailing financial reporting standards in Canada and Colombia. Additionally, the accounting system and company finances are audited several times each year by independent auditors who provide an additional layer of reliabitly regarding the accuracy of the financial reporting used to estimate the operations costs for the Mineral Reserve estimate.

Table 15.6 shows the operations costs used in the break-even cut-off grade estimate.

Table 15.6 Operations Costs

	Cost Area	Fixed Cost	Variable Cost	Total Cost
ZEUS	Mine	US$ 15.06	US$ 44.10	US$ 59.16
	Plant	US$ 3.84	US$ 15.24	US$ 19.07
	General Services	US$ 14.48	US$ 6.47	US$ 20.95
	Administration	US$ 5.92	US$ 3.82	US$ 9.73
	Commercial	US$ 0.53	US$ 12.53	US$ 13.05
		US$ 39.82	US$ 82.15	US$ 121.97

The Break-Even Cut-Off Grade is estimated using the operations costs, the plant recovery and the average estimated metals price:

- Operations Cost per Dry Metric Tonne (US Dollars) - $121.97.
- NSR Payable Copper per % Copper in Concentrate is $56.30.
- Process Plant Recovery Copper – 94.15%.
- Process Plant Recovery Gold – 61.82%.
- Smelter Payable Copper is 95%.
- Copper Price - $7,176.80/Dry Metric Tonne Cu Metal or $3.26/Pound Cu metal.
- Gold Price - $1,278.56/troy ounce.
- The estimated Break-Even Cut-Off Grade is 1.93% Cu Eq.

15.11. Mineral Reserves

Mineral Reserves are estimated using the Measured and Indicated Resources and applying the parameters discussed earlier in this chapter of the report. Mineral Reserves for the Zeus deposit have been estimated and classified applying the following criteria:

- Proven Mineral Reserves are the economically viable, mineable portion of the Measured Resource for which, after considering relevant mining information, processing/metallurgical information and other relevant factors the Qualified Person believes that economic extraction is feasible;
- This Mineral Reserve has been estimated based upon the economics of the material being mined, hauled from underground, processed at the El Roble process plant, the resultant concentrate shipped to a port and then to a smelter for final processing;
- Reserves have been estimated using the break-even cut-off grade estimated in Section 15.10 above;
- Dilution is estimated to be four and one-half percent in primary stopes in the Zeus deposit and seven percent in secondary stopes in the same deposit;
- Overall mining recovery in the Zeus deposit is estimated to be 83.7 percent;
- Processing recovery is estimated to be 94.15 percent for copper and 61.82 percent for gold based upon operating information provided by Atico;

Table 15.7 shows the Mineral Reserve estimate.

Table 15.7 Zeus Mineral Reserves as of June 30, 2018

Category	Orebody	Tonnes (000)	NSR (US$/t)	Cu (%)	Au (g/t)	Cu_eq (%)
Proven	Zeus	1,143	241	3.53	1.91	4.21
Probable	Zeus	324	206	2.93	1.81	3.58
Total	Zeus	1,467	233	3.40	1.88	4.07

Notes:

1. *Mineral Reserves are as defined by CIM Definition Standards on Mineral Resources and Mineral Reserves;*
2. *Mineral Reserves are reported as of June 30, 2018;*
3. *There are no known legal, political, environmental or other risks that could materially affect the development and mining of the Mineral Reserves in the Zeus deposit;*
4. *Mineral Reserves were reviewed by Mr. Thomas Kelly, RM-SME, president of Andes Colorado Corp., who is a Qualified Person for the estimate and independent of Atico Mining and it's subsidiaries;*
5. *Reserves are based on break-even cut-off grade of 1.93 percent copper equivalent, which is based on actual El Roble operating costs from January 1, 2017-June 30, 2018 along with other factors;*
6. *Reserves were estimated using a metallurgical recovery rate of 94.15% Cu and 62.82% Au, these are average recoveries for both metals reported by the El Roble process plant for the period Jan. 1, 2017-June 30, 2018;*
7. *Copper price used for this estimate is $3.26/lb copper metal and the gold price used for this estimate of $1,278.56/troy ounce gold, both are based on a basket of estimated futures prices from recognized commodity forecasters;*
8. *Figures in the table are rounded to reflect estimate precision; small differences are not regarded as material to the estimate;*
9. *Reserves are estimated based on mining material that will be mined, processed and smelted.*
10. *CuEq for each block was calculated by multiplying one tonne of mass of each block by block grade for both Au and Cu by their average recovery, metal payable recovery and metal price. If the block is higher that CuEq cut-off, the block is included in the reserve estimate.*

15.12. Comparison to Previous Estimates

There are no previous NI 43-101 Mineral Reserve estimates for comparison purposes.

15.13. Comments on Section 15

The Quaified Person is of the opinion that the Proven and Probable Mineral Reserve estimate has been undertaken with reasonable care and has been classified using the 2014 CIM Definition Standards. Mineral Reserves are to be extracted using established underground methodology at El Roble.

16. Mining Method

The El Roble Mine consists of an underground mine with surface infrastructure and a processing plant with a nominal capacity of processing 850 dry metric tonnes of ore daily using standard flotation technology. Access is by paved primary and secondary highways from Medellin, Antioquia. The mine produces ores that are processed at the local process plant, concentratres are shipped to Buenaventura, Colombia on the Pacific coast for storage and eventual shipping to overseas smelters.

The workings are all underground. The principal mine adit is located within a kilometer of the process plant at the nominal 1,850 Level (1,850-m MASL). The 1880 Level serves as a ventilation intake as well as access for all personnel and materials; additionally, it is the main haulage access to transport ore and waste to the surface. A secondary access is located at the 2000 Level (2,000-m MASL), this access is the primary ventilation exhaust for the mine.

Ore is hauled from underground in highway dump trucks and dumped to covered surface stockpiles, the stockpiles are sampled and the material blended to meet the plant feed grade needs. Mine offices, the maintenance facility, warehouse, compressors, electrical substations, dining hall and other infrastructure are all in close proximity on the surface near the adit and process plant.

16.1. Mining Method

Various stoping methods have been used at El Roble successfully. Early in the mine's life blasthole open stoping was done successfully. Large, stable voids were excavated in the massive sulfides with no backfill palced immediately after mining. This method was used from abpve the 2200 Level to the 2000 Level. As large voids were not filled, eventually massive wall failures resulted in collapsed stopes and accesses.

Atico elected to develop a new main access at the 1880 Level to address the newly discovered, deeper deposits. The adit was started in August 2013 and intersected the first deposit in January 2014. Since that time mining has been continuously performed from the 1880 Level, with a declining ramp and raises developed to address the deposit below the 1880 Level horizon.

The drift-and-fill mining method is used in the Zeus deposit. Several other deposits are also mined at El Roble, the company uses variations of sublevel caving and glory-holing to mine these deposits. The work is mostly mining remnants within the other deposits, there is not enough reliable data to be able to estimate a mineral reserve for any deposit other than Zeus at El Roble at present.

The Zeus drift-and-fill mining is addressing a large, amorphous volume of massive sulfide material which contains payable metals (Cu and Au). All of the development work to mine the deposit is complete, the only work remaining is to complete the mining of the stope blocks. Some minor infrastructure will be excavated as required for local ventilation and utilities service needs but this work is not considered to be economically significant. During the Andes Colorado visit the mine was observed to be in safe operating condition, with safety signage, safety equipment and other general mine operational issues in compliance with North American mining standards.

16.1.1. Mining in the Zeus Deposit

Zeus is the deepest deposit to be mined at El Roble, approximately 450 meters below the mountain topography. Zeus is accessed via a main ramp (nominal section 4.5m x 4.5m) departing from the 1880 Level at a decline of nominally 12 percent. All equipment access, haulage, fresh air intake and services are placed in the ramp. There are several Alimak raises that connect the ramp at various elevations to the upper workings on the 2000 Level; these raises serve as exhaust raises to remove spent air from the workings and deliver it to the surface through an adit and workings on the 2000 Level.

Mining is well executed, workplaces are in good order with equipment hung on the walls and roadways clear of debris and graded. All personal observed underground was using the appropriate safety equipment and there were written workplace insrructions posted for each workplace visited.

16.1.1.1. Zeus Stope Access

The Zeus deposit is accessed at vertical intervals ranging from 45 to 60 meters, using cross-cuts and sub-ramps from the main ramp. These cross-cuts and sub-ramps have a nominal section of 4m X 4m and wide radii of curvature to accommodate large equipment. The main ramp was situated approximately 40-60 meters from the Zeus deposit while the ramp was located in black chert. Basalt was found in the footwall of the deposit and the ramp transitioned to the basalt as it is much more stable than the black chert and requires much less ground support. The ramp in basalt remains a nominal 40 meters from the Zeus contact. The condition of the main ramp was very good andis supported by rock bolts and shotcrete for the entire length of the ramp.

Cross-cuts and sub-ramps are driven with mechanized equipment following normal mechanized development cycles of drilling, blasting, scaling, mucking, mapping (geology and/or geotechnical), installation of ground support and then repeated. Ramps and cross-cuts have a nominal 4.5m x 4.5m cross-section with a graded road bed. Since there is little water present in the mine there is no significant ditch but this does not affect the quality of the road bed surface. Headings are ventilated with ventilation fans taking fresh air from the main ramp and forcing the air into the heading to be ventilated with standard plasticized canvas, flexible ventilation tubing. Vent tube diameter depends upon the active heading and associated equipment fleet; diameters range from 30 inches to 36 inches.

Cross-cuts and sub-ramps are driven from the main ramp to access the Zeus deposit as per the mine design. The deposit is amorphous; the accesses may be located at any reasonable access point depending upon the design needs. The sub-ramps and cross-cuts are designed to swing or pivot, providing one access point from the main ramp for each nest of sub-ramps or combination of cross-cut and sub-ramps. The sub-ramp or cross-cut intersects the deposit at the required elevation, stope development and stoping commence. When the lift is completed and the primary stopes have been backfilled the back of the access is brought down as required to provide access to the next lift upward. The broken rock from the back provides the fill for the roadway, extra swell is hauled to the surface as waste. Once the contact has been reached the normal stope development and mining plan resumes.

As the stope access nears the contact a cut-out is slashed and excavated. The cut-out becomes the access for an ore pass system on that level. The orepass system consists of vertical raises with nominal 3-m x 3-m dimensions, either driven conventionally or using longhole raising techniques. At the bottom of the ore pass system chutes have been installed for loading ore from the ore pas into haul trucks and delivered to the surface stockpiles.

