CR05628-2017



# Lepanto Consolidated Mining Company
# LC

## PSE Disclosure Form CP TR-1 - Technical Report
***Reference: Implementing Rules and Regulations of the Philippine Mineral Reporting Code***

| | |
|---|---|
| **TR Form No** | 1 |

| **Description of the Disclosure** |
|---|
| Technical Report on the Lepanto Copper-Gold Mineral Resource Estimates |

**Filed on behalf by:**

| | |
|---|---|
| **Name** | Odette Javier |
| **Designation** | Vice President and Assistant Corporate Secretary |

# TECHNICAL REPORT ON THE EXPLORATION RESULTS AND MINERAL RESOURCES OF THE LEPANTO COPPER-GOLD PROJECT

## Mankayan, Benguet, Philippines

### EXP-2017-001

Covered by
MPSA No. 001-90

By: Joel S. Diaz

B.Sc. Geology 1977
Registered Geologist, PRC Lic. No. 0497
Competent Person - PMRC/GSP CP Reg. No. 12-10-3
Exploration Results and Mineral Resource Estimation of
Epithermal Gold Exploration and Porphyry Copper-Gold Deposits

**28 July 2017**

## CERTIFICATION AND CONSENT OF COMPETENT PERSON

I, Joel S. Diaz, Filipino, of legal age, and with residence address at Unit 603 Cityland Pasong Tamo, 6264 Calle Estacion, Brgy Pio Del Pilar, Makati City, depose and state THAT:

- I am a Licensed Geologist registered with the Professional Regulations Commission of the Philippines.

- I graduated, and hold a Bachelor of Science degree in Geology from the University of the Philippines, Diliman.

- I hold the following Professional Qualifications, and have been in good standing with the following professional organizations:
  *Geological Society of the Philippines (GSP) – Member*
  *Philippine Mineral Reporting Code (PMRC)/Geological Society of the Philippines (GSP) – Accredited Competent Person*

- I have practiced my profession since my graduation in 1977, and have worked as an Exploration Geologist and Mining Geologist, and on occasions, as Geological Consultant for over 35 years. I have been involved in mineral exploration on properties in the Philippines, Indonesia and Brazil, and have undertaken project generation activities in these same areas.

- I have extensive experience and know-how in the evaluation of mineral properties, in particular, exploration, evaluation and exploitation of epithermal gold and/or copper vein deposits and porphyry copper and gold deposits. My experience is well beyond the minimum required by the PMRC and other equivalent reporting codes.

- I am aware of the definition of “Competent Person” as defined in the Philippine Mineral Reporting Code (PMRC), and certify that by virtue of my education, training, related work experience as well as affiliation and accreditation with the sole professional organization for Geologists, that I fulfill the requirements for a “Competent Person” set out by the Philippine Mineral Reporting Code.

- I was employed by Lepanto Consolidated Mining Company from April 1977 to December 1977 and from February 1992 and March 1995 but am no longer connected with the Company; I am presently, and since April 2011 has been, employed by Cordillera Exploration Company Incorporated as Exploration Manager.

- It is my professional opinion that the Mineral Resource Estimates, as prepared by the Technical Staff of Lepanto Consolidated Mining Company is a result of diligent and systematic geological work, systematic drilling programs, and maintenance of an impeccable and functional geological database.

- I have no vested interest whatsoever in Lepanto Consolidated Mining Corporation which have engaged me to review the mineral resource estimates prepared by the company's Technical staff and consultants for its Enargite Operations at its Mankayan Mine Operation in Mankayan, Benguet Province, covered by MPSA No. 001-90-CAR. For this task, I have made the resource estimate conforming to the required guidelines set out by the Philippine Mineral Reporting Code.

- I consent to the filing of this certification with the Philippine Stock Exchange and other regulatory government authorities and any publication by them for regulatory and disclosure purposes, including electronic publication in the public company files on their websites accessible by the public, of this technical review, in the form and context in which it appears.

Signed in Makati City, this JUL 28 2017 day of July, 2017.

Signed by and Sealed:

**JOEL S. DIAZ**
Competent Person
Reg. No. 12-10-3
Licensed Geologist
PRC Lic. No. 0497
PTR No. A-3245343
Issued on 18 January 2017
Issued in Taguig City

**SUBSCRIBED AND SWORN** to before me this ____ day of JUL 28 2017 2017 in Makati City, affiant exhibiting to me his PRC Lic. No. 0497.

Doc. No. 327;
Page No. 66;
Book No. I;
Series of 2017.

**MARVIN LESTER N. DE PAZ**
Notarial Appointment No. M-459
Notary Public for Makati City
Until 31 December 2017
21st Floor Lepanto Building
8747 Paseo de Roxas, 1226 Makati City
Roll No. 63424
IBP No. 1055074; 12-28-16; PPLM
PTR No. 5918342; 01-11-17 Makati City
MCLE Compliance No. V-0021547; 05-13-16

# 6 Certification

## CERTIFICATION

I, **ANGELINE B. ABRENICA**, Filipino, of legal age, with office address at Lepanto Mine Division, Lepanto, Mankayan, Benguet, and being the Resource Geologist of Exploration Department, Lepanto Mine Division, Lepanto Consolidated Mining Company, a corporation duly organized and existing under Philippine laws with office address at the 20th Floor, Lepanto Building, 8747 Paseo de Roxas, Makati City, Metro Manila, after being duly sworn to, hereby certify THAT:

I conducted the mineral resource estimation for the recent Copper-Gold Project of Lepanto in accordance with the generally accepted Mineral Resource Estimation Procedures in the Philippine Mining Industry.

