**ATICO MINING CORPORATION**

# TECHNICAL REPORT ON THE EL ROBLE PROJECT, Chocó Department, Colombia


**Prepared by:**

**Greg Smith, B.Sc., P. Geo.**
**Demetrius Pohl, Ph.D. AIPG Certified Geologist**


**Effective date February 15th, 2012**

## Date and Signature Page

## Certificate of Authors

### Greg Smith

As a co-author of this report entitled, “Technical Report on the El Roble Project, Colombia “ with an effective date of February 15th, 2012, I, Greg Smith, do hereby certify that:

1) I reside at #605 – 2008 Fullerton Ave, North Vancouver, BC and I am a Professional Geologist.

2) I graduated with a degree of B. Sc. in Geology from St. Francis Xavier University, Antigonish, Nova Scotia, in 1987.

3) I am a registered professional geologist in the Province of British Columbia, since 1993.

4) I have worked as a geologist in the mining industry for 25 years and have experience with exploration and development projects including the preparation of Technical Reports, Preliminary Economic Assessments and Feasibility Studies. I also have experience with producing underground and open pit mines. I have prepared reports, assessments and studies for volcanogenic massive sulfide targets in Canada (British Columbia and Yukon), Mexico, Central America, and Venezuela.

5) I completed a personal inspection of the El Roble Project Colombia on December 14 and 15, 2010.

6) I am Qualified Person for the purposes of NI 43-101;

7) I am independent person for the purposes of NI 43-101.

8) For the Technical Report I am responsible for all parts of all Sections 1 through 27.

9) I have had no previous involvement with the El Roble Project.

10) I have read NI 43-101, Form 43-101F1, and 43-101CP. The Technical report has been prepared in compliance with those regulations.

11) As of the date of this certificate, to the best of my knowledge, information and belief, the technical report contains all scientific and technical information that is required to be disclosed to make the technical report not misleading.

I consent to the filing of the Technical Report entitled, "Technical Report on the El Roble Project, Colombia" dated February 15th, 2012

Dated this 15th day of February, 2012


Greg Smith, B.Sc., PGeo

## Demetrius C Pohl

As a co-author of this report entitled, “Technical Report on the El Roble Project, Colombia with an effective date of 15th February, 2012, I, Demetrius C. Pohl, of 2179 W. 20th St, Los Angeles CA, 90018, U.S.A. do hereby certify that:

1) I am a consulting geoscientist with Carlson Pohl Associates, at the same address;

2) This certificate applies to the report "“Technical Report on the El Roble Project, Colombia dated of 15th February, 2012" for Atico Mining Corporation of Vancouver, B.C.;

3) I hold the following degrees: B. Sc. with Honors, in Earth Sciences, Macquarie University North Ryde, N.S.W., Australia, 1968; M.Sc. in Economic Geology, James Cook University of North Queensland, Australia 1974; and Ph.D., Geochemistry, Stanford University, Palo Alto California, 1984. I am a member in good standing of the American Institute of Professional Geologists (AIPG). I have practiced my profession continuously since graduation in Economic Geology and Geochemistry;

4) I have had no previous involvement with the El Roble Project. I have visited the El Roble Project area and El Roble Mine as well as the offices of Minera El Roble S.A. where I reviewed original documentation with respect to the El Roble mine and Project, inspected core and the underground workings as well prospects on the Project from 12th January, 2012, through January 14th 2012;

5) In the report entitled, "Technical Report on the El Roble Project, Colombia", I am responsible for the sections on History, Geological Setting, Deposit Types, Mineralization, Exploration, Drilling;

6) I am Qualified Person for the purposes of NI 43-101;

7) I am independent person for the purposes of NI 43-101.

8) I have worked on a variety of mineral exploration projects and properties for precious and base metals for major exploration companies (BHP-Billiton, Exxon Minerals, Anaconda), and numerous properties with volcanic-associated massive sulfide deposits, in Queensland and Tasmania Australia and Eritrea. I was responsible for the exploration program which discovered the Hambok VMS deposit in Eritrea and establishing the resource for this deposit as well as regional exploration and discovery of numerous other VMS gossans and occurrences in Eritrea. I have published numerous papers and maps, and internal company reports as well as articles in refereed journals and government publications;

9) I have been asked to act as a second author on this report in light of my experience evaluating and exploring for volcanic hosted massive sulfide deposits and general expertise in exploration geology and methods.

10) I have read NI 43-101, Form 43-101F1, and 43-101CP. The Technical report has been prepared in compliance with those regulations.

11) As of the date of this certificate, to the best of my qualified knowledge, information and belief, this technical report contains all the scientific and technical information required to be disclosed to ensure that the report is not misleading.

I consent to the filing of the Technical Report entitled, "Technical Report on the El Roble Project, Colombia " dated February 15th, 2012.

Dated this 15th day of February, 2012 :

Demetrius C. Pohl Ph.D., P. Geo.
AIPG-CPG # 10925

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# 1.0 Summary

## 1.1 Introduction

Consultants Greg Smith of Vancouver, Canada and Demetrius Pohl of Los Angeles, U.S.A. have been commissioned by Atico Mining Corporation (Atico) to evaluate the exploration potential of an area in Colombia known as the El Roble Project for volcanogenic massive sulfide (VMS) deposits. The El Roble Project (Project) owned by Minera El Roble S.A. (MINER) consists of an 8,361.60 hectare block of concessions and an operating underground copper, gold and silver mine near the town of Carmen del Atrato. Mr. Smith concentrated primarily on the verification of field data while Dr. Pohl focused on the verifying technical data, geological descriptions and technical aspects of the proposed exploration program recommendations. All current and historic resource data of the El Roble Mine as well as any drill and assay data, as well as many of the geologic descriptions, were provided by MINER and Atico geologists, and personnel and not overseen by Mr. Smith or Dr. Pohl.

## 1.2 Geology and Mineralization

The El Roble mine went into production in 1990 and has produced 1,468,871 tonnes of primarily pyrite chalcopyrite ore with an average grade of 2.53% copper from a Cretaceous volcanogenic massive sulfide (VMS) deposit. The deposit is localized at the contact between mafic volcanic flows of the Barroso Formation and overlying exhalites silicified felsic tuffs and pelagic sediments of the Penderisco Formation. All of these rock units were deformed and metamorphosed during Late Cretaceous to Tertiary accretion of the island arc to South America and offset by both low-angle and high-angle faults. The stratigraphic package is overturned and steeply dipping to the east in the vicinity of the El Roble Mine. The stratigraphic contact between mafic volcanic unit and exhalative and pyroclastic rocks appears to be an important control on VMS mineralization. This contact can be traced for ten kilometres across the MINER concession block (Fig. 4). The contact will be the focus of the exploration program both in the immediate mine area and along strike. A number of mineralized prospects have been discovered near this contact, including the original mineral discovery at the Santa Anita mine.

Underground workings at the El Roble mine have reached the 2000m level where new VMS lenses continue in production. The currently outlined dimensions of the El Roble deposit measure 325 metres along strike by 250 metres in depth by up to 45 metres thick. Locally, narrow intervals (0.5 metres in thickness) of finely interbedded, massive sulfide and grey to red chert provide convincing evidence for the syngenetic origin of the ore deposit.

Tertiary andesitic dikes intrude both the ore and the host rocks (Ortiz et al., 1990). These dikes measure up to 10 metres in thickness and are locally mineralized with copper which may be the result of remobilization of volcanogenic massive sulfide mineralization. Alternatively, the mineralized dikes may indicate potential for nearby porphyry-related copper.

## 1.3 Previous Exploration

Kennecott Mining of the U.S.A., ("Kennecott"), and Nittetsu Mining of Japan, ("Nittetsu"), explored the area in the immediate vicinity of the El Roble mine between 1982 and 1997. Exploration included surface mapping and sampling of ten square kilometres, a ground magnetic survey and 9,920.55 metres of drilling in 88 holes. MINER continued underground exploration of the mine from 1998 to the present and conducted surface exploration by stream geochemistry, mapping, prospecting, as well as surface drilling of the Archie and Santa Anita prospects. MINER drilled a total 21,293.36 metres in 213 holes at the El Roble mine, and Archie and Santa Anita prospects.

Kennecott reported a historic estimate of 1,100,000 tonnes of 4.9 % Cu and 3.7 g/t Au based on drilling in 1982-83, and by 1991 Nittetsu drilling had increased this estimate to 1,213,992 tonnes at 4.83% copper, 3.23 g/t gold, and 12.4 g/t silver. Both historic resource estimates were produced by reputable mining companies before NI 43-101 came into effect and as such are considered reliable and accurate by the authors and are supported by subsequent production from the El Roble mine. The estimates are included here only for the purpose of demonstrating the size and possible grade of exploration targets on the Project area.

During 2011, Atico completed property-scale and detailed geological mapping, surface and underground sampling and geochemistry, and a ground magnetometer survey. Additionally Atico completed a re-interpretation of existing geochemical and geophysical data previously collected by MINER.

## 1.4 Status of Exploration

Atico continues to explore the Project area. It has completed a ground magnetic survey of the favorable host-horizon on the Project and is interpreting this data set. Atico continues to map the underground workings of the El Roble mine to better understand the faulting history of the El Roble mineral deposit with goal of locating fault offsets of the known mineralization. Concurrently Atico geologist continue to map the Project area in detail.

## 1.5 Development and Operations

The El Roble mine continues to operate at 320 tonnes per day, extracting ore from between the 2100 metre and 2000 metre levels. Production drilling continues to find new mineralization ahead of mining operations. Mine management does not estimate any resource grade or tonnage based on this drilling data. The drill data is used only to locate and characterize the geometry of the mineralization.

Total production of 1,478,861 tonnes of ore to the end of 2011 exceeds the historical estimate of 1,213,992 tonnes originally defined by Kennecott and Nittetsu. If mining dilution is taken into account, the tonnage produced to date is very close to the original tonnage estimate which in turn suggests that little ore remains above the 2000m level. The quantity of ore below the 1980m level is yet to be determined and remains one of the prime exploration targets.

## 1.6 Mineral Resource and Reserve Estimates

There are currently no mineral resources on the El Roble Project that comply with NI 43-101.

MINER is producing from within the original mineralization envelope defined by Kennecott and Nittetsu. The current method of ore delineation is exploration by development and precludes any ability to derive a reportable NI 43-101 compliant reserve estimate.

## 1.7 Conclusions

There is good potential for additional VMS orebody discoveries both at the mine and along the 10-kilometre strike length of prospective ground covered by the El Roble Project based on the production history of VMS deposits at the El Roble mine, on the identification of the prospective host horizon contact between mafic volcanic rocks and exhalative cherts and silicified felsic tuff, on the observed presence of an exhalite chert package which hosts massive sulfide ore at the El Roble mine, along the entire 10 kilometre length of the prospective contact, on the identification of anomalous copper and gold in surface rock chip samples at multiple locations on the contact, on the presence of copper mineralization encountered by drilling at the Santa Anita prospect, and on the well-established tendency for VMS deposits to occur in clusters rather than as single isolated occurrences. In addition, the recognition that the mineralization has been truncated and offset by multiple faults suggests, that fault offsets of mineralization remain to be found in close proximity to the El Roble mine.

## 1.8 Recommendations

The authors recommend an aggressive Phase I and Phase II exploration program of $6.102M to discover additional VMS deposits on the El Roble Project. A two pronged approach to Phase I exploration is recommended: i) a “brownfields” program in the immediate mine vicinity and underground to discover extensions and fault offsets of the known El Roble mineralization; and ii) a “greenfields” program to discover new deposits along the favourable host lithology on the Project area. These two programs include a significant core drilling component: 3500 metres for the near-mine “brownfields” program and 7,500 metres for the district “greenfields” program. These two programs could be run concurrently. A Phase II program, budgeted at $2.82 million and contingent upon the discovery of new VMS deposits during Phase I, is designed to provide an estimate of the size and grade of any such discoveries.

The recommended Phase I "brownfield" exploration program at the El Roble mine should consist of:

i) Detailed mapping of all underground openings in the El Roble mine to determine fault sets and offsets of the mineralisation (this work has already been started at the time of writing). This will provide movement directions on faults and thus vectors to prospective but unexplored fault blocks.

ii) Core drillholes of 3,500 metres into "gaps" in existing drilling below the 2000m level and deeper stratigraphic drillholes lateral to and below the El Roble mineralization

iii) Drillholes should be probed with downhole EM to discover off-axis conductors. This will aid targeting of fault offset ore pods.

The recommended Phase I "greenfields" exploration program is designed to quickly define drill targets along the entire length of the El Roble Project area. The recommended program is as follows:

i) Additional surface mapping and rock chip sampling. If necessary pitting should augment surface mapping particularly when following the prospective mafic volcanic -chert contact.

ii) Stream sediment geochemistry survey. Recent discovery of sulfide patches and veining in black chert float boulders together with elevated background base- and precious metal geochemistry in the chert units, suggests that a stream geochemistry program should be effective. It is recommended that a dense, bulk-leach-extractable metals (gold, copper, silver) stream sediment survey be undertaken. This program should sample each small stream draining the major ridgelines on the Project area. Such a program would entail the collection of 100-150 2kg samples for cyanide leach extraction.

iii) Helicopter-borne time domain EM survey. It is recommended that the helicopter-borne EM survey be run at 100m line spacing to ensure that at least 2 lines will cross a massive sulphide conductor.

iv) Ground gravity surveys of selected EM targets. Gravity is recommended to discriminate between strong EM conductors such as pyritic, graphitic pelagic shales in the stratigraphic hangingwall of the El Roble mineralization and massive sulfide mineralization. It is anticipated that four to five of the best EM conductor anomalies generated be followed up with one square kilometre gravity surveys. Line spacing should be 50m with readings each 25m. Detail gravity measurements will allow modeling of gravity anomalies to determine the depth of the body, dip and geometry prior to drilling.

v) A core drilling program of 7,500 metres to test the five best anomalies generated above with 1500 metres of drilling on each.

Notice to terminate the option on the Project area is due in November 2012. In the current exploration environment it is uncertain, because of the limited availability of helicopter-borne EM and drilling contractors in a timely manner, whether Atico will be able to execute the recommended exploration program before the option expires. Therefore it is additionally recommended that Atico budget an additional $1,200,000 to extend the option period for another year.

## 2.0 Introduction

This technical report was prepared for Atico Mining Corporation (Atico) in compliance with disclosure requirements of Canadian National Instrument 43-101 Standards for Disclosure for Mineral Projects (NI 43-101). Atico is a corporation incorporated on April 15, 2010 and continued into British Columbia effective October 17, 2011. Atico's head office is located in Vancouver, British Columbia, and the business of Atico is primarily focused on the acquisition, exploration and development of copper and gold projects in Latin America.

The purpose of the report is to describe existing volcanogenic massive sulfide (VMS) mineralization on the El Roble Project (Project) and recommend an exploration program designed to discover additional VMS deposits within the El Roble Project concession block. Information used to prepare the report includes production records of Minera El Roble S.A. (MINER) from the El Roble mine from inception in 1991 through 2011, MINER's drill hole database in MSAccess format, a concession map, a geologic map of the concession block, surface sample locations, analytical results for surface samples, the results of ground magnetic and induced polarization/resistivity (IP/Res) surveys conducted over the El Roble mine, results of a ground magnetic survey conducted by Atico over the adjacent area, newly reinterpreted IP/Res results, and a preliminary selection of drill targets prepared by Atico. In addition, copies of reports prepared by previous MINER partners were made available for review. These include monthly reports by Kennecott Minerals of the USA (Kennecott) and a final report by Nittetsu Mining Company (Nittetsu) of Japan.

Greg Smith, a co-author of this report and a qualified person under the definition of NI 43-101, reviewed technical information at the offices of MINER in Medellin and visited the El Roble mine on December 14 and 15, 2010. Demetrius Pohl, the other author of this report and a qualified person under the definition of NI 43-101, visited the El Roble Mine and reviewed technical information, documents, core and core storage facilities, inspected underground workings at the mine and visited prospects on the Project area on January 12$^{th}$ through January 14$^{th}$, 2012, and verified the presence of volcanogenic massive sulfide mineralization in underground workings and in core. Analytical results for samples collected by the authors are reported on in section 12.0, Data Verification.

## 3.0 Reliance on Other Experts

For mineral concession status, the author reviewed a report for Atico titled “Certification” by Tamara Romero Restrepo of the legal firm Alianza WJ Ltda, of Bogota, Colombia and dated October 4, 2011, in which such legal firm confirmed the status of legal ownership of the concession contracts.

## 4.0 Property Description and Location

According to the concession registry maintained by Ingeominas, the government agency in charge of approving and maintaining concession records, eight adjacent mining concession titles and title applications in the Chocó Department of Colombia are held by and on behalf of MINER (Table 1). These titles and title applications total 8361.60 hectares (ha) and, together with the operating El Roble copper-gold mine within the concessions, comprise the El Roble Project. All of the concessions are located relative to a fixed reference point in the field from which corner locations are measured.

An overview of the El Roble mine site, the beneficiation plant and the tailings impoundment is shown on Figure 1. The 2000m level tunnel is visible above the plant, which is located behind the tailings impoundment. The Atrato River, barely visible at the bottom of the photograph, flows north to south, towards the viewer. The original discovery outcrop is out of sight to the right, at the top of the ridge. Another tailings impoundment is located to the right, outside the frame of the photograph.


**Figure 1** Overview of the El Roble mine site**.** The 2000m level tunnel is visible above the plant, which is located behind the tailings impoundment. The Atrato River, barely visible at the bottom of the photograph, flows north to south, towards the viewer. The original discovery outcrop is out of sight to the right, at the top of the ridge.

The location of the El Roble project is shown in figure 2. The El Roble Project is located within the Chocó Department close to the border with the Antioquia Department. Driving time to the mine is four hours on paved highway from the city of Medellin to the town of Carmen del Atrato followed by ten minutes on an improved gravel road to the mine site. Figure 3 shows the location of the MINER concession block along with the location of the mine, the main access road and the nearby town of Carmen del Atrato.

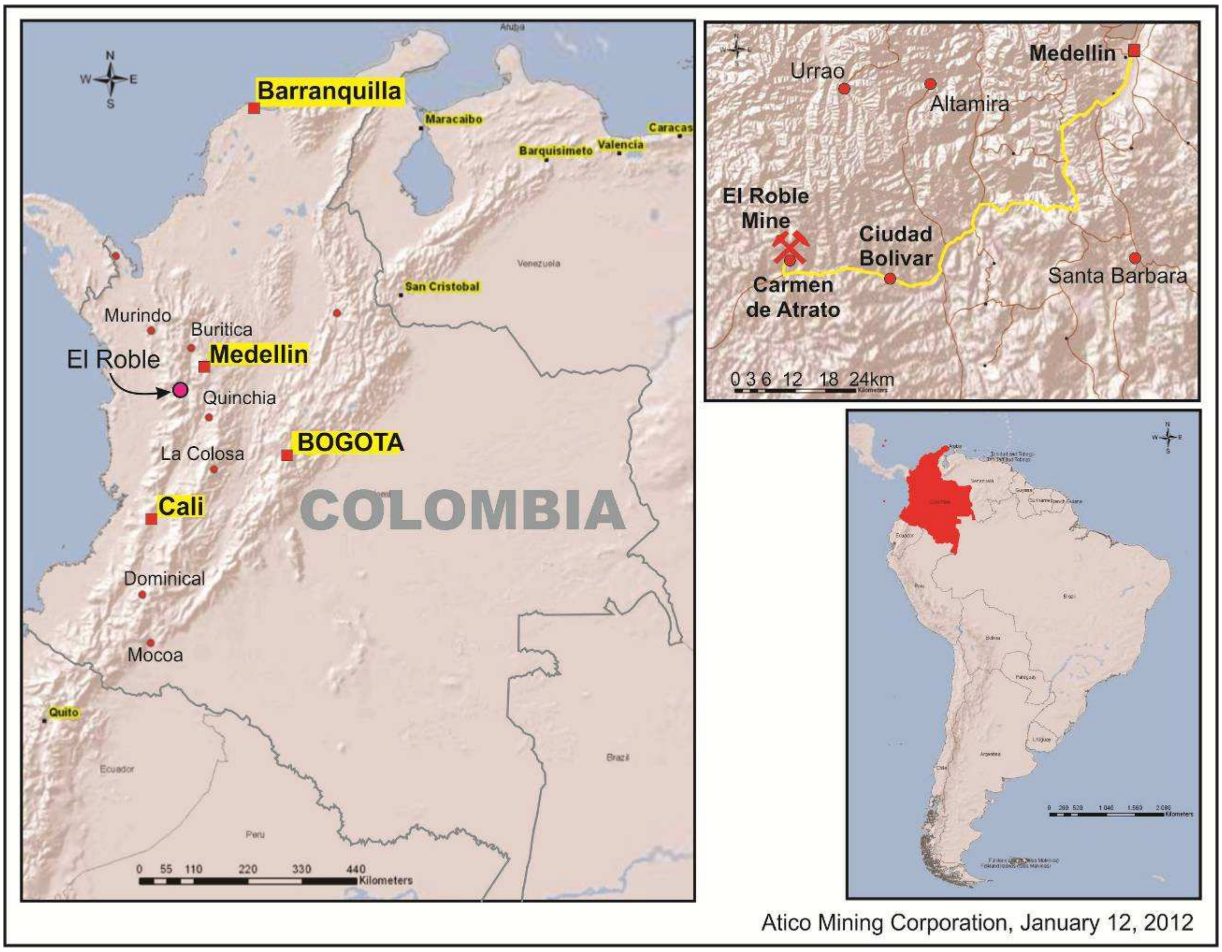



**Figure 2:** Location map for the El Roble Project, Colombia. The El Roble mine and Project area are shown the large red dot, smaller red dots are other significant exploration projects in Colombia.

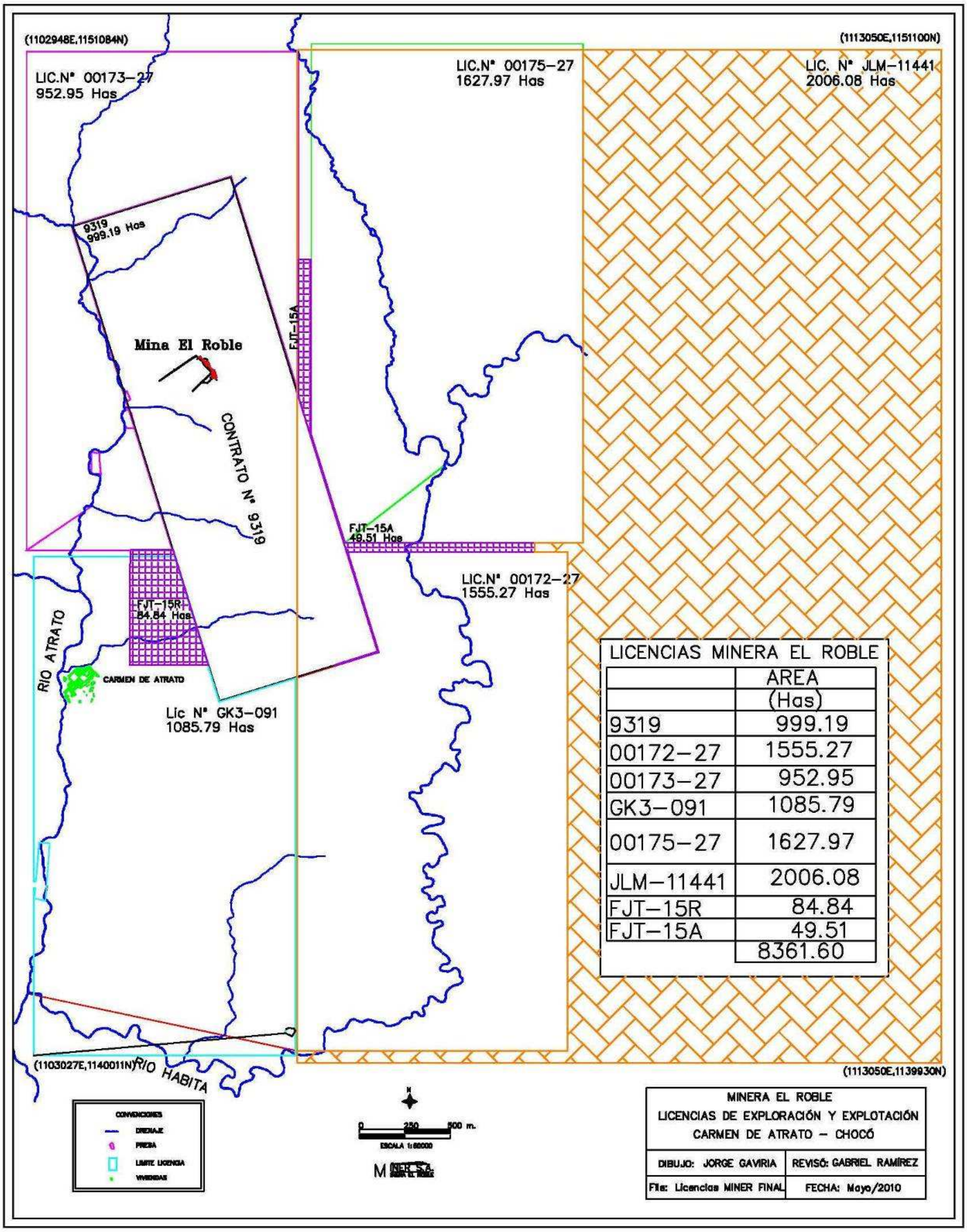



**Figure 3:** El Roble Project area showing individual MINER tenement blocks. Blocks FJT15R and FJT15A are marked by square cross-hatching and infill between other MINER concession blocks. Brick pattern denotes other mining tenements.

The El Roble Project consists of eight mineral concessions of which two, numbers 00172-27 and 00173-27 are valid exploration licenses. Exploration license number 00175-27 is authorized pending registration in the National Mining Register. Four are valid mining concession contracts, numbers 9319, GK3-091, FJT-15A, FJT-15R. Application for mining concession contract number JLM-1441 secures possession pending grant of the mining concession contract by National Mining Authority. The status of the eight concession titles listed in Table 1 was confirmed by the legal firm of Alianza WJ. S.A. and as of the date of this report, all of the titles and title applications listed in Table 1 are in good standing and in compliance with all of their obligations.

| Title Type | Title Number | Registration Date | Title holder | Status | Expiration | Area (ha) |
|---|---|---|---|---|---|---|
| Mining Concession Contract | GK3-091 | Dec 17, 2010 | Minera El Roble S.A. | Registered Valid First year exploration | December 16, 2040 | 1085.79 |
| Exploration License | 00172-27 HCTP-02 | Dec 24, 2010 | Anibal Gaviria Correa | Registered Valid First year exploration | December 23, 2015 | 1555.27 |
| Exploration License | 00175-27 | Registration pending | Gabriel Ramirez M., Humberto Echavarria O. | Authorized for work | Five years fom registration date | 1627.97 |
| Exploration License | 00173-27 HCUH-01 | Dec 23, 2010 | Anibal Gaviria Correa | Exploration license | December 22, 2012 | 952.95 |
| Mining Concession Contract | 9319 | March 20, 1990 | Minera el Roble, S.A.. | 21st year of exploitation contract | March 19, 2020 | 999.19 |
| Mining Concession Contract | FJT-15A | Feb 11, 2008 | Minera el Roble S.A. | 1st year of construction contract | Jan 13, 2038 | 49.51 |
| Mining Concession Contract | FJT-15R | Feb 11, 2008 | Minera El Roble S.A. | 1st year of construction contract | Jan 13, 2038 | 84.84 |
| Mining Concession Contract application | JLM-11441 | N/A | Minera El Roble, S.A. | Title secure pending grant | N/A | 2006.08 |
| Total | | | | | | 8361.60 |

**Table 1:** Minera El Roble mineral title blocks and status.

MINER owns the surface rights to 208 hectares in the immediate mine area (within mining concession contract 9319 and exploration license 00173-27). Surface ownership on the remainder of the 8361.60 ha El Roble Project is divided among multiple individual landowners. In the past, access for the purpose of conducting exploration activities has been negotiated on an as-needed basis. Access to the surface is guaranteed by law. Surface owners are typically compensated during the exploration phase but cannot refuse access. When land purchase becomes necessary, it is negotiated with the surface landowner and by law compensation is based on the fair market value of the surface and cannot be based on the value of contained minerals.