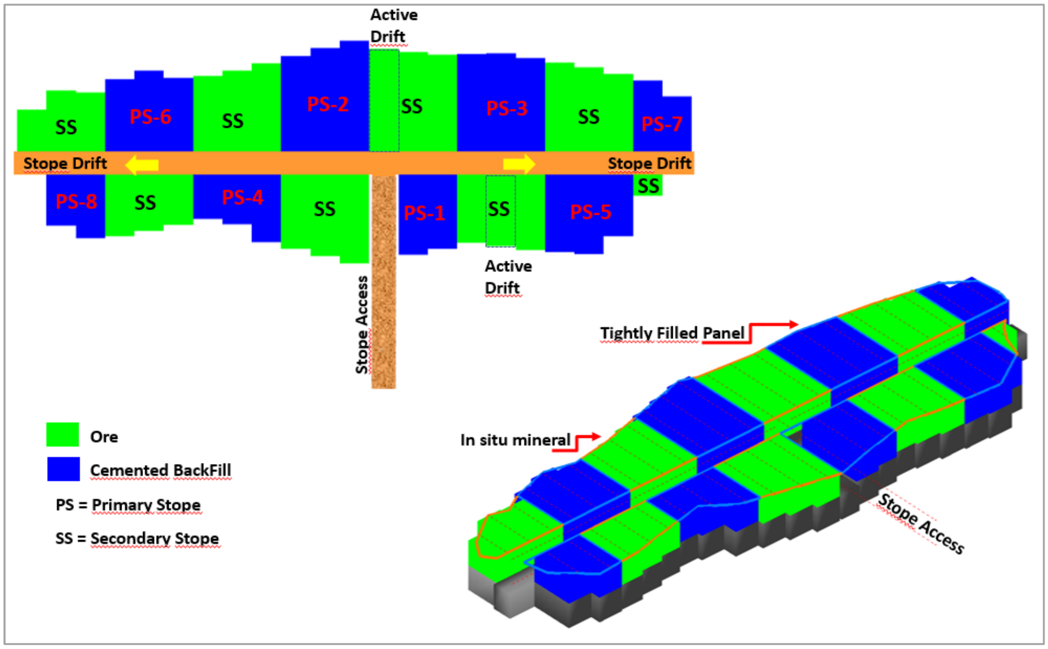
16.1.1.2. Zeus Stoping

The Zeus deposit has been divided into various blocks, each block separated by a five-meter thick horizontal pillar that covers the entire deposit. The first access to a stope block is from the ramp and accesses the lowest stoping elevation within the stope block. Where deposit geometry and the ramp position permit, the access is driven down the approximate longitudinal axis of the deposit, running from contact to contact. If the ramp and deposit geometry do not permit the longitudinal access a cross-cut along a stope block centerline is developed from the sub-ramp or cross-cut access. This cross-cut is driven until it intersects the theoretical centerline of the longitudinal axis of the deposit. At this point a stope drift is turned perpendicular right and left of the cross-cut to develop the stope access drift along the longitudinal axis of the deposit.

The access is nominally 4.5-m x 4.5m with a nominal five-meter back height. The access is supported with shotcrete and rockbolts as required by the local ground conditions. The mining cycle work is performed utilizing the same equipment used in ramp and cross-cut access work. All scaling is mechanized.

Each block in the deposit has been divided into stope blocks. Stope blocks are classified as primary or secondary. Primary stopes are taken in the first pass of mining through the block. These blocks are nominally 5-m x 5-m in section and run from the stope access along the longitudinal access to the contact between the massive sulfides and the host rock. Groups of three primary stope blocks are mined in three separate panels, normally mining one or two non-adjacent panels, filling those panels with a cemented rockfill and then mining and filling the panel between the first two primary stope blocks with the same cemented rockfill. In this manner primary stope blocks with dimensions of 15-m x 5-m are completed from the access to the contact. Primary stope blocks are alternated with 15-meter wide secondary stope blocks on the same side of the longitudinal access and they are staggered with regard to primary and secondary stope blocks on the opposite of the longitudinal access. A basic checkerboard pattern is thus established. Figure 16.1 shows the pattern.

Figure 16.1 Stope Development Pattern, Zeus Deposit



As the main stope drift proceeds along the approximate longitudinal axis of the deposit the primary stope locations are slashed as the drift passes, establishing faces for two of the three panels in each primary stope block. These faces are the two panels within the block that contact the secondary stope blocks on either side. The third panel, located between the other two panels, is left until the first two panels have been filled with the cemented rockfill. Once the first two panels have been backfilled the middle panel may be excavated as needed.

Primary stope panel faces advance along with the main drift in the stope. As the faces advance they are sampled, mapped for geology and geotechnical purposes and surveyed. The results of the sampling and survey are reconciled with the block model to understand the accuracy of the model, reconcile tonnage and grade and provide grade predictions for the advancing faces as well as the secondary stope blocks to be mined in the second pass of stope mining.

Once an entire level has mined and rockfilled all of the primary stope blocks the main drift is filled with uncemented rockfill. The stope access from the main ramp is pivoted upwards so that the access point is now five meters above the old access point, in the same geometric location but five meters above the previous floor. Breasting is done to re-develop the stope access and stope drift, with ground support advancing with the faces. As the primary stope blocks are passed with the stope drift they are slashed and prepared for advance. Mining then proceeds in the same manner as described for the first floor of mining primary stopes. The only difference from mining the first floor is that the stope drift is filled with a cemented backfill, not the uncemented fill used in the first-floor stope drift fill. This process is repeated until the top of the stope block.

Once the mining of the primary stopes in a block is complete the secondary stopes are mined. The mining cycle is the same except on the first lift the stope access is redeveloped by mucking the uncemented backfill from the original stope access drift. The cemented rockfill from the upper lifts is supported as required with shotcrete and bolts. As the secondary stope panel faces become available, they are slashed in the same way as the primary panels. The two outside panels are slashed and mined first, filled with a weak cemented rockfill and then the remaining interior secondary panel is mined and filled. Once the first level mining is complete the stope access is filled with one to two meters of cemented rockfill followed by nominally three meters of uncemented rockfill. Mining on the next level vertically above begins with breasting across the stope access and stope drift and mining the secondary panels in the same manner as they are mined on the first lift as described above.

Mining of the secondary stopes is performed using the same equipment as the primary stopes. Ground support is with shotcrete and rockbolts. The secondary stopes are sampled, mapped (geologic and geotechnical) and surveyed in the same manner as the primary stopes. These results are reconciled with the block model and with the results reported from the process plant and concentrate shipments.

Once the mining of the primary and secondary stopes has been completed in a stope block there is no solid rock left in the block. The rock has been replaced with a cemented rockfill. A five-meter thick pillar is left at the top of the stope block. This pillar is planned for mining in the same manner as the primary and secondary stoping. The pillar mining will start once all of the primary and secondary stopes in Zeus have been mined.

All ore mined in all of the stopes in a lift is mucked to the ore pass system located immediately outside the ore in the waste near the contact between the two. The ore in the ore pass system reports by gravity to chutes at the bottom of the system. The chutes load haul trucks which deliver the ore to surface stockpiles.

16.1.1.3. Dilution and Recovery of Ore in Stopes

The Zeus deposit is a large, amorphously-shaped deposit. This allows practically all of the mining to take place within the deposit with little exposure to the contacts with the wall rock. The exposure to dilution from the host rock is therefore small. As each stope panel face approaches the contact a call is made by the geologist to either stop the face or continue an additional round. This close control minimizes the dilution potential from the wall rock.

Stopes mining next to backfill may be diluted from several sources. One is poor-quality backfill running into the open stope and diluted broken muck. Another is over-drilling the ore or using excessive explosive loads and creating overbreak in the rockfill. Neither source is reported to be significant due to tight control.

The rockfill is routinely monitored at the mix plant for the correct mix proportions and cylinders of each batch are cured and systematically broken to understand the strength of the batch. Additionally, an independent monitoring group monitors blast vibrations in stope headings and makes on-going recommendations regarding powder facotrs and other adjustmetns to the blasting practices to avoid overbreak into the cemented rockfill. These measures contribute greatly to minimizing dilution from the rockfill.

Shotcrete can also cause dilution. Care is given while applying the shotcrete in an attempt to have the shotcrete stick to the rock surface, avoiding the creation of voids between the rock and the shotcrete that can fail into the broken muck after blasting. The work appears to minimize shotcrete dilution as little dilution I snoted in the reconciliations and the processplant does not report excessive concrete, pH variances or other issues in the process chemistry.

16.1.1.4. Ground Support

Ground support is installed in virtually all underground openings at El Roble. The El Roble geotechnical department indicates the type of support to be installed after evaluating the ground conditions in headings and reviewing the conditions in previous lifts (if available) for stope support. Headings are also evaluated regarding their status as permanent or temporary headings and heading sizes are kept to under 6-m x 6-m to minimize the ground support issues.

The majority of ground support is applied by mechanized methods; shotcrete is applied with a mechanized pump/spray system and rock bolts are typically installed with a bolting jumbo. Some bolting in temporary openings is with split set-type bolts and occassionally metal sets are installed. Bolts are installed using standard bolt patterns depending upon the quality of the ground and the dimensions of the opening to be supported.

Typical ground support measures include:

- Wet shotcrete with metal fiber, sparyed on surfaces using a Robojet spray system mounted on a Putzmeister pump truck. Pre-mixed, wet shotcrete complete with the fiber and accelerators is delivered via transfer trucks from a surface mixing plant. Shotcrete is applied in virtually all workings, applying an average two-inch thick covering. The shotcrete typically sets up to a nominal 4-Mpa after a two-hour cure time;
- Resin/rebar bolts are installed in permanent openings and some temporary openings, depending upon the quality of the ground. The rebar is typically 22-mm diameter with a length of seven or eight feet, depending upon the ground quality. Several resin cartridges are applied at the hole bottom, followed by several cartridges of fast-setting cement. The cartridges are shot into the bolt hole and the bolt is then immediately inserted and spun to mix the resin and the cement in the cartidges. The fast setting resin anbchors the bots while the slower setting cement provides strength along the bolt column. Installation is performed using a Sandvik DS311 bolter;
- Split set bolts are installed in temporary openings in good quality ground. The bolts are typical split set-style bolts with a length of seven feet. Jackleg hole diameter is nominally 38-mm;
- In permanent openings welded wire mesh is installed over the resin bolts. Head plates and bolts are used to maintain the mesh tight to the rock mass being supported. The mesh and the shotcrete applied before the mesh installation provide skin support to the opening while the resin bolt provides deep anchoring;
- In areas of very heavy ground or when mining through a caved area, steel arched sets are used. The sets are comprised of W6x20-lb H-Beams with an ASTM rating of A36. Typically, timber lagging is installed in the web of the flanges to provide cover from small rocks falling from above or infiltrating from the walls. Nominal dimensions are 4-m x 4-m inside the sets. The area between the sets, lagging and fresh rock may be backfilled after set installation to prevent further movement.

In stopes either rebar bolts or split sets may be used. The decision regarding which bolt to use depends upon ground quality, length of time the excavation will remain open and other factors as evaluated by the geotechnical personnel.

16.1.1.5. Ore Flow

As described above, broken ore in stopes is delivered to the ore pass system. There is an access to the ore pass system near the main sub-lvel access on each sub-level. The ore reports through the system to a chute at the bottom of the system. From the chute the ore is discharged into haul trucks (either Sandvik 20-tonne underground hault rucks or highway dump trucks) and hauled up the main ramp directly to surface stockpiles where each load is dumped, sampled and tagged individually. Once the grade of the dumped load is determined from the sampling the material is mixed with other stockpiled and sampled material to achieve a relatively constant feed grade to the process plant.

16.1.1.6. Mining Rate

El Roble mines at a production rate of 850 dmt per day. This rate has been sustained for several years and is not excessive for the deposit geometry. There is room to increase this rate, however Andes Colorado believes that it is not advisable to do so until additional mineral reserves are identified and developed as any increase in the present mining rate will only serve to deplete the Zeus mineral reserve at a faster rate than the present.

16.1.1.7. Mine Fleet and Maintenance

The El Roble mining mechanized mining fleet consist s of the following equipment:

- 1 Sandvik electro-hydraulic face jumbo, model DD-311 (single boom, 70-KW);
- 1 Sandvik electro-hydraulic face jumbo, model DS-322 (two boom, 135-KW);
- 1 Sandvik LHD – 4-yd^3 capacity;
- 2 Sandvik LHD – 6-yd^3 capacity;
- 1 Sandvik electro-hydraulic roofbolter, model DS-311 (single boom, 70-KW);
- 1 Shotcrete Pump and Spray Robojet (37-KW) with 2 mixers, each with a capacity of 2.5-m^3 material;
- 1 RESEMIN Scalemin hydraulic rock scaler (36-KW);
- 2 Sandvik 20-tonne underground haul trucks.