I am responsible for the compilation, organization and preparation of this report entitled "Technical Report on the Lepanto Copper-Gold Mineral Resource Estimates" dated 12 July 2017.

To the best of my knowledge, experience and information, I believe that this technical report contains all scientific and technical information pertinent to resource estimation and that all data are reported in a systematic and organized format that is credible and not misleading.

Mankayan, Benguet: July 2017

**ANGELINE B. ABRENICA**
Licensed Geologist
PRC License No. 0001647
PTR No. 5078402
Mankayan, Benguet

SUBSCRIBED AND SWORN to before me this 13th day of July 2017 in Baguio City, Philippines, affiant having exhibited to me her SSS No. 34-0948997-3.

ATTY OMAR R. EVANGELISTA
NOTARY PUBLIC
UNTIL DECEMBER 31, 2018
A. NO. 39-NC-17-R
13-B TACAY ROAD, PINSAO PROPER, BAGUIO CITY
ROLL NO. 40195/MAY 3, 1995
PTR NO. 2946042/JANUARY 3, 2017/BAGUIO CITY
IBP O.R. NO. 1056802/JANUARY 3, 2017/BAGUIO-BENGUET CHAPTER
MCLE COMPLIANCE NO. V-0002754/JULY 3, 2014

Doc. No. 52;
Page No. 11;
Book No. LXVII;
Series of 2017.

# EXECUTIVE SUMMARY

Lepanto had been a copper-gold mine for about 60 years until the discovery of Victoria and Teresa intermediate sulfidation epithermal gold deposits in 1995 which prompted the company to switch to gold mining. From 1997 up to present, Lepanto has been producing gold and silver bullions from the Victoria and Teresa ore bodies. Now that the gold veins are nearing depletion, Lepanto has reverted to exploring the unmined portions of the old enargite mining area largely through underground drilling with the aim of blocking sufficient mineral resources that would warrant the re-opening of the copper-gold mine.

The present Copper-Gold Project of Lepanto involves the recently delineated Au + Ag ± Cu bearing quartz-pyrite-gold (QPG) and enargite-luzonite breccia veins. The QPG breccia veins represent a late-stage precious metal mineralization event associated with the high sulfidation epithermal Cu + Au (enargite-luzonite) deposits. The QPG breccia veins are deposited largely along steeply-dipping faults and associated tensional fractures and to a lesser extent along lithological unconformities. Typical alteration minerals associated with the breccia veins include dickite + pyrophyllite + illite ± alunite. Precious metal minerals include native gold, electrum, argentite, and gold-silver tellurides.

This PMRC-compliant technical report, prepared by the Lepanto Exploration team under the supervision of Mr. Joel S. Diaz, PMRC/GSP-accredited Competent Person, discloses information related to the results of exploration activities and mineral resource estimation of Lepanto's Copper-Gold Project effective 28 July 2017. This report has been also prepared for submission to the Philippine Stock Exchange (PSE) as support to the Company's listing application for Stock Right's Offering.

The updated mineral resource estimates of Lepanto, also referred to as Run 9A, cover the enargite-QPG ore bodies comprising of Carmen, NW QPG, Florence, Elena and Easterlies. The estimates utilized all available drillhole data generated up to June 07, 2017 and all channel cut data available from 2001 up to May 31, 2017. A total of 981 drillholes equivalent to more than 173.0 km of drill cores and 25,558 channel cut samples were considered in the current resource model and estimate. All resource estimation processes such as database validation, geological modeling, geostatistical analysis, block modeling and estimation were carried out using GEMS v6.5 software.

The latest estimates of the enargite-QPG at 1.0% CuEq cutoff yielded a total indicated resource of 6.86 million tonnes averaging 1.96 g/t Au and 0.91% Cu and an inferred resource of 0.89 million tonnes grading 2.11 g/t Au and 0.79% Cu.

In addition to the above mineral resources, an estimated 7.29 million tonnes of geologic or potential copper-gold mineral resources have been likewise defined based on ongoing drilling as well as historic drillhole and underground stope data from abandoned mined areas. This geologic resource will be the main target of Lepanto Exploration's next drilling program in order to bring these areas into inferred and indicated resource categories.

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# 1.0 INTRODUCTION

## 1.1 Purpose of Report

This technical report, commissioned by the Lepanto Consolidated Mining Co., discloses and validates all information related to the results of exploration activities and mineral resource estimates carried out by Lepanto for its Copper-Gold Project in Mankayan, Benguet.

This report is intented to be submitted to the Philippine Stock Exchange (PSE) in fulfillment of its requirement for mining companies that are applying to conduct capital raising activity such as Stock Rights Offering through the agency.