Atico Mining Corporation signed a purchase option agreement with the owners of MINER on January 28, 2011. The agreement calls for staged payments of US$2.25 million over two years during which Atico will explore for new VMS deposits on the MINER concession block. If Atico is successful and decides to exercise its option, a lump-sum payment of US$14 million is due on the closing date, 60 days after the end of the two-year option term. At that time 90% of MINER shares will be transferred to Atico. The option period can be extended for one year for an additional US$1.2 million. Atico has no right to any portion of mine production or proceeds until and unless the option is exercised.

There are no other known royalties, back-in rights or encumbrances that affect the Project other than the mining laws of Colombia (Law 865 of 2001 and Law 756 of 2002) which call for a 4% net smelter return royalty (NSR) on precious metals and a 3% NSR on copper. There is a contract for energy with ISAGEN, a public company that generates and markets electric power. MINER also has pension obligations with respect to its employees and a severance agreement with respect to employees who belong to the union, Sintramienergetica. Finally, there are outstanding payments due to four employees for resolution of a salary dispute.

With respect to environmental liabilities affecting the property, a partial failure of the tailings impoundment occurred in 2009 (described in section 20.1). This resulted in a sanction that required MINER to reforest the affected area and to restock the river with fish. MINER is complying with these requirements and, as of January 2010, the tailings impoundment had been repaired. There are no long-term impacts of the tailings failure or restrictions in place that might affect the future ability of the mine to operate. Upon exercise of the option agreement, Atico will assume responsibility for any environmental liabilities and for meeting eventual closure requirements that pertain to the existing mine and processing facility.

A PMA (Environmental Permit) was issued to MINER by CODECHOCO (Corporación Autónoma del Chocó, a government agency) on January 30, 2001 (Resolution 30). The PMA allows MINER to operate the El Roble mine under terms outlined in section 20.2 of this technical report. A new processing facility, if needed, would require a formal plan approved by the Ministry of Mines and Energy and an environmental license granted by the Ministry of the Environment.

## 5.0 Accessibility, Climate, Local Resources, Infrastructure and Physiography

The El Roble Project is an existing copper and gold mine with surrounding exploration tenements located in the western cordillera of Colombia, 2.8 kilometres from the town of Carmen del Atrato, Department of Chocó. Driving time to the mine is four hours on paved highway from the city of Medellin to the town of Carmen del Atrato followed by ten minutes on an improved road to the mine site (Fig. 2 and 3). The region is drained by the Rio Atrato which flows from north to south past the mine site. Elevations range from 1600 metres to 2700 metres and relief is abrupt. Climate is tropical with well-defined wet and dry intervals; temperatures range from 18 to 28 °C daily with little variation over the course of the year. Vegetation consists of forested hill slopes and cultivated lowlands. Exploration and mining take place all year round with a three-week break over the Christmas and New Year holiday.

MINER controls 208 hectares in the immediate mine vicinity which is sufficient to operate the existing mine and dispose of tailings. Should new mining operations be commenced on new discoveries of massive sulfides on the project area, MINER may have to acquire surface rights to accommodate new mining activities.

Currently, the mine disposes of tailings at the mine site. Other potential tailings disposal sites are located between the mine site and the town of Carmen del Atrato. Water is drawn from the Atrato River and returned to the Atrato River after processing. Mining personnel come from the nearby town of Carmen del Atrato. A five megawatt substation operated by Isagen provides energy for operating the mine and processing facility.

## 6.0 History

This section focuses on the discovery, exploration and development, and past production history of the El Roble mine. The current mining operation, under the direction of MINER, is described in Sections 15 to 21. Atico's exploration program is described in Section 9.

### 6.1 Discovery

The first copper mineralization was reported during the 1970's in the El Roble area from the Santa Anita deposit, located within the existing El Roble Project, six kilometres south of the current mine (Fig. 4). Vein and stockwork mineralization was mined by underground methods (Ortiz, 1988) and a small amount of copper was produced. The foundations of a processing facility and abandoned underground workings at Santa Anita are still preserved.

During this same period, eroded boulders of massive sulfide mineralization were discovered by Don Humberto Echavarria, the owner of Santa Anita mine, during construction of a road from El Carmen to Urrao below what is now the El Roble mine (Dr. Guillermo Gaviria, personal communication, 2010). The boulders were traced upslope to a landslide scarp that exposed oxidized massive sulfide (gossan) in outcrop (Ortiz et al., 1990). Minas El Roble, the original mining entity, was incorporated in 1972 and production began at a rate of 30 tonnes per day. Dr. Guillermo Gaviria Echeverri joined the company in 1975 in equal partnership with Humberto Echavarria. Upon the partnership with Nittetsu in 1986 the company name was changed to ERESA and in 1987 when C. Itoh and Co., of Japan joined the partnership it was changed again to EREESA.

The present company, Minera El Roble S.A. (MINER) was formed in 1997 when Nittetsu and C. Itoh withdrew from the partnership.

## 6.2 Historic Exploration and Development

Kennecott entered into a joint venture with Minera El Roble S.A. in 1982 and, over two years, spent roughly two million dollars on exploration including surface mapping and sampling of one square kilometre, a ground magnetic survey (45 lines for a total of 27 line kilometres) over the same area, and a drill program in 1982-1983 that identified a historic resource of 1.1 million tonnes at an average grade of 4.9 % Cu and 3.7 g/t Au. The Kennecott historic estimate, being executed by a reputable and established mining company is, in the opinion of the authors, reliable, being based on a total of 2190 metres of core from 22 diamond drill holes (R-01 to R-22). The resource did not meet Kennecott's minimum deposit size and the company withdrew from the project.

After Kennecott withdrew, a joint venture was formed in 1985 between Nittetsu Mining Company of Japan and MINER. Nittetsu expanded the area of surface mapping and sampling to ten square kilometres, conducted an induced polarization and resistivity survey, and completed additional drilling. By 1986, two mineralized zones had been delineated. The Main zone (measuring 100 metres down dip by 80 metres along strike by 45 metres thick) was reported by Nittetsu to contain an historic estimate of 717,416 tonnes of proven plus probable reserves above the 2225 level, averaging 5.48% copper, 3.06 g/t gold and 9.39 g/t silver. The adjacent North orebody (dimensions of 100 metres along strike by 80 metres down dip by 15 metres in thickness) was reported to contain 272,687 tons at 2.67% copper, 3.25 g/t gold and 10.9 g/t silver. Nittetsu joined forces with C. Itoh and Minas El Roble to form EREESA in 1987 and construction began on a plant with a capacity of 96,000 tons per year.

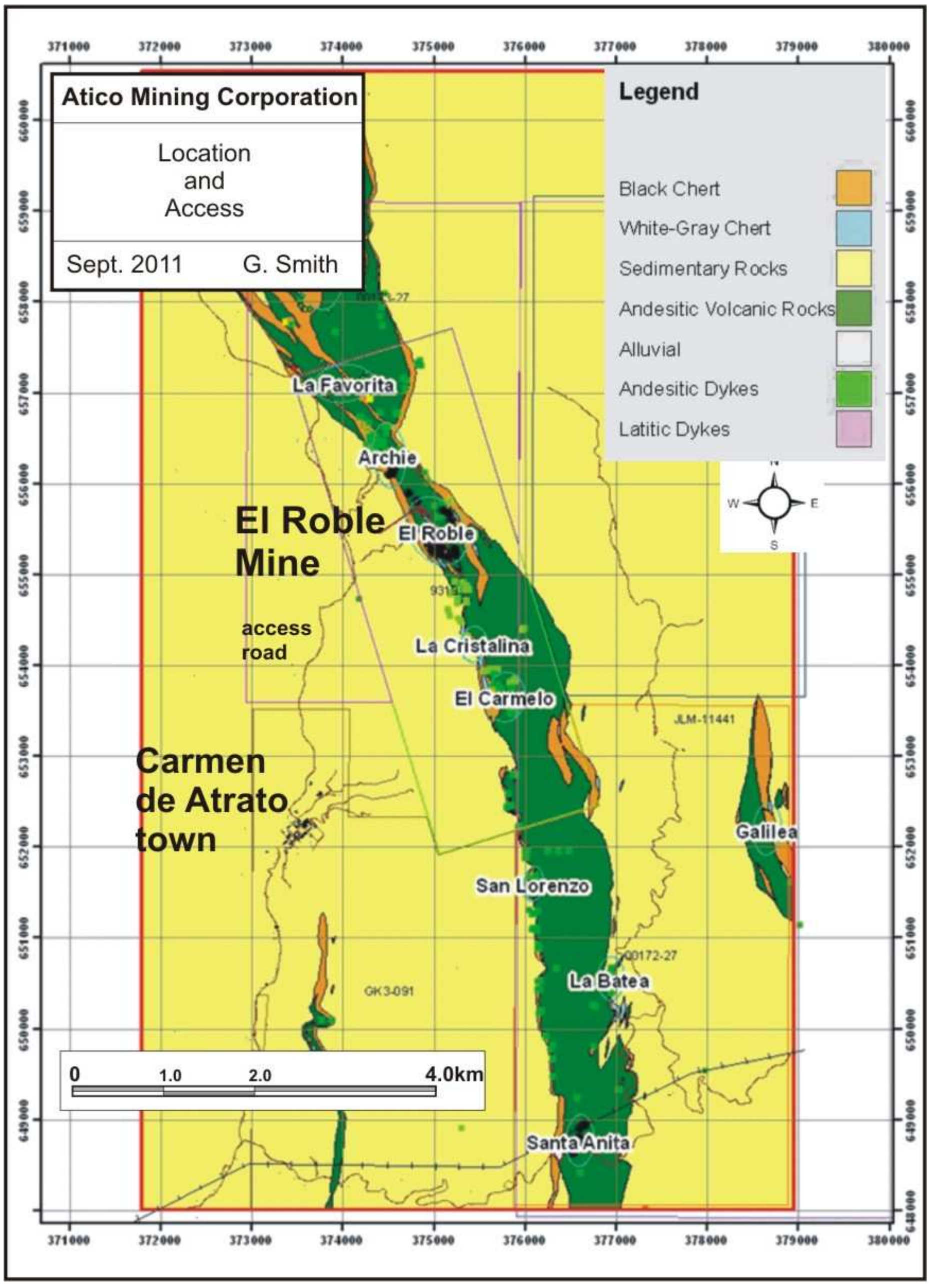



**Figure 4:** Surface geologic map of the El Roble Project area based on 2011 Atico mapping. Prospect locations are labelled in black on white. The contact with the "black chert" lithology (orange) and "andesitic" volcanics (mid-green) is the favourable locus of VMS mineralization.

Nittetsu's reserve estimates were prepared before NI 43-101 reporting standards were in place but are considered reliable and accurate by the authors based on the fact that Nittetsu was a long-established mining company and as evidenced by subsequent MINER production records.

Nittetsu completed a total of 7730.55 metres in 66 diamond drill holes. As a result of the Nittetsu's drill program, the reported historic estimate increased to 1,213,992 tonnes with an estimated grade of 4.83% copper, 3.23 g/t gold, and 12.4 g/t silver. The Nittetsu historic estimate was prepared before NI 43-101 came into effect, however in light of subsequent production by Nittetsu and MINER, the authors consider this estimate both accurate and reliable. Rock density was estimated at 3.5g/cc in the Main orebody and 3.3g/cc in the North orebody. A plant was completed in 1990 and went into operation with a capacity of 380 tonnes per day. An IP/Res survey, conducted in 1990-1991, consisted of fifteen lines 1.0 to 1.5 kilometres each with an electrode spacing of 50 to 100 metres. Twenty drill holes (CR1 to CR-20) for a total of 4638.05 metres were completed from the surface in 1991-1992. Nittetsu withdrew from the joint venture and Colombia in 1997 for security reasons.

Since the withdrawal of Nittetsu in 1997, the El Roble mine has been operated by Minera El Roble S.A. (MINER). A total of 189 holes were drilled beginning in 2005 for a total of 21,293.36 metres. Of those drill holes, 164 for 10,914.39 metres were drilled from underground. Production through 2011 (now at the 2000m level) totals 1,400,000 tonnes with an average grade of 2.6 % Cu and a gold grade that has varied from 1.02 to 3.91 g/t during the years 2004 to 2011 (Table 3). MINER also explored the concession block and conducted surface sampling and mapping at the La Calera, La Favorita, El Carmelo, and La Batea prospects (Fig. 4), drilled 20 holes to test targets immediately south of the mine, drilled 14 holes at the Archie prospect (Fig. 4) and drilled 10 holes (2161.3 metres) at the Santa Anita prospect (described in Section 9.7).

Although historic estimates quoted above were prepared before NI 43-101 was in effect, the fact that the estimates were prepared by two reputable mining companies, one of which put the deposit into production, indicates to the authors that the estimates provide a clear picture of the deposit. These estimates have been confirmed by subsequent production, discussed in the following section 6.3. In fact, actual production through 2011 (1,468,871 tonnes) has exceeded the Nittetsu historic estimate (1,213,992 tonnes) by 21 percent.

## 6.3 Historic 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. The mine operates on a small industrial scale and maintains only production records. There are no geological staff. All mining to date has been in the mineralization envelope established by the joint venture partners Kennecott and Nittetsu. From data reflected in Tables 2 and 3 and Figures 5 and 6 it is clear that copper and gold production has been declining as the Main and North massive sulphide bodies have been mined.

Yearly production from the El Roble mine is illustrated in Tables 2 and 3 and Figures 5 and 6. Through 2011, the mine has processed 1,468,871 tonnes of mineralization at an average grade of 2.53% copper. Gold grade for the period 2004 through 2010 averaged 2.54 g/t (Table 3). Gold production (Figure 6) is calculated from concentrate grades. Prior to 2004 ore was not assayed for gold and thus no head grade gold values are available.

## 6.4 Current Production

Current production of 320 tonnes per day is based on additional massive sulfides discovered during development (Figure 16). Resources are defined on a daily and weekly basis, based on production exploration drilling. Core from these drill holes is not assayed (recovery is often poor) but the core is retained. Drill hole coordinates, azimuths, declinations, and total depth are recorded. Mineralized intercepts are determined by visual inspection and plotted on mine opening maps. Production exploration drilling is generally only 30-50m ahead of the working face and no estimates of size and grade of mineralization encountered in such drilling are made.

MINER reported production of 127,874 tonnes as of May, 2010. Between the 2000m and 2100m level, where mining is currently underway, individual massive sulfide lenses have been in excess of 50,000 tonnes but several (Cuerpo B, B sur, B inf, 25S in Figure 16) are much smaller. At current production rates, massive sulfide bodies currently being mined are projected to be exhausted during the two-year option period.

Underground drilling is employed to locate new lenses of massive sulfide, followed by tunnelling to expose the mineralization for mining. The size and grade of the massive sulfide lens is not established prior to mining but is estimated from production drilling as mining proceeds. A longitudinal section showing the past and currently exploited mineralized lenses is shown in Figure 16.

Mine production records and sales receipts of concentrates have been verified by the authors. The fact the El Roble mine has operated continuously for 20 years would support the view that a resource exists at the mine, however poorly constrained, and that it has been and continues to be worthwhile to exploit this massive sulfide mineralization. Production drill holes have penetrated to the 1980m level and encountered mineralization (Figure 9b), that MINER intends to exploit.

Based on MINER historical estimates and production records of tonnage and grades for the various mineralized bodies being mined, the potential exploration targets within the immediate mine vicinity would range from less than 700 tonnes to greater than 50,000 tonnes and with grades based on current production, that would be in the range of 1% to 5% copper (Table 2), and 1 to 4 g/t gold (Table 3). Deleterious constituents of the mineralization, such as mercury, are expected to range from less than 1 ppm up to 45ppm. The quantity and grade of any potential discovery, based on MINER production data, is conceptual in nature, and there has been insufficient exploration to define a mineral resource and it is uncertain if further exploration will result in any target in the vicinity of the mine being delineated as a mineral resource.

| Year | Ore mined (tonnes) | Head grade Cu % |
|---|---|---|
| 1990 | 4,769 | 5.33 |
| 1991 | 98,256 | 3.67 |
| 1992 | 75,234 | 3.19 |
| 1993 | no production | |
| 1994 | 86,113 | 3.20 |
| 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 |
| 2005 | 68,696 | 2.06 |
| 2006 | 29,684 | 2.03 |
| 2007 | 49,878 | 1.63 |
| 2008 | 61,838 | 1.88 |
| 2009 | 73,214 | 1.77 |
| 2010 | 71,312 | 1.14 |
| 2011 | 76,379 | 1.19 |
| **Total** | **1,468,871** | **2.53** |

**Table 2.** Tonnes mined and copper grade 1991-2011. Note that the mine was closed during 1993 for security reasons.

| Year | Ore (tonnes) | Cu % | Au (g/t) | Concentrate (tonnes) | Cu % | Au (g/t) |
|---|---|---|---|---|---|---|
| 2004 | 75706 | 2.25 | 2.46 | 7840 | 18.2 | 15.92 |
| 2005 | 68696 | 2.06 | 1.02 | 6330 | 20.76 | 11.65 |
| 2006 | 29684 | 2.03 | unknown | 2903 | 19.39 | 10.83 |
| 2007 | 49878 | 1.63 | 3.91 | 4196 | 18.0 | 23.13 |
| 2008 | 61838 | 1.88 | 3.91 | 5253 | 19.5 | 23.16 |
| 2009 | 73214 | 1.77 | 3.17 | 5688 | 20.8 | 25.70 |
| 2010 | 71312 | 1.14 | 2.00 | 3916 | 18.64 | 21.90 |
| 2011 | 76379 | 1.19 | * | 4042 | 20.3 | * |
| **Total** | **506707** | | | **41162** | | |

**Table 3**: Copper and gold values in ore and concentrates from 2004 through 2011. *Grade pending December 2011 assays.

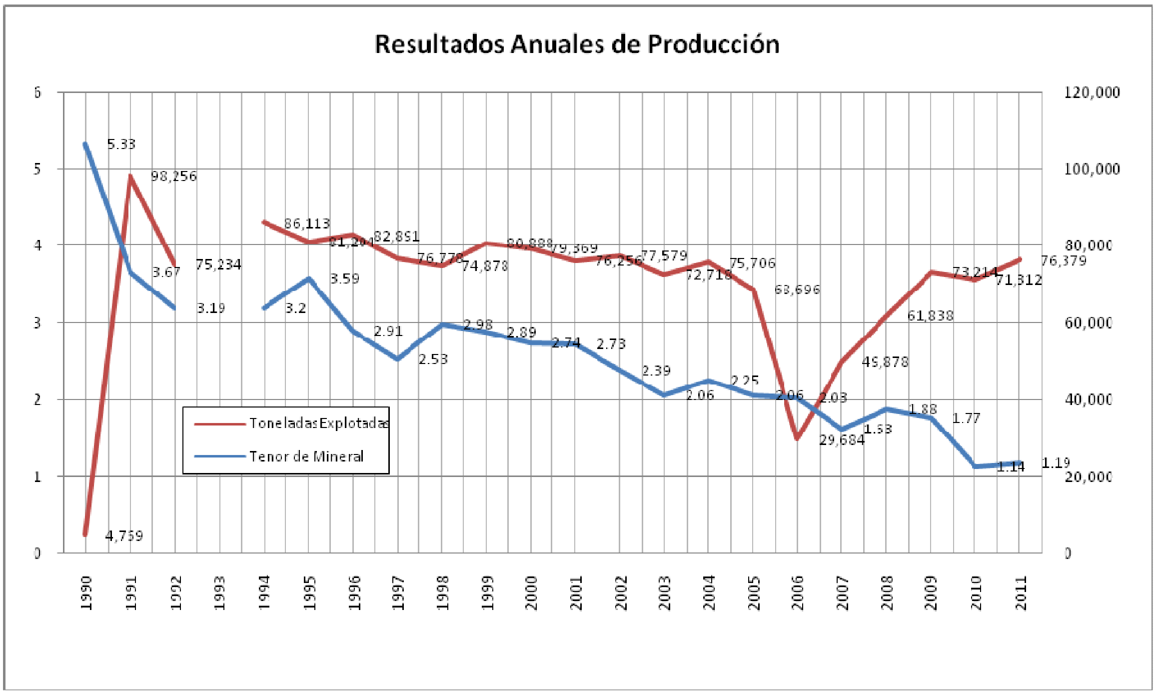



**Figure 5.** Past Production: tonnes of ore extracted and copper head grade, El Roble mine.

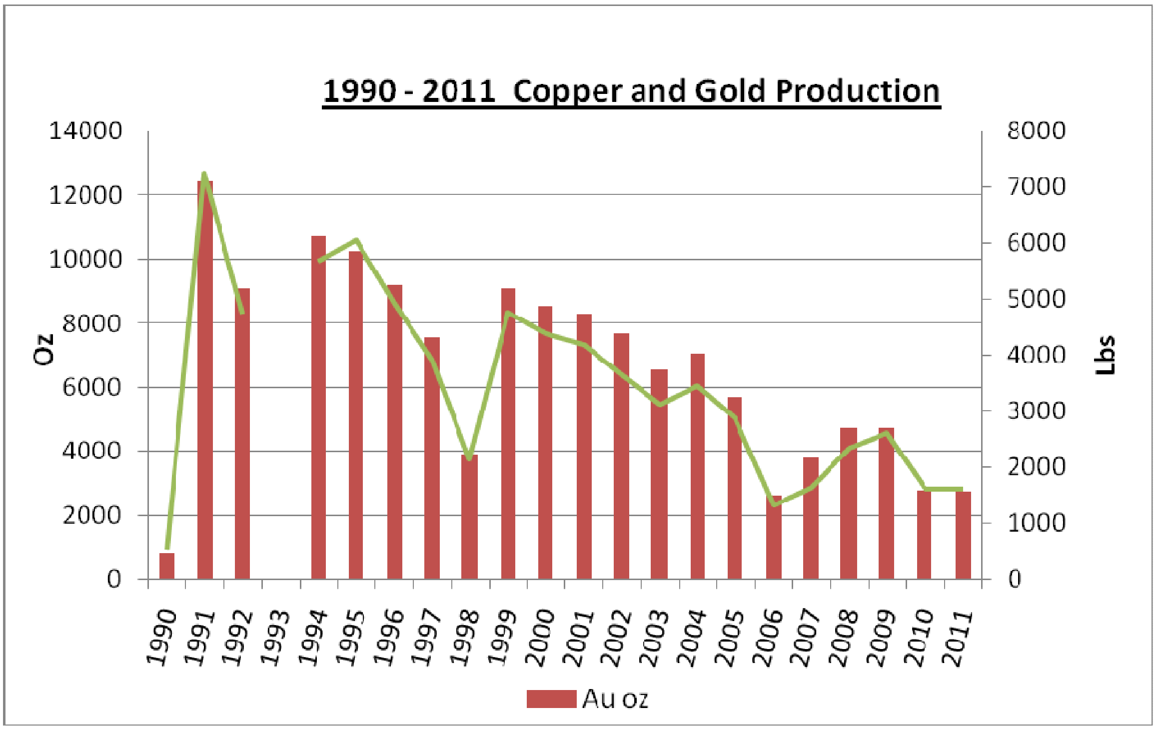



**Figure 6.** Production of copper and gold from the El Roble mine.

## 7.0 Geological Setting and Mineralization

Host rocks at the El Roble mine, and at nearby volcanogenic massive sulfide (VMS) mineral occurrences on the MINER concession block, include basalt flows, black to grey chert and overlying pelagic sedimentary rocks and sandstone-shale turbidites (Ortiz et al., 1990). Whole rock (NaO, K2O, MgO, FeO) analyses reported by Ortiz et al. (1990) place the basalt flows in the tholeiitic field. These rock units, shown on Figure 4, belong to the Cretaceous Cañasgordas Group which can be traced for over 800 kilometres along the western cordillera of Colombia (Figure 7**).** 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 to continental South America. Accretionary tectonics resulted in both low-angle and high-angle faulting of the stratigraphy (Figure 7).

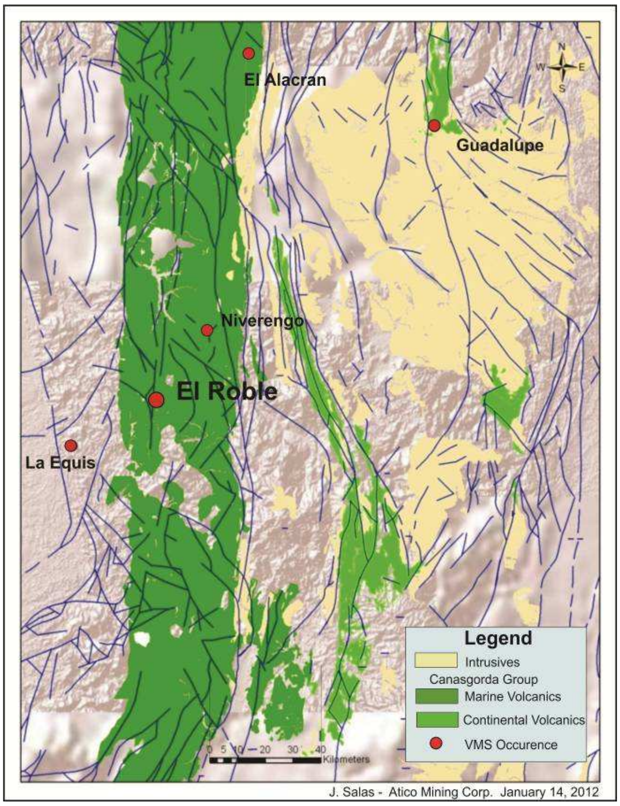



**Figure 7**. Regional geology showing Cretaceous marine volcanic Canasgorda Group and known VMS occurrences and major strike slip and thrust faults.

Atico geologists have recognized that the volcanic Barroso Formation at El Roble contains not only basalt flows with interflow breccias and hyaloclastites but also thin but significant andesite-dacite-rhyolite flow and pyroclastic members. The basalt flows are often separated by thin (less than 50cm thick), black, pyritic and graphitic shale beds. A black, pyritic and locally graphitic chert unit up to 30m thick caps the volcanic sequence and is the host to the massive sulfide mineralization. The black chert is interpreted as an exhalite horizon. The black chert unit is in turn overlain by “grey chert”. Atico geologists have identified the “grey chert” as a silicified, fine-grained ash tuff unit. Stratigaphically above the “grey chert” is a thick, greater than 1km, sequence of thin-bedded, immature sandstones, siltstones and pelagic, graphitic and pyritic, black shales with minor limestone horizons.