MINER contracts some underground haulage with local providers, a contractor mixes and delivers the cemented rockfill to the pump on the 1880 Level. This equipment Is not counted in this list.

The fleet is adequate for the work planned, there is no need to acquire additional equipment. Andes Colorado made no evaluation regarding what, if any equipment may need to be replaced over the course of the planned work.

Sandvik provides factory maintenance at the site for the Sandvik equipment. MINER personnel are trained by the factory to maintain the other equipment. El Roble has a three-bay maintenance facility near the 1880 Level Adit with adequate equipment to maintain the fleet. In addition, El Roble has a preventive maintenance program that has been effective in minimizing major equipment failures.

16.1.2. Backfill

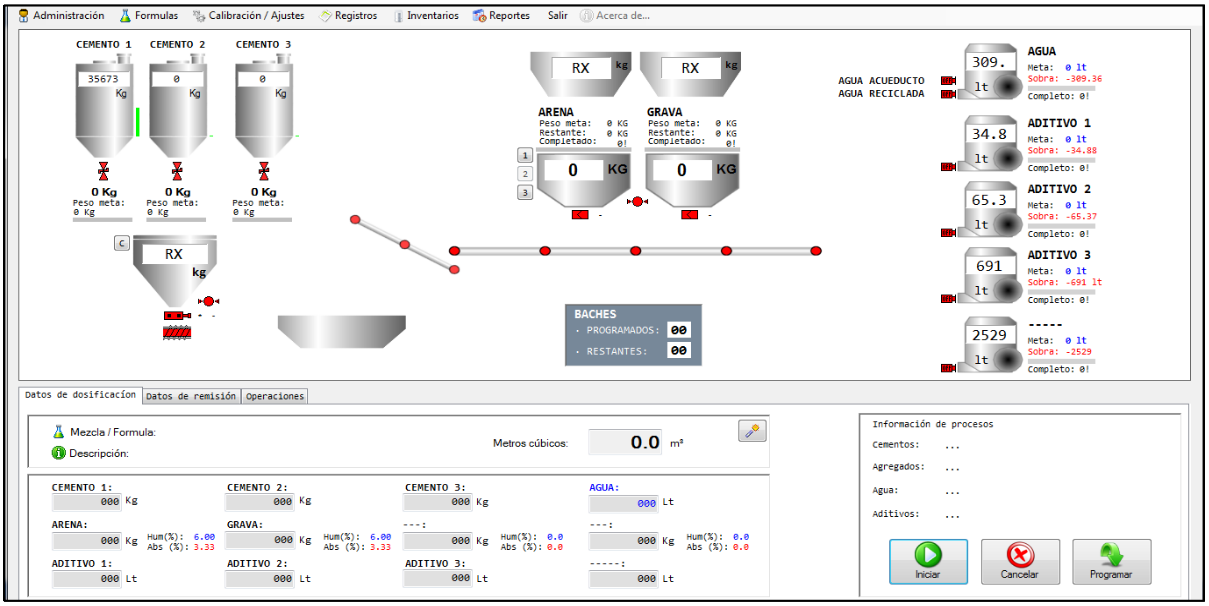
All stope backfill at El Roble is cemented rockfill, with the exception of final fills in some lifts where the central stope access drift is filled with uncemented rockfill. Cemented rockfill is produced on surface and delivered underground in underground cement mixer trucks. The use of uncemented rockfill is limited to areas where no further work adjacent to, under or (in some cases) over the uncemented rockfill is planned. This percentage of the backfill is not large compared to the cemented rockfill.

Typical cemented rockfill is made from washed sand and screened but unsorted gravel prepared in local streambeds, using a nominal -3/4”, +1/8” fraction of the stream gravel. Washed sand is purchased locally from various suppliers. After screening the materials are stockpiled near a cement mixing plant on the surface approximately 0.75-km from the 1880 Level Adit. The sand and gravel is mixed with cement and other additives at the plant to make the cemented rockfill. The sand to gravel ratio in the mix is 66 percent gravel and 36 percent sand.

The plant is a locally-made Colombian mixer plant with a nameplate capacity of 45m3/hour of mixed material output. The main componenets are three cement silos, each with a capacity of 85-tonnes of dry cement, several silos with a combined capacity of 25,000-liters of additives (accelerators, plastifiers and other additives as called for by various backfill mixes) and a computerized dosage system that applies the required amount of each ingredient to the scale-weighed sand and gravel. The components report into a waiting mixer truck which mixes the material while transporting it underground.

Mixtures may vary depending upon the strength of the rockfill required for each application and range from two to eight MPa. Typically, primary stopes receive a slightly higher-strength mixture than the secondary stopes. The mixture recipes are programmed into the mixing plant, the plant operator selects the required mix from a menu of mixes and the plant makes the required amount of cemented rockfill as per the desired mixture. Figure 16.2 shows a schematic diagram of the mixing plant.

Figure 16.2 El Roble Cemented Rockfill Mixing Plant



CEMENTO 1: 35673 Kg; 0 Kg; Peso meta: 0 Kg
CEMENTO 2: 0 Kg; 0 Kg; Peso meta: 0 Kg
CEMENTO 3: 0 Kg; 0 Kg; Peso meta: 0 Kg

ARENA
Peso meta: 0 KG
Restante: 0 KG
Completado: 0!
0 KG

GRAVA
Peso meta: 0 KG
Restante: 0 KG
Completado: 0!
0 KG

BACHES
· PROGRAMADOS: 00
· RESTANTES: 00

AGUA: 309. lt
Meta: 0 lt
Sobra: -309.36
Completo: 0!

ADITIVO 1: 34.8 lt
Meta: 0 lt
Sobra: -34.88
Completo: 0!

ADITIVO 2: 65.3 lt
Meta: 0 lt
Sobra: -65.37
Completo: 0!

ADITIVO 3: 691 lt
Meta: 0 lt
Sobra: -691 lt
Completo: 0!

-----: 2529 lt
Meta: 0 lt
Sobra: -2529
Completo: 0!

Mezcla / Formula:
Descripción:
Metros cúbicos: 0.0 m³

CEMENTO 1: 000 Kg
CEMENTO 2: 000 Kg
CEMENTO 3: 000 Kg
AGUA: 000 Lt
ARENA: 000 Kg Hum(%): 6.00 Abs (%): 3.33
GRAVA: 000 Kg Hum(%): 6.00 Abs (%): 3.33
---: 000 Kg Hum(%): 0.0 Abs (%): 0.0
---: 000 Kg Hum(%): 0.0 Abs (%): 0.0
ADITIVO 1: 000 Lt
ADITIVO 2: 000 Lt
ADITIVO 3: 000 Lt
-----: 000 Lt

Información de procesos
Cementos: ...
Agregados: ...
Agua: ...
Aditivos: ...

The mixed material reports via the mixing trucks to a pumping chamber located approximately 800-m inside the 1880 Level Adit. The pumping chamber consists of a receiving tank to which the mixed rockfill reports. From the receiving tank the material flows to a Schwing SP2000 concrete pump. The pump sends the matrial to the desired stope via a network of pipes that travel down the main access ramp and several dedicated backfill raises to the various stope sub-levels and stope accesses. The pump can place cemented rockfill at the nominal rate of 90-m3/hour.

16.2. Mine Infrastructure

The principal mine infrastructure was installed through 2016, the main ramp reached its final depth in early 2018. There is no significant capital development program for the mine planned at this time as the present infrastructure is adequate to extract the Zeus deposit in its economic entirety. The most important on-going infrastructure systems include the ventilation system, mine sevices (compressed air and electrical distribution) and the dewatering system.

16.2.1. Mine Ventilation

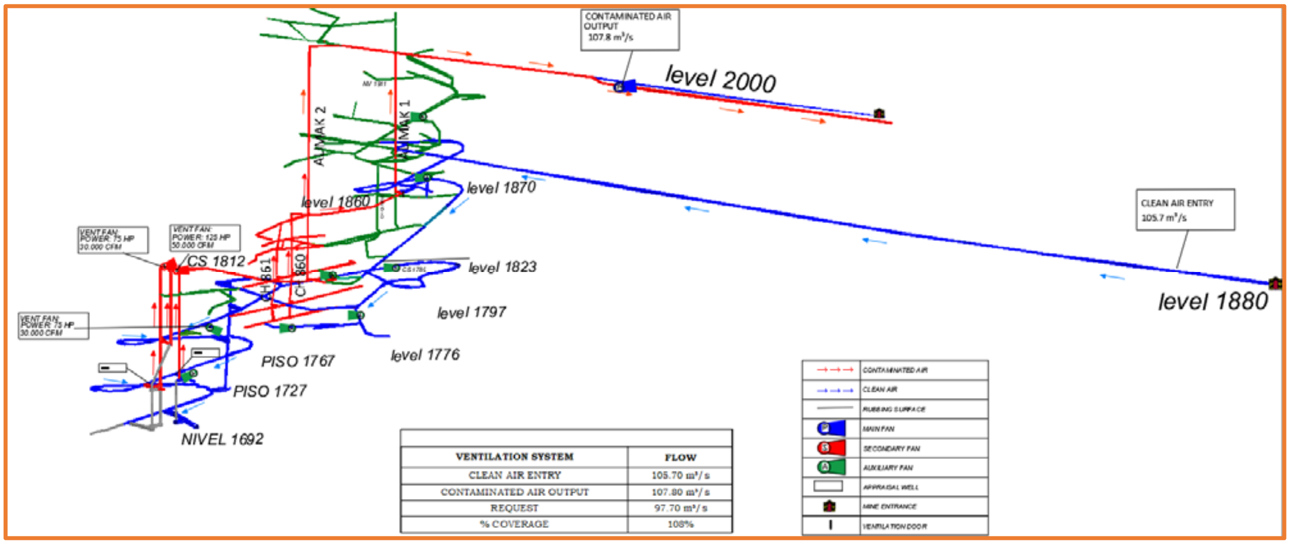
The mine is ventilated using the 1880 Level as the fresh air intake. Since all personnel, equipment and materials travel through this access it is critical to maintain high quality ventilation. The fresh air volume is estimated to be 105.7-m3/second, the volume is measured by a ventilation technician regularly; the volume reported in this report is an average over several measurements. The measured average volume is approximately 10 percent higher than the required volume of 97.7-m3/second. The required volume was estimated using the measured equipment work hours, maximum number of personnel working underground and other data and applying international standards for underground mine ventilation requirements (fresh air flow per brake-horsepower, per person, etc.).

The air travels down the main access ramp where splits are separated by secondary, axial vane fans and the air blown into the various workings on the active sub-levels. The air in the workings reports via a system of raises in the workings to exhaust raises located on the north and west sides of the Zeus deposit. These raises allow the spent air to flow up to the 2000 Level where the air exhausts to the surface.

The exhaust output averages approximately 108.7-m3/second, the increase in airflow from that reported on the 1880 Level intake is from leakage pulled into the sytem from the 2000 Level and above. The 2000 Level connects through old workings to other surface openings on the 2100 Level and above, due to leaking seals in the upper workings an additional 3-m3 of air is taken in through the old workings and reports as exhaust on the 2000 Level.

The main ventilation fan is a Spendrup Model 200-080-1200-A-2 direct drive axial flow fan operating ar 1200 RPM. The fan has a 78.75” diameter and uses 16 adjustable, cast aluminum blades to move the air. The working fan pressure (wet gauge) is 10.5-mm water with the fan blades in the number five setting. The fan motor is electric (250-HP, 480-V) complete with starter, fed from an electrical substation on the 2000 Level surface near the portal. Figure 16.3 shows a line diagram of the ventilation system.