## 1.2 Scope of Work

Activities leading to the preparation of this report, such as compilation of results of exploration works, data validation, geological modeling and mineral resource estimation, were undertaken by the Lepanto Exploration team.

The preparation of this technical report was likewise carried out by the Lepanto Exploration team while review and evaluation of information contained in the report was done by Mr. Joel S. Diaz, a PMRC/GSP-qualified Competent Person commissioned by the Lepanto Consolidated Mining Co., to ensure that the report was in accordance with the standards and guidelines outlined in the Philippine Mineral Reporting Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves.

## 1.3 Members of the Technical Report Preparation Team

The following Lepanto Exploration personnel, who are licensed Professional Geologists registered with the Professional Regulation Commission, have contributed in the preparation of the following chapters in this report:

| | |
|---|---|
| Mervin C. Delos Santos | - Chapter 3. Tenement and Mineral Rights |
| *Chief Exploration Geologist* | - Chapter 5. Previous Work |
| | - Chapter 6. History of Production |
| | - Chapter 7. Regional and District Geology |
| | - Chapter 8. Mineral Property Geology |
| | - Chapter 9. Mineralization in the Mineral Property |
| Angeline B. Abrenica | - Chapter 4. Geographic Features |
| *Resource Geologist* | - Chapter 10. Exploration |
| | - Chapter 11. Mineral Resources Estimate |

Compilation and organization of the whole manuscript was carried out by Angeline B. Abrenica under the supervision of Mr. Joel S. Diaz, designated Competent Person, who is accordingly responsible and accountable for the correctness of information provided within the technical report.

## 1.4 Compliance of Report with PMRC

As reviewed and evaluated by the Competent Person, Mr. Joel S. Diaz, this technical report complies with the implementing rules and regulations of the PMRC.

# 2.0 RELIANCE ON OTHER EXPERTS AND COMPETENT PERSONS

Some of the chapters in this technical report have been based on reports and works of past and current technical staff of Lepanto, several external consultants commissioned by the Company as well as various professors and graduate students from different universities both in the Philippines and abroad as enumerated in the References section.

# 3.0 TENEMENT AND MINERAL RIGHTS

## 3.1 Description of Mineral Rights

The Lepanto tenement comprises 302 mining claims covering an area of 4,168.18 hectares spread across different barangays within the municipality of Mankayan, in the province of Benguet. It includes two Mineral Production Sharing Agreement (MPSA) that have been approved by the Philippine Government and four applications for Production Sharing Agreement (APSA) (Figure 3-1).

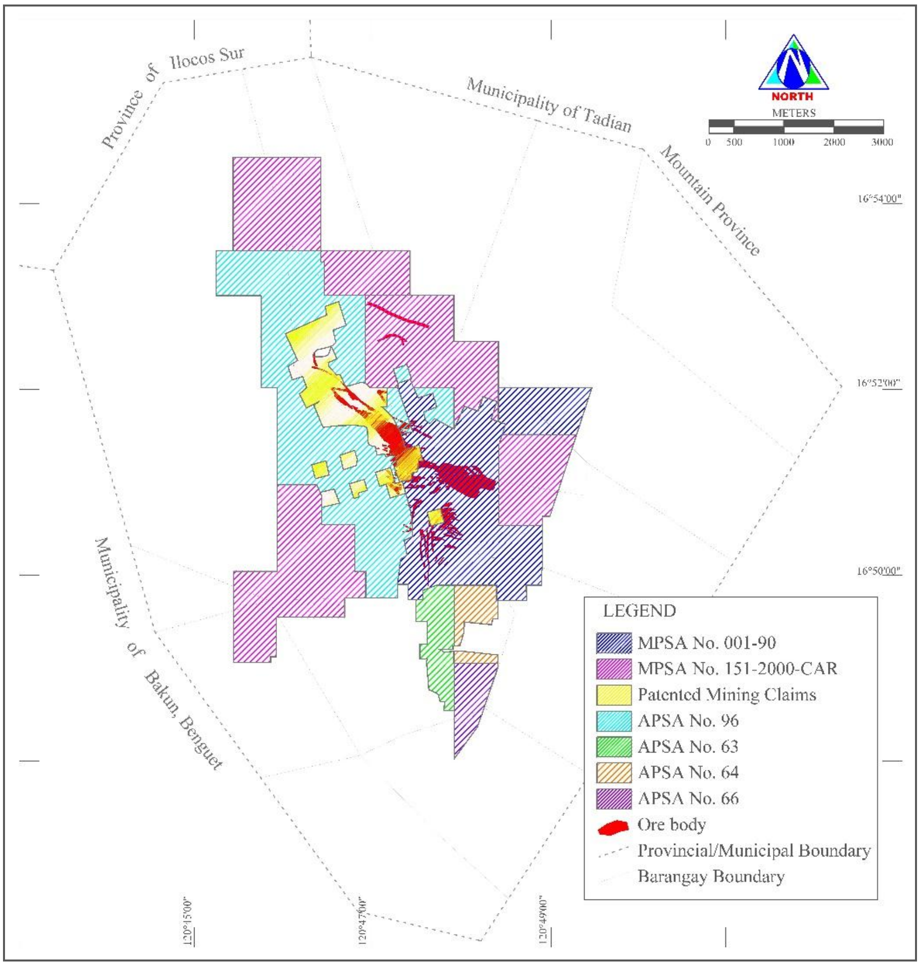



Figure 3-1. Lepanto tenement map.