The stratigraphic contact between volcanic rocks and black and grey cherts has been traced by Atico geologists for ten kilometres across the El Roble Project area (Fig. 4). This contact has been determined to be an important control on VMS mineralization, and will be the focus of the exploration program recommended in Section 26.

Volcanogenic massive sulfide mineralization at the El Roble deposit, overturned by folding, now dips steeply to the east. Figures 8 and 13 show a longitudinal and cross section of the El Roble VMS deposit. Underground workings have now reached the 2000m level where new VMS lenses, not known in 1991 when mining started, continue in production (Figures 13, and 16). The currently outlined dimensions of the El Roble deposit measure 325 metres along strike by 250 metres in depth by up to 45 metres in thickness. Locally, narrow intervals (0.5 metres thick) of finely interbedded, massive sulfide, and grey to red chert provides convincing evidence for the syngenetic origin of the ore deposit.

Tertiary andesite and latite dikes of calc-alkaline to shoshonitic composition intrude both the massive sulfides and the host rocks (Ortiz et al., 1990, Figure 8). These dikes are up to 10 metres thick. Negative anomalies for Ta and Nb indicate that the dikes are arc related. They are also locally mineralized. Copper mineralization in the dikes may be the result of remobilization of volcanogenic massive sulfide mineralization.

Strands of a major regional northwest-striking fault (Figure 7) offset VMS mineralization at the El Roble mine. This fault is responsible for dismemberment of massive sulfide lenses, particularly below the 2100 level. Currently mining continues at the 2000m level but it is unclear if massive sulfide mineralization continues below the 1980 level as only 12 scattered drill holes extend below this level and only 4 widely spaced drill holes extend below the 1900m level. The recommended work program includes drilling which will be directed at testing for offsets of VMS mineralization below the 1980m level and on the south side of the Bolivar fault.

Massive sulfide, shown in Figures 9a, 9b, and 10, is dominantly pyrite and chalcopyrite. The bulk of mineralization mined to date is fine-gained, massive sulfide with little internal structure or banding (Figure 10). Recently stockwork mineralization consisting of chalcopyrite with subordinate pyrite in massive veins and patches in a gangue of stockwork quartz and chlorite veins has been intersected in production exploration drill holes between the 2000m and 1980m levels.

Gangue minerals include quartz and chlorite along with lesser calcite, dolomite and minor hematite and magnetite. Euhedral, subhedral, crushed and colloform pyrite grains measure approximately 200 microns in diameter but vary from 0.04 to 0.01 millimetres. Chalcopyrite fills the space between pyrite grains along with minor pyrrhotite, sphalerite, magnetite, and electrum (as 10 to 100 micron irregular grains). No other sulfide minerals are reported.

Channel samples collected early in the 1980's, reported by Ortiz et al. (1990), provide a good indication of the variation in grade of volcanogenic massive sulfide mineralization at El Roble. Copper varies in concentration from 0.1% to 19.3%. Gold varies from 0.1 to 13.1 g/t and. silver varies from 0.9 to 38.9 g/t. Zinc locally reaches as high as 0.33% but is not recovered. Thin and polished section examination indicates that volcanogenic massive sulfide mineralization has been subjected to at least one episode of ductile deformation and thermal recrystallization.

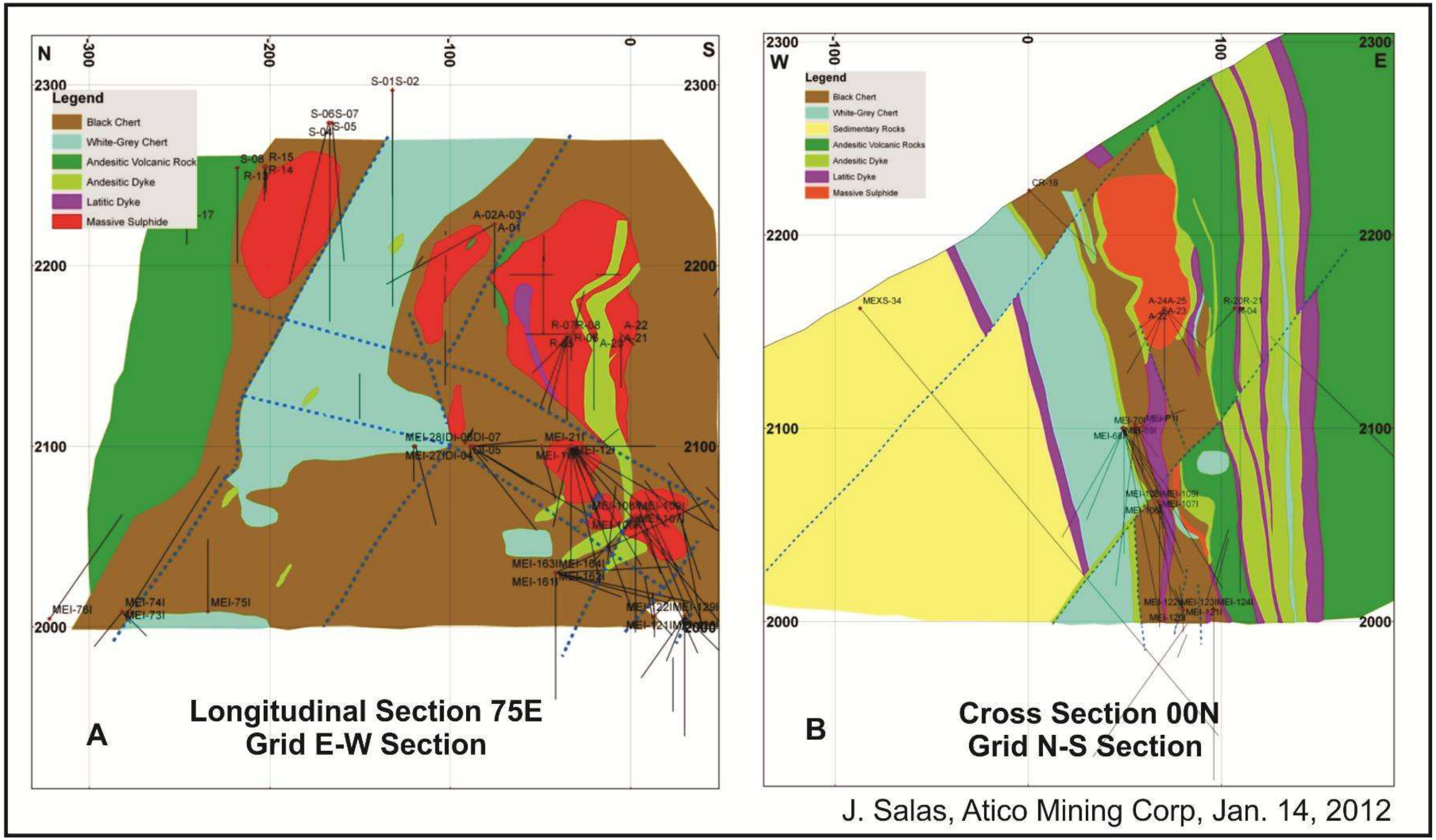



**Figure 8.** The sections clearly show the dismembered nature of the massive sulfides as well as the relationship to the black chert – andesitic volcanics contact.

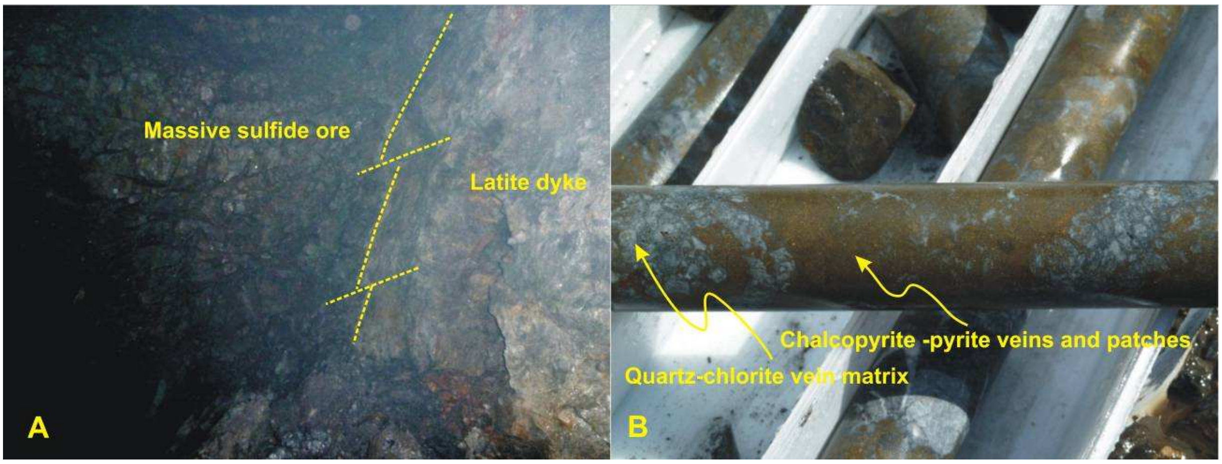



**Figure 9.** A) Massive sulfides in fault contact with an intrusive latite dyke, on 2080m level. B) Chalcopyrite-pyrite veins and patches in quartz-chlorite stockwork in drill core from the below the 2000m level.

**Figure10.** Photo of pyrite-chalcopyrite massive sulfide from the El Roble mine, Colombia.

## 8.0 Deposit Type

VMS mineralization on the El Roble Project and, specifically, the deposit at the El Roble mine are mafic-type volcanogenic massive sulfide deposits according to the classification scheme of Franklin et al. (2005). This classification scheme replaced the older but still commonly-used scheme of Sawkins (1976) under which El Roble, and similar deposits, were classified as Cyprus-type massive sulfides (Ortiz, 1988). Other mafic-type massive sulfides deposits in Colombia are Guadalupe (Antioquia), La Equis - 25km from El Roble (Choco), Sabablanca (Valle de Cauca) as reported in Mosier et al. (2009) and El Alacran .

Volcanogenic massive sulfide (VMS) deposits are well-defined by hundreds of examples from around the world. Franklin et al. (2005) cite 804 known VMS deposits. By 2009, the number had grown to 1090 (Mosier et al., 2009). VMS deposits are defined by Franklin et al. (2005) as "stratabound accumulations of sulfide minerals that precipitated at or near the sea floor in spatial, temporal and genetic association with contemporaneous volcanism." A schematic cross section of a VMS deposit is provided in Figure 11.

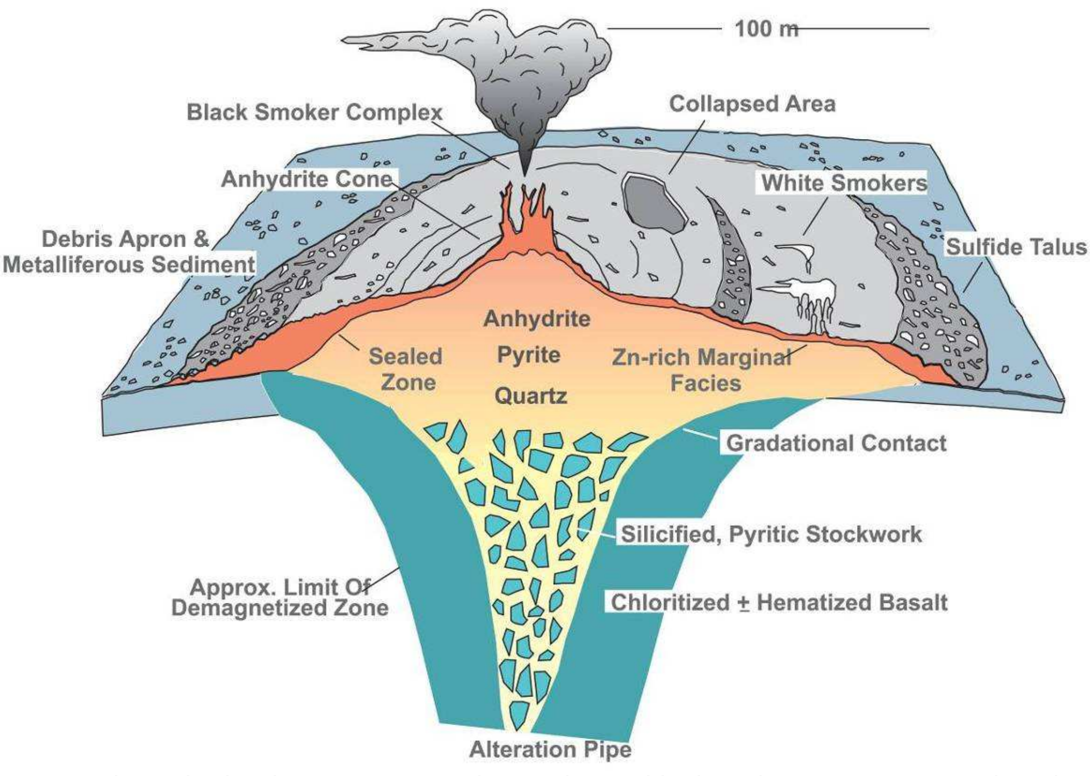



**Figure 11:** Schematic sketch of a volcanogenic massive sulfide deposit from Galley et al., (2011).

Mafic (Cyprus-type) VMS deposits, one of five sub-types defined by Franklin et al. (2005), occur in volcanic rock successions that are dominated by tholeiitic basalt, including mid-ocean ridge basalt (MORB), along with lesser sedimentary rocks including chert. In the case of El Roble, ocean floor basalt and chert-bearing sedimentary host rocks represent a fragment of Late Cretaceous seafloor that was accreted to South America.

Given the large number of mafic-type VMS deposits around the world, it is possible to estimate the size and grade of future discoveries based on the grade and tonnage distribution of known deposits. Franklin et al. (2005) list the statistical mean deposit size for 74 individual, mafic-type, VMS deposits as 2.7 million tonnes (Mt) at 1.82% copper, 0.02% lead, 0.84% zinc, 1.4 g/t gold, and 10.62 g/t silver. Mosier et al. (2009) expanded the data set to 174 individual, mafic-type, VMS deposits. Ninety percent of the deposits studied by Mosier et al. (2009) are larger than 0.03 Mt at 0.61% copper; ten percent are larger than 15 Mt at 4.1% copper, 2.1% zinc, 1.7 g/t gold and 33 g/t silver. Mosier et al., (2009) also cite the Guadalupe deposit in Choco province, Columbia as containing 28Mt at 1.8% Cu, 0.4% Zn, 2g/t Au and 12g/t Ag. These figures are of interest because they provide a range of the likely size and grade of possible future mafic-type VMS discoveries in the El Roble district. The resource estimates quoted above were extracted from academic and government publications and compilations and the potential quantity and grade of any discovery based on these figures in the Project area is conceptual in nature. There has been insufficient exploration to define a mineral resource at this point in time and it is uncertain if further exploration will result in any target being delineated as a mineral resource.

VMS deposits, including mafic-type VMS deposits, typically occur in clusters (Galley et al., 2011). The size and grade information cited above applies to individual deposits. A cluster of mafic-type VMS deposits can, in aggregate, can have considerably larger tonnages. The aggregate size depends on the number and characteristics of individual VMS deposits that make up the cluster. The El Roble Project concession block covers 10 kilometres strike length of prospective ground. The recommended exploration program, discussed in Section 26 of this report, aims to discover new VMS deposits on the El Roble concession block.

The largest VMS occurrence in South America are the Tambo Grande deposits of northern Peru, a cluster of at least five massive sulfide lenses which in aggregate total more than 200Mt including Tambo Grande I: 109 Mt of 1.6% Cu, 1.0% Zn, 0.5 g/t Au, 22 g/t Ag; Tambo Grande II: 82 Mt of 1.0 % Cu, 1.4 % Zn, and 0.8 g/t Au, 25 g/t Ag; Tambo Grande III; and B5 (Winter et al., 2010). There are also several clusters of VMS deposits in Ecuador and the western Cordillera of central Peru.

# 9.0 Exploration

## 9.1 Previous Exploration

Most exploration on the Project area was carried out by Kennecott and Nittetsu joint venture partners with MINER from 1982 until 1991 to establish a resource prior to mining. Kennecott drilled a total of 2190 metres in 22 diamond drill holes (R-01 to R-22) in the immediate El Roble mine vicinity to establish an initial resource. Nittsetsu drilled an additional 66 holes for 3530.55 metres. All of Nittetsu's drilling was in either surface in the immediate vicinity of the mine or from underground to establish a mineable resource (Figure 12 and 13).

Nittetsu expanded the area of surface mapping and sampling to ten square kilometres, and conducted an induced polarization and resistivity survey. The area of previous magnetic and IP/Res surveys is shown in Figure 26.

After withdrawal of Nittetsu in 1997, MINER, beginning in 2005, has drilled a total of 189 holes for a total of 21,293.36 metres. Of those drill holes, 164 for 10,914.39 metres were drilled from underground in the mine and an additional 5 holes for 132.74 metres were drilled from the surface in mine area. This drilling served to define the mineral resource currently being exploited.

MINER also explored the concession block and conducted surface sampling and mapping at the La Calera, La Favorita, El Carmelo, and La Batea prospects (Figure 4). MINER drilled 20 holes to test targets immediately south of the mine, drilled 14 holes at the Archie prospect 800 metres north of the mine (Figure 4) and drilled 10 holes (2161.3m) at the Santa Anita prospect 7 kilometres south of the mine (described in Section 9.7)

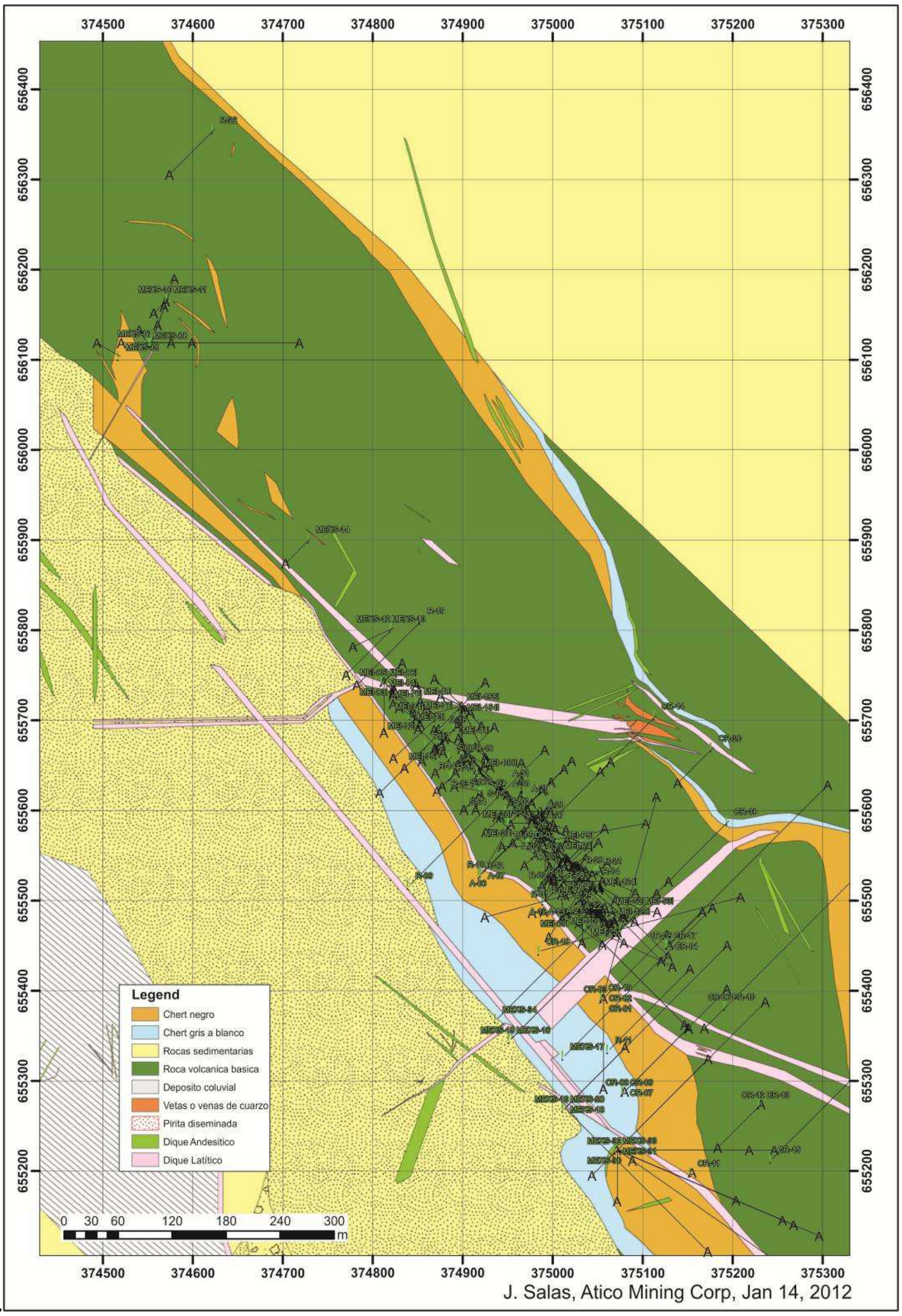



**Figure 12.** Drill holes completed by Kennecott, Nittetsu and MINER between 1982 and 2005. Most drilling was concentrated in the El Roble mine area with limited drilling at the Archie prospect 800m northwest and Santa Anita prospect 7 km southeast.

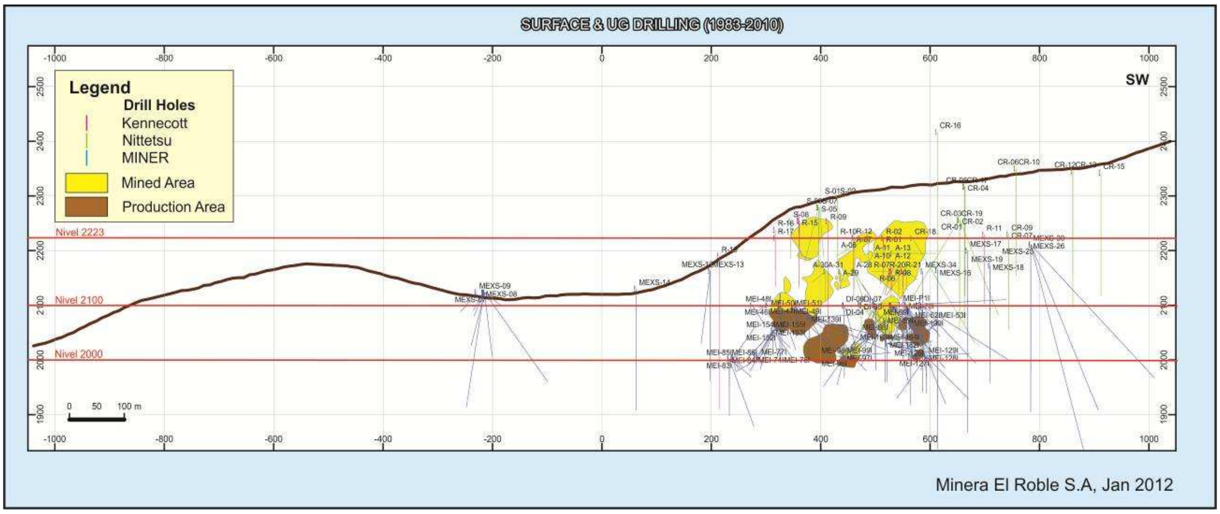



**Figure 13**. Longitudinal section of the El Roble workings showing historical drill holes and workings. Note that the area between the 2000m and 1900m levels has been incompletely tested for additional massive sulphide lenses.

## 9.2 Geologic mapping by Atico

Atico began its exploration program at the El Roble Project in April of 2011. The discussion of exploration results in this report is current through November 25, 2011.

Atico started with surface (1:5,000 and 1:10,000 scale) and underground (1:250 scale) geologic mapping of the El Roble mine, the immediate mine area, and the MINER concession block. The 10,000 scale map covers an area of 85 square kilometres with results shown on Figure 4. Geological sections (e.g. Figures 8 & 14) were generated by Atico, based on an updated understanding of the geology in the mine area. The main result of the Atico surface mapping program was confirmation of a prospectively mineralized contact between basaltic volcanic rocks and exhalite chert ("black chert") and a silicified ash tuff unit ("grey chert") that extends for ten kilometres across the MINER concession block. This contact exerts a strong control on the location of geochemically anomalous samples and thus becomes the focus of Atico's preliminary drill targets (Figures, 8, 14, and 15). In addition Atico geologists noted that high- and low-angle faulting had dismembered the El Roble mineralization (Figures 14, 15, and 16).

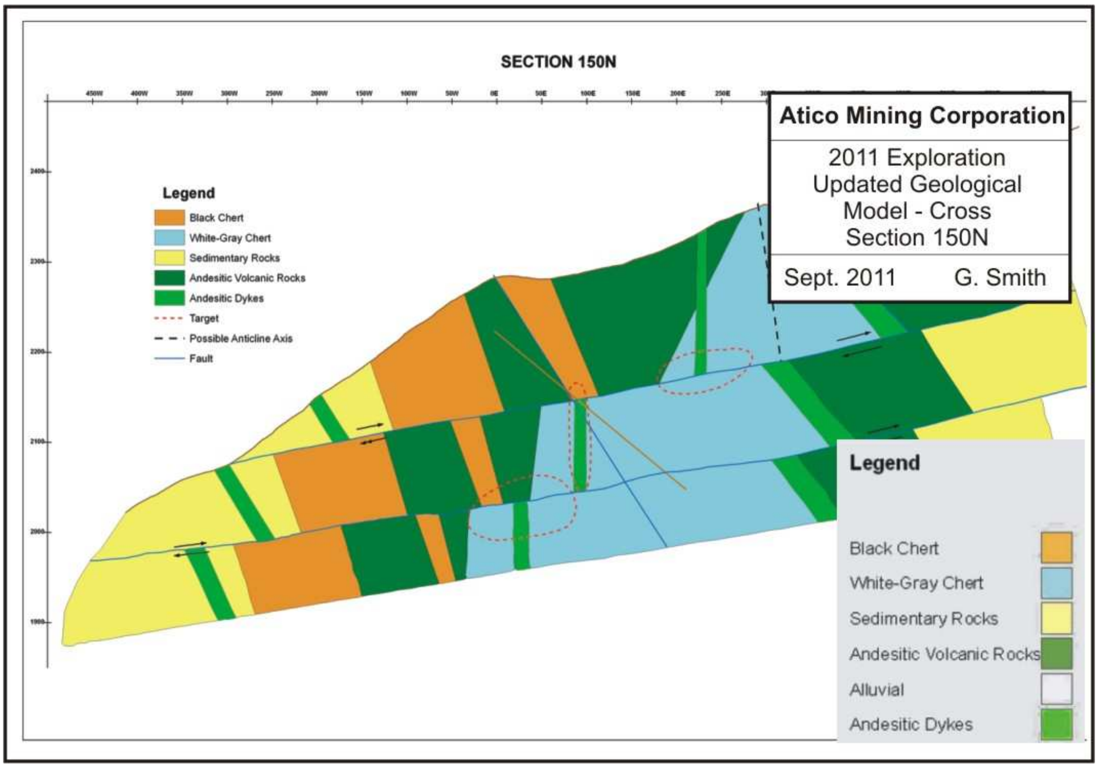



**Figure 14**: Interpretive geologic cross-section on Section 150N at the El Roble mine based on mapping by Atico in 2011. Drill targets are located near the contact of white grey chert unit (blue) and mafic volcanic rocks (dark green).