Figure 16.3 El Roble Ventialtion Line Diagram



VENTILATION SYSTEM	FLOW
CLEAN AIR ENTRY	105.70 m³/s
CONTAMINATED AIR OUTPUT	107.80 m³/s
REQUEST	97.70 m³/s
% COVERAGE	108%

16.2.2. Mine Services

Mine services are comprised of the communication system, compressed air distribution system and the electrical energy distribution system. The communication system is a mine wide sytem of radios and repeaters that requires no further discussion. The system is mine-wide, anyone with a radio can access the system anytime and there is continuous communication between underground personnel and the surface. The system provides a high degree of industrial security, personnel safety and control of activities throughout the workings and the surface.

Compressed air is a secondary source of energy for drilling, is used for shotcreting and may be used to purge cemented rockfill pipes in the event the pipes become plugged or have a near-plugging incident requiring an immediate need to evacuate the rockfill from the pipe. Electrical energy is used for mechanized drilling, mechanized rock bolting, secondary ventilation, mine dewatering and underground lighting.

16.2.2.1. Compressed Air

Compressed air is provided by four compressors. All fo the compressors are located on the surface near the 1880 Adit, close to the mine substation and near the surface maintenance facility. The various compressors are:

- 2 each, Airman SMS125/150S electric, screw-type compressors driven by 200-HP electric motors with a nominal output of 850-CFM at 100-PSI;
- 1 each, Ingersoll Rand SSR-XF150 electric, screw-type compressor driven by a 150-HP electric motor with a nominal output of 740-CFM at 125-PSI;
- 1 each, Ingersoll Rand SSR-XF200 electric, screw-type compressor driven by a 200-HP electric motor with a nominal output of 1000-CFM at 125-PSI.

Compressed air reports from the compressors to a receiver tank that feeds at 6-inch HDPE airline. The airline is routed through the 1880 Level Adit to the main ramp where a small spilt in a 4-inch HDPE airline reports to the upper workings. An additional 4-inch HDPE airline reports down the ramp to the Zeus workings. Individual airlines of 2-inch diameter feed the various workplaces where compressed air may be required. Not all workings required compressed air, therefore the distribution in the Zeus workings is installed and removed on an as-needed basis.

16.2.2.2. Electrical Distribution

Electrical energy is delivered to the property substation (three transformers, each with a capacity of 1-MW) from the national power grid at 13.2 Kv. This substation provides surface energy to the mine plant, backfill mix plant, shops, process plant, offices and other surface installations. A high voltage line from the substation reports to the underground workings (13.2-Kv). Three mobile, purpose-built underground substations, located at various points near operating workings, transform the high voltage electricity to 440-v energy for use with equipment. The mobile substations may be relocated using an LHD as required for the mine's operations.

The three underground substations have capacities of 500-KvA/627-A, 600-KvA/753-A and 1-MW/1,255-A. All electrical energy delivered to the site is 60-Hz frequency. The electrical energy supply is adequate for the sustained mine operations required to achieve the production estimates used for mineral reserve estimation in this report.

16.2.3. Mine Dewatering

The mine makes no significant flows of water, the only consequential water found in the mine is that introduced by the mining operations (drilling, wetting down muck piles, flushing the cemented rockfill pump lines, etc.). As such, mine dewatering needs are modest, the total water handling system is capabale of pumping approximately 200-l/minute of mine water to the surface.

The system is comprised of portable, electric collector pumps in the active workings that pump the mine water to a sump located on the 1827 Level in the main ramp or the main sump located on the 1880 Level. Each sump has a decantation sump and a clear water sump. Mine water is discharged into the decantation sump where the water first flows past an oil catcher (floating sponge) and then into deeper water where the discharge loses velocity and drops solids into the bottom of the sump. Overflow from the far end of the decantation sump flows into the clear water sump where further settling of fine particles occurs.

At the far end of the clear water sump a fixed electric, centrifugal pump picks up the water and delivers it into a 2-inch HDPE pipeline. The pipe line from the 1827 Sump reports to the 1880 Sump, the pipe line from the 1880 Sump reports to a surface settling pond where the water is again clarified, polished and then discharged to the environment. The discharge is monitored for compliance with local environmental regulations.

16.3. Mine Labor

Mine labor is provided by the local community of Carmen de Atrato. Underground mining has been conducted in the area for over thirty years and experienced labor is readily available. For specialized labor and training purposes selected personnel may be contracted in Peru and work at the site, generally as trainers or as specialized equipment operators.

16.4. Mine Planning

MINER has developed a life-of-mine (LOM) production schedule that depletes the mineral reserve in the Zeus deposit. Since there are no other reserves in any other deposits in the mine, the Zeus reserve represents the entire reserve base. The Zeus production schedule is the LOM schedule for El Roble.

Production is planned at an average process plant throughput rate of 815-dmt/Operating Day. The schedule includes minor stope development access in 2019 and 2020 (194-m in 2019 and 107-m in 2020). There is no further development work required or scheduled to extract the remaining mineral reserve in Zeus, no capital mine development work is planned for the duration of the mine plan.

Sequence of the stope block extraction in Zeus is set by the mining method and extraction sequences that began when the first sub-levels were established over the past few years. Andes Colorado has reviewed the stope sequence and concurs that the sequence is a reasonable and safe sequence. The mineral reserve tonnage extracted is the same as the estimated mineral reserve (1,467,112 dmt). All of the production is planned for processing in the same year it is produced. Table 16.1 shows the El Roble LOM production schedule.

Table 16.1 El Roble Estimated LOM Mineral Production and Processing Schedule

	H2 2018*	2019	2020	2021	2022	2023
Mine Production	135,057 ton	278,947 ton	282,897 ton	281,921 ton	284,379 ton	203,911 ton
Process Plant Throughput	135,057 ton	278,947 ton	282,897 ton	281,921 ton	284,379 ton	216,655 ton
Head Grade Cu (%)	3.36 %	3.50 %	3.45 %	3.15 %	3.40 %	3.53 %
Head Grade Au (g/dmt)	1.99 g/dmt	1.93 g/dmt	1.88 g/t	1.86 g/t	1.78 g/t	1.94 g/t
Head Grade, Cu-eq. (%)	4.06 %	4.19 %	4.12 %	3.81 %	4.04 %	4.22 %
Recovery Cu to Con. (%)	94 %	94 %	94 %	94 %	94 %	94 %
Recovery Au to Con. (%)	62 %	62 %	62 %	62 %	62 %	62 %
Concentrate Production (dmt)	19,523	42,033	42,054	38,235	41,692	32,898
Concentrate Grade Cu (%)	22 %	22 %	22 %	22 %	22 %	22 %
Concentrate Grade Au (g/dmt)	8.49 g/dmt	7.91 g/dmt	7.83 g/dmt	8.47 g/dmt	7.51 g/dmt	7.90 g/dmt
DMT Cu Contained in Con	4,269 ton	9,191 ton	9,195 ton	8,360 ton	9,116 ton	7,193 ton
Troy Ounces Au Contained in Con	5,330 tr. oz.	10,691 tr. oz.	10,580 tr. oz.	10,412 tr. oz.	10,060 tr. oz.	8,353 tr. oz.
Price Cu (USD/lb.)	3.26	3.26	3.26	3.26	3.26	3.26
Price Au (USD/tr. oz.)	1,279	1,279	1,279	1,279	1,279	1,279
N.S.R. (USD/dmt mineral reserve)	233.73	240.07	236.32	219.18	231.15	241.84

** Corresponds to the period July 1-Dec. 31 2018;*

- *Table results are rounded, rounding error is not material;*
- *2018 Estimated Production is from July 1-December 31, 2018.*

The production shown in Table 16.4.1 was used for the economic analysis found in Chapter 22. The schedule demonstrates that the project is profitable.

17. Recovery Methods

17.1. Process Description

The existing processing plant at El Roble has a rated nominal through put capacity of 850 tonnes per day. The processing methods consist of conventional crushing, grinding, and flotation to produce a copper-gold concentrate. Grinding is to 80 percent passing 200 mesh before reporting to flotation cells. Four banks of six flotation cells each generate concentrates which are subsequently thickened, filtered and stored on site for shipping via highway truck to the Pacific coast port of Buenaventura. Process tailings are deposited in an impoundment facility situated along the banks of the Rio Atrato located downstream of the processing plant. Process waste water is decanted in a tailings dam and then released (at a pH between 7.48 to 8.45) into the Rio Atrato.

The process recovery in the last 18 months (January 2016 to June 2018) averaged 94.15 percent for copper and 61.82 percent for gold. Concentrate grades for the last 18 months averaged 21.87 percent Cu and 7.85 grams per tonne Au. The only penalty metal known to the Qualified Person responsible for this portion of the Technical Report that occasionally exceeds maximum limits is mercury.

Current smelter charges are US$101.75 per dry metric tonne. Refining charges are US$0.10175 per payable pound of copper, 0.75 percent of gold price subject to a minimum of US$8.00 per payable ounce of gold, and US$0.35 per payable ounce of silver. Payables are specified in the concentrate sales contract as the copper content minus 1.1 percent, 95 percent of the contained gold and 95 percent of the contained silver.

The current sales contract specifies that copper concentrate grades must be maintained between 18 and 24 percent Cu, gold grades between 4 and 20 grams per tonnes, and silver grades between 5 and 60 grams per tonne.

17.2. Process Plant

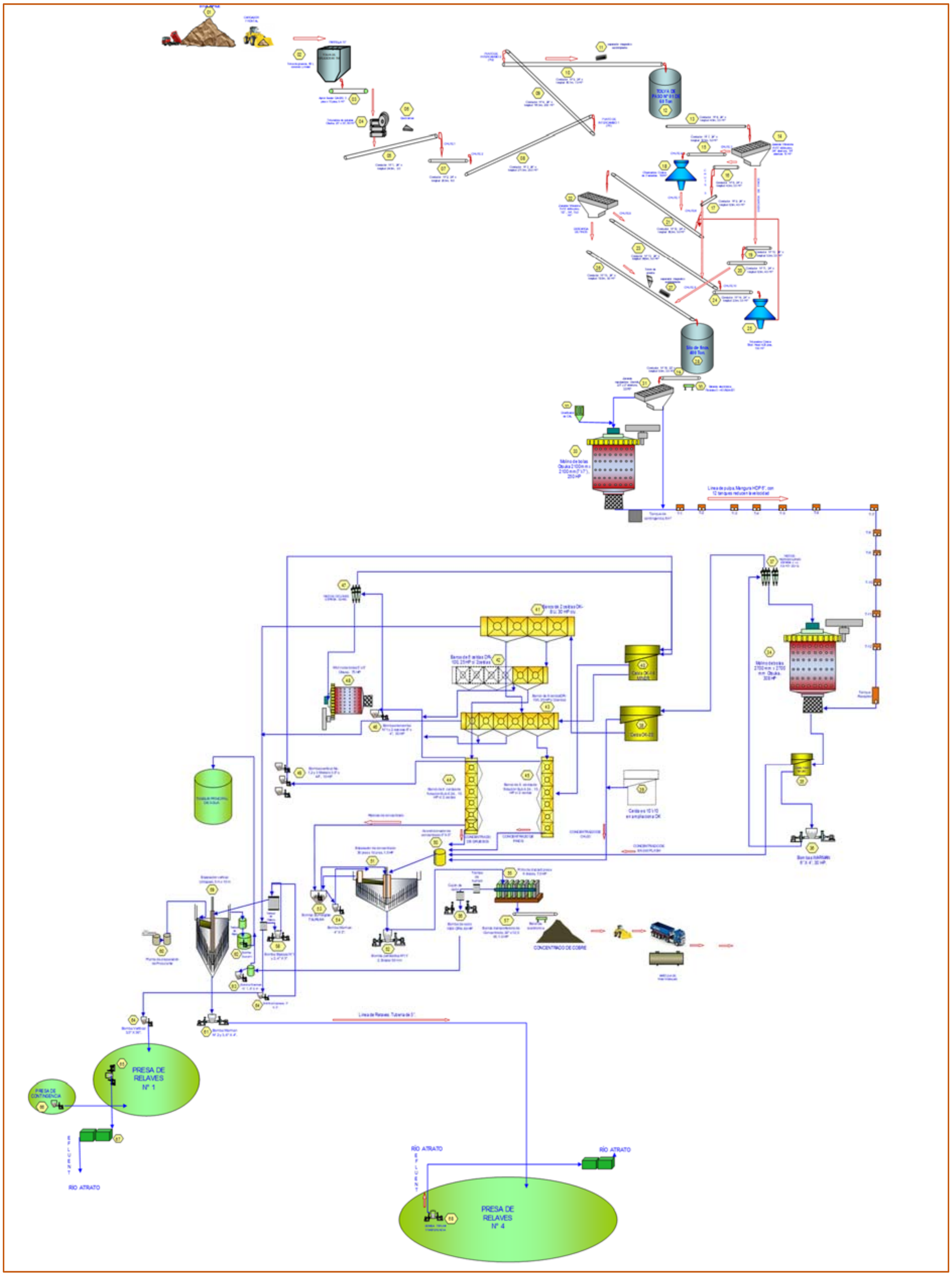
The process plant may be broken down by the various sub-processes that the plant useds to extract copper and gold from the process feed material. The basic sub-processes are crushing, grinding, flotation, concentrate thickening and filtering, tailings disposal. Figure 17.1 shows the general flow chart for the El Roble process plant.