## 3.2 History of Mineral Rights

Lepanto Mankayan tenement aggregating approximately 4168.18 ha was controlled by Lepanto until the late 1980's when the leasehold system was abolished. The leasehold system was implemented from the 1935 Constitution through Commonwealth Act No. 137 (Mining Act of 1936) and carried over into the 1973 Constitution through Presidential Decree 463. In lieu, the contract system was promulgated by the 1987 Constitution (Article XII, Section 2), through Executive Order Nos. 211 and 279. Eventually the Philippine Mining Act of 1995 or Republic Act 7942 was passed. Thus, the Lepanto Mankayan tenements consist of Patented Claims, MPSA-001-90-CAR, MPSA-151-2000-CAR and APSA 96.

## 3.3 Agreements with Respect to Mineral Rights

MPSA or Mineral Production Sharing Agreement is normally valid for 25 years and renewable for another 25 years typically under the same term and condition as the original contract.

APSA is an Application for MPSA that is yet to be perfected/approved by the Philippine government.

Patented Claims are pre-1935 Constitution that implemented the Regalian Regime leasehold system. Patented mineral land is a legacy from the Philippine Bill of 1902, which grant both mineral and surface rights to claimants that perfected their application. It does not expire as long as it is maintained accordingly.

## 3.4 Validity of Current Mineral Rights

Lepanto controlled tenements with their respective area and date of approval (or date filed if pending approval) are summarized in Table 3-1.

Table 3-1. List of mining claims of Lepanto and their date of approval/filing.

| Claim | Area (hectares) | Date Approved/Filed |
|---|---|---|
| Patented | 336.00 | |
| MPSA 1 | 945.65 | 3/3/1990 |
| MPSA 151-2000 | 1,829.36 | 3/9/2000 |
| APSA 96 | 1,057.17 | 6/3/1999 |
| Total | 4,168.18 | |

Option agreement with private claim owners Brett-Panganiban was also secured in tenements covering the old Suyoc Mine in the south through APSA 63, 64 and 66.

Lepanto and subsidiary Far Southeast Gold Resources, Inc. (FSGRI), joint contractors of MPSA No. 001-90-CAR (the "MPSA"), jointly filed on June 4, 2014 (nine months prior to expiry of the MPSA) an application for renewal of the MPSA. A dispute arose among Lepanto, FSGRI and the Republic of the Philippines, represented by the DENR, as to whether or not Lepanto and FSGRI may be required to comply with the Free and Prior Informed Consent (FPIC) and

Certification Precondition requirements of the Indigenous People's Rights Act of 1997 (IPRA) in connection with the renewal considering that the IPRA was promulgated in 1997, seven years after the issuance of the MPSA and two years after the promulgation of the Philippine Mining Act. Under the terms of the MPSA and Section 32 of the Philippine Mining Act, the MPSA was renewable for another term not exceeding 25 years under the same terms and conditions without prejudice to changes mutually agreed by the parties. There can thus be no additional requirements for renewal. The dispute was submitted to arbitration and the arbitral tribunal ruled that the FPIC and Certification Precondition requirements may not be validly imposed as requirements for the renewal of the MPSA. The matter has been elevated to/ now subject of a Petition with, the Court of Appeals. Meanwhile, Lepanto continues its mining activities within MPSA No. 001-90-CAR."

All of Lepanto's planned exploration and mining operation will be within MPSA-001-90-CAR and/or Patented Claims (Figure 3-1).

## 3.5 Payments Made to the Government

Listed in the table below are the payments made by Lepanto to the government in the form of taxes, licensing and permitting fees for the period 2010 – 2016.

Table 3-2. Payments made by Lepanto to the government from 2010 up to 2016.

| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| **TAXES/LICENSES/FEES/PERMITS:** | | | | | | | |
| Real Estate Tax | 6,828,099.12 | 5,768,132.16 | 6,112,170.00 | 6,797,000.04 | 6,797,600.03 | 6,594,600.00 | 6,823,717.97 |
| Business Tax | | 2,195,531.26 | 2,407,959.65 | 3,075,863.76 | 2,916,375.00 | 2,066,708.94 | 1,609,778.84 |
| Professional Tax | 61,025.00 | 56,340.00 | 37,035.00 | 41,400.00 | 55,245.00 | 71,600.00 | 61,370.00 |
| Water Rights Permit/Filing Fee/Renewal | 3,936.40 | 33,720.11 | 83,600.11 | 33,724.00 | 33,716.22 | 33,720.11 | 89,401.25 |
| Treasurer's certification fee for business permit | 40.00 | 40.00 | 40.00 | 40.00 | 40.00 | 40.00 | 40.00 |
| Blaster's Licenses/Processing fees | 47,720.00 | 28,995.00 | 50,040.00 | 36,535.00 | 45,089.00 | 10,441.00 | 43,924.60 |
| Annual Provincial Permit | 50,000.00 | 50,000.00 | | 50,000.00 | 50,000.00 | 50,000.00 | 50,000.00 |
| Mayor's Permit Fee | 2,000.00 | 2,000.00 | 2,000.00 | 2,000.00 | 2,000.00 | 2,000.00 | 2,000.00 |
| Community Tax Certificate - Class B | 6,500.00 | 6,500.00 | 6,500.00 | 10,500.00 | 10,500.00 | 10,500.00 | 10,500.00 |
| Business Permit Fee | 50,000.00 | 50,000.00 | 50,000.00 | | | | |
| BIR Annual Registration Fee | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 | 500.00 |
| Occupation Fees (MPSA 001) | 208,374.45 | 448,774.45 | 208,374.45 | 208,374.45 | 208,425.00 | 208,425.00 | 208,425.00 |
| Others | 1,003,164.47 | 2,431,746.71 | 979,267.39 | 761,822.46 | 1,171,973.48 | 498,498.12 | 982,590.13 |
| **PRODUCTION TAX - BATCH 18** | | | | | | | |
| **Copper – 68100** | 4,527.49 | | | | | | |
| **Gold - 68200** | 25,477,730.87 | 30,500,943.26 | 41,172,401.61 | 39,129,123.85 | 27,824,497.78 | 22,240,042.58 | 28,002,078.05 |
| **Silver - 68300** | 721,028.66 | 1,056,964.82 | 1,315,225.94 | 1,270,057.26 | 716,105.05 | 688,294.31 | 636,488.41 |
| **CUSTOM DUTY - 63405** | 18,456,430.13 | 5,955,753.32 | 6,216,882.46 | 7,411,986.37 | 7,140,634.98 | 5,210,502.79 | 2,184,992.23 |
| | | | | | | | |
| **T O T A L** | **52,921,076.59** | **48,585,941.09** | **58,641,996.61** | **58,828,927.19** | **46,972,701.54** | **37,685,872.85** | **40,705,806.49** |

# 4.0 GEOGRAPHIC FEATURES

## 4.1 Location and Accessibility

The Lepanto Copper-Gold Project is located within the Lepanto Mine in the municipality of Mankayan in the province of Benguet. Geographically, the mine site is confined within coordinates 16°49'00" to 16°54'33" north latitudes and 120°45'20" to 120°49'33" south longitudes (Figure 4-1). Physiographically, the mine is situated within the northernmost municipality of Benguet bounded by the municipality of Cervantes, Ilocus Sur on the north, Bakun, Benguet on the south, Bauko, Mountain Province on the east and Buguias, Benguet on the west.

The mine, approximately 250 aerial kilometers north of Manila, can be reached either through land or air transports. By land, the project area can be accessed in approximately eight to nine hours travel utilizing a sealed, well-formed and maintained national highway up to Baguio City and through Halsema – Abatan, Buguias highway. By air, the mine can be reached by a light plane in fifty minutes, with Manila as take-off point and landing at the mine site's 850-meter long airstrip.


Figure 4-1. Location map of Lepanto Copper-Gold Project. *Source: Encarta 2009, inset from Google Map*.

## 4.2 Topography, Physiography, Drainage and Vegetation

The project area is characterized by mostly rugged terrain with elevation reaching to about 1,000 to 1,500 meters above sea level. Because of the mostly rugged topography, the very steep slope conditions encourage rapid run-off of water. The major natural drainage system consists of tributaries like the Camanpaguey and Gambang rivers to the west, Guinaoang-Suyoc rivers in the south and the Guillong-Baguyos rivers to the north.

Vegetation within the forest lands is mostly of Benguet pine trees while agricultural lands are usually planted to high-land vegetables such as cabbage, potatoes, carrots and the like.

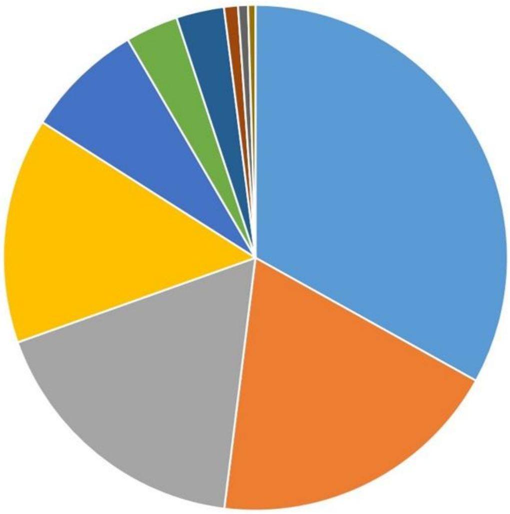
## 4.3 Climate and Population

The climate that prevails over the region is classified as Type I based on the Modified Corona Classification of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). The dry season begins in November and ends in April, while the rainy season is experienced between the months of May and October. The average rainfall per annum is 340 cm per year and the average temperature is 18° Celsius.