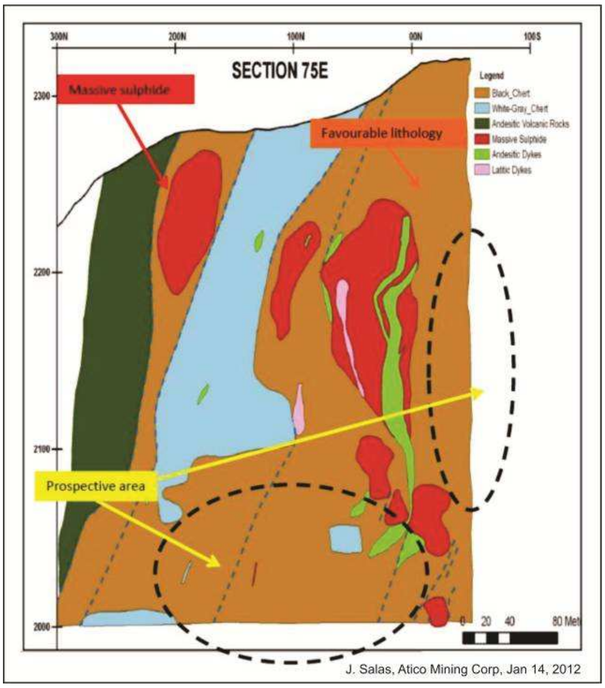



**Figure 15** Longitudinal section 75E at El Roble mine based on Atico mapping showing prospective drill target areas.

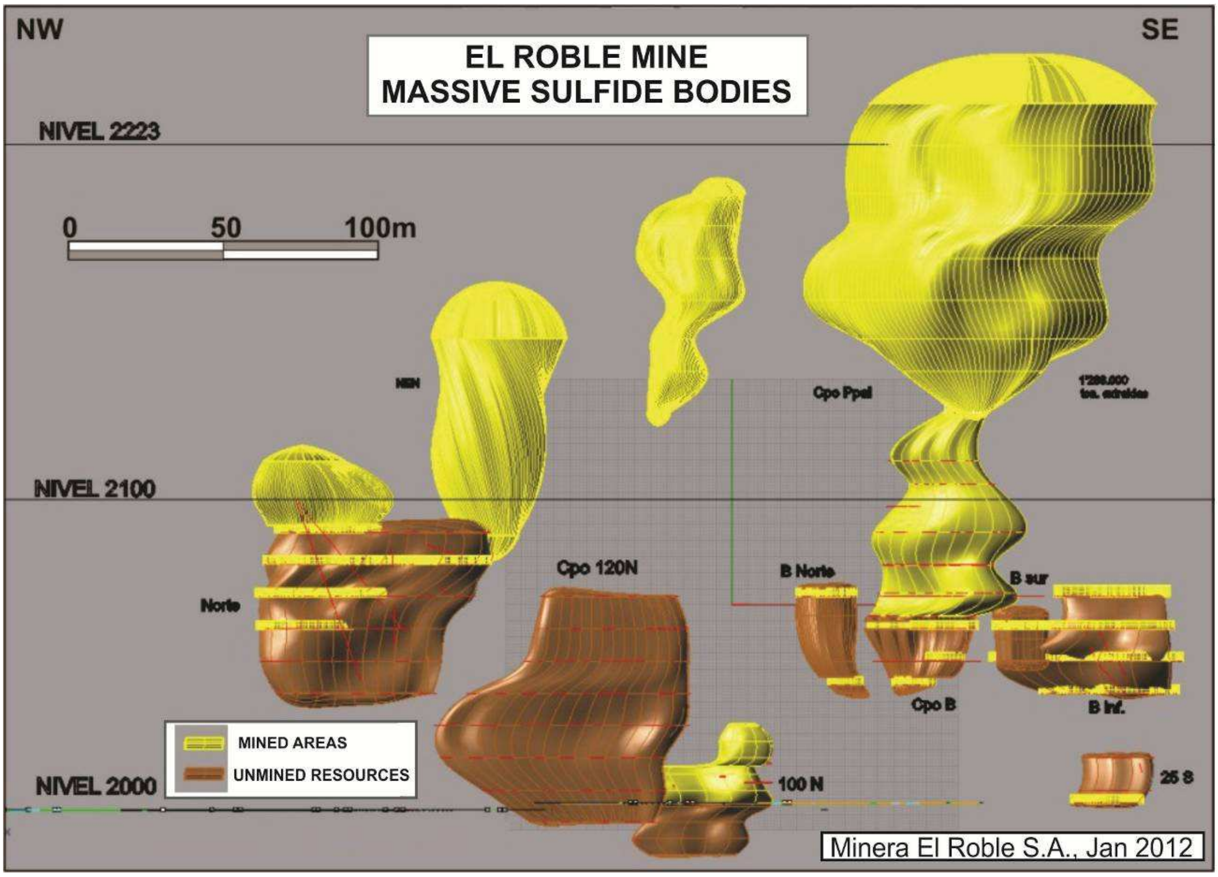



**Figure 16:** 3-D view of El Roble massive sulphide bodies in October 2010. The dismembered geometry of the massive sulfide bodies is evident in this view. Note also that no mineralization is indicated below the 1980m level.

## 9.3 Rock chip sampling by Atico

Atico compiled a single, up-to-date geochemical database for both underground and surface samples. The database includes analytical results for samples collected by Atico as well as results from previous sampling campaigns (Kennecott, Nittetsu and MINER). This compilation of old and new and old surface geochemical data generated a total of 13 preliminary drill targets (Fig. 17). The targets are described in Table 4.

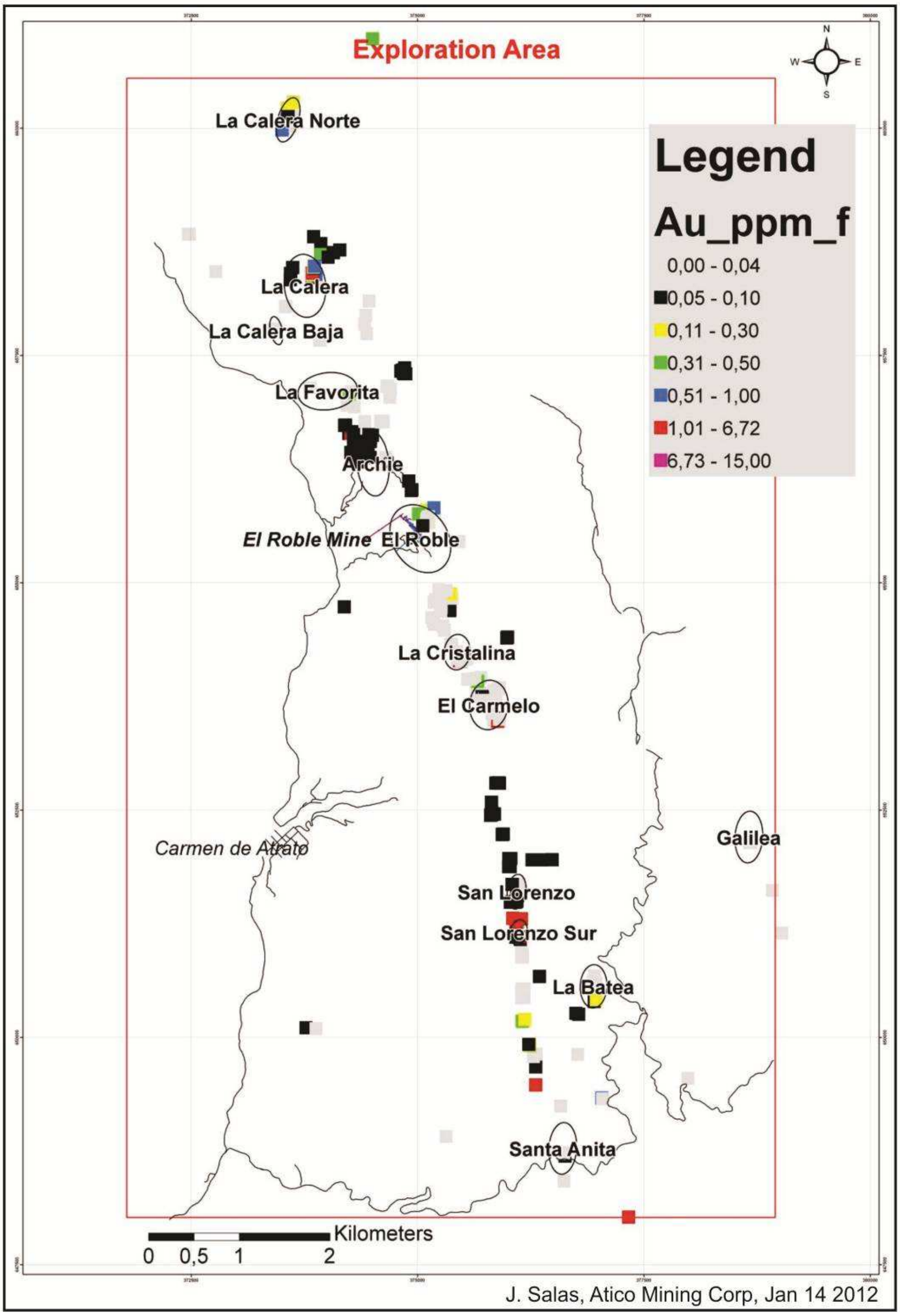



**Figure 17:** Preliminary drill targets generated by Atico based upon rock chip gold geochemistry, and favourable host horizon outcrop.

**Table 4**. Preliminary drill targets generated by Atico (see Figs. 4 and 17 for locations)

| **Target** | **Description** |
|---|---|
| La Calera Norte | 26 surface rock samples range from 173 to >10,000 ppm Cu and 0.11 to 3.2 ppm Au. The host rock is basalt, from near the prospective contact between basalt and overlying pelagic sedimentary rocks. |
| La Calera | 40 surface rock samples returned 0.1 to 3.42 ppm Au and 31 to 298 ppm Cu from milky pyritic quartz veins and nodules. Host rocks are basalt, black chert and shale from the prospective contact between basalt flows and overlying pelagic sedimentary rocks. Magnetic anomaly from the newly reprocessed Kennecott survey data (shown on Fig. 27). |
| La Calera Baja | Weak magnetic anomaly from the newly reprocessed Kennecott survey data (shown on Fig. 27). |
| La Favorita | 6 surface rock samples, 23 soil samples, six stream sediment samples and 10 stream sediment panned concentrate samples returned 0.01 to 1.09 ppm Au and 100 to 184 ppm Cu. Two magnetic anomalies from the newly reprocessed Kennecott survey data are located immediately to the east of La Favorita (see Fig. 27). |
| Archie | 110 soil samples, 73 surface rock samples returned 0.1 to 1.6 ppm Au and 0.01 to 323 ppm Cu. Host rocks are basalt and chert from the prospective contact between basalt flows and overlying pelagic sedimentary rocks. Fourteen diamond holes (MEX-01 to MEX-14) were drilled by MINER (1824.02 metres) during 2005 and 2006. Results were negative; no massive sulfide lenses were intersected. Magnetic anomaly from the newly reprocessed Kennecott survey data (shown on Fig. 27). |
| El Roble | Twenty diamond holes (MEX-15 to MEX-34) were drilled by MINER (5142.63 metres) during the period 2007 to 2010 in the Quebrada El Roble area, immediately south of the El Roble mine. Magnetic anomaly from the newly reprocessed Kennecott survey data (shown on Fig. 27). |
| La Cristalina | 36 surface rock samples range from 0.1 to 3.48 ppm Au; the samples were not analyzed for copper. Host rock is black chert, from the prospective contact between basalt and overlying pelagic sedimentary rocks. |

**Table 4 continued**: Preliminary drill targets generated by Atico (see Figs. 4 and 17 for locations).

| | |
|---|---|
| El Carmelo | 71 surface rock samples returned 0.01 to 1.4 ppm Au and 41 to 4670 ppm Cu from brecciated and silicified basalt cut by pyrite- and chalcopyrite-bearing quartz veins. Host rocks include basalt and black chert from the prospective contact between basalt flows and overlying pelagic sedimentary rocks. |
| San Lorenzo | 27 surface rock samples returned 0.16 to 6.1 ppm Au and 71 to 225 ppm Cu. The host rock is black chert, from the prospective contact between basalt and overlying pelagic sedimentary rocks. |
| San Lorenzo Sur | 24 surface rock samples returned 0.3 to 6.2 ppm Au and 71 to 273 ppm Cu. Samples were collected from grey chert, at the prospective contact between basalt and overlying pelagic sedimentary rocks. |
| La Batea | 27 surface rock samples returned 0.01 to 0.24 ppm Au and 52 to 130 ppm Cu from brecciated host rocks including basalt, black chert and graphitic shale. La Batea is located at the prospective contact between basalt flows and overlying pelagic sedimentary rocks. |
| Santa Anita | 5 surface rock samples returned 0.01 ppm Au; Cu was not analyzed. Host rocks include basalt cut by quartz veins containing pyrite, chalcopyrite, covellite and malachite. Ten diamond holes were drilled by MINER. The best interval was a 37.5 metre section (drill hole MERSA-1 at 63.0 metres to 100.5 metres depth) that averaged 0.54 % Cu and was described as a sulfidic silicified breccia. Santa Anita is described in more detail in section 9.7 of this report. |
| Galilea | 6 samples were collected from basalt and from black chert, at the prospective contact between basalt and overlying pelagic sedimentary rocks. Pyrite varies from 5 to 10%, but analytical results are low (0.1 ppm Au), suggesting that Galilea may be the distal portion of a VMS deposit. |

Atico's rock chip sampling program in the immediate mine area is designed to confirm the geological model (VMS deposit) and provide orientation and baseline technical information to guide future exploration. Samples collected to date from the El Roble deposit include 66 rock chip samples of massive sulfide and surrounding host rock units. These samples were collected to confirm the presence of copper, gold and zinc mineralization and to determine whether or not these metals are enriched outside of the massive sulfide lenses. Rock chip sample results are presented in Figures 18, 19 and 20.

Analytical results for massive sulfide samples were within the range of previous sampling efforts at the El Roble mine reported by Ortiz et al. (1990). Gold values ranged from 0.1 to 8.9 g/t Au, copper values from 0.1 to 8.4%, and zinc ranged from 47 to 7800 ppm. Analytical results for the host rocks showed no evidence for dispersion of gold beyond the massive sulfide lenses. Copper values between 172 and 490 ppm and spotty elevated zinc values were noted in both the host rocks and the intrusive dikes. These results indicate that gold, copper and zinc mineralization is confined to the massive sulfide lenses; migration or chemical dispersion into the host rocks is minimal. The metal content of cross-cutting, intrusive dikes is weakly anomalous but no values of economic significance were reported.

## 9.4 Orientation Soil Sampling by Atico

Atico conducted an orientation soil sampling program which, to date, includes results for 44 samples collected from two lines across the middle and northern portion of the immediate El Roble mine area. The objective of these two lines is to geochemically characterize the major lithologic units. Results are shown in Figures 21, 22, and 23. These results show a clear geochemical characterization of the major lithologic units as well as dispersion of mineralized samples collected up to 400 metres to the west of and downslope from the projected trace of outcropping of VMS mineralization. Soil sampling will be expanded to cover the ten-kilometre, prospective strike length of the target horizon.