Flotation reagents used are common reagents readily available in Colombia or through importation in bulk. El Roble reports the reagents and dosages have remained consistent for a number of years, no changes are required to achieve the recoveries used in estimating the mineral reserves. The reagent consumption is shown in Table 17.1 below.

Table 17.1 El Roble Process Plant Flotation Reagents and Consumption

Reagent	Kilograms/dmt Ore
Lime	0.266
AP 3477	0.096
AP 318 A	0.038
Z-6	0.006
MIBC	0.028

Figure 17.1 General Schematic, El Roble Process Plant



17.2.1. Crushing

Run-of-Mine (ROM) material is passed through a grizzly to a coarse ore bin, bar spacing on the grizzly is fixed to pass minus 10-inch material. The material in the coarse ore bin reports to an Otsuka 20-inch x 30-inch, 60-HP, single-toggle type jaw crusher via a 3-foot x 10-foot apron feeder. After jaw crushing the material reports to a conveyor system and then a two deck (3/4-inch and ¼-inch screen openings respectively), 5-foot by 12-foot vibrating screen.

The oversize from the vibrating screen reports to a 3-foot diameter, 100-HP cone crusher, this crushed material joins the middling product and reports to a single-deck vibrating screen (1/4-inch openings), the undersize reports to the fine ore bin and the oversize reports to a 4.25-foot diameter, 150-HP short head cone crusher. Crushed material from the secondary and tertiary crushers (cone crusher and short-head conce crusher respectively) reports back through the screen system for resizing and eventually reports to the fine ore bin.

17.2.2. Grinding

Material from the fine ore bin reports by apron feeder to a derrick screen where the material is wetted and screened using a 2.5-millimeter by 2.0-millimeter aperture high frequency vibrating screen. The undersize material reports to the ball mill discharge pulp, screen oversize reports to an Otsuka 2.1-meter by 2.1-meter, 250-HP ball mill. Ball mill discharge reports to the pulp slurry line without further classification. The pulp is then piped by gravity down a steep gradient with an approximate vertical drop of 150-meters to the main process plant.

The ground material reports to the 2.7-meter by 2.7-meter, 308-HP Otsuka ball mill discharge sump, from the sump the amterial is pumped to an SK-240-type flotation cell. The flotation overflow reports to the concentrate thickener, underflow reports to a cyclone nest where the material is classified, with the cyclone overflow reporting to flotation and the cyclone underflow reporting to the second ball mill for further size reduction. The ball mill discharge reports to the same ball mill sump where the pulp from the first stage of milling reports.

MINER is in the process of installing a SAG mill at the site to replace the present first stage ball mill. The existing circuit will be kept and maintained on a stand-by basis. No change in recovery or other process results is expected, the metallurgical results in the process plant expected to remain the same. No adjustments in the plant performance used to estimate the mineral reserve has been made to recognize the change in the first stage of milling.

17.2.3. Flotation

The flotation circuit begins with one OK-20-style flotation cell fed by the secondary ball mill cyclone overflow. The OK-30-style cell overflow reports to the concentrate thickener, the underflow reports to a bank of two, OK-8-style flotation cells. The flotation overflow from these cells reports to the concentrate thickener, the underflow reports to eight, Denver 100-style flotation cells. Cell overflow feeds the final cleaner cells, with cleaner overflow reporting to the concentrate thickener and underflow to the tailings thickener.

The Denver 100-style cell underflow reports to a nest of cyclones for classification, the underflow from the cyclones reports to an Otsuka 5-foot by 5-foot ball mill for further grinding, the ball mill discharge reports to the ball mill sump where it is pumped back to the cyclone nest for classification. The cyclone overflow reports to an OK-14-style flotation cell. The overflow from this cell reports to the cleaner flotation circuit while the underflow reports back to the eight Denver 100-style cells mentioned above.

17.2.4. Thickening and Filtration

Concentrates

Concentrate thickening is performed with a 30-foot by 10-foot rake thickener utilizing a 1.5-HP motor. Thickened material reports to the concentrate filter. The concentrate filter is a six-foot diameter, eight disk vacuum filter. The filtered material has a moisture content ranging between eight and ten percent water. Filtered material reports via conveyor belt to a concentrate storage shed where it is kept dry and secure. Concentrates are loaded onto highway haul trucks with sealed, covered beds for haulage to the MINER concentrate storage facility at Buenaventura, Colombia on the Pacific coast.

Tailings

The tailings are thickened in a five-meter by ten-meter vertical thickener with a conical base. The thickener overflow is recycled to the ball mill and flotation circuits, the underflow reports to a pump box for pumping to the tailings impoundment.

17.3. Electrical Energy

Three-phase electrical energy is delivered to the site from the national grid at a nominal voltage of 13,200 KvA. The high voltage line is split at the property boundary with feeds to the process plant, mine and additional, smaller sub-stations dirtibuted at other points within the property. The plant transformer is rated at 800-KvA. Average electrical energy consumption for the period Jan. 1, 2017-June 30, 2018 is shown in Table 17.2 below.

Table 17.2 Average El Roble Process Plant Electrical Energy Consumption, Jan. 1, 2017 – June 30, 2018

Item	Process	Energy Consump. (KW)
1	Crushing	154,746 KW
2	Grinding	332,960 KW
3	Flotation	171,049 KW
4	Tailings	33,134 KW
5	Filtration	30,990 KW
Total		722,879 KW

17.4. Mass Balance Estimate

The El Roble Process Plant mass balance I shown in Table 17.3 below.

Table 17.3 El Roble Process Plant Mass Balance for 815 dmt Throughput Rate

Daily Throughput	815 dmt		
Mass Balance		Concentrate	Tailings
Concentration Ratio	RC	6.02	1.20
Average Density (dmt/m3)	dp	1.45	1.25
Specific Gravity	g.e.	4.00	2.85
Percent Solids by Weight	% Sp	41.38	30.32
Percent Liquid by Volume	% Lv	85.00	86.76
Mass Flow	m3/tm	1.67	2.65
Production Basis	dmtyear	8,086	285,314
Pulp Volume	m3/year	13,477	755,933
Water Volume	m3/year	11,456	655,823

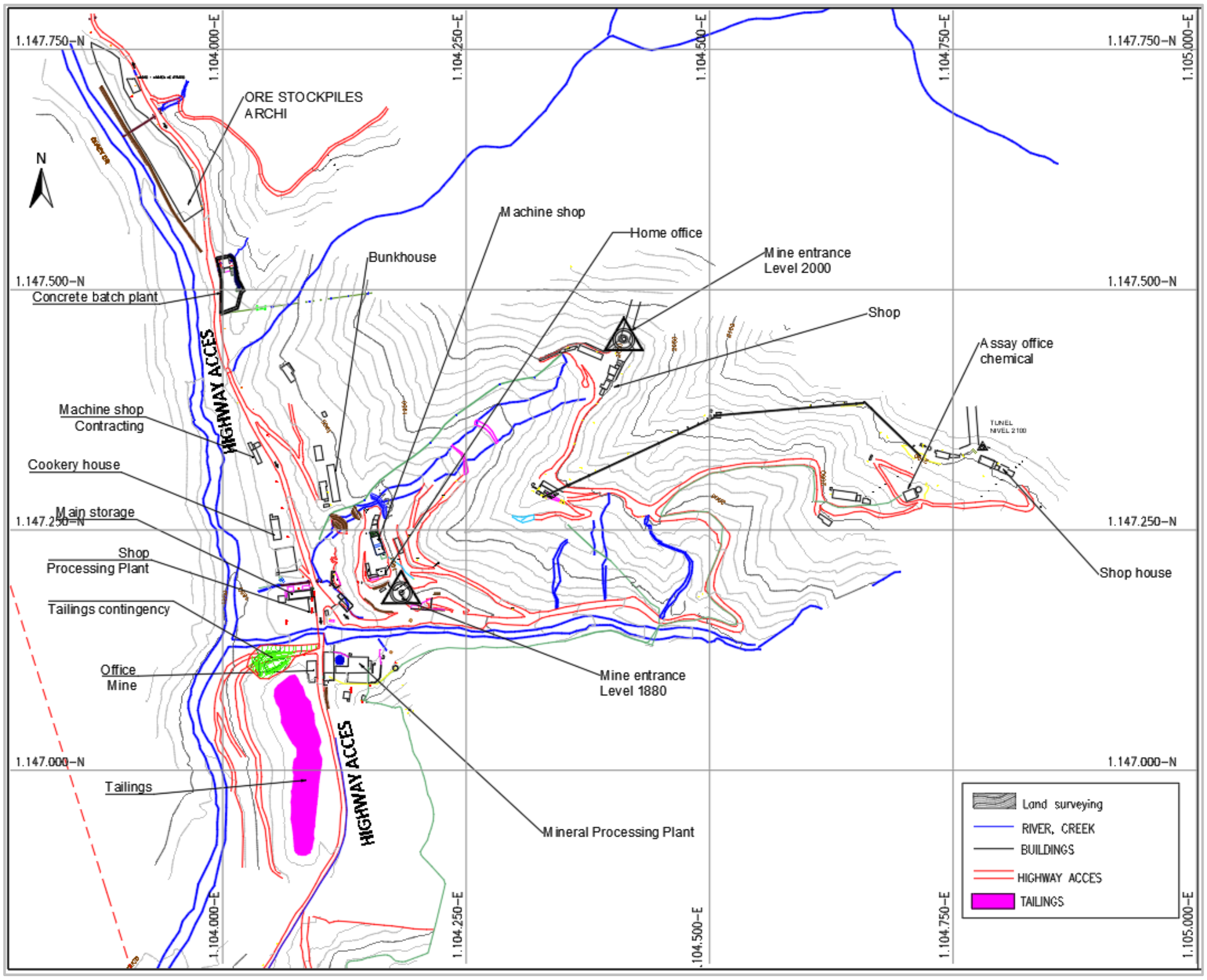
Process Water Consumption	667,279	m3/year
Process Water Consumption	55,607	m3/month
Process Water Consumption	1,854	m3/day
Process Water Consumption	77.23	m3/hour
Ratio Water Consumption	2.27	m3/dmt

Total water used in Plant considering the 40% water reused from filtration and recirculation.	72.65	m3/hour	Litros/s
	1,744	m3/day	
	52,305	m3/month	
	627,663	m3/year	
Consumption Ratio	2.14	m3/dmt	

18. Infrastructure

All of the important operations infrastructure is contained within the permitted land en Colombian Mining Title number 9319. El Roble owns or controls the surface rights for the area. Figure 18.1 shows the location of important infrastructure at the site.