The municipality of Mankayan has a population of 35,953 residents based on the government's latest census in 2015. This includes 5,744 individuals residing in the principal host barangay, Brgy. Paco. Though the population is composed mostly of indigenous communities of the highlands, the mining community has become a melting pot of people coming from La Union, Pangasinan and even from the southern part of Mindanao.

## 4.4 Land Use

The chart below illustrates the land use pattern in Mankayan according to area covered:



| | Mankayan Land Use | Area (Ha) | Percentage |
|---|---|---|---|
| | Forest Land | 2,900.2 | 33% |
| | Agricultural Land | 1,656.0 | 19% |
| | Grass/Pasture Lands | 1,542.7 | 18% |
| | Idle Lands | 1,265.5 | 14% |
| | Mineral Lands | 662.3 | 8% |
| | Industrial | 296.2 | 3% |
| | Residential | 268.7 | 3% |
| | Institutional | 78.3 | 1% |
| | Recreational | 55.5 | 1% |
| | Infa/Utilities | 41.3 | 0% |
| | Total | 8,766.7 | 100% |

Figure 4-2. Land use pattern in Mankayan, Benguet.

## 4.5 Socio-Economic Environment

The municipality of Mankayan is generally known as a mining town, being the location of several mines, including the Lepanto Consolidated Mining Co.. Outside of the mining community, the main source of income in the municipality is agriculture which is shown by the second highest classification of land use in the area.

In order to ensure sustainable improvement in the socio-economic situation of the community, the company maintains a Social Development and Management Plan that is aimed at building the capability of the community within the municipality and its neighboring areas to enable them to work progressively towards self-reliance. This will be achieved through, but not limited to, health programs, arts, education, roads, bridges, housing, livelihood, peace and order and religious programs that would harness and mobilize both human and institutional resources in the community in pursuit of environmental goals.

# 5.0 PREVIOUS WORK

## 5.1 History of Previous Work

Lepanto is within Mankayan Mineral District (MMD), has an estimated mineral resource at 8 Mt Cu and 37 Moz Au. Similar to other world-class mineral district, it has complex geological history and is subject to continuous scientific studies and thus evolving geological knowledge. It has been studied by Gonzales (1956, 1959), Sillitoe and Angeles (1985), Tejada (1989), Concepcion and Cinco (1989), Garcia (1991), Arribas et al. (1995), Mancano and Campbell (1995), Hedenquist et al. (1998), Claveria (1997), Cuison et al. (1998), Imai et al. (1999), Sillitoe (2000), Sajona et al. (2002), Cooke et al. (2005), Deyell et al. (2010), Chang et al. (2011), Tanaka (2012), and Gaibor et al. (2013), among other previous work. Current data, research and exploration results are being compiled in an ongoing technical write-up care of Subang et al. (in prep.) for the latest evolving geological understanding.

In September 2009, Lepanto released an internal report entitled “Enargite Project Feasibility Update” covering nine enargite areas within the mine, namely Carmen Main, Carmen South, Carmen Northeast, Carmen Northwest, Florence South, Florence North, Florence West, Elena and Northwest (Project Engineering, 2009). These areas were reported to have an estimated combined mineral resources of 8.7 million tonnes of ore with average grades of 1.99% Cu and 2.84 g/t Au. The report does not specify who conducted the resource estimation of the enargite ore bodies although a short statement related to tonnage and grade estimations were included in the write-up. The enargite resource tonnages and grades reported in the 2009 feasibilty report have since been utilized by Lepanto for its annual declaration of mineral resources.

In late 2014, Lepanto commissioned an external Resource Geologist consultant in the person of Cyrill Orssich, P.Geo. to conduct an estimation of the Carmen mineral resource and propose a drilling program to upgrade its resources (Orssich, 2014). In 2015, he was again requested by the company to carry out the same for Elena and Florence deposits. The estimation parameters and procedures used by Mr. Orssich during his previous estimates served as the main basis and guide for the Lepanto Exploration team for its subsequent resource update of the Enargite-QPG ore bodies (Orssich, 2016a, 2016b and 2016c).

## 5.2 Description and Conclusion of Previous Workers

There are three main types of deposit/mineralization in MMD. These are porphyry copper (e.g. FSE deposit, Bulalacao prospect, Guinaoang deposit, Buaki-Palidan prospect), high-sulfidation enargite-luzonite vein (e.g. Lepanto Cu-Au deposit), and intermediate-sulfidation quartz-gold vein (e.g. Suyoc deposit, Nayak-Palidan prospect, QPG deposit, Victoria-Teresa deposit).

For the FSE – Enargite deposit evolution, synthesis of previous work essentially state that the origin or source of volatiles and fluids responsible for high-sulfidation Cu-Au mineralization to have been attributed to out-gassing and migration of fluids from the Far Southeast porphyry Cu-Au system. This has been based on several fluid inclusion and stable isotope studies (indicating decreasing temperature and fluid dilution away from FSE), coupled with the mapped outward flaring morphology of massive enargite-luzonite lenses, away from the FSE porphyry. This model is likely appropriate for the main historically mined massive enargite lenses along the FSE tapping Lepanto Fault.