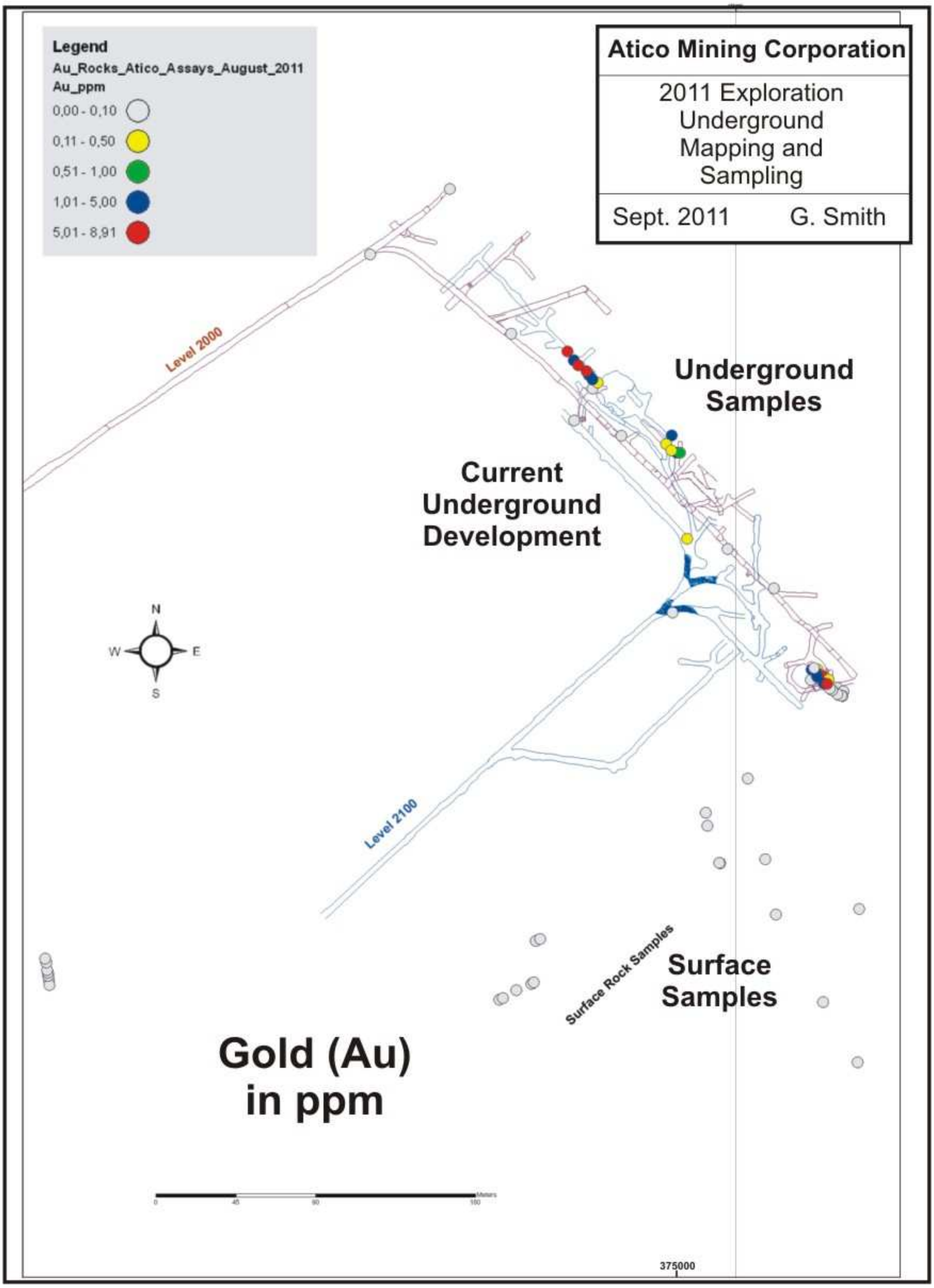



**Figure 18.** 2011 Atico rock chip geochemical sampling results – Gold

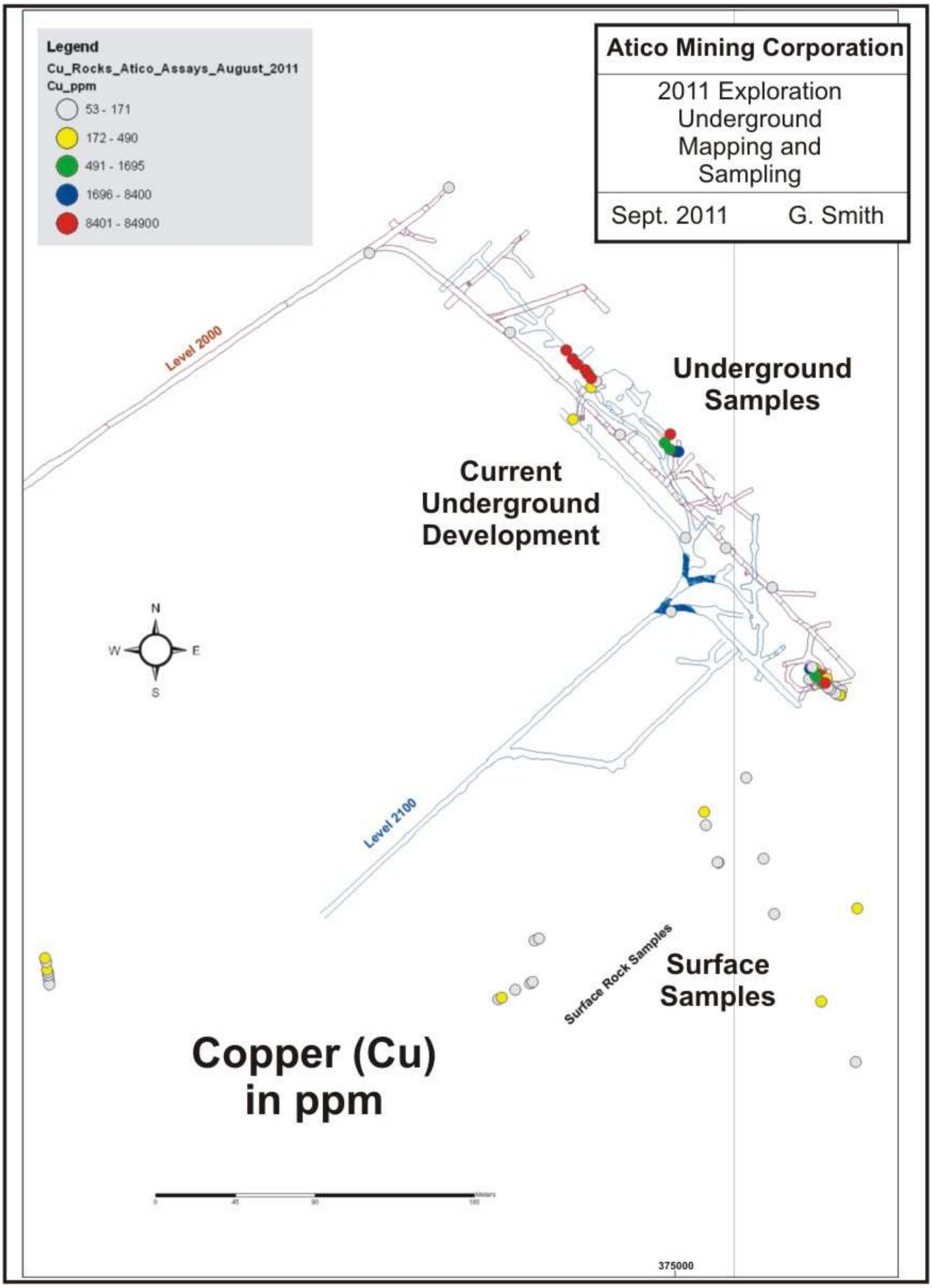



**Figure 19.** 2011 Atico rock chip geochemical sampling results – Copper

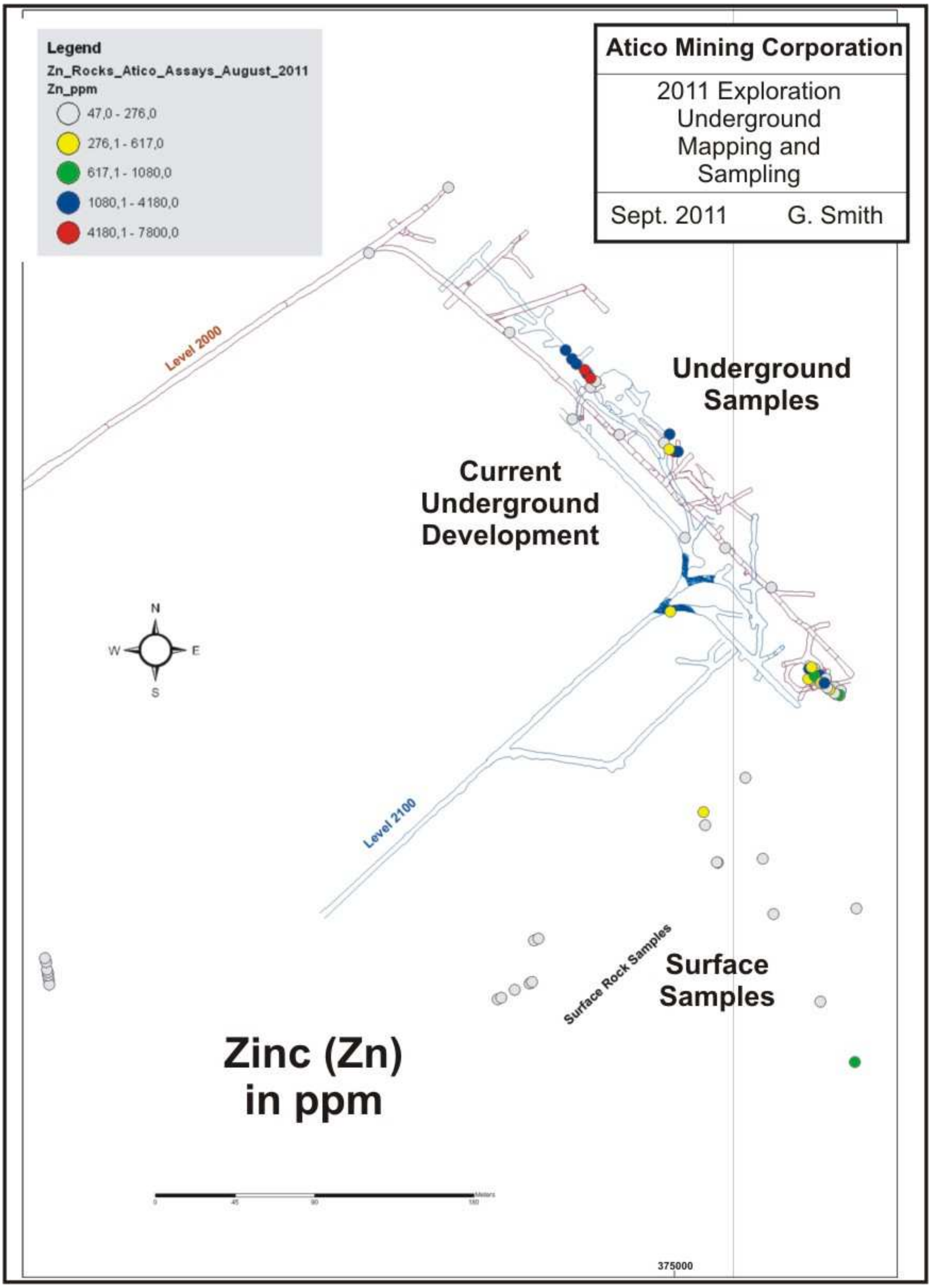



**Figure 20.** 2011 Atico rock chip geochemical sampling results – Zinc

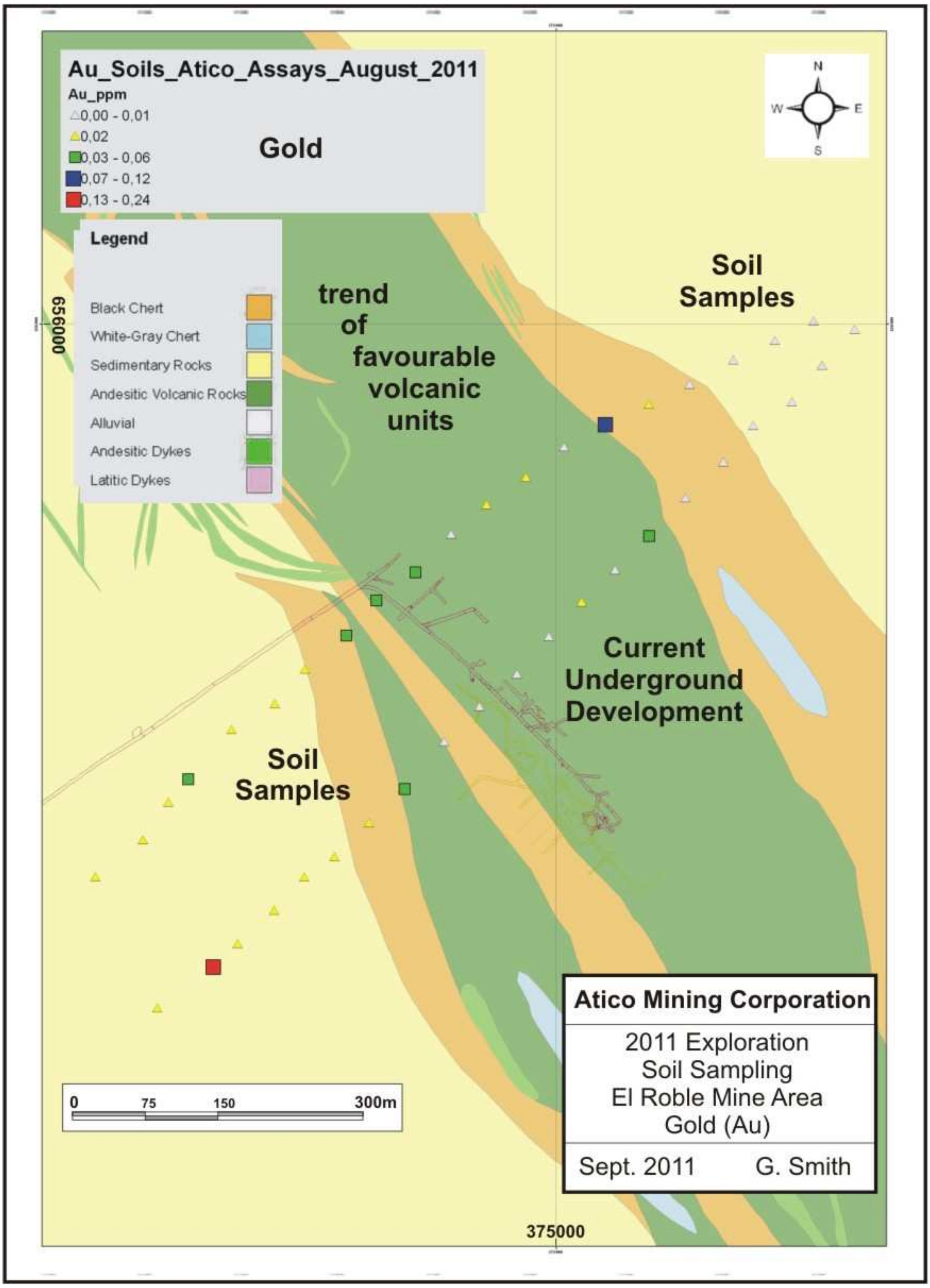



**Figure 21.** Orientation Soil Sampling by Atico 2011 – Gold

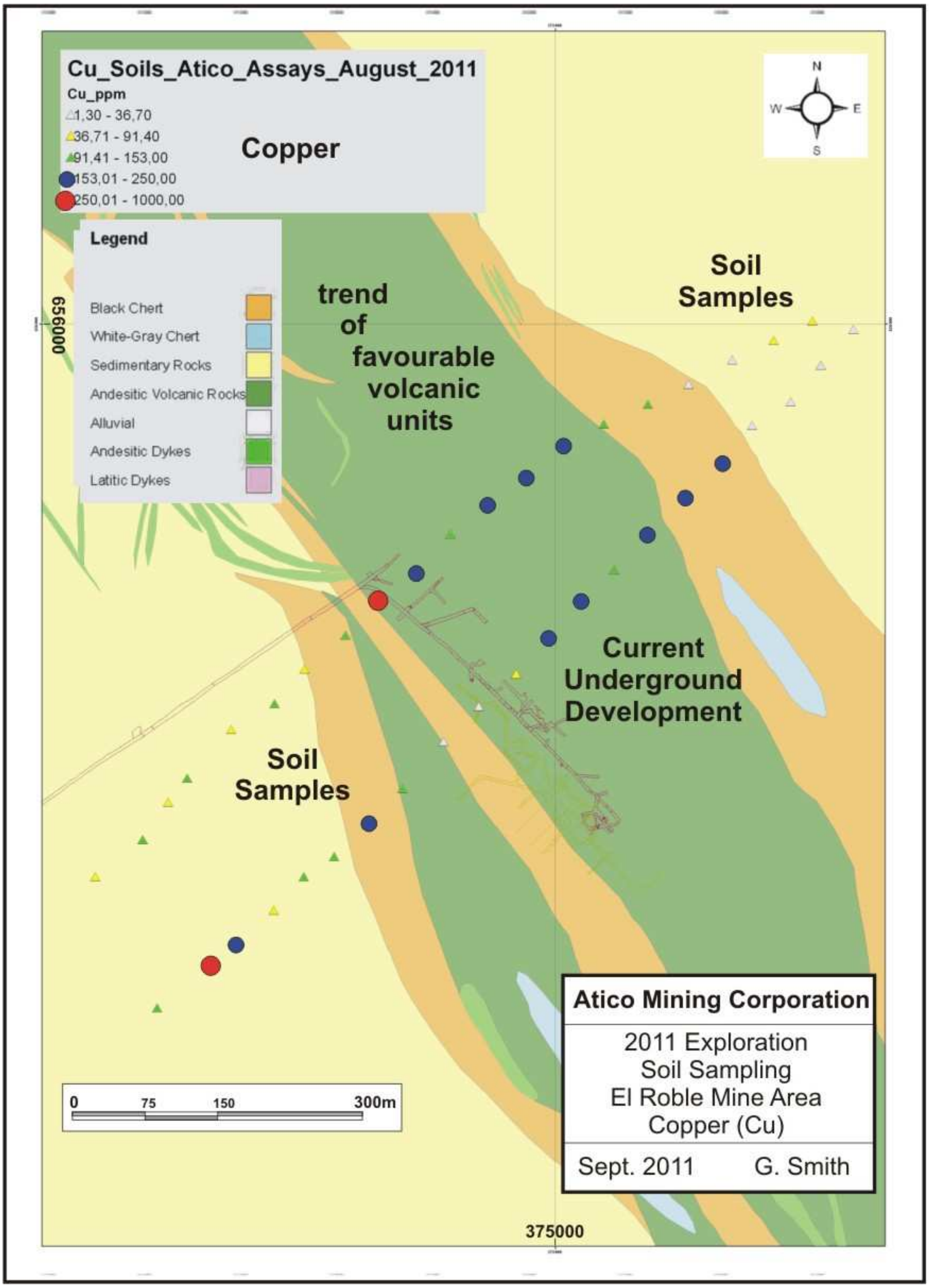



**Figure 22.** Orientation Soil Sampling by Atico 2011 – Copper

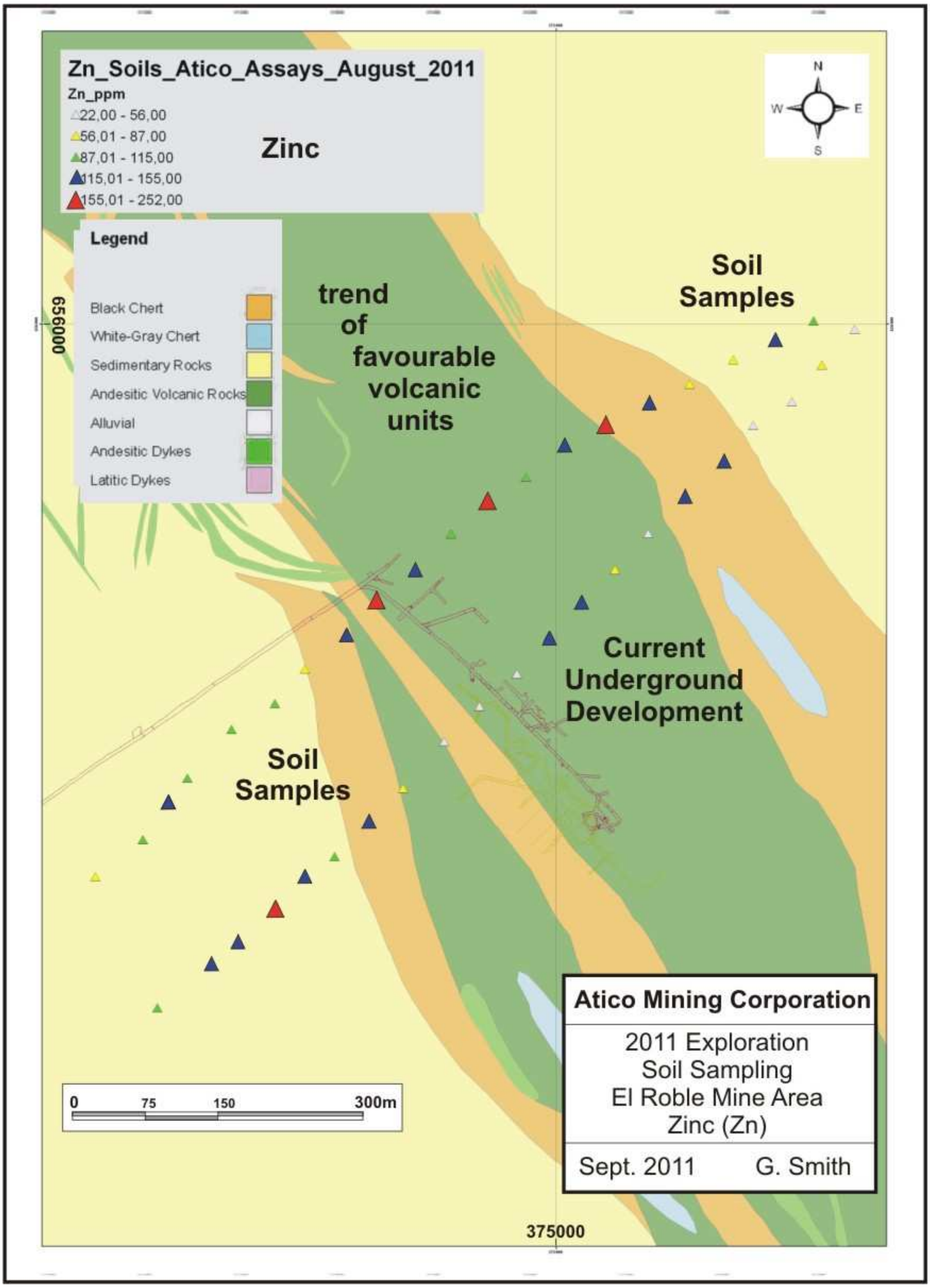



**Figure 23:** Orientation Soil Sampling by Atico 2011 – Zinc

## 9.5 Geophysical surveys – reinterpreted IP/Res data

During 2011, Arce Geophysics Company reprocessed existing resistivity and induced polarization (IP/Res) data on behalf of Atico. IP and resistivity are proven exploration tools for volcanogenic massive sulfide exploration. The original data was collected by Nittetsu in 1985-1986 on 1- to 1.5-kilometre lines with a 50-metre spacing between lines. The results of the reprocessing are shown in three dimensions on Figure 24 and in map view on Figure 25. The 3-D view, in particular, highlights the correspondence between known mineralization at the El Roble mine and areas of anomalously low resistivity (shown in red on Fig. 24).

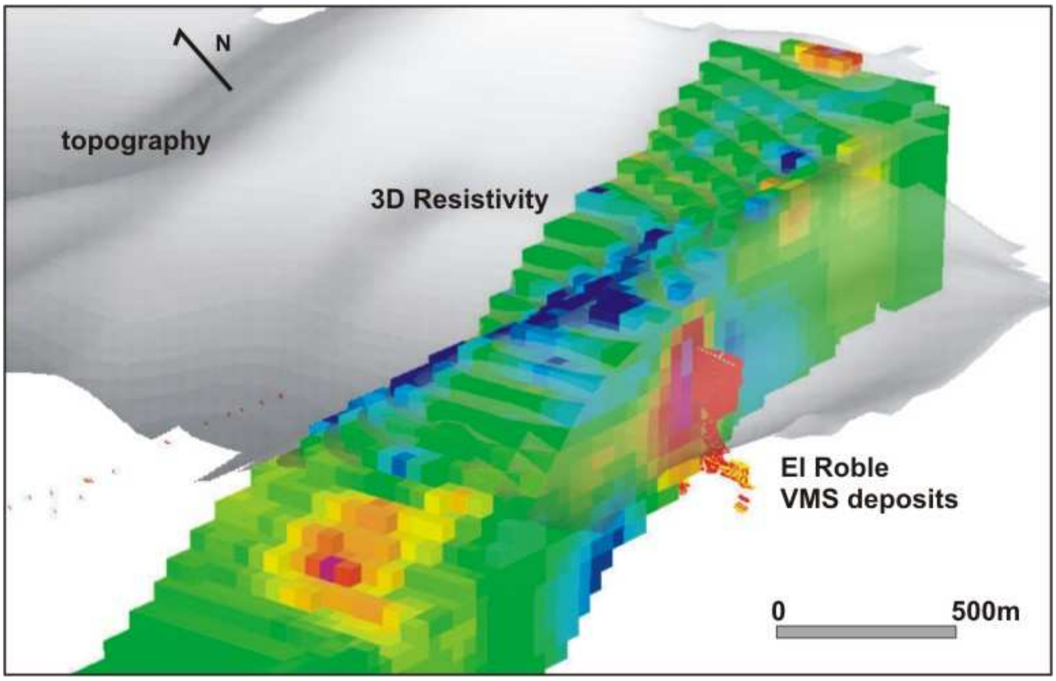



**Figure 24.** Three-dimensional view of resistivity (color), topography (grey surface), and VMS mineralization (red solid) at the El Roble mine. Note correspondence of resistivity lows (hot colors) with EL Roble mineralization.

Currently, the most probable explanation of the resistivity lows and chargeability highs shown on Figure 25 is a package of locally-graphitic, black to grey (locally red) chert beds, up to 100 metres in thickness, that encloses known VMS mineralization at the El Roble mine. Targets identified by IP may need to be further refined by other geophysical methods such as gravity and EM before drilling.

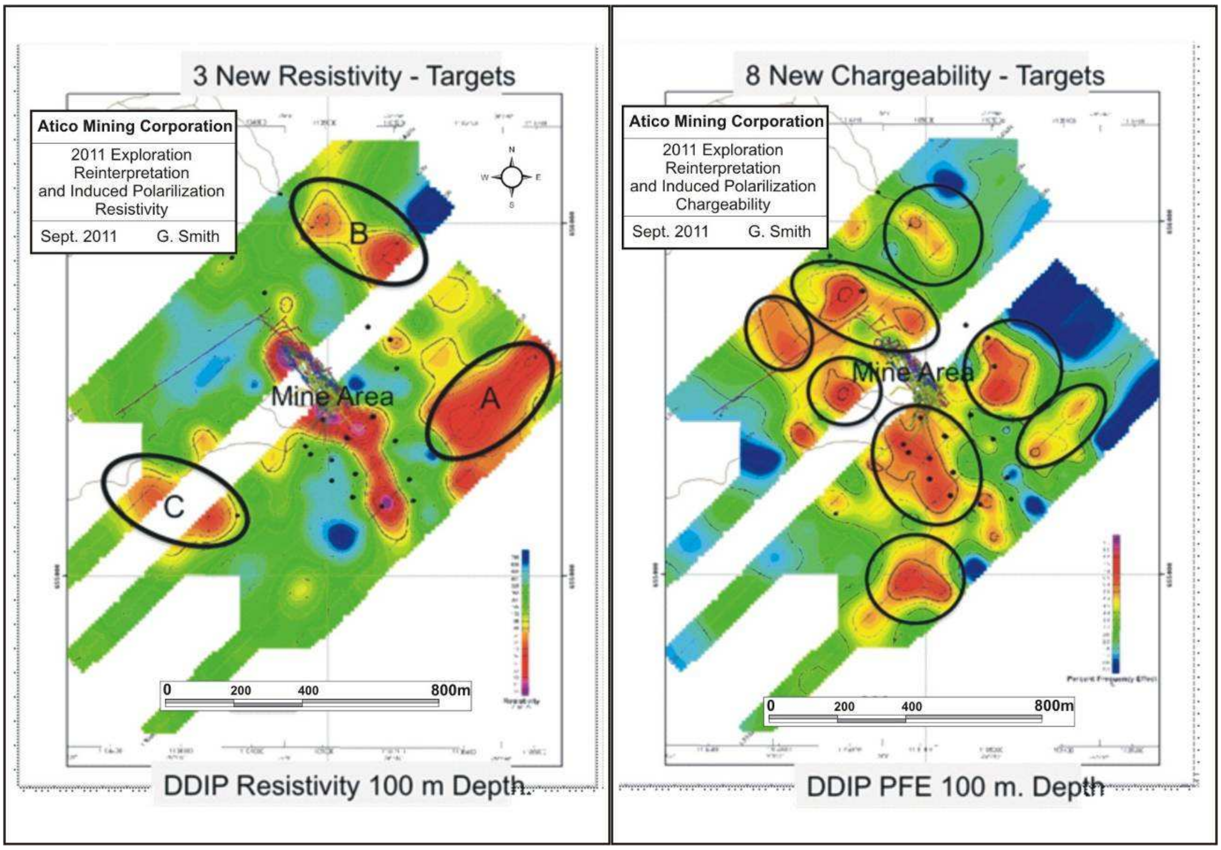



**Figure 25:** Reinterpreted resistivity and chargeability data showing preliminary target areas around the El Roble mine.

## 9.6 Geophysical surveys – Reinterpreted magnetic data

Since the chert package, rather than volcanogenic massive sulfide mineralization, is thought to be responsible for the anomalous IP/Res response at the El Roble Project, additional geophysical tools are needed to distinguish between conductive graphite and volcanogenic massive sulfide mineralization. With this in mind, Atico undertook a new ground magnetic orientation survey at the El Roble mine and, in addition, had Arce Geophysics Company reprocess approximately 40 line kilometres of ground magnetic data collected in 1985-1986 by Nittetsu. The reprocessed magnetic map (Fig. 27) shows a weak magnetic anomaly over the El Roble mine and four stronger magnetic anomalies located north of the mine.

## 9.7 Geophysical surveys – Atico ground magnetic program

Partial results for 415 line kilometre ground magnetic survey carried out by Arce Geophysics Company during 2011 are shown on Figure 28. Data for the remaining 115 line kilometres is being processed and results are expected in the immediate future. The ground magnetic survey utilized three ground magnetometers, two operators and 8 field assistants. Results to date show a number of strong magnetic anomalies including a weaker anomaly over the largely mined out El Roble deposit (Fig. 28). These results confirm the utility of ground magnetics as a tool for defining VMS stratigraphy and possible volcanic centers across the MINER concession block.

In addition 50 line kilometres of IP/Resistivity are being run at the time of writing.

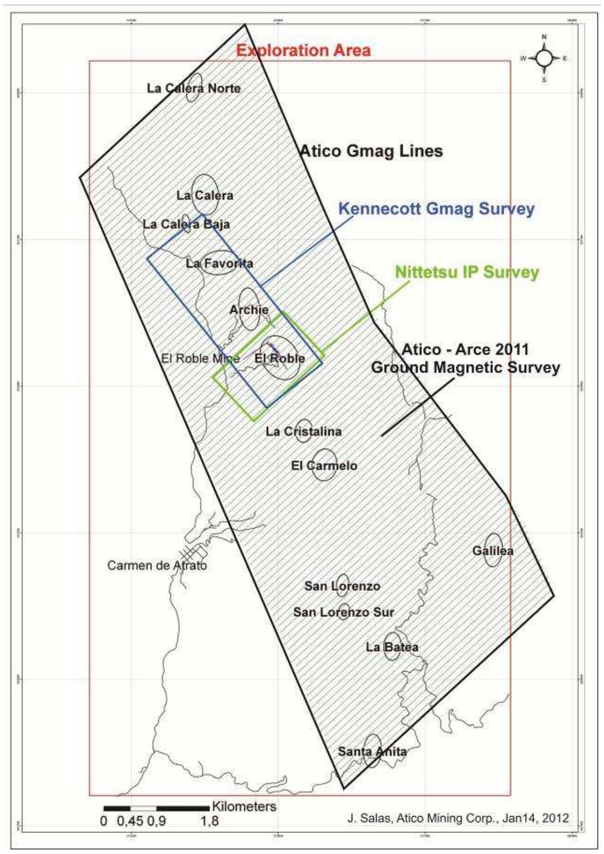



**Figure 26.** Map showing coverage of ground geophysical surveys on the El Roble Project area. Atico 2011 ground magnetic survey is black, hachured polygonal area . Blue rectangle is area of Kennecott ground magnetic survey and green rectangles show area of Nittetsu IP/Res surveys.

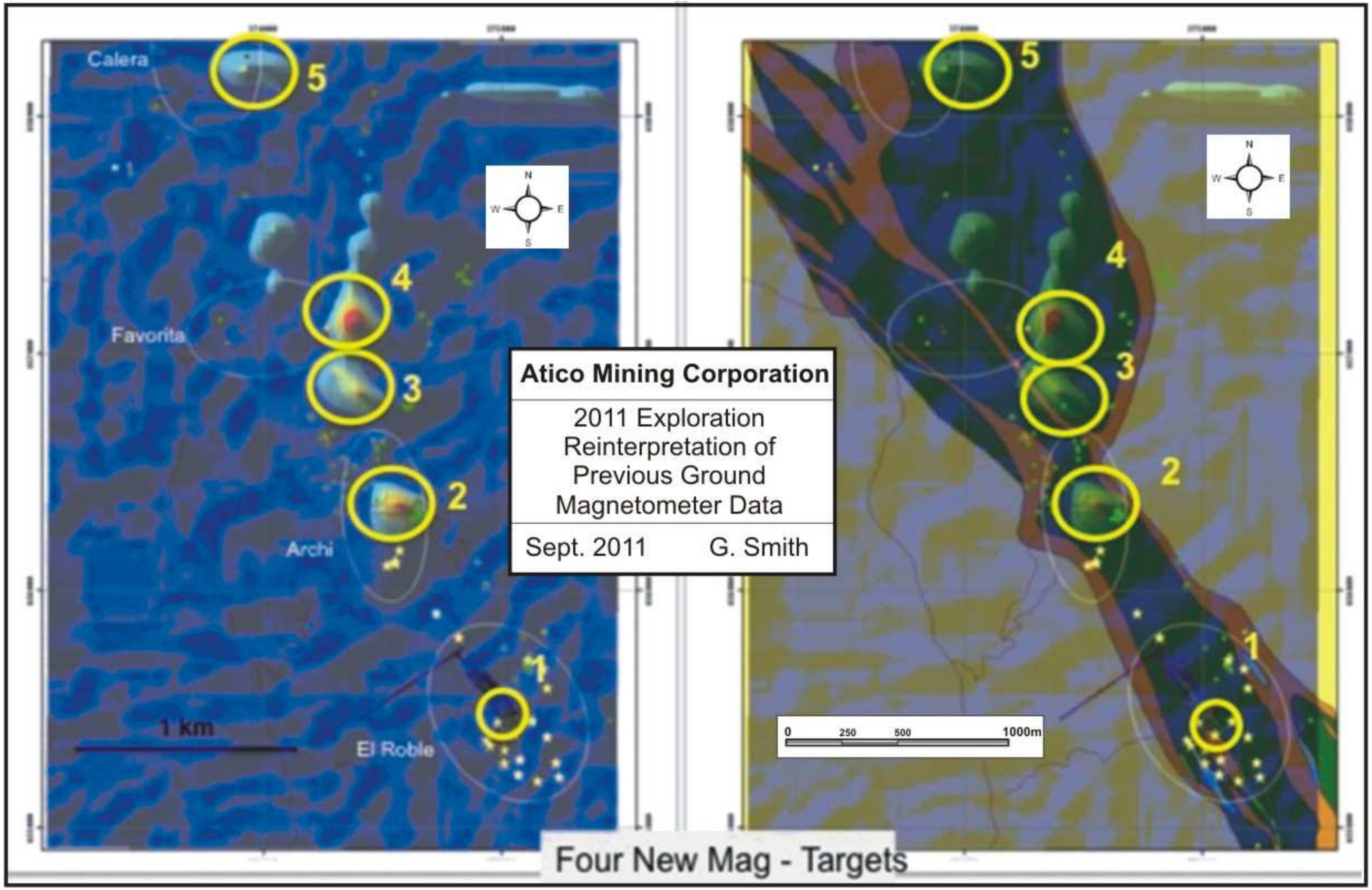



**Figure 27.** Magnetic data acquired by Nittetsu during1985-86 re-interpreted by Atico and showing preliminary target areas. Small yellow dots are artifacts of data processing.