Figure 18.1 El Roble Mine and Process Plant Site Infrastructure



Site access is by gravel road for three kilometers from the town of El Carmen de Atrato, Choco, Colombia. El Carmen de Atrato is approximately 150-km via paved, improved highway from Medellin, Antioquia, Colombia. Medellin offers a wide variety of mining related supplies and materials as well as an international airport and general services as may be found in any large city.

18.1. Tailings Impoundments

El Roble has four tailings impoundments. Impoundment 1, shown in Figure 18.1 as Tailings is used as a surge storage area for tailings in the event that the current tailings impoundment (Impoundment 4) is not able to receive tailings from the process plant. Tailings are redirected to

Impoundment 1 where they are held until Impoundment 4 can receive tailings. Impoundments 2 and 3 are closed and reclaimed.

Impoundment 4 is an earthen construction design with a compacted core and a very large terraplain buttress. The dam was constructed in several lifts with the appropriate soils test work and monitoring during construction. The test records and inspection reports are available from MINE.

The impoundment meets technical speciifcations FS>1.4 (static) and FS>1 (psuedostatic) as defined by the U.S. Corp of Engineers for tailings impoundments. It is built to withstand a 1,000 year, 24-hour maximum rain event. The impoundment has been permitted by the appropriate local governmental agencies.

Impoundment 4 is located approximately 3.4-km down stream from the process plant in the same valley. Tailings report to the impoundment from the tailings thickener underflow pump box through a three-inch steel wall pipe buried under the road that accesses the mine site. The tailings are distributed at the impoundment by moving a flexible discharge pipe to appropriate points for discharge.

MINER estiamtes that Impoundment 4 has a useful life of 26 months, after which the impoundment will be closed. MINER is negotiating a site for Impoundment 5 and has plans to reopen Impoundment 3 if required. The capacities available in the various impoundments are sufficient for the life of mine plan used to estimate mineral reserves in this report.

18.2. Mine Waste Stockpiles

Mine waste reports to a single waste stockpile near the 2000 Level Adit. The stockpile is a fully-permitted, terraced dump that has limited capacity available for further dumping. This should not be a problem going forward as the stockpile has adequate capacity to receive the limited amount of development work required to realize the mine plan used to estimate mineral reserves in this report.

18.3. Mine Ore Stockpiles

Mined ore reports from underground by highway dump truck or low-profile underground haul truck to the surface. The 2000 Level surface area provides a flat area and acts as the main ore stockpiling area. The stockpile is close to the coarse orebin and requires little materials handling. The other two areas are located below the 1880 Level Adit and are used as surge areas whne the 2000 Level stockpile area is full. All of the areas are permitted for their use.

The stockpile management is performed by the Mine Geology department. Individual truck loads are dumped, sampled and tagged. When analytical results are recieved the individual loads are mixed to make a consistent grade plant feed. This material is then dumped by loader to the coarse orebin of the process plant. Total ore stockpile capacity is estimated by MINER to be 20,000 WMT of run-of-mine ore. This stockpile capacity is adequate for the mine plan used to estimate mineral reserves in this report.

18.4. Concentrate Production and Transportation

The process by which concentrates are made was discussed in Chapter 17. The filtered concentrate reports to a concentrate storage facility at the process plant. Approximately every three days a caravan of 30-dmt covered highway haul trucks are loaded with concentrates. The loaded concentrates are sampled and the trucks are weighed before departing site for the concentrate storage facility at the port. When the trucks arrive at the port they are weighed and the weight compared to the weight reported by the mine site scale. No discrepancies have been reported over the five years the present system has been in place.

18.5. Communications Systems

The El Roble site has mobile telephony, fixed telephony and broadband internet service. The services are provided locally. The underground workings have a leaky feeder system, with the leaky feeder cable distributed along the 1880 Level from the adit to the main ramp. The cable follows the main ramp throughout the vertical extent of the ramp, providing communication and internet services to the underground workings.

18.6. Water Supply

Fresh water comes from the Archy ravine, a ravine wholly-contained on the El Roble surface rights. A water takes of approximately 180-m3 fresh water is used for domestic uses (offices, kitchen, etc.) and the process plant. Water is captured in various small dams and directed to the various end users. The flow is continuous and the water take is permitted by the appropriate authorities. The water supply has been stable for many years, it is adequate to meet the needs of the production schedule used to estimate the mineral reserves in this report.

19. Market Studies and Contracts

MINER has a long-term contract with Trafigura SAC, an international minerals concentrate trader. The terms vary slightly year-on-year but are all within internationally recognized concentrate purchasing standards and industry norms.

20. Environmental Studies, Permitting and Social or Community Impact

20.1. Environmental Permits and Studies

MINER follows an environmenal management plan (PMA is the Spanish-language acronym) approved by the Choco regional government's environmental department (Spanish-language acronym CODECHOCO) on January 22, 2001 and identified as Resolution 0030/2001. The resolution states that El Roble is a viable mining project while the operation complies with the policies and guidelines found in the resolution. Resolution 0030/2001 was later modified by Resolution 0850/2002 by CODECHOCO however there were no significant changes. The Company presents to CODECHOCO a report every six months that includes environmental compliance reports (Spanish-language acronym ICA) regarding all activities related to water monitoring, solid and liquid waste management, reforestation and other activities demonstrating compliance with the established policies, regulations, guidelines, formats and methodologies as set out by the Ministry of the Environment.

MINER has additional permits established in Resolution 0870/2013 and 0871/2013 granted on September 10, 2013. These resolutions allow for the waste rock storage area near the 2000 Level Adit and Tailings Impoundment 4 respectively.

Additional permits are Resolution 1638/2016 which allows the company to take surface waters for exploration activities and Resolution 0960/2017 which sets out certain environmental compliance requirements that MINER has been addressing.

MINER has an Environmental Department staffed by environmental professionals that manages environmental administration, prevention and risk control.

20.1.1. Laws and Regulations

The project operates under Colombian laws, regulations and guidelines. Andes Colorado understands that the relevant permits, licenses and approvals have been obtained for the El Roble Mine and Process Plant. Andes Colorado has not checked the individual licenses and permits.

20.1.2. Waste and Tailings Disposal Management

The two major sources of solid waste are the mine waste rock and the tailings generated by the process plant. All of the mine waste rock reports to the 2000 Level waste dump. The process plant tailings all report to Impoundment 4 for storage. Both facilities meet regional and national requirements.

20.1.3. Water and Solid Residue Management

Rain Water Run-Off

Tailings impoundments 3 and 4, as well as the 2000 Level waste dump have ditches around them to prevent inflows of water to the impounments or filtration through the waste dump. Catchment ponds capture run-off from the impoundments and the waste storge facility. The catchment ponds are designed to capture the run-off waters, settle them to allow for the deposition of solids and then discharge the clarified water to the environment.

Tailings Impoundment Water Discharge

Water from Impoiundment 4 is discharged occasionally to the environment. The discharge water is monitored for pH and percentage of suspended solids daily with semi-annual monitoring and reporting of all of the discharge water aspects. The report goes to the Choco government agency assigned to monitor environmental issues within the region (CODECHOCO).

Impoundment 4 also has piezometers spaced around its perimenter. The piezometers are monitored regularly to check for water migrating from the impoundment through leaks in the facility. Additionally, permanent survey points have been installed on the dam and are surveyed regularly to monitor for any possible movement of compponenets of the impoundment. No incidents have been monitored to date.

Oil and Grease Traps, Spent Oil Handling

All of the maintenance facilities, both underground and on the surface, have traps to catch the run-off water from the floors of the facilites and pass the water through a trap system whereby the floating oils and greases may be captured and contained. The kitchen also has an industrial kitchen grease trap.

Spent oil from equipment oil changes and other sources is captured in barrels and sent off-site by contractor to licensed disposal facilites within Colombia.

Domestic Sewage Water Handling

Domestic sewage water is captured in septic tanks. The material in the septic tanks is periodically pumped and taken to licensed disposal sites within Colombia by a contractor.

Solid Residue Handling

Each workplace on the El Roble site has solid waste recipients (barrels) color-coded as to what maybe disposed in each color barrel. The color-code is from the Colombian Technical Guide GTC24, distributed by the national government. Solid residue from each of the three colors is collected separately and sent to the appropriate disposal site.

Scrap metal is kept in a scrap metal storage area. From time to time the scrap is sold to a scrap dealer who collects the scrp metal and hauls it away for recycling.

20.1.4. Air Quality

Underground dust generation and exhaust gas is managed with water sprays, equipment air scrubbers and high-volume ventilation flows. All air quality measurements from underground have been positive, no detrimental air conditions have been identified.

Surface dust is managed by water sprays. There is little dust generated due to the moist nature of the ore reporting to the crushing plant. The tailings impoundments have been covered with topsoil and seeded or are kept moist to avoid dust generation by blowing wind.

20.1.5. Environmental Permits

The following permits have been granted by CODECHOCO and are in good standing:

- Resolution 0030/2001 – Environmental Management Plan – overall operating permit;

- Resolution 0850/2002 – Certain minor amendments to Resolution 0030/2001;
- Resolution 0870/2013 – Permit to establish and use waste rock storage facility near El Roble Mine 2000 Level Adit;
- Resolution 0871/2013 – Permit to construct and operate tailings impoundment 4;
- Resolution 1638/2016 – Allows the use of surface waters for exploration use;
- Resolution 0960/2017 – Sets out certain environmental compliance requirements.

20.2. Land Use, Social and Community

Land Use

The land surrounding the El Roble mine is dedidicated to agriculture or ranching. No ecological sites, archeological sites or other zones requiring limited access or special controls exist in the area.

Social and Community

MINER has established an alliance with the Colombian national government for training personnel in underground mining work, heavy equipment operation and maintenance, environmental management and occupational health and safety. In the past several years over 100 people have been certified in these various fields.

Additionally, MINER sponsors sport leagues for men and women locally, a meal for students program in the local school system and other health initiatives. The Company has also supported local micro business development, agricultural programs and provided services to the local government when weather events have damaged roads and other infrastructure.

There is strong local backing for the mining operation. The town of El Carmen de Atrato relies on the operation for employment of local residents as well as support of local business.

20.3. Mine Closure

The mine closure plan consists of covering the tailings impoundments with topsoil and reseeding, dismantling the process plant and removing the equipment along with related site reclamation. A closure plan has been approved by the Colombian government. MINER estimates the cost to execute the reclamation and remediation work to be $3,120,000. This is included in the long-term capital expenditure budget.

21. Capital and Operating Costs

Capital and operating costs (CAPEX and OPEX respectively) have been developed by the MINER staff using the past years of operation, including comprehensive production and financial reports, historic productivity and unit costs. Detailed costs are available for the mining unit operations (drill, blast, muck, backfill, etc.), process plant unit cost by sub-process as well as detailed administration costs and sales costs. Costs have been reported in United States of America Dollars (USD) or Colombian Pesos (pesos), where the costs have been reported in pesos the relevant exchange rate at the time of reporting was used to convert the costs to USD.