The Enargite deposit consists of an open-space filling and replacement type copper-arsenic sulfide deposit in silicified metavolcanics and dacitic host rocks. The main orebody is made-up essentially of elongated breccia-filling of 4 to 50-meter widths and striking N55°W. East-west trending structures also occur in zones with 2 to 100-meter widths and appear to branch-off from the main ore body in both hanging wall and foot wall. The main orebody developed over a strike length exceeding 2 kilometers. Ore minerals are principally enargite and luzonite; while gold and silver are present as tellurides and native metals. Closer to the porphyry hydrothermal engine/driver, enargite is deemed more abundant relative to its lower temperature dimorph luzonite.

The Far Southeast porphyry Cu-Au deposit is a WNW-trending and longitudinally bell-shaped body with its top lying 650 m below surface. Main host rocks, which display the classic porphyry copper alteration pattern with extensive overprints, are the FSE Quartz Diorite Porphyry and the Balili Volcaniclastics. Centrally truncating the FSE deposit is a steep hypabyssal breccia pipe, which in itself is also mineralized. Mineralization consists principally of bornite and chalcopyrite as dissemination or veinlet. Gold is associated with the sulfides.

The Victoria-Teresa quartz-gold vein is an intermediate sulfidation epithermal deposit. It has been mined in 13 mining levels from 1200 down to 670. Underground workings with significant drill intercept show an arcuate vein strike and ore shoot trending NE, ENE, E-W, WNW, NW, NNW to N-S from deeper to shallower ore zones, respectively, at SE/east in Victoria towards west/SW in Teresa veins. Vein systems are generally steeply dipping south, SW and east at around 70° to 85°. Localization of the veins were controlled by interconnected northeast and northwest trending conjugate shears and their associated east-west trending tensional fractures, forming arcuate linear structures and cymoid loops fault kinematics.

## 6.0 HISTORY OF PRODUCTION

### 6.1 Production History

Metal extraction from the Lepanto ore deposit started as early as the thirteenth century. Earliest records have mentioned copper in the Province of Tuy, now the Mountain Provinces. Authentic Chinese records proved that a considerable trade in copper was carried on at lIocos ports by Chinese sea merchants before the coming of the Spaniards to the Philippines. Chinese relics also point to the area as a copper source during the Ming Dynasty (1368-1644 AD).

In 1668, the Spaniards led by Admiral Pedro Duran Monforte made an attempt to find the source of copper in the area and was successful in locating the mine in Mankayan. The group was composed of 100 Spaniards, 2,000 Indios, and 3 Agustinian friars. In 1833, Galvey was able to pinpoint the Igorot mines which is the source of copper. He sent samples to the Spanish authorities in Spain prompting the Spanish Queen to issue a royal decree creating a commission led by Sainz de Baranda to undertake exploration of the mines. On February 3, 1850, Engineer D. Antonio Hernandez made an investigation on the ore deposit, mapped out the route and collected samples which confirmed the existence of copper in the area.

In 1856, Senor Tomas Balbas y Castro applied for the demarcation of the properties. In 1864, the Spanish government issued a mining regulation to govern the operation on the mines in the Philippines. A large-scale mining operation in the area commenced soon after an 1865 agreement with the different rancherias in the area paying an amount of Five Hundred Pesos ($200) and a guaranteed employment of the Igorots in the mines at regular fixed rates. The agreement which was approved by the government led to the creation in 1865 of a stock company "Sociedad Minero-Metalurgica Cantabro-Filipino de Mancayan" headed by Senor Balbas (Eveland, 1905:19). Approximately 10 years later in 1875, it ceased operation after producing about 2.5 million pounds (1136 tonnes) of copper due to the death of the engineer, Don Jose Maria Santos.

On January 1900, after the Spanish-American war, an American party of eight came to the area and witnessed the rich mineral ore. Among them was Leonard Lehlbech who conducted further exploration of the area and examination of its ores. This venture was later made successful by John Muller and Victor E. Lednicky. In 1932 the Halsema road was opened to vehicular traffic primarily to serve as access to the mines to bring supplies more conveniently.

On September 21, 1936, Lepanto Consolidated Mining Company was incorporated through the efforts of Victor E. Lednicky to operate the property, particularly the enargite mine. A road leading to Lepanto was built, a mill with 400 tons per day crushing capacity was constructed and in 1937, Lepanto started mining operations.

On December 8, 1941, when the Japanese struck without warning, Lepanto's first mill was burned at the request of the U.S. Army to prevent the mine to fall into the hands of the Japanese for their use in the war. In 1942, the Japanese took immediate control of the mines due to the importance of copper needed to support the armaments of the Japanese Imperial Army. The Mitsui Mining Company of Japan re-opened and operated Lepanto Mines together with Suyoc Mines and called it Mitsui Mankayan Copper Mines. They operated the mines until 1945 producing some 11,000 metric tons of copper.