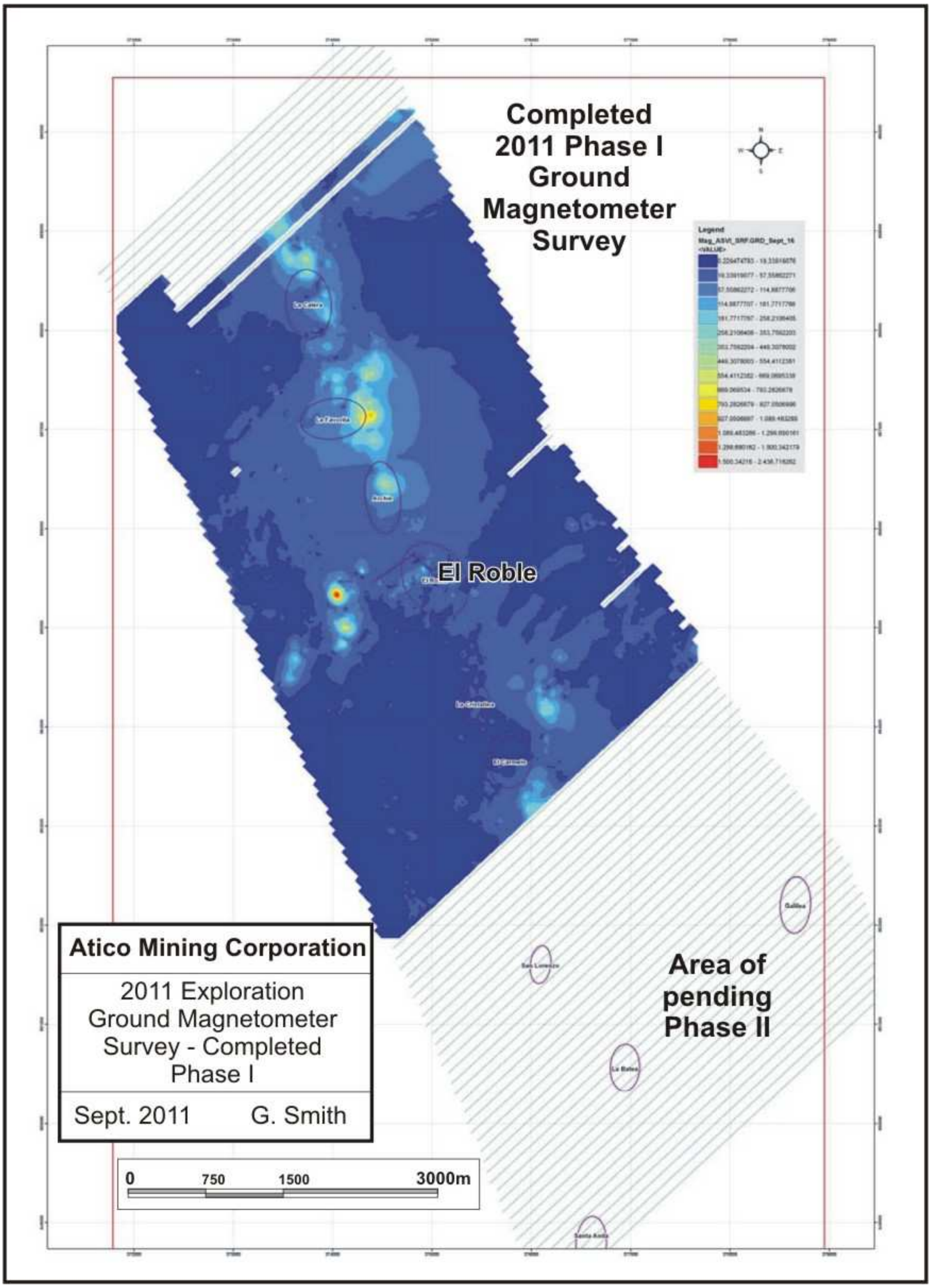



**Figure 28.** Partial results of Atico ground magnetometer survey completed during 2011 showing preliminary target areas. Note that the cross hatched area of the Phase ground magnetic survey has been completed and results are being processed.

## 9.8 Santa Anita target area

Ortiz (1990) reports minor copper production from the inactive Santa Anita mine (Fig. 4). MINER sampled the surface at Santa Anita, confirmed anomalous gold and copper at the surface and drilled 10 diamond holes. No bedded volcanogenic massive sulfide mineralization was intersected but the holes are not unmineralized. The best interval was a 37.5 metre section (drill hole MERSA-1 at 63.0 metres to 100.5 metres depth) that averaged 0.54 % Cu and was described as a sulfidic, silicified breccia. This breccia may represent part of a feeder zone, shown in the schematic section provided as Figure 9. Only portions of the core were analyzed. A second mineralized interval in drill hole MERSA-4 (148.8 to 152.4 metres depth) returned 0.16 % Cu and 23.5 ppb gold. A photo of chalcopyrite-bearing mineralization in drill hole MERSA-10, from an interval that was not analyzed, is provided in Figure 29. More drilling is recommended at Santa Anita.

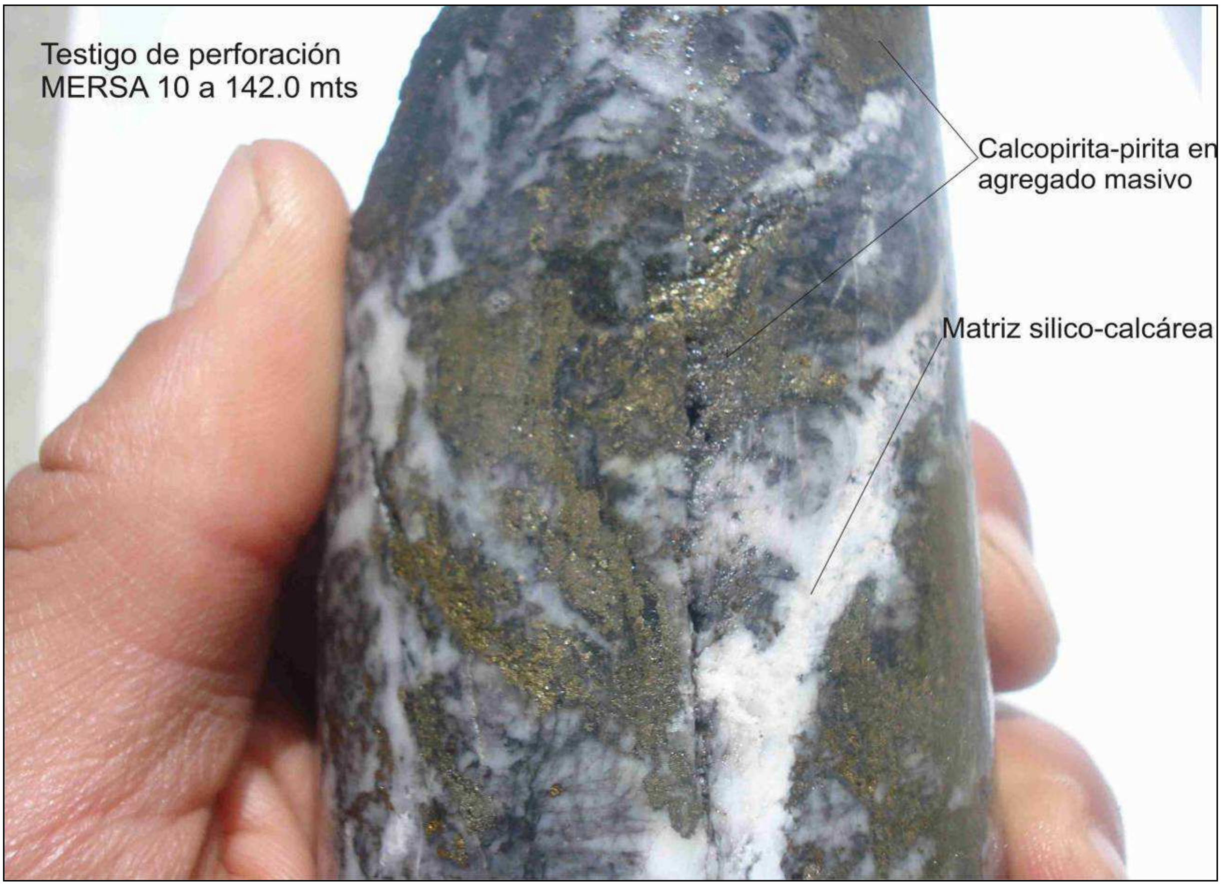



**Figure 29:** Copper mineralization from the Santa Anita area, drill hole MERSA-10, at a depth of 142m.

## 9.9 El Roble Mine Exploration

The El Roble mine is currently operating between the 2100m and 2000m levels where massive sulfide lenses original defined by Kennecott and Nittetsu are being mined over a strike length of 325 metres. Drilling is needed below the 1950 level to test for the down-dip extensions of known mineralization. At the present time, only six drill holes penetrate the potentially mineralized horizon below the 2000 level. To the north of the mine, fourteen (14) MINER drill holes provide a partial test as far as Archie, located 640 metres north of the mine. To the south, diamond drilling from the surface by MINER (17 holes) and Nittetsu (20 holes) provides a partial test of an additional 320 metres of strike length. These drill holes do not test the preliminary target areas defined by reinterpreted IP/Resistivity and the Atico ground magnetic program. The total strike length that has been partially drill tested to date is 1285 metres. The total strike length of potentially mineralized ground, as defined by surface sampling and geologic mapping, is ten kilometres.

Atico geologists have recognized high- and low-angle faulting which has dismembered the El Roble VMS deposit into a number of discrete massive sulfide pods (figures 8, 13, 14 and 15) strongly suggesting that additional mineralization remains to be found on offset portions of andesitic volcanic – pelagic sediment contact below and adjacent to the known massive sulfide mineralization.

# 10.0 Drilling

The following is a summary of the drill programs undertaken by MINER and by previous joint venture partners. Atico Mining Corporation has not conducted any drilling at El Roble but will include drilling in a two phases as part of the recommended program, described in Section 26.

References have been found in MINER records to drilling by the Kennecott Mining Company during the period 1982 to 1984 when they drilled 22 diamond holes for a total of 2190 metres. Drill collar, azimuth, declination and total depth is reported but complete logs and results are missing. A final report was prepared in 1984 but the text of the report is not on file with MINER and, to date, has not been located. It is presumed that the drilling by Kennecott was within the envelope of the mineralization that has been mined by MINER and this drilling defined the original resources in the immediate mine area but this cannot be verified

Nittetsu Mining Company Ltd. in joint venture with C. Itoh and Company Ltd. drilled 66 holes from 1985 to 1997 for a total of 7730.55 metres. Reports with logs and results from the Nittetsu exploration campaign are on file at the MINSA office in Medellin, Colombia. Drilling campaigns conducted by Kennecott and Nittetsu focused on defining the size and grade of massive sulfide bodies above the 2100 level. Currently, mining continues on and above 2000m levels and production drilling has encountered massive sulfide mineralization to the 1980m level. Drill holes are shown relative to known massive sulfide lenses on Figure 30

MINER, during the period 1998 through 2010, completed 163 underground development drill holes and 31 surface exploration drill holes Figures 12, 13, and 30 for a total of 16,092.83 metres. These drill holes focused primarily on discovering massive sulfide mineralization between the 2100m and 2000m levels, where mining continues at the present time. The underground drilling recorded collar coordinates, azimuth, declination and total depth, as well as visible massive sulfide intercepts. The massive sulfides were plotted on mine opening maps and integrated into a digital database, but not generally assayed. Consequently underground drilling defined the spatial configuration, geometry and location of massive sulfide bodies but provides little or no information that can be used in defining resources or predicting the location of new massive sulfide pods. Exploration drill holes outside of the immediate mine area (e.g. Santa Anita) were unsuccessful in identifying mineable grades and thicknesses of massive sulfide mineralization.

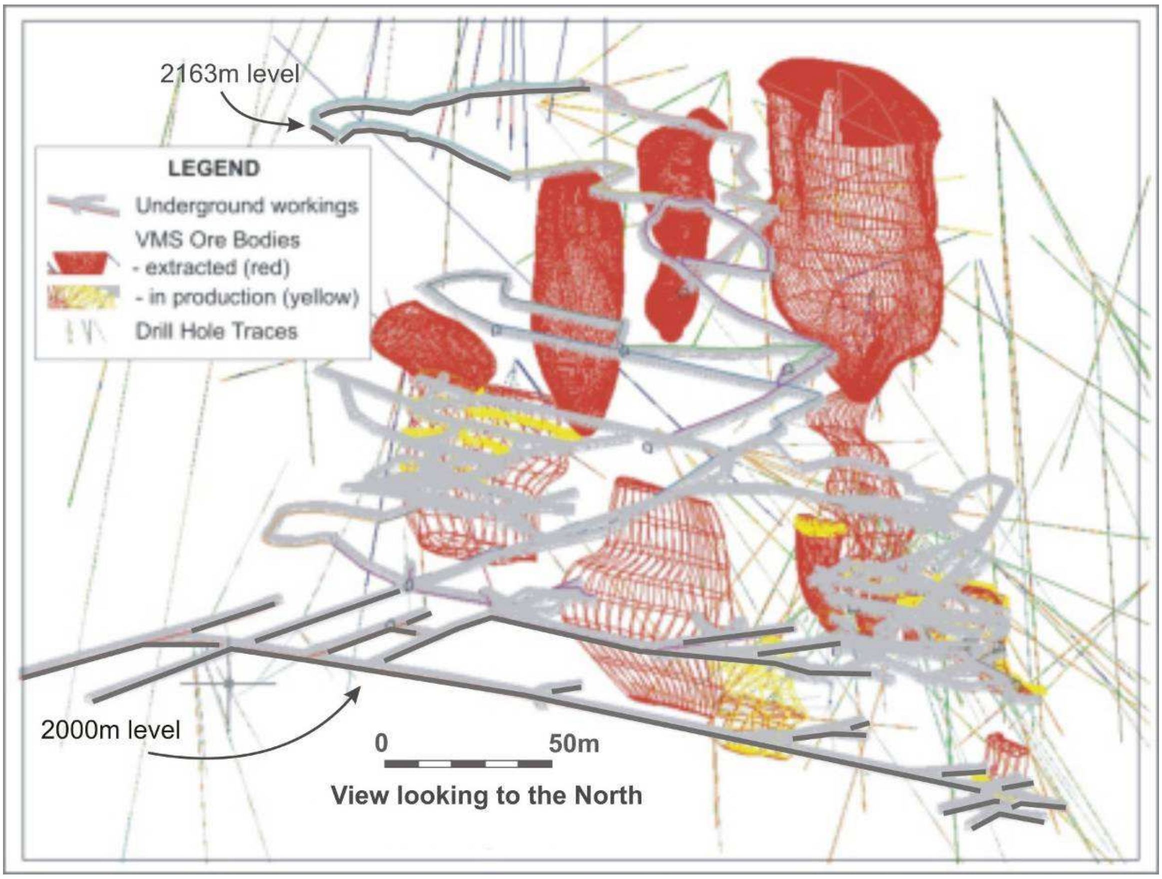



**Figure 30:** Underground workings (grey), extracted massive sulfide bodies (red), massive sulfide bodies in production (yellow) and drill hole traces, showing the 2000 m level, the 2100 m level, the 2163 m level and the 2225 m level. As can be seen from the figure, mineralization remains unexplored below the 1980m level.

Table 5 shows the total number of holes drilled and the total number of metres drilled for each of the drilling campaigns conducted at El Roble through November 25, 2011. The notes column provides a brief description of each drill program. Drilling by Kennecott and Nittetsu was over strike length of approximately 1km in immediate mine vicinity (Figures 12 and 13). Historic drill hole data was combined with a record of underground production to produce Figure 30 above), a visual representation of VMS mineralization and drill hole density in the immediate mine area. Figure 30 shows a steeply-dipping massive sulfide horizon that narrows with depth from the surface and continues below the 2000m level, the extent of current mine workings.

| Campaign | Drill hole numbers | Notes | Total drill holes | Total metres drilled |
|---|---|---|---|---|
| Kennecott Mining Co., 1982-1984 | R-01 to R-22 | Surface diamond drill program (core), at mine site results locations | 22 | 2190 |
| Nittetsu Mining Co., 1985-1997 | A-01 to A-31 | Underground drill program from the 2223m, 2195m, and 2162m levels (core), at mine site | 31 | 1496.8 |
| | CR-01 to CR-20 | Surface diamond drill program (core), up to 300m south of mine | 20 | 4638.05 |
| | DI-01 to DI-07 | Underground drill program from 2100m level, at the mine site | 7 | 820.1 |
| | S01 to S08 | Surface diamond drill program (core), at mine site | 8 | 775.6 |
| MINER, 1998 - 2010 | MEI-01I to MEI-164I | Underground development drill program from the 2100 and 2000 levels (core), at the mine site | 164 | 10,914.39 |
| | MEI-P1I to MEI-P5I | Underground drill program at mine site | 5 | 132.74 |
| | MEXS-01 to MEXS-34 | Surface diamond drill program (core), MEXS-01 to 14 drilled up to 600m north of the mine, MEXS-15-31 were drilled up to 300m south of mine site | 34 | 8084.93 |
| | MERSA-01 to MERSA-10 | Santa Anita surface drill program (core) | 10 | 2161.3 |
| **Total** | | | | **31,213.91** |

**Table 5.** Summary of drilling campaigns conducted at El Roble, Colombia

## 11.0 Sample Preparation, Analyses and Security

Fourteen samples collected by the author from underground workings at the El Roble mine are described in the data verification section. What follows is a summary of the sampling method and approach used by Atico, by MINER, by Kennecott and Nittetsu. Atico has collected a total of 43 soil samples and 73 surface and underground rock samples including duplicates, standards and blanks. These samples were collected for data verification purposes and to characterize the geochemical signatures of different lithologic units and alteration types.

Drill core collected by MINER was boxed, labelled, cut with a rock saw, logged by the geologist and stored on site at the El Roble mine site. Only massive sulfide horizons were selected for analysis along with occasional samples of other intervals that, in the opinion of the geologist, might be mineralized. The simple observation of hydrothermal alteration or the presence of sulfides (e.g. Fig. 23) was not sufficient to qualify a sample for analysis.

Atico uses the ALS Minerals laboratory in Medellin, Colombia for sample preparation. Rock samples are crushed, split and pulverized to the point where 85% of a 250 gram samples passes a 75-micron mesh (ALS procedure code: PREP-31). Soil samples are sieved to minus 180 microns or 80 mesh (ALS procedure code: PREP-41). Geochemical analyses are carried out at the ALS Minerals laboratory in Lima, Peru. Gold is analyzed using a fire assay preparation procedure followed by analysis using inductively coupled plasma – atomic emission spectrometry (ALS procedure code: Au-ICP22) on a 50-gram sample. Ore grade samples are analyzed by standard fire assay techniques using a gravimetric finish (ALS procedure code: Au-GRA22). Gold analyses are supplemented with analyses for 48 elements (ALS procedure code: ME-MS61m) using a four-acid digestion followed by analysis using both inductively coupled plasma-mass spectrometry (ICP-MS) and inductively coupled plasma-atomic emission spectrometry (ICP-AES). This procedure provides analytical results at trace levels for Ag, Al, As, Ba, Be, Bi, Ca, Cd, Ce, Co, Cr, Cu, Cs, Fe, Ga, Ge, Hf, In, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, Rb, Re, S, Sb, Sc, Se, Sn, Sr, Ta, Te, Th, Ti, Tl, U, V, W, Y, Zn, and Zr. Ore grade (Cu, Pb, Zn, Co, Ni, Ag) samples are supplemented with more aggressive digestions (ALS procedure codes: AA61 and AA62). Mercury is analysed using an aqua regia digestion, cold vapor extraction and atomic adsorption spectroscopy. To ensure sample security, Atico personnel collect, transport and deliver samples to the ALS sample preparation facility in Medellin.

*Kennecott drill program:* Core from the Kennecott drill program was split and stored on site. Samples of up to three metres in length were collected from mineralized intervals (of massive sulfide) and shipped to the United States (unknown laboratory) for Cu, Au and Ag analysis. Sample preparation consisted of crushing to minus one-quarter inch followed by crushing to minus 80 mesh. The resulting sample was split successively to generate a 500 gram sample for submission to the laboratory. Security precautions employed by Kennecott are unknown. Mineralization identified during this phase of drilling has since been removed by mining.

*Nittetsu drill programs:* Core from the Nittetsu drill campaigns was split in two. Half of the core was crushed and split and submitted for analysis. Analysis for Cu, Au, Ag, Fe, S and Hg was performed internally at a laboratory operated by Nittetsu. Security precautions employed by Nittetsu are unknown. Mineralization identified during this phase of drilling has since been removed by mining.

*MINER drill programs:* Core from the MINER drill program is cut and logged on site. Intervals of suspected mineralization are sampled and transported to the Inspectorate or to the SGS sample preparation facility in Medellin. Samples from the Santa Anita (MERSA) drill program were prepared by the ALS-Chemex sample preparation facility in Bogota. Samples are crushed, split and shipped to the corresponding laboratories in Callao, Peru for analysis. All three laboratories used by MINER are properly accredited. Security precautions employed by MINER include supervision of drilling, sampling and transportation by MINER personnel. Samples are delivered to a certified ALS sample preparation facility in Medellin.

Samples from the MINER underground drill programs are analyzed for Au using a fire assay preparation procedure followed by atomic absorption analysis. Cu and Ag are analyzed by atomic absorption. A 30-element package is analyzed by inductively coupled plasma and optical emission spectrometry. Standards are provided by the laboratory; duplicates are provided by MINER.

Samples from the MINER surface drill programs are analyzed for Au using a Fire Assay preparation procedure followed by Atomic Adsorption analysis. Remaining elements (Ag, Al, As, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Ga, K, La, Li, Mg, Mn, Mo, Na, Nb, Ni, P, Pb, S, Sb, Sc, Sn, Sr, Ti, Tl, V, W, Y, Zn, Zr, Hg, Se, and Te are analyzed using a two-acid digestion followed by inductively coupled plasma – optical emission spectrometric analysis.

The authors believe that sampling procedures, sample preparation, digestion and assay methods employed by MINER are appropriate for the materials being analyzed and for the contained elements being assayed and in accordance with industry standards. MINER routinely conducts quality-assurance and quality-control analysis on all assay results, including the systematic utilization of certified reference materials, blanks and field duplicates.The chain of custody is maintained through adequate record keeping by MINER and by the accredited laboratories use by MINER.

## 12.0 Data Verification*.*

This report was prepared using public and private information provided by Atico regarding the Project. After verification of the various data sources and documents and the contents thereof, the authors believe that the information provided and relied upon for preparation of this report is accurate and that interpretations and opinions expressed in them are reasonable and based on current understanding of mineralization processes, the host geologic setting and the exploration and mining methods employed.

The authors inspected and reviewed reports by both Kennecott and Nittetsu, as well as drill logs and assay sheets pertaining to exploration activities by those companies. Kennecott and Nittsetsu surface drill collars could not be definitively relocated in the field owing to the abundant tropical growth away from the immediate mine area. Historical underground drill locations have been rendered inaccessible or lost because of mining activity. MINER, the current operator of the mine, has maintained a database of drilling data including those historical holes drilled by its joint venture partners, Kennecott and Nittetsu. Locations of drill holes recently drilled by MINER, both surface and underground, were verified by the authors and compared to the database. This database has been used by Atico to prepare geological sections of the mine area.

MINER production reports and records were also verified.

Atico sets aside 15% of each sample shipment for standards, blanks and duplicates. Standards were purchased from Ore Research and Exploration and include samples OREAS 66a, OREAS 68a, OREAS 110 and OREAS 113. A granodiorite from the company “Granitos de Antioquia” is used as a blank. With respect to standards, all analytical results to date have fallen within one standard deviation of the certified value both for gold, silver and copper. Duplicate samples have shown good reproducibility for values over 0.5 g/t Au, 1 g/t Ag and 500 ppm Cu; reproducibility at lower grades (less than 0.5 g/t Au, less than 1 g/t Ag or less than 500 ppm Cu) is not as good. Low-grade duplicate samples occasionally vary by as much 57%.

A total of fourteen underground rock chip samples (Table 7) were collected by the author on December 14 and 15, 2010 to confirm the presence and grade of copper and gold mineralization at the El Roble deposit. Results are presented in Tables 7. The samples confirm copper and gold mineralization in the massive sulfide lenses and, in addition, show anomalous gold values (up to 0.88ppm) in the enclosing chert package. Gold and copper potential in units other than volcanogenic massive sulfide has not been confirmed by Atico. However, in addition to the gold content of the chert package, gold and copper have been reported by MINER from Tertiary calc-alkaline dikes that cut the Cretaceous VMS deposit and its host rocks. Further sampling by Atico may lead to the development of gold and/or copper targets on the El Roble Project in addition to the VMS targets that are the focus of the recommended exploration effort.

Samples reported on in Tables 6 and 7 were collected in accordance with industry standards and delivered by the author (GS) to SGS Laboratories sample preparation facility in Medellin, on December 16 2010 and, from there, delivered by SGS to their laboratory in Lima, Peru. The samples were initially analyzed by a fire assay followed by atomic absorption analysis. For samples with gold over 5000ppb, the sample was re-analyzed by traditional fire assay. Copper and other elements were analyzed using inductively coupled plasma – mass spectrometry supplemented by atomic absorption analysis for samples with copper in excess of 10,000ppm.

The check sample results clearly show that the massive sulfide mineralization exposed in the various mine openings contains sufficient copper, gold and silver to warrant the current mining operations and that if fault offset mineralization is found as a result of Atico's exploration efforts it is likely to be of similar grade and composition.

**Minera El Roble - Due Diligence Samples**

| Smpl # | Type | Length | Location | Material | Description |
|---|---|---|---|---|---|
| 1210001 | chip | 1.2m | stop #1 - 2090m | massive sulphide | small working adjacent main access; pyrrhotite, pyrite, chalcopyrite, fine grained, massive, blocky, rare to minor carbonate stringers especially near contact |
| 1210002 | chip | 1.5m | stop #1 - 2090m | graphitic chert | Adj. sample #001; host rock to sulphides, black, highly graphitic, siliceous chert. Much more fractured than sulphides, easily broken. Graphite/clay soft on fracture – easily dirties hands |
| 1210003 | chip | 1.5m | stop #2 - 2060m | massive sulphide | large active working face (note access somewhat blocked due to recent rock/mud fall); open area approximately 35 metres long by 10-15 metres wide, recent drilling completed ready for additional blasting. Samples #003 - #006 consist of a series of consecutive chip samples across the width of the exposed massive sulphide – Cuerpo Norte. Pyrrhotite, pyrite, chalcopyrite. Material is very fined grained, blocky, very weakly fractured, no evident zoning |
| 1210004 | chip | 1.5m | stop #2 - 2060m | massive sulphide | Continuous chip adjacent (west) to #003; |
| 1210005 | chip | 1.5m | stop #2 - 2060m | massive sulphide | Continuous chip adjacent (west) to #004; |
| 1210006 | chip | 1.25m | stop #2 - 2060m | massive sulphide | Continuous chip adjacent (west) to #005; |
| 1210007 | chip | 2.5m | stop #2 - 2060m | massive sulphide | Collected on same sulphide body as #003 - #006; chip approximately 10 metre north. Central portion of sulphide body. As above. |
| 1210008 | chip | 2.0m | stop #3 - 2023m | massive sulphide | Cuerpo Nuevo; tunnel with active mining. Sample of Pyrrhotite, pyrite, chalcopyrite from wall of tunnel. Blocky, massive, very weakly fractured. Trace carbonate stringers especially near contact and in zone at central portion of mineralization. |
| 1210009 | chip | 2.0m | stop #3 - 2023m | massive sulphide | Continuous chip adj. #008 - Pyrrhotite, pyrite, chalcopyrite; as above |
| 1210010 | chip | 0.75m | stop #3 - 2023m | grap. chert w sulphides | Selective chip of portion of structure with moderate carbonate. Less massive. More fractured. Also redish staining probably hematite (possible HgS) |
| 1210011 | chip | 2.6m | stop #4 - 2030m | massive sulphide | Chip sample from roof of open working with abundant massive sulphide debris. Pyrrhotite, pyrite, chalcopyrite. Blocky, no evident zoning, weakly fracture. |
| 1210012 | chip | 1.75m | stop #5 - 2006m | massive sulphide | Chip from wall and roof of active mine working; Pyrrhotite, pyrite, chalcopyrite. Material is zoned or layered on cm scale with lighter Phy and darker Py (Sph??) +/-carbonate layers. Weakly fractured |
| 1210013 | chip | 1.75m | stop #5 - 2006m | massive sulphide | Continuous chip adj. #012; Pyrrhotite, pyrite, chalcopyrite |
| 1210014 | chip | 2.5m | stop #6 - 2006m | brx chert w sulphides | Chip of Brecciated and moderately to highly fractured zone with graphitic chert and sulphides. |

**Table 6.** El Roble verification sample descriptions.

| Sample # | Cu % | Au g/t | Pb ppm | Zn ppm | Ag ppm | As ppm | Hg ppm | Fe % | Total S % |
|---|---|---|---|---|---|---|---|---|---|
| 1210001 | 4.64 | 2.83 | 39 | 638.6 | 10.0 | 222 | 33 | 26.55 | 30.47 |
| 1210002 | 0.02 | 0.18 | 8 | 503.1 | 4.8 | 119 | 6 | -- | 2.65 |
| 1210003 | 1.44 | 3.18 | 56 | 6792.8 | 14.9 | 93 | 18 | 32.05 | 31.64 |
| 1210004 | 3.40 | 5.69 | 61 | 5720.9 | 17.4 | 151 | 17 | 28.44 | 30.80 |
| 1210005 | 0.96 | 1.96 | 45 | 6864.7 | 16.7 | 95 | 16 | 24.58 | 26.82 |
| 1210006 | 3.52 | 6.62 | 58 | 6536.5 | 17.1 | 73 | 16 | 31.12 | 35.61 |
| 1210007 | 3.56 | 5.06 | 32 | 2052.2 | 11.8 | 106 | 13 | 26.44 | 30.56 |
| 1210008 | 0.76 | 0.81 | 13 | 2362.5 | 4.4 | 70 | 6 | -- | 7.38 |
| 1210009 | 4.48 | 7.13 | 45 | 1654.9 | 12.0 | 251 | 21 | -- | 16.52 |
| 1210010 | 0.16 | 0.88 | 17 | 1107.9 | 3.1 | 92 | 6 | 17.84 | 10.72 |
| 1210011 | 5.08 | 7.23 | 64 | 236.9 | 33.6 | 59 | 5 | -- | 19.62 |
| 1210012 | 11.30 | 6.00 | 83 | 1158.6 | 9.3 | 50 | 4 | 23.43 | 24.11 |
| 1210013 | 7.94 | 5.81 | 69 | 1917.3 | 15.4 | 51 | 3 | 19.02 | 20.39 |
| 1210014 | 0.03 | 0.06 | 10 | 613.1 | 7.7 | 63 | 4 | -- | 2.42 |

**Table 7.** El Roble verification sample results.

## 13.0 Mineral Processing and Metallurgical Testing

Atico has not undertaken mineral processing or metallurgical testing at the El Roble Project. This section describes mineral processing at the current El Roble mine and metallurgical recoveries as estimated from two decades of mining and beneficiation at El Roble.