21.1. Mine Capital Cost Estimate

The CAPEX estimate for the operation includes the installation of a primary crusher and SAG mill to replace the existing crushing and primary ball mill circuit, tailings dam construction and mine closure. There is no capital mine work included. Andes Colorado notes that additional capital investment may be required should additional mineral deposits be identified that require underground development work for access and extraction. The CAPEX spending Schule for the LOM Plan for El Roble is shown in Table 21.1 below.

Table 21.1 Estimated El Roble CAPEX LOM Spending (USDx10^3)

	2018 2nd Sem.*	2019	2020	2021	2022	2023
Capex	1,800	4,435	3,808	2,589	1,340	1,040

**July 1, 2018-Dec. 31, 2018;*
All numbers have been rounded to the nearest 000.

21.2. Mine Operating Cost Estimate

The OPEX budget for the life-of-mine was developed using the existing cost basis. The existing cost basis accumulates costs and, on a monthly basis, reconciles the costs at the corporate level to budgets and forecasts. The process is well-established and produces reliable results as per the reconciliation in publically available corporate filings. MINER does not foresee any circumstances that would materially alter the cost estimate based upon present operating circumstances. Andes Colorado notes that operating costs may change should additional mineral deposits be identified that require substantially different equipment or mining methodology to access and extract the new deposits. Table 21.2 shows the unit cost per dry metric tonne OPEX estimate for the LOM Plan.

Table 21.2 Estimated El Roble OPEX LOM Spending, Unit Cost in US Dollars

Unit Cost OPEX		2018 (Q3-Q4)	2019	2020	2021	2022	2023
Mine	USD/dmt	62.8	62.8	62.2	62.9	62.2	59.0
Process Plant	USD/dmt	16.6	18.9	17.0	16.8	16.9	13.1
General Services	USD/dmt	19.1	21.0	17.6	17.0	16.7	11.4
Admin and Off-Site	USD/dmt	9.3	9.7	9.4	9.4	7.5	5.7
		107.8	112.3	106.3	106.2	103.2	89.3

A 12 percent increase in the price of energy has been announced and is included in this OPEX estimate. Additionally, Colombia forecasts an annual inflation rate of 3.3 percent, this has also been included in the OPEX estimate.

22. Economic Analysis

The following section is a summary of the major economic considerations of the operation based on the economic analysis conducted by Atico following appropriate economic evaluation standards for an operating asset such as El Roble. The following section presents the elements of the financial model starting with the financial parameter assumptions and production estimates. Those main inputs allow the forecast of revenues, operating costs, capital costs, sustaining capital, working capital, closure and reclamation costs for final calculations of net project cash flows. The economic analysis has accounted for the nominal processing of 815 tpd, operating 340 days a year.

The start date for the economic analysis was July 1, 2018. The financial results are presented based on future metal production, operating costs (OPEX) and capital expenditures (CAPEX) to completion basis from this date. This represents the total project costs without the production and expenditures to that date. The economic analysis is based on an annual production plan for the life of the mine and associated operating and capital costs. The economic analysis calculates an after-tax NPV at a 5 percent discount rate of US$ 80.5 million giving an average EBIDTA margin of 42 percent.

22.1. Financial Assumptions

The most important financial assumptions influencing the economics of the mine include the following parameters:

- Copper price of US$3.25 per pound;
- Gold price of US$1,279 per ounce;
- Colombian Peso exchange rate (COP $3,000.00 = US$1.00);
- Government royalty of 4 percent NSR for gold and silver and as of 2022, 5 percent NSR for copper;
- Commercial royalty of 1 percent NSR;
- Income tax rate of 37% percent for 2018 and 33% thereafter.

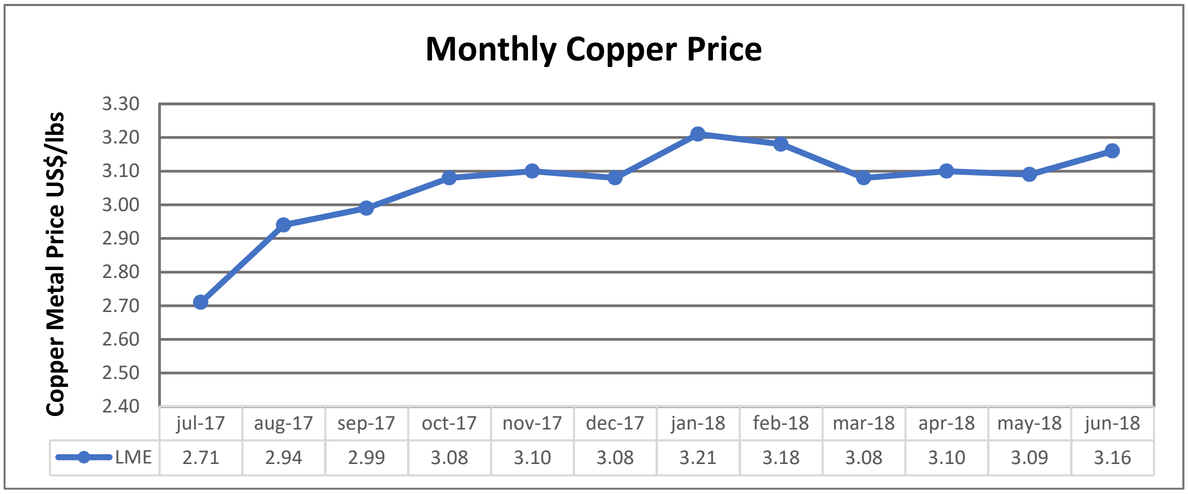
Exchange rate assumptions are based on spot rates; no depreciation or appreciation is considered in the LOM. The exposure to local currency (70 percent) reflects the cost structure for the LOM.

22.1.1. Copper Price

The base case financial model considers a copper price of US$3.25 per pound through 2023.

The price level used is within financial and mining analysts long-term forecast prices and forward selling curves. The average monthly copper price from July 2017 to June 2018 based on London Bullion Market Association (LBMA PM) pricing is shown in Figure 22.1.

Figure 22.1 Average Monthly LME Copper Price (US$/lbs), July 2017 - June 2018

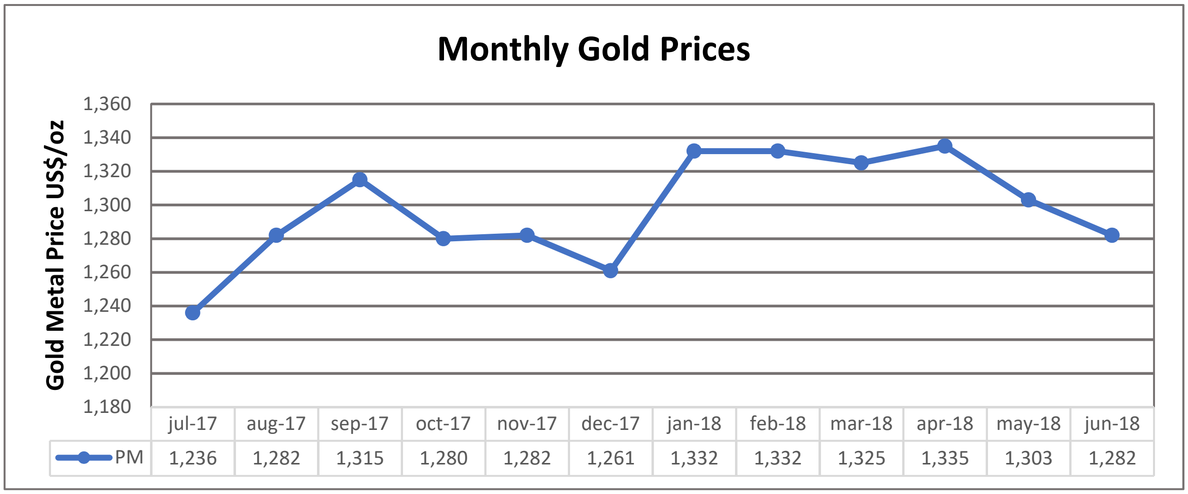


	jul-17	aug-17	sep-17	oct-17	nov-17	dec-17	jan-18	feb-18	mar-18	apr-18	may-18	jun-18
LME	2.71	2.94	2.99	3.08	3.10	3.08	3.21	3.18	3.08	3.10	3.09	3.16

22.1.2. Gold Price

The base case financial model considers a gold price of US$1,279 per troy ounce through 2023. The price level used is within long-term forecast prices and forward selling curves used by financial and mining analysts. The average monthly gold price from July 2017 to June 2018 based on LBMA PM pricing is shown in Figure 22.2.

Figure 22.2 Average Monthly LBMA PM Fix Gold Price (US$/troy ounce), July 2017 - June 2018



	jul-17	aug-17	sep-17	oct-17	nov-17	dec-17	jan-18	feb-18	mar-18	apr-18	may-18	jun-18
PM	1,236	1,282	1,315	1,280	1,282	1,261	1,332	1,332	1,325	1,335	1,303	1,282

Colombian Peso exchange rate

The relevant capital and operating costs denominated in Colombian Pesos include:

- Wages and salaries
- Electrical power
- Contractor costs
- Services costs
- Material costs
- Federal, provincial and local taxes

Financial projections to assess economics for the El Roble Mine have used an exchange rate of COP/3,000.00 to US$1.00 in line with current exchange rates.

22.2. Life-of-mine Production Plan

The life-of-mine (LOM) plan includes the estimated Mineral Reserves (1.48 Mt) reported as of July 1, 2018 as well as stockpiled ore as of June 2018 (12,746 dry metric tonnes). The Mineral Reserve estimate has only considered Measured and Indicated Resources (1.8Mt) and does not include any Inferred Resources. Table 22.1 details the annual production plant feed and concentrate production for the El Roble Mine.

Table 22.1 Life-of-mine Production Plan for the El Roble Mine

Type	Item	H2 2018*	2019	2020	2021	2022	2023**	Total
Treatment	dmt	135,057	278,947	282,897	281,921	284,379	216,655	1,479,856
	Cu (%)	3.36	3.50	3.45	3.15	3.40	3.53	3.40
	Au (g/t)	1.99	1.93	1.88	1.86	1.78	1.94	1.88
Metallurgical Recovery	Cu (%)	94.1	94.1	94.1	94.1	94.1	94.1	94.1
	Au (%)	61.8	61.8	61.8	61.8	61.8	61.8	61.8
Concentrate	dmt	19,523	42,033	42,054	38,235	41,692	32,898	216,435
Metal Content	Cu (dmt)	4,269	9,191	9,195	8,360	9,116	7,193	47,325
	Au (oz)	5,330	10,691	10,580	10,412	10,060	8,353	55,427

**Considers the period July 1st 2018 to December 31st 2018*
*** Includes 12,746 dmt from stockpiles (3.36% Cu, 2.09 g/t Au) as per June 30, 2018*

22.2.1. Inventory

The LOM annual tonnage and head grades have been obtained from the Mineral Reserves estimate based on the processing plant treatment capacity and the established mining sequence for reserves in the mineral deposit.

Metallurgical recoveries, concentrate production and metal content for the LOM have been estimated based on the estimated head grades, processing plant historical metallurgical recoveries as well as metallurgical testing (as described in Section 17).

22.3. Operating Costs

The projected operating costs are based on the related LOM mining and processing requirements, as well as historical information regarding performance and operation and administrative support demand. Table 22.2 details the projected operating costs for the life-of-mine.