Post-war rehabilitation commenced in early 1947 and on June 28,1948, anew 450 mtpd mill started operations. Increases in production capacity were made in 1950 to 900 mtpd, in 1966 to 1,800 mtpd, in 1969 to 2,700 mtpd, and in 1973 to 3,600 mtpd with a separate gold mill. Capacity was decreased in 1977 to 3,000 mtpd with one concetrator. In 1985, production was increased to 3,300 mtpd and then 3,600 mtpd in 1993.

After more than sixty (60) years of mining operation, by the end of February 1997, the company decided to temporarily stop the operation of the Enargite Mine and concentrate on the operation of Victoria gold ore. On March 16, 1997, the completion of the CIP Plant designed to process Victoria gold ore at 1,500 mtpd marked the shift of Lepanto's mining operation from copper to gold. Production ramped up to 2200 tpd in 2004 before tapering around to 1500 tpd per present and current year's production. Summary of historical metal production to 2017 is summarized and described in Table 6-1.

Table 6-1. Production* total ore/metal and average grade from 1948 (post world-war II) to Jan. 2017 is presented. Victoria-Teresa Cu grade is assumed at 0.22 % Cu average#. Total Cu metal production during Spanish period and World War II is also shown. Not accounted for are the Au production of numerous groups of artisanal miners on top and south of Teresa, within Lepanto's tenement area.

| Source | K mt Cu | M oz Au | M oz Ag | Mt ore | % Cu | g/t Au | g/t Ag |
|---|---|---|---|---|---|---|---|
| 1865 - 1875 Spanish Co. | 1 | - | - | - | - | - | - |
| 1942 - 1945 Japanese Co. | 11 | - | - | - | - | - | - |
| Lepanto Enargite | 743 | 2.96 | 12.5 | 36.3 | 2.19 | 3.4 | 11 |
| Victoria - Teresa | 4 | 1.39 | 2.4 | 10.7 | # | 4.4 | 18 |
| ***Total/Average** | **759** | **4.35** | **14.9** | **47.0** | **1.74** | **3.6** | **13** |

## 6.2 Mining Areas

Enargite – QPG Cu-Au resource and Victoria – Teresa Au-Ag resource areas are also the general location of previous and recent mining activity. Historical and current mineral resource as well as production/mining area is presented and described in Figure 6-1.

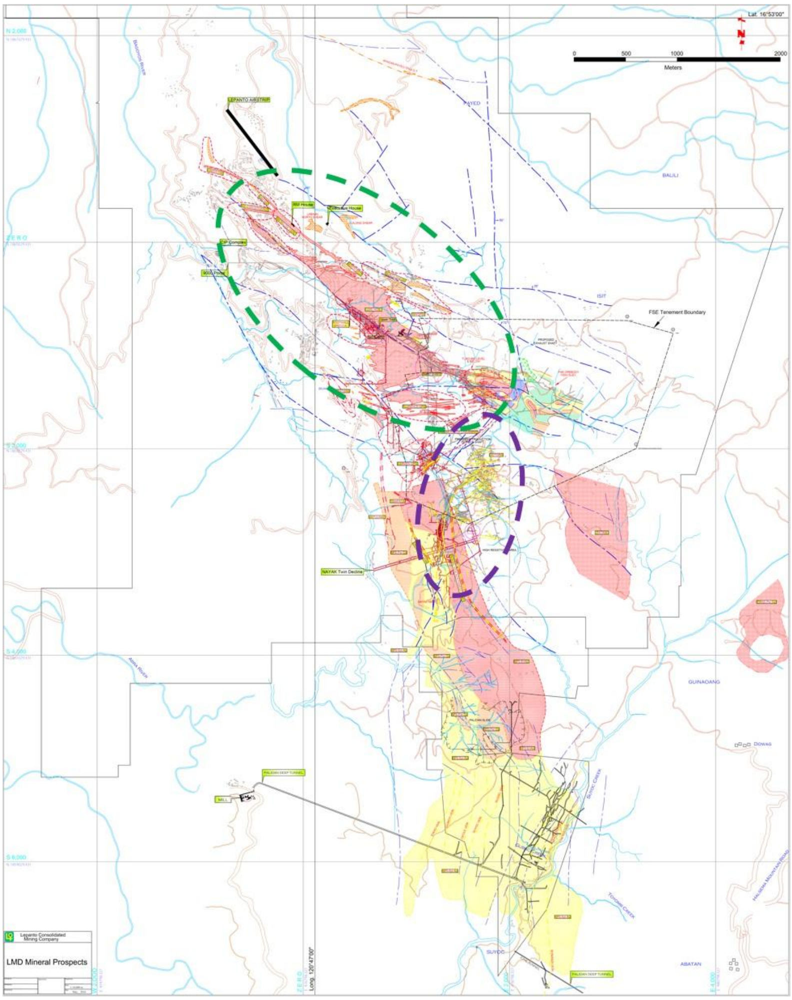



Figure 6-1. Enargite – QPG Cu-Au resource covered in this report as well as the historical mining area are composited on the red zones encircled in green. The Victoria – Teresa Au-Ag resource, whose ore reserves are currently mined are the yellow lines encircled in purple. Lepanto tenement/controlled area are the black outline outside the encircled resource area.

# 7.0 REGIONAL AND DISTRICT GEOLOGY