Mineral processing at the El Roble mine consists of conventional crushing, grinding, flotation, thickening and filtering. Grinding is done to a particularly fine mesh of minus 270 (53 microns). Four banks of six flotation cells generate a concentrate which is thickened, filtered and stored on site for shipping. The plant design is shown in Figure 31 and a list of plant equipment is provided in Table 8.

Monthly copper recovery varied from 87.4% to 93.9% during 2010 according to a reconciliation of tonnes mined and head grades with copper concentrate production (Table 3) and has averaged 90.6% during 2011 (January through October). Gold recovery is estimated at 60% for 2010 and 63% for 2009 based on reconciliation of gold-in-ore and gold-in-concentrate using the figures presented in Table 4. Current copper and gold recoveries are relevant because they provide an indication of what can be expected from similar VMS discoveries in the future. However, new discoveries may differ substantially from the deposit currently being mined by MINER. Current recoveries may not provide a reliable estimate of copper and gold recoveries from new discoveries.

## 14.0 Mineral Resource Estimates

There are currently no mineral resources on the El Roble Project that comply with NI 43-101. MINER is producing from within the original mineralization envelope defined by Kennecott and Nittetsu and mineralization being mined is defined on a weekly or monthly basis ahead of production drilling and blasting. Consequently there are no reportable resources at the El Roble mine. Total production of 1,478,861 tonnes exceeds the historical estimate of 1,213,992 tonnes originally defined by Kennecott and Nittetsu. If mining dilution is taken into account, the tonnage produced to date is very close to the original historical tonnage estimate which in turn suggests that very little economically mineralized rock remains above the 2000m level. The quantity of economically mineralized rock below the 1980m level is yet to be determined and remains one of the prime exploration targets.

Atico has not yet done any drilling and will not undertake a resource estimate until a new discovery is made and sufficient drilling is completed to demonstrate continuity of mineralization. There is no guarantee that future drilling by Atico will lead to a new discovery or that a new discovery, if made, will be economic to extract. Atico’s objective during the two-year option period is to discover new resources, either at the existing mine or elsewhere on the MINER concession block. In the meantime, MINER continues to operate the existing El Roble mine at its historic production rate of 320 tonnes per day.

## 15.0 Mineral Reserve Estimates

The mineralization being mined by MINER on the El Roble Project is based on Nittetsu work from the late 1980s though 1997. There are currently no mineral reserves on the El Roble Project that comply with NI 43-101. Atico has not yet done any drilling and will not undertake a reserve estimate until a new discovery is made and sufficient drilling is completed to demonstrate continuity of mineralization. There is no guarantee that future drilling by Atico will lead to a new discovery or that a new discovery, if made, will be economic to extract. Atico's objective during the option period is to discover new resources, either at the existing mine or elsewhere on the MINER concession block.

### 15.1 Current Reserves

There are no reportable reserves at the El Roble mine. The current method of ore delineation is exploration by development and precludes any ability to derive a reportable NI43-101 reserve estimate.

However, MINER continues to operate the El Roble mine an extraction rate of 320 tonnes per day and will continue to operate the El Roble mine during the option period. Atico will not receive a share of production or revenue from the El Roble mine until and unless the option is exercised and the sale is closed. There is no guarantee that MINER will maintain the mine in operation through to the end of the option period. The remainder of this section and following sections (16 through 21) describe the current mining operation including current reserves, current production, mining methods, recovery methods, project infrastructure, sales contracts, environmental and permitting issues, social and community impact, capital and operating costs.

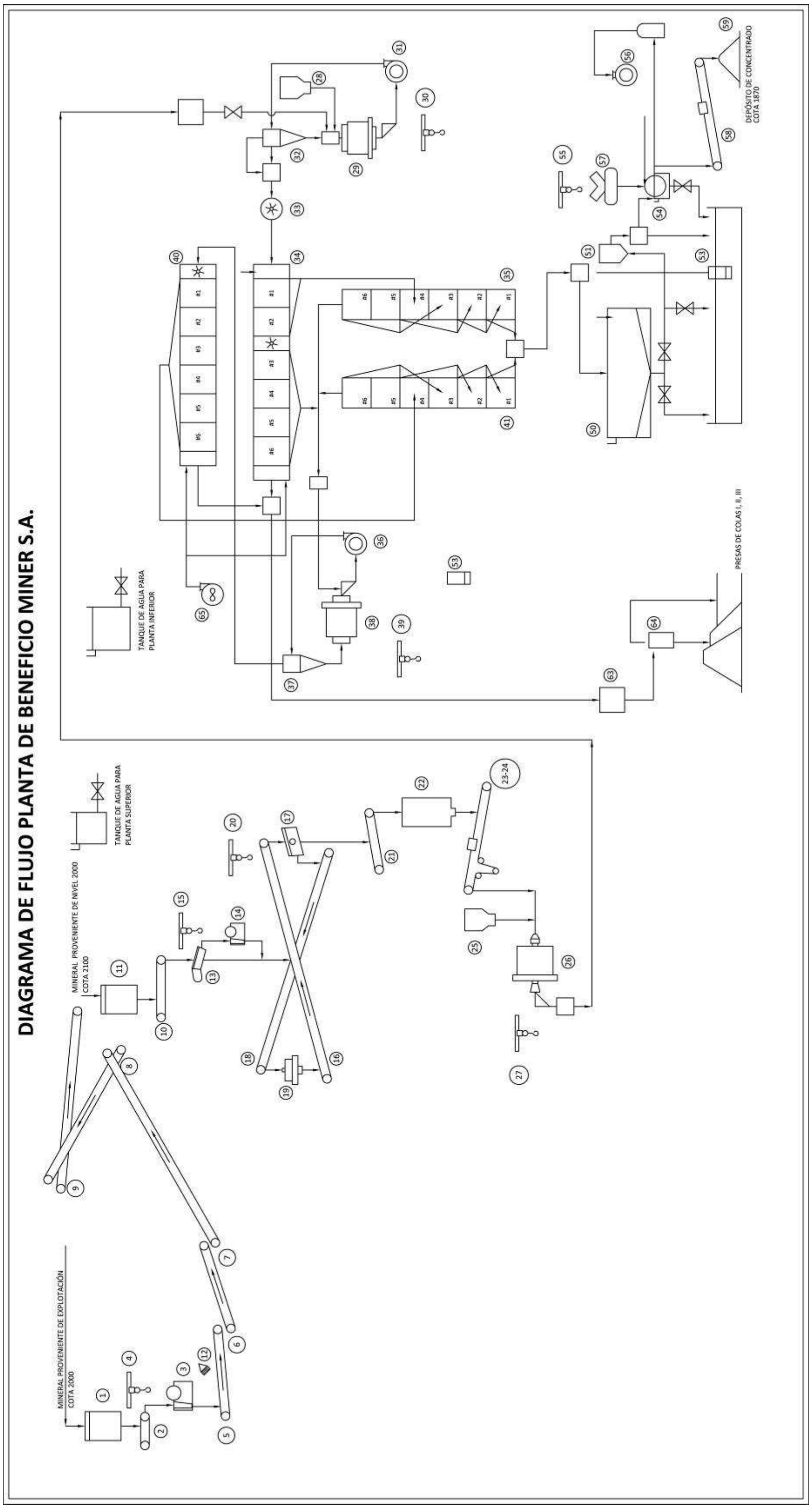



**Figure 31.** El Roble schematic plant layout

| Beneficiation Plant Equipment | | | |
|---|---|---|---|
| Nº | Item | Q´ty | Descriptions |
| 1 | CRUDE ORE BIN | 1 | 60T, Metalic and Reinforced concrete. 2000 m.s.n.m |
| 2 | APRON FEEDER | 1 | QA-930. Variable Speed Feeder |
| 3 | PRIMARY JAW CRUSHER | 1 | Single Toggle Jaw Crusher, FS 3020, 45 kw, 57 TPH @ OSS 65 mm; Otsuka |
| 4 | CHAINT HOIST Nº 1 | 1 | Spur Geared Chain Hoist with Geared Trolley, 5 t |
| 5 | No 1 BELT CONVEYOR | 1 | 24" x 24.5 Mts. C to C.; 57 mts / min.; 3,0 HP |
| 6 | No 2 BELT CONVEYOR | 1 | 24" x 20.5 Mts. C to C.; 57 mts / min.; 6,0 HP |
| 7 | No 3 BELT CONVEYOR | 1 | 24" x 211,5 Mts. C to C.; 57 mts / min.; 25,0 HP |
| 8 | No 4 BELT CONVEYOR | 1 | 24" x 161,5 Mts. C to C.; 57 mts / min.; 20,0 HP |
| 9 | No 5 BELT CONVEYOR | 1 | 24" x 80,1 Mts. C to C.; 57 mts / min.; 7,5 HP |
| 10 | No 6 BELT CONVEYOR | 1 | 22" x 10,5 Mts. C to C.; 60 mts / min.; 3,3 HP |
| 11 | CRUDE ORE BIN | 1 | 60T, Reinforced concrete. 2100 m.s.n.m. |
| 12 | HANGING MAGNET | 1 | KEM 60H Ø 600mm., 585 V, 2,6 A; Kobukuro Iron Works Japan |
| 13 | GRIZZLY FEEDER VIBRATING | 1 | GFH - 33 BDT; 15 - 60 TPH; 500 mm W x 900 mm L, 0,56 Kw |
| 14 | SECONDARY JAW CRUSHER | 1 | Single Toggle Jaw Crusher, FS 3010, 30 kw, 33 TPH @ OSS 30 mm; Otsuka |
| 15 | CHAINT HOIST Nº 2 | 1 | Spur Geared Chain Hoist with Geared Trolley, 1.5 t |
| 16 | Nº 7 BELT CONVEYOR | 1 | 24" x 27,5 Mts. C to C.; 60 mts / min.; 6,6 HP |
| 17 | VIBRATING SCREEN | 1 | F 1500 x 3000 x 1D; 57 TPH; Furukawa CO. Ltd. Japan |
| 18 | Nº 8 BELT CONVEYOR | 1 | 22" x 27,5 Mts. C to C.; 60 mts / min.; 4,8 HP |
| 19 | CONE CRUSHER | 1 | CSH 900, 55 Kw, 27 TPH; @ CSS 9 mm |
| 20 | CHAINT HOIST Nº 3 | 1 | Spur Geared Chain Hoist with Geared Trolley, 5 t |
| 21 | Nº 9 BELT CONVEYOR | 1 | 22" x 18,0 Mts. C to C.; 60 mts / min.; 2,4 HP |
| 22 | MILL BIN | 1 | 400 T, Corrugated Steel Plate |
| 23 | BELT FEEDER | 1 | 22" x 9,5 Mts. C to C.; 60 mts / min.; 0,75 kW |
| 24 | BELT WEIGHER | 1 | Ricelake 20" - 450, 8 - 20 TPH, equipped with constant feed controller |
| 25 | SLAKED LIME FEEDER | 1 | Capacity 0,5 To 1,0 Kg./ min ;0.4 kW |
| 26 | PRIMARY BALL MILL | 1 | 7´ ø x 7´ L, 110 kW, hi- Mn Steel Liner; Otsuka Iron Works Japan |
| 27 | CHAIN HOIST Nº 4 | 1 | Spur Geared Chain Hoist with Geared Trolley, 3 t |
| 28 | SLAKED LIME FEEDER | 1 | Capacity 0,5 To 1,0 Kg./ min ;0.4 kW |
| 29 | SECONDARY BALL MILL | 1 | 9´ ø x 9´ L, 230 kW, Rubber Liner; Otsuka Iron Works Japan |
| 30 | CHAIN HOIST Nº 5 | 1 | Spur Geared Chain Hoist with Geared Trolley, 3 t |
| 31 | PRIMARY CICLONE FEED PUMP | 1 | Pump Warman 6" X 4" SC, Vs 22 kW |
| 32 | PRIMARY CICLONE | 2 | D 10 B; Krebbs |
| 33 | CONDITIONER | 1 | 5´ ø x 5´ L, 5.5 kW |
| 34 | PRIMARY FLOTATION MACHINE | 6 | 100DR - 100 f t 3 / cell; Denver USA |
| 35 | PRIMARY FLOTATION CLEANER | 6 | 24CC - 50 f t 3 / cell ; Denver USA |
| 36 | REGRINDING CICLONE FEED PUMP | 1 | Pump Warman 4" X 3" SC, Vs 11 kW |
| 37 | REGRINDING CICLONE | 3 | D 6 B; Krebbs |
| 38 | REGRINDING BALL MILL | 1 | 5´ ø x 5´ L, 37 kW, Rubber Liner; Otsuka Iron Works Japan |
| 39 | CHAINT HOIST Nº 6 | 2 | Spur Geared Chain Hoist , each 1 t |
| 40 | SECONDARY FLOTATION MACHINE | 6 | 100DR - 100 f t 3 / cell; Denver USA |
| 41 | SECONDARY FLOTATION CLEANER | 6 | 24CC - 50 f t 3 / cell ; Denver USA |
| 42 | REAGENT FEEDER | 8 | CLARKSON, Model E |
| 43 | INDUSTRIAL pH METER | 4 | 4 points, with a recorder |
| 44 | DENSITY SCALE | 3 | Sepor |
| 45 | REAGENT RESOLVE TANK | 1 | Agitator 0.4 kW |
| 46 | REAGENT RESERVOIR TANK | 1 | Agitator 0.4 kW |
| 47 | SLAKED LIME PULPER | 1 | Agitator 0.4 kW |
| 48 | LIME MILK RESERVOIR | 1 | Agitator 1.5 kW |
| 49 | PLATFORM SCALE | 2 | 100 kg , 50 kg |
| 50 | CONCENTRATE THICKENER | 1 | 12 m ø x 3 m SD |
| 51 | THICKENER UNDERFLOW PUMP | 1 | DUPLEX EC-1" - (10 - 40) xx / min, adjustable |
| 52 | THICKENER CONC. BACK | 1 | 5 m3 |
| 53 | CONC. SUBMERSIBLE PUMP | 2 | 0.15 m3 / min x 10 mAq |
| 54 | VACUUM DRUM FILTER | 1 | 6´ ø x 6´ w, Variable Speed Reducer |
| 55 | CHAINT HOIST Nº 7 , 8 | 2 | Spur Geared Chain Hoist , each 1,5 t |
| 56 | VACUUM PUMP | 1 | 13 m3 / min @ 500 mm Hg, 22 kW |
| 57 | AIR COMPRESOR | 1 | 1.2 m3 / min @ 7kg / cm2, 11 kW |
| 58 | CONCENTRATE BELT CONVEYOR | 1 | 450 mm W, 3 mm/ min, 0.75 kW |
| 59 | CONCENTRATE STOCK YARD | 1 | 2000T |
| 60 | TIRE SHOVEL LOADER | 1 | CAT 416 B |
| 61 | PROCESS WATER RESERVOR | 1 | 80 T |
| 62 | WATER SUBMERSIBLE PUMP | 1 | 0.15 m3 / min x 10 mAq |
| 63 | TAILING PUMP | 1 | Pump Warman 6" X 4" SC, Vs 18 Kw. Head 25 m |
| 64 | | | ılds JC 2" X 3" - 14". 60 Hp Head 27 m |
| 65 | VENTILADOR | 1 | xxxxxxx |

**Table 8.** Plant equipment at the El Roble mine

## 15.2 Current Production

Mining at El Roble is guided by underground drilling from the 2100m and 2000m level followed by drifting and development. Twenty years of mining experience above the 2000m level has established the strike and dip of the mineralized horizon and the grade and thickness of massive sulfide lenses. These lenses are projected to the 1980m level, located and confirmed with a few, short, less than 50m, underground drill holes, drifted on and mined. The size and grade of massive sulfide lenses are not established prior to mining.

During 2011, the last full year for which figures are available, the El Roble mine operated for 251 days and extracted 76,379 dry metric tonnes of ore at an average grade of 1.19 % copper. A total of 4,042 dry metric tonnes of concentrate were produced, from which 821 tonnes of copper were recovered for an overall copper recovery of 89.6%. Copper grade in concentrate varied from 17.5% to 22.2%.

Tailings totaled 67,396 dry metric tonnes at grades that varied from 0.05 to 0.17% Cu for a loss of 80.7 tonnes of copper. Monthly copper recovery varied from 87.5% to 92.2%.

Gold recovery is estimated at 60% based on a reconciliation of 2010 metallurgical recovery of gold from ore-to-concentrate (Table 3). Gold recovery in 2009 was 63%. Head grades for gold are uncertain for the year 2006 and are unknown prior to 2004. Gold values in the concentrate have been recorded only for the years 2004 through 2010 during which time they have steadily increased (Table 3). Copper head grades have steadily fallen over the same time period, largely as a result of mining dilution, currently estimated at 45%. Dilution has increased in recent years as a result of disruption of the massive sulfide lenses by post-mineral faulting. There has been no attempt to date to look at gold distribution throughout the mine relative to copper although MINER reports that gold locally runs as high as 73.5 g/t and that elevated gold grades do not correlate with high copper grades.

## 16.0 Mining Methods

Atico is not currently mining at the El Roble Project. This section describes mining methods being employed by MINER who have been mining at El Roble since 1990 and who continue to mine today from the 2000 level at a rate of 320 tonnes per day.

The El Roble mine employs 126 workers. There are three 8-hour shifts per day and the mine operates six days a week. Mining method is mechanized cut-and-fill with waste used as back fill. Ore is hauled using 3-cubic-yard load-haul-dump loaders (LHD's) with a main extraction level (2000) serviced by trolley locomotive and 3-tonne mine cars. The 2000m level is the main extraction level. Rises are developed between levels for ventilation and services (compressed air, water, electricity).

Between the 2000m and 2100m level, where mining is currently underway, production from individual massive sulfide lenses has run as high as 50,000 tonnes but several lenses are much smaller (Cuerpo B, B sur, B inf, 25S). Both the hangingwall and the footwall are sufficiently competent to support stope openings of 5 to 10 metres and strike lengths of 15 to 20 metres.

A descending ramp is currently being driven to access massive sulfides to the 1950 level. The ramp is driven to the side of the massive sulfide lenses with cross cuts every 25 metres in preparation for stoping. On the 1950 level, these underground workings confirm the presence of a massive sulfide lens with dimensions of 10 metres in width by 10 metres in length by 50 metres in height.

The thickness of massive sulfide lenses has decreased with depth from 40 metres at the original surface (2223 metre level) to 15 metres at the 2000 level and 10 metres at the 1980 level. It is not clear whether changes in the size and thickness of the massive sulfide lenses reflect smaller deposits and, consequently, lower potential with depth or simply reflect the influence of post-mineral faulting.

Production from the El Roble mine is carried out on behalf and under the direction of MINER. There is no guarantee that production by MINER will continue in the future or that Atico will exercise its option to purchase the El Roble Project. Atico's objective is to discover and develop new resources, either at the existing mine or elsewhere on the El Roble Project.

## 17.0 Recovery Methods

Atico is not currently mining or recovering metallic minerals at the El Roble Project. This section describes recovery methods being employed by MINER who have been mining at El Roble since 1990 and who continue to recover copper and gold today.

The existing processing plant at the El Roble mine has installed capacity for 380 tonnes per day and, in 2011, was operating at 304 tonnes per day. Processing consists of conventional crushing, grinding, flotation, thickening and filtering. Grinding is done to a particularly fine mesh of minus 270 (53 microns). Four banks of six flotation cells generate a concentrate which is thickened, filtered and stored on site for shipping. Metallurgical recovery for copper is over 90 % and for gold is estimated to be 60 % (see section 6.3 and 15.2). The commercial product is a copper-gold concentrate typically assaying around 20% Cu and 10 to 25 g/t gold (Table 3). Mercury is reported only when it exceeds minimum penalty limits.

## 18.0 Project Infrastructure

Atico is not currently mining or recovering metallic minerals at the El Roble Project. This section describes project infrastructure currently being employed by MINER who have been mining at El Roble since 1990 and who continue to recover copper and gold today.

A full range of services and supplies required to support the El Roble mine is available in Medellin, located 146 kilometres from the mine via paved roads (Fig. 2). Buenaventura, a major seaport located in the Pacific coast, provides facilities to export concentrate.

Electrical power for the El Roble mine is supplied from the existing electrical grid system through a three-year contract with ISAGEN, a public Colombian company that generates and markets electrical power. Monthly electricity consumption at the mine was 363 kwh during 2010 and 364 kwh per month for the period January through October, 2011.

A small reservoir collects water from a tributary to the Atrato River. The water is then piped one kilometre to the mine and processing plant using a 3-inch pipe. Flotation underflow (320 tonnes per day), is decanted in a series of ponds before being released at a pH of 10.2 into the Atrato River.

Tailings are stored next to the processing plant, along the banks of the Atrato River, and in a separate impoundment located downstream of the processing plant (Fig. 32). Accumulated tailings total over a million tonnes.

Other facilities for the mine, in addition to the processing plant, include buildings for mine operations, project staff housing, management offices and metallurgical testing. Other service buildings include a warehouse, a clinic/security/fire station, a cafeteria and a weighing station.

**Figure 32:** Tailings impoundments and the plant site, El Roble mine in the valley of the Atrato River. (February 2, 2009).

## 19.0 Market Studies and Contracts

Atico is not currently mining or recovering metallic minerals at the El Roble Project. This section describes marketing contracts concluded by MINER who have been mining at El Roble since 1990 and who continue to recover copper and gold today.

The commercial product from the El Roble Mine is a copper-gold concentrate typically assaying around 20% Cu and 10 to 25 g/t gold (Table 3). All of the production, estimated at 4500 tonnes in 2011, is sold to Consorcio Minero de Mexico, a Trafigura Group company.

Table 3 summarizes concentrate sales by year for the period 2004 to 2011. The concentrate sales contract specifies that copper grade must be maintained between 18 and 24%, gold grade between 8 and 30 g/t and silver grade between 5 and 60 g/t. Smelter charges are US$80 per dry metric tonne and refining charges are US$0.08 per payable pound copper, US$6.00 per payable ounce gold, and US$0.35 per payable ounce silver. Payable figures are specified in the contract as the copper content minus 1%, 95% of the gold and 75% of the silver. These terms are reasonable and conform to worldwide norms and standards.

# 20.0 Environmental Studies, Permitting and Social or Community Impact

Atico is not currently mining or recovering metallic minerals at the El Roble Project and has not conducted any environmental studies. This section describes environmental issues, permitting requirements, and social and community impacts experienced by MINER who have been mining at El Roble since 1990.

## 20.1 Tailings

On August 13, 2009 the tailings impoundment adjacent to the plant suffered a failure. Photos taken after the event show the failure (Fig. 33 and the results of the reclamation effort (Fig. 34). The mine was required to reforest the affected area and restock the river with fish. There is no long-term environmental liability related to the tailings failure nor are there any restrictions in place that might affect the future ability of the mine to operate.

## 20.2 Permitting

MINER's most recent Environmental Management Plan (PMA) was approved by CODECHOCO (Corporación Autónoma del Chocó, a government agency) on January 30, 2001 (Resolution 30). The PMA allows MINER to operate the El Roble mine under the following terms which are applicable to all companies that use water resources. Hazardous waste (tailings) must be disposed of using an appropriately licensed contractor. A compensation fee must be paid to CODECHOCO for the use of natural resources (water) and a bond must be posted equivalent to 20% of the value of the Environmental

Management Plan. Exploration activity (principally drilling) must comply with Mining Environmental Guidelines (Resolution 18-0861).

A new processing facility, if needed in the future, would require a formal plan approved by the Ministry of Mines and Energy and an environmental license granted by the Ministry of the Environment.

**Figure 33.** Tailings failure of August 13, 2009.

**Figure 34.** Repairs to the tailings impoundment, photo taken January 17, 2010.

## 20.3 Mine closure

The mining law of Colombia does not specifically address mine closure. Environmental guidelines governing mine closure are established by Resolution 18-0861. MINER prepared a mine closure plan in November, 2010. The closure plan addresses underground work, waste dumps, tailings management and infrastructure. The total cost is US $500,000 including 60% for demolition and dismantling and 40% for environmental remediation. Upon closing of the purchase option, Atico will assume responsibility for any environmental liabilities and for meeting eventual closure requirements.

# 21.0 Capital and Operating Costs

Atico is not currently mining or recovering metallic minerals at the El Roble Project and has not incurred capital or operating costs. This section describes actual capital and operating costs incurred by MINER who have been mining at El Roble since 1990 and who continue to recover copper and gold today.

MINER's capital and operating costs for 2010 and 2011 are provided in US dollars in Table 9. The conversion rate used from Colombian pesos to US dollars is 1913.98 Colombian pesos per US dollar. The author has reviewed the operating costs and finds them to be consistent with production rate, mining methods and equipment currently in use at the El Roble mine.

| Item | US dollars |
|---|---|
| Exploration | 562,395 |
| Personnel facilities | 84,566 |
| Tailings dam | 64,385 |
| **Total** | **711,346** |

**Table 9:** El Roble Mine projected capital expenditures for 2011.

| Cost Center | 2010 Unit Cost | 2011 Unit Cost |
|---|---|---|
| | (US$ per tonne) | (US$ per tonne) |
| Mine | $17.46 | $16.31 |
| Milling | $13.00 | $13.99 |
| Electricity | $7.70 | $7.36 |
| Mine G & A | $4.06 | $4.96 |
| Shipping | $9.45 | $5.11 |
| **Total** | **$51.67** | **$47.73** |

**Table 10**: El Roble Unit operating costs 2010 and 2011 (January- October)

These cost figures (Tables 9 and 10) provide an indication of the probable cost of future mining operations at the existing El Roble mine. However, there is no guarantee that new VMS discoveries, if any, will be amenable to the same mining and recovery methods. The capital and operating costs of a future mining operation on the El Roble Project may differ substantially from those presented here.