Table 22.2 Life-of-Mine Operating Costs (OPEX) in US$000

Area	H2 2018*	2019	2020	2021	2022	2023
Mine	8,481	17,505	17,598	18,476	18,430	12,041
Plant	2,395	5,258	4,813	4,062	4,748	3,669
Mine General Services	2,756	5,839	4,974	4,783	4,702	3,211
Mine Administrative Services	1,332	2,712	2,666	2,646	2,101	1,595
Mine Operating Expenses	3,150	6,027	6,027	5,700	5,992	5,225
Total	18,114	37,341	36,079	35,668	35,972	25,471

** Considers the period July 1st 2018 to December 31st 2018*

22.4. Capital Costs

The projected capital costs (Table 22.3) are based on the related LOM mine development, equipment and infrastructure requirements. Capital costs related to the mine closure increase the equipment and infrastructure expenses in the last three years of the LOM (2021-2023).

Atico has operated the El Roble Mine since 2013 so the capital costs in this case are referring to the annual addition of capital required to sustain the operation and production at current levels (i.e. sustaining capital expenditure).

Table 22.3 Life-of-mine Capital Costs (CAPEX) in US$000

Area	H2 2018*	2019	2020	2021	2022	2023	Total
Mine Development	252	340	160	130	50	0	680
Equipment and Infrastructure	1,548	4,095	3,648	2,459	1,290	1,040	12,532
Total	1,800	4,435	3,808	2,589	1,340	1,040	13,212

** Considers the period July 1st 2018 to December 31st 2018*

22.5. Economic Analysis Summary

The summary of the LOM economic analysis, showing the annual free cash flow forecast based on the Proven and Probable Reserves, is shown in Table 22.4.

The economic evaluation shows positive after-tax free cash flow for the LOM, consequently it also shows a positive Net Present Value (NPV). The NPV at a 5 percent discount rate is US$80.5 million. The Internal Rate of Return (IRR) and payback period do not apply for a presently operating mine with a LOM positive cash flow.

Table 22.4 El Roble LOM Financial Summary

Description	Units	H2 2018*	2019	2020	2021	2022	2023**
Revenues	US$ '000	31,567	66,968	66,854	61,790	65,733	52,396
Net Income	US$ '000	6,835	16,215	17,330	14,908	16,716	13,548
EBITDA	US$ '000	12,845	28,363	29,526	24,936	26,635	24,164
EBITDA Margin	%	41%	42%	44%	40%	41%	46%
Investments	US$ '000	1,800	4,435	3,808	2,589	1,340	4,160
Free cash flow	US$ '000	5,883	14,735	16,505	14,701	16,759	26,892
NPV @ 5%		$ 80,458					

** Considers the period July 1 2018 to December 31 2018*

*** Includes revenues and profits from 7,316 tonnes of concentrate as of June 30 2018*

22.6. Sensitivity Analysis

Sensitivity analyses has been performed to assess the effect on the NPV of changing copper and gold metal prices, as well as the effects of altering head grade, capital and operating costs.

22.6.1. Sensitivity to Metal Price

The effect of changing copper price by US$0.20/lb increments and gold price by a 10 percent positive and negative increment from the base case is detailed in Table 22.5.

Table 22.5 Sensitivity Analysis, Varied Copper & Gold Price vs NPV

NPV Sensitivity		Copper Price ($/lb)				
		2.86	3.06	3.25	3.46	3.66
Change in Gold Price ($/oz)	-10 %	54,902	65,929	76,957	87,985	99,014
	0 %	58,403	69,431	80,458	91,486	102,514
	+10 %	61,904	72,932	83,959	94,987	106,015

22.6.2. Sensitivity to Head Grades

The effect on NPV when varying the copper and gold head grades as expressed at a 10 percent negative and positive increment from the base case is detailed in Table 22.6.

Table 22.6 Sensitivity Analysis for Silver and Base Metal Head Grade Variations on NPV

NPV Sensitivity		Change in Head Grade of Copper		
		- 10 %	0 %	+10 %
Change in Head Grade of Gold	- 10 %	62,265	76,618	90,971
	0 %	66,105	80,458	94,812
	+10 %	69,945	84,299	98,652

22.6.3. Sensitivity to Capital and Operating Costs

The effect on NPV when varying the capital and operating costs as expressed at a 10 percent negative and positive increment from the base case is detailed in Table 22.7.

Table 22.7 Sensitivity Analysis for Capital and Operating Cost Variations on NPV

NPV Sensitivity		Change in Capital Costs		
		- 10 %	0 %	+10 %
Change in Operating Costs	- 10 %	91,367	90,212	89,058
	0 %	81,613	80,458	79,304
	+10 %	71,858	70,704	69,550

22.7. Taxes

Colombian tax laws establish

23. Adjacent Properties

There are no other active mines near El Roble. While some artisanal mining has been performed in the past in nearby rivers nd streams the histories are all anecdotal with no documentation.

24. Other Relevant Data and Information

24.1. Risk Assessment

Mining by its nature is a relatively high-risk industry when compared to many other industries. Each mine is hosted in a geologic deposit, the occurrence and mineralized grade of which and the resultant response to mining and processing of which are unique.

An in-depth risk analysis is beyond the scope of this report. However, the reader is advised that there are inherent risks regarding the mine, the surface plant, the tailings impoundments and other installations with regard to major seismic events, forest fires, very large rainfalls or other natural phenomenon. Additionally, acts of war, industrial sabotage and other man-made threats may occur from time to time in any environment. A lack of community support, threats of action from anti-mining NGOs or other political risks may also occur.

MINER does not foresee any such natural or man-made threats at the present time, however they may manifest themselves with little or no warning. MINER does have a Loss Prevention program that assists in mitigating most risk and the fact that few incidents have occurred while Atico has operated the site indicate that the Company uses precaution in its operations. The community remains solidly behind the mining activities, NGO activity is not significant and no other potential threats have been identified at this time.

24.2. Other Data

Andes Colorado is unaware of any other data and/or information regarding El Roble that has not been made available and could have an impact regarding the mineral reserve estimate.

25. Interpretation and Conclusions

The El Roble operation is an operating underground mine and a flotation process plant to treat the material mined underground. Based on site visits and data review Andes Colorado concludes the following:

- The mine and plant are effectively operated by experienced workers and management;
- The resource and reserve estimates presented in this report form the basis for MINER's on-going mining operations at El Roble. Andes Colorado is unaware of any legal, technical, environmental or political considerations that would have an adverse impact on the extraction and processing of the mineral reserves located at El Roble;
- The present mineral reserve is adequate for approximately five years sustained operations at the present production rate. It is important to maintain an aggressive exploration program that can identify additional resources that may be developed into mineral reserves. If the exploration is unsuccessful the operations will close in 2023.

26. Recommendations

The principal recommendation is for the operation to continue working in the same manner as the work has been performed, professionally and in a workman-like manner. Safety should continue to be the top consideration, with training in best practices for mining and plant work in a safe manner continued as they are now practiced.

Mineral resources should remain mineral resources until sufficient information is available and studies have been completed to allow the resources to become mineral reserves. This is the present practice and should remain so.

When new resources are identified novel or new ground support methods should be explored to maintain a high level of safety at a lower operating cost.

Ways of lowering the cost of backfill components should be reviewed, especially with regard to reagents and out-sourced gravel and sand.

Targets located with IP-DAS geophysics should be explored and drilled.

27. References

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28. Certificates

28.1. Statement of Certification by Author

I, Thomas R. Kelly, MSc., EM, do hereby certify that:

1) I am a Mining Engineer and owner of Andes Colorado Corp., 15400 West 64th Avenue, Ste E9, Number 150, Arvada, CO, 80007, USA and co-author of the report "NI 43-101 Technical Report, Mineral Reserve Estimate, El Roble Mine, Colombia" dated 28 December 2018 and effective as of 30 June 2018. I am jointly responsible and have reviewed and jointly edited Sections Sumary 1, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, and 28 of this Independent Technical Report.
2) I am a Registered Member in good standing of the Society for Mining, Metallurgy, and Exploration, Inc. (SME) (Registered Member Number 1696580).
3) I have practiced my profession as a Mining Engineer since 1974.
4) I am a graduate of the Colorado School of Mines, and earned a Bachelor of Science Degree in Mining Engineering in May 1974, as well as a Master of Science Degree in Mining Engineering from the Colorado School of Mines in December 1995.
5) I am a Fellow of the Australasian Institute of Mining and Metallurgy (Fellow Number 109746).
6) As a Mining Engineer, I have been involved from 1974 to 2017 with evaluation of resources and reserves, and design and operation of mines and other underground facilities in copper, gold, silver, lead, zinc, tin, and tungsten in the United States (Nevada, Colorado, Idaho, Alaska, and California), Bolivia, Peru, Chile, Colombia, Mexico, Honduras, Nicaragua, Costa Rica, Brazil, Ecuador, Republic of South Africa, Ghana, Guinea (West Africa), Indonesia, and Kazakhstan.
7) As a result of my experience and qualifications, I am a Qualified Person as defined in National Instrument 43-101.
8) I act as the independent qualified person for Atico Mining regarding mining issues. I am independent of the issuer according to the definition of independence presented in Section 1.5 of National Instrument 43-101.
9) I visited the site on 22–24 January 2018, and inspected the underground mine workings, surface plant related to underground mine operations, and the engineering offices at the mine site.
10) As at the effective date of the Independent Technical Report, to the best of my knowledge, information, and belief, those sections or parts of the Independent Technical Report for which I was responsible contain all scientific and technical information that is required to be disclosed to make those sections or parts of the Independent Technical Report not misleading.
11) I have read National Instrument 43-101 and Form 43-101 F1. This report has been prepared in compliance with these documents to the best of my understanding.
12) I consent to the filing of the Independent Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their web sites accessible by the public, of the Independent Technical Report.

Dated this 28 day of December, 2018.

Signed and Sealed (*Thomas R. Kelly*)

"Thomas R. Kelly"

Thomas R. Kelly, RM-SME
President & CEO, Andes Colorado Corp

28.2. Statement of Certification by Author

I, Antonio Cruz, hereby certify that:

1) I am currently employed (since Juanary 2013) as Senior Geologist for Atico Mining Corporation Peru S.A.C., Calle Miguel Dasso 153 Of. 3C, San Isidro, Lima, Peru. and co-author of the report "NI 43-101 Technical Report, Mineral Reserve Estimate, El Roble Mine, Colombia" dated 28 December 2018 and effective as of 30 June 2018. I am jointly responsible and have reviewed and jointly edited Sections Summary 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 23, 24, 25, 26, and 28.

2) I am a graduate of the Universidad Nacional de Mayor de San Marcos of Peru in 2007 where I obtained a Bsc Geology Engineer degree, in 2011 I obtained a Professional degree in Geological Engineering. I have practiced my profession continuously since 1998.
3) I am a registered member of the Australian Institute of Geoscientists (AIG), member No MAIG # 7065.
4) I hold relevant work experience in Mineral Resource estimation of VMS, replacement polymetallic deposits and other veins 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, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.
6) From February 3, 2013 to June 30, 2018, I have visited the mine constantly.
7) I have not had prior involvement with the property that is the subject of the Technical Report.
8) I have read NI 43-101 and Form 43-101F1 and the sections of the Technical Report I am responsible for have been prepared in compliance with that instrument and form.
9) As of the aforementioned Effective Date, to the best of my knowledge, information and belief, the sections of the Technical Report I am responsible for contains all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.
10) I consent to the filing of the technical report with any stock exchange and other regulatory authority and any publication for regulatory purposes, including electronic publication in the public company files on their websites accessible to the public of extracts from the technical report.

Dated this 28 day of December, 2018.

Signed and Sealed (*Antonio Cruz*)

"Antonio Cruz"

Antonio Cruz, MAIG
Senior Geologist, Atico Mining Corporation Peru S.A.C.