## 22.0 Economic Analysis

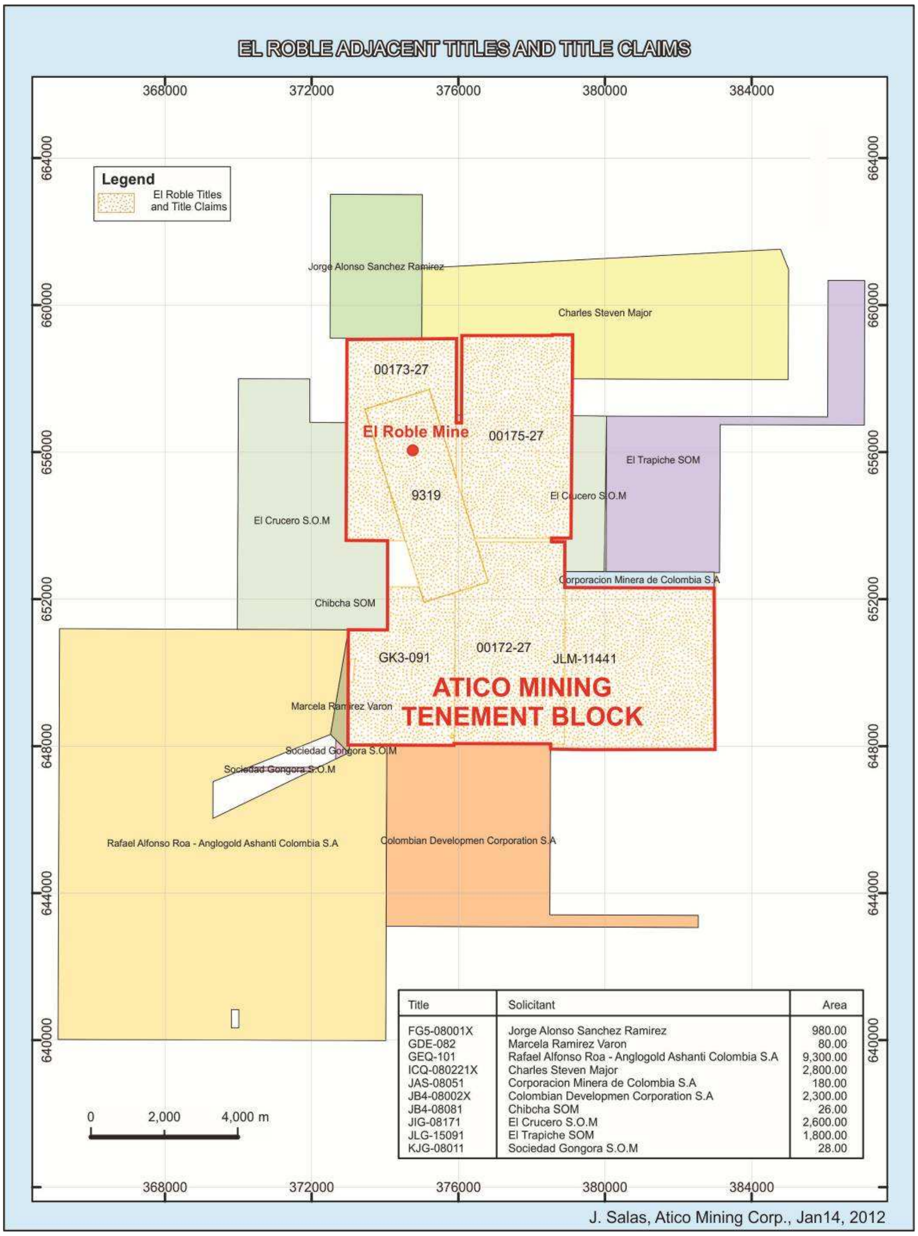
Atico is not currently mining or recovering metallic minerals at the El Roble Project. There are no mineral resources or reserves on which to base an analysis of future income or cash flow. Capital and operating costs incurred during the operation of the El Roble mine are presented in Section 21. Concentrate production is summarized in Table 3. Taxes and royalties are summarized in Section 4.

## 23.0 Adjacent Properties

Figure 35 shows mineral title blocks adjacent to the the El Roble project. There are no known VMS deposits or prospects on the adjacent properties. There are no known exploration or mining actvities on the adjacent mineral titles at the time of writing. The closest deposit similar to El Roble, the Equis VMS, is located twenty-five kilometres southwest of El Roble but is not in production. Its current exploration status is unknown.

## 24.0 Security and Community Relations

The El Roble mine is located in the Choco department, an area of Colombia that has suffered from guerilla activity. Mining at El Roble was halted for all of 1993 due to security concerns and it is reported (MINER personnel, 2009) that Nittetsu withdrew from the EREESA joint venture in 1998 largely out of a concern for personal security. The area around Carmen de Atrato was contested by armed guerilla factions as recently as 2008. The guerilla group active in the area was subsequently demobilized. The army currently maintains a military base at Carmen de Atrato and local support for the mine, where many community members work, is strong. Mine personnel and staff transit regularly from Medellin to the project with no recent incidents.




| Title | Solicitant | Area |
|---|---|---|
| FG5-08001X | Jorge Alonso Sanchez Ramirez | 980.00 |
| GDE-082 | Marcela Ramirez Varon | 80.00 |
| GEQ-101 | Rafael Alfonso Roa - Anglogold Ashanti Colombia S.A | 9,300.00 |
| ICQ-080221X | Charles Steven Major | 2,800.00 |
| JAS-08051 | Corporacion Minera de Colombia S.A | 180.00 |
| JB4-08002X | Colombian Developmen Corporation S.A | 2,300.00 |
| JB4-08081 | Chibcha SOM | 26.00 |
| JIG-08171 | El Crucero S.O.M | 2,600.00 |
| JLG-15091 | El Trapiche SOM | 1,800.00 |
| KJG-08011 | Sociedad Gongora S.O.M | 28.00 |

**Figure 35.** Mineral title claims adjacent to the El Roble Project.

## 25.0 Interpretation and Conclusions

The El Roble Mine has been in continuous production by MINER since 1990, having produced more than 1.4 million tonnes of ore with an average grade of 2.5% Cu and with an estimated average gold grade of 2.54 g/t. Production continues at a rate of 320 tonnes per day. Accounting for dilution, tonnage mined is close to the estimate derived by Kennecott and Nittetsu, suggesting that the El Roble mine is close to exhausting the historically defined mineralization. However mining continues at and below level of the deepest intercepts in the Kennecott and Nittetsu defined historic estimate, strongly suggesting that additional resources may be discovered by exploration below the 2000m level of the mine. Current exploration for additional ore is by mine development and no resources or reserves are established ahead of mining beyond one or two month's production.

Atico has entered into and option agreement with MINER with the objective of the discovering additional VMS deposits either at the mine or elsewhere within the El Roble Project.

Historic resource estimates cited in this report are provided for information purposes only. These historic estimates were completed prior to the institution NI 43-10 but are considered reliable by the authors and have been confirmed by production. The estimates are relevant, however, as they provide an indication of the possible size and grade of potential new VMS discoveries on the El Roble Project. The discussion in Sections 15 to 22 of mining methods, recovery methods, project infrastructure, marketing contracts, environmental and permitting issues, and capital and operating costs pertains to the existing El Roble mine owned and operated by MINER. This discussion may not apply to future VMS discoveries on the El Roble Project.

Atico is in the process of conducting a multifaceted exploration program which to date has include: geological mapping, geochemical sampling, and geophysical surveying from April through November of 2011. Geological mapping has included surface (1:5000 scale and

1:10,000 scale) and underground (1:250 scale) mapping of the El Roble mine, the immediate mine area, and the MINER concession block. Geological mapping identified the contact between a package of andesitic volcanic rocks, exhalites, pelagic and sedimentary rocks as the prospective locus of massive sulfide mineralization. This contact extends for more than 10km across the El Roble Project area. Surface geochemical sampling by Atico focused on the ten-kilometre, prospective strike length of the target horizon (Fig. 4). Atico also collected other surface and underground rock chip samples, soil samples, collected magnetic susceptibility and conductivity measurements, reinterpreted existing magnetic and IP/Res data, and conducted a ground magnetic orientation survey. Existing geophysical magnetics and IP/Res was reprocessed which confirmed some VMS targets previously identified by MINER as well as identifying new targets.

The mined tonnage of the El Roble deposit is about half the size of the statistical mean of individual mafic-type VMS deposits worldwide (Mosier et al., 2009), namely 2.7 million tonnes. Given the exploration work carried out to date and the fact that the mine continues operation in economic mineralization, there is a reasonable expectation that more massive sulfide lenses will be discovered either at depth, below the existing workings or laterally to them. In addition, there is good potential for new VMS discoveries on the MINER concession block. The above tonnage estimate was extracted from academic and government publications and compilations and the potential quantity and grade of any discovery based on these figures in the Project area is conceptual in nature. There has been insufficient exploration to define a mineral resource at this point in time and it is uncertain if further exploration will result in any target being delineated as a mineral resource.

There is good potential for additional VMS discoveries both at the El Roble mine and along the 10-kilometre strike length of prospective ground covered by the El Roble Project based on the following criteria:

1) Identification of the black chert unit as an exhalite horizon with elevated levels of base metal and precious metal geochemistry. The “black chert is host to the EL Roble massive sulphide mineralization,

2) The locus of VMS mineralization has been identified as the contact between basaltic to andesitic volcanics and "black chert –grey chert" package across the El Roble Project,
3) Identification of the grey chert unit as a silicified, felsic, fine ash tuff unit stratigraphically above the "black chert" unit. The grey chert unit is a marker bed which can be used to map follow the "black" chert package enclosing the massive sulfide at the El Roble mine, for the entire 10 kilometre length of the prospective contact,
4) Anomalous copper and gold in surface rock chip samples at several locations on the contact,
5) IP/Res and magnetic anomalies across the El Roble Project. Magnetic anomalies may mark volcanic centers which may be the source of massive sulphide mineralization,
6) Copper mineralization encountered by drilling at Santa Anita, and
7) The established tendency for VMS deposits to occur in clusters which make the entire trend of "black chert" exhalite a high priority exploration target.

Atico Mining Corporation has entered into a purchase option agreement with MINER which provides Atico with a two-year period to explore the El Roble Project including the immediate mine area and the 10-kilometre strike length of prospective ground currently under concession to MINER. During the option period, Atico is not responsible for mining or for resource development. MINER continues to own and operate the mine; Atico receives no share of production or revenue during the option period. If Atico's exploration program is successful and new VMS deposits are discovered, Atico will exercise its purchase option and conduct an evaluation of the potential to expand the current processing plant to a target size of 1500 to 3000 tonnes per day.

The challenge for Atico is to define new resources which will justify exercising the option to purchase the Project. In the current exploration environment it may not be possible to contract geophysical companies for the helicopter-borne EM survey or drill rigs to test the resulting anomalies in a timely fashion. The option period expires in November, 2012 and it is possible that Atico's may have to extend the option for an additional year at a cost of

$1.2 million. To that end Atico should not only budget sufficient funds to successfully explore the district-wide "greenfield" potential and for new resources within the immediate mine vicinity but also have sufficient in hand to extend the option for an additional year.

## 26.0 Recommendations

The authors recommend an aggressive Phase I and Phase II exploration program of $6,102,503, including a 10% contingency, to discover additional VMS deposits on the El Roble Project. A two pronged approach to Phase I exploration is recommended, i) a "brownfields" program in the immediate mine vicinity and underground to discover extensions and fault offsets of the known El Roble mineralization costing approximately $771,000 and, ii) a "greenfields" program of about $ 2,502,000 to discover new deposits along the favourable host lithology on the Project area. These two programs could be run concurrently and would cost approximately $3,600,000. Budgets for these programs are presented in Tables 11a and 11b. A budget for additional Phase II drilling costing approximately $2,822,000 contingent on success in Phase I success is presented in Table 12.

The recommended Phase I "brownfield exploration program at the El Roble mine should consist of:

i) Detailed mapping of all underground openings in the El Roble mine to determine fault sets and offsets of the mineralisation (this work has already been started at the time of writing). This will provide movement directions on faults and thus vectors to prospective but unexplored fault blocks.

ii) Core drillholes of 3,500m into "gaps" in existing drilling lateral to and below the 2000m level, e.g. such as evident in Figures 8, 14 and 15.

iv) Deeper stratigraphic drillholes lateral and below the El Roble mineralization which will then be surveyed with down-hole EM to determine the presence of proximal conductors indicative of new massive sulphide lenses.

v) Drillholes should be probed with downhole EM to discover off-axis conductors. This will aid targeting of fault offset massive sulfide pods.

vi) Sections of core and well-located mine opening samples should for whole element chemistry including ("loss on ignition", LOI) to determine the chloritization index of the rock which is a measure of the degree of alteration by VMS hydrothermal solutions. Chlorite Alteration Index is represented by the formula $(MgO+Fe_2O_3)*100/(MgO+Fe_2O_3+CaO+Na_2O+K_2O)$ where the oxides are in weight percent.

The Phase I "greenfields" exploration program is designed to quickly define drill targets on the El Roble Project area. Issues facing this program include steep terrain, jungle cover on many ridge crests and thick soil and vegetation cover which obscures outcrop. The recommended program is as follows:

i) Additional surface mapping and rock chip sampling. If necessary pitting should augment surface mapping particularly when following the prospective volcanic-chert contact.

iii) Stream sediment geochemistry survey. Recent discovery of sulfide patches and veining in black chert float boulders together with elevated background base- and precious metal geochemistry in the chert units, suggests that a stream geochemistry program should be effective. It is recommended that a dense, bulk-leach-extractable metals (gold, copper, silver) stream sediment survey be undertaken. This program should sample each small stream draining the major ridgelines on the Project area. Such a program would entail the collection of 100-150 2kg samples for cyanide leach extraction.

iv) Helicopter-borne time domain EM survey. Because of the steep terrain ground survey methods have been demonstrated to be slow. Time domain EM has been shown to be effective in detecting massive sulphide mineralization at depths up to 200m under optimum conditions. In practice 100-150m penetration and detection is a more realistic goal, particularly in rugged terrain. It is recommended that the helicopter-borne EM survey be run at 100m line spacing to ensure that at least 2 lines will cross a massive sulphide conductor.

v) Ground gravity surveys of selected EM targets. Gravity detects density differences and massive sulfides with densities of 4-4.5 g/cc will have a very high density contrast with the host rocks of the Project area, namely cherts (2.7 g/cc) and mafic to intermediate volcanics (2.8-3.0 g/cc). Gravity is recommended to discriminate between strong EM conductors such as pyritic, graphitic pelagic shales in the stratigraphic hangingwall of the El Roble mineralization and massive sulfide mineralization. It is anticipate that four to five of the best EM conductor anomalies generated be followed up with one square kilometre gravity surveys. Line spacing should be 50m with readings each 25m. Detail gravity measurements will allow modeling of gravity anomalies to determine the depth of the body, dip and geometry prior to drilling.

vi) Drill testing of the four or five best anomalies generated by steps i) through v) above, with up to 7,500m of core drilling.

The Phase I, district level exploration program for the El Roble Project area is as shown in Table 11a, and budgeted for $2,502,034, while the El Roble “brownfields” exploration program is budgeted for $771,120 as shown in Table 11b. A 10% contingency of $327,315 is included in the budgeted Phase I programs. An additional contingent recommended budget of $2,821,622 is presented in Table 12. The contingent budget assumes that either one or both of the mine exploration or greenfields exploration programs discover additional massive sulfide mineralization.

| GREENFIELDS EXPLORATION PROGRAM | | | | | |
|---|---|---|---|---|---|
| **Item** | **Activity** | **Personnel** | **Distance** | **Rate** | **12-month total*** |
| Ground Magnetometry (Completed) | Phase II | Contractor | 115km | $238 per km | $27,370 |
| Heli-borne Time Domain EM | 100m line spacing | Contractor | 400km | $175 per km<br>$2500 per day helicopter time | $108,750 |
| Ground gravity | 100-metre line spacing. | Contractor | 50km | $1, 500 per km | $75,000 |
| Surface drilling | Five targets, 1500 metres per target. | Atico staff | 7500m | $170 per metre | $1,275,000 |
| Geology | Surface mapping | Atico geologist | | 500 per month<br>8 months | $4,000 |
| | Atico Exploration Staff | A manager, senior geologist, 3 project geologists, & GIS support person | | $46,316 per month | $444,634 |
| Sampling and Analytical Cost | 1,000 surface and 3,400 core samples | Atico staff | 4,400 samples | $62 per sample | $272,800 |
| Logistical Support | Truck rental, fuel, food, etc. | Atico staff | | $8,900 per month | $85,440 |
| General and Administrative expenses | Office rent, accounting, legal, etc. | 4 staff | | $21,775 per month | $209,040 |
| **Total** | | | | | **$2,502,034** |

***** All 12 month totals are combined totals with the Items and Activities in Table 11b

**Table 11a**. Budget for recommended Phase I, greenfields exploration program, El Roble Project.

| EL ROBLE MINE EXPLORATION PROGRAM | | | | | |
|---|---|---|---|---|---|
| **Item** | **Activity** | **Personnel** | **Distance** | **Rate** | **12-month total *** |
| | | | | | |
| Geology | Underground mapping | Atico geologist | | $500 per month 3 months | $1,500 |
| | Drill logging | Atico geologist | | $500 per month 3 months | $1,500 |
| Drilling: Surface | 5 holes, 300m | Atico staff | 1,500 m | $170 per metre | $255,000 |
| Drilling: Underground | 10 holes 200m | Atico staff | 2,000m | $170 per metre | $340,000 |
| Downhole Geophysics EM | | Contractor | 2500m | $2500 per day | $37,500 |
| Sampling and assays | 1,00 core and whole rock samples | Atico staff | 1000 samples | $62 per sample | $62,000 |
| Logistical Support | Truck rental, fuel, food, etc. | Atico staff | | $8,900 per month | $21,360 |
| General and Administrative expenses | Office rent, accounting, legal, etc. | 4 staff | | $21,775 per month | $52,260 |
| **Total** | | | | | **$771,120** |

* Same as for Table 11a on previous page

**Table 11b**. Budget for recommended  Phase I exploration program, El Roble mine.

| PHASE II EXPLORATION (Contingent on Success Phase I Program) | | | | | |
|---|---|---|---|---|---|
| **Item** | **Activity** | **Personnel** | **Distance** | **Rate** | **9-month total** |
| Geophysics | Deep EM CSAMT | Contractor | 25 km | $1,800 per km | $45,000 |
| Surface drilling | Follow-up on Phase I results and test new targets . | Atico | 10,000 metres | $170 per metre | $1,700,000 |
| Geology | Surface mapping | Atico | | $500/month | $4,500 |
| | Oversee drill program | Atico | | $500/month | $4,500 |
| | New target development | Atico | | $ 12,462 per month | $112,158 |
| | Manager Snr geologist 3 Project geologists GIS support person | Atico | | $46,316 per month | $416,844 |
| Sampling and Analytical Cost | 500 surface samples and 3,000 core samples | Atico | | $ 62 per sample | $217,000 |
| Logistical support | Truck rental, fuel, food, etc. | Atico | | $ 8,960 per month | $80,640 |
| General and Administrative Expenes | Office rent, accounting, legal, etc. | 4 Atico support staff | | $ 26,775 per month | $240,980 |
| **Total** | | | | | **$2,821,622** |

**Table 12**. Recommended contingent Phase II exploration program, El Roble Project

## 27.0 References


Franklin, J.M., Gibson, H.L., Jonasson, I.R., and Galley, A.G., 2005. Volcanogenic massive sulfide deposits. In: Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., and Richards, J.P. (eds.). Economic Geology, 100th Anniversary Volume, 523-560.

Galley, A., Hannington, M., Jonasson, I., 2011, Volcanogenic massive sulfide deposits. Geological Survey of Canada, 601 Booth Street, Ottawa, ON, K1A OE8, publication: http://www.estratigrafiaquimica.com.br/artigos/mineracao/deposit_synth.pdf

Gómez-Pinzón Zuleta Abogados, S.A., 2010, Red Flags Report. Privileged and confidential Red Flags report prepared for Atico Mining Corporation. November 9, 2010.

Kennecott, 1984, EL ROBLE MINE COLOMBIA. VOL 1: Maps 1-12. Land & Geology, Cross Sections, prepared for Kennecott Minerals Company.

Kennecott, 1984, EL ROBLE MINE COLOMBIA, VOL 2: Maps 12-23. Geochem, I.P., S.P., Magnet, Assay. prepared for Kennecott Minerals Company.

Kennecott, 1984, EL ROBLE MINE COLOMBIA, VOL 3: Maps 24-32. Topography 1:250 to 1:10.000. prepared for Kennecott Minerals Company.

Montgomery, M., 2010, Amended Independent Resource Report, Cerro Vetas Prospect, Titiribi Project, Antioquia, Colombia. prepared for Sunward Resources Ltd., May 19, 2010

Mosier, D.L., Berger, V.I., Singer, D.A., 2009, Volcanogenic massive sulfide deposits of the world – database and grade and tonnage models. United States Geological Survey Open-File report, 2009-1034, 46 p.

Nittetsu, 1984, SUPPLEMENTS OF FEASIBILITY REPORT OF EL ROBLE MINE. Tunnel Geological Maps, Outline of the Main Ore Body, Tunnel Assay Maps, Cross Sections, Proposed Exploration Program, Layout of El Roble Mine Expansions Plan, Flow Sheet of Beneficiation Plant, Layout of Beneficiation Plant, Geological Columnar Secctions of D.D.H, Main Mining Equipments List, Main Equipment List of Beneficiation Plant. Prepared for Nittetsu Mining Company, November, 1984.

Nittetsu, 1986, Feasibility report, El Roble Mine Project, Republic of Colombia. Unpublished technical report prepared for Nittetsu Mining Company Ltd. and C. Itoh and Co. Ltd., April 1986. Preface, General Circumstances, Geology and Ore Deposits, Mining, Ore Beneficiation, Electric Power, Site, Welfare Facilities, Office, Transportation of Concentrate, Production-Sales Program, Development Schedule, Development Expenses, Cost of the Products, Profit and Loss, and Fund Procurement Program, Summary and Evaluation. Prepared for Nittetsu Mining Company, April 1986

Nittetsu, 1986, FEASIBILITY REPORT, EL ROBLE MINE PROJECT. REPUBLIC OF COLOMBIA. MAPS AND DRAWINGS: Locality Map of El Roble, Plan of El Roble Mine, Geology (Regional, Roble Mine, Levels & Secctions), Exploration, Mining &

Beneficiation, Plan of Underground Mining, Ore Beneficiation Plant, Tailing Dam, Power, Concentrate Stock Yard. Prepared for Nittetsu Mining Company, April 1986

Nittetsu, 1986, FEASIBILITY REPORT, EL ROBLE MINE PROJECT. REPUBLIC OF COLOMBIA. APPENDIX: Specifications For Second Exploration Plan, Table of Actual Exploration Records, Detailed Table of Ore Reserves, Table of Annual Plan of Crude Ore Production, Detailed of Operating Cost, Classified by Individual Ore Body, Beneficiation Test Results, Study Report on Comparison of Power Installation, Progress Plan for Development Works Classified by Individual Departments, Detailed Statement of Investment According To Department, Detailed Statement of Costs, Profits and Losses. Prepared for Nittetsu Mining Company, April 1986.

Nittetsu, 1989, REPORT OF THE SECOND STAGE EXPLORATION OF EL ROBLE MINE. REPUBLIC OF COLOMBIA: Summary, Geology and Ore Deposits, Results of Exploration, Ore Reserves Calculation, Conclusion and Recommendation, Figures & Maps. unpublished report prepared for Nittetsu Mining Company, October, 1989

Nittetsu, 1990, THE REPORT ON THE FIRST YEAR EXPLORATION OF THE FIRST PHASE, EL ROBLE MINE, REPUBLIC OF COLOMBIA: Outline of Exploration, Geological Survey, Laboratory Works, Geochemical Survey, Conclusions, Figures & Maps. unpublished report prepared for Nittetsu Mining Company, July, 1990

Nittetsu, 1991, THE REPORT ON THE SECOND YEAR EXPLORATION OF THE FIRST PHASE, EL ROBLE MINE, REPUBLIC OF COLOMBIA: Outline of Exploration, Geological Survey, Laboratory Works, Geochemical Survey, Geophysical Survey, Conclusions, Figures & Maps. unpublished report prepared for Nittetsu Mining Company, April, 1991

Nittetsu, 1992, THE REPORT ON THE THIRD YEAR EXPLORATION OF THE FIRST PHASE, EL ROBLE MINE, REPUBLIC OF COLOMBIA. APRIL , 1992: Summary First and Second Year's Exploration, Third Year's Exploration, Geophysical Survey, Drilling Survey, Conclusions, Figures & Maps. unpublished report prepared for Nittetsu Mining Company, April, 1992

Nittetsu, 1998, REPORT ON THE FOURTH YEARS'S EXPLORATIONS OF THE FIRST PHASE EXPLORATION IN THE EL ROBLE MINE: Outline Exploration, Results of the Fourth Year's Exploration, Ore Reserves & Grades Calculation, Conclusion & Recommendations, Figures & Maps. unpublished report prepared for Nittetsu Mining Company, January, 1998

Ortiz, F., 1988, El Roble, un ejemplo Colombiano de un yacimiento de sulfuros masivos volcanogenico. Trabajo de investigación presentado como requisito parcial para la promocion a Profesor Titular, Universidad Nacional de Colombia, Seccional de Medellin, Facultad de Ciencias, Departamento de Ciencias de la Tierra, 199 p.

Ortiz, F., Gaviria, A.C., Parra, L. N., Arango, J.C., Ramirez, G., 1990, Guias geologicas para localizacion de metales preciosos en las ofiolitas del occidente de Colombia. In Fonbonte, L., Amstutz, G.C., Cardozo, M., Cedillo, E. and Frutos, J., (eds.), Stratabound ore deposits in the Andes, Springer-Verlag, p. 379-387.

Parsons, B., 2011, Mineral Resource estimate of Marmato Gold Project, Colombia, 6 January, 2011. NI 43-101 technical report prepared by SRK Consulting (UK) Ltd. For Medoro Resources Ltd., 158 p.

Sarmiento, R., L., 1987, Minerales de Zinc: in Villegas B., A., ed., Recursos Minerales de Colombia: Publicaciones geologicas especiales del Ingeominas, Bogota, Colombia, No. 1, p. 490-566.

Sawkins, F.J., 1976. Massive sulfide deposits in relation to geotectonics. Geological Association of Canada, Special Paper 14, 221-240.

Winter, L.S., Tosdal, R.M., Mortensen, J.K., Franklin, J.M., 2010, Volcanic stratigraphy and geochronology of the Cretaceous Lancones Basin, Northwestern Peru: Position and timing of Giant VMS deposits. Economic Geology, v. 105, p. 713-742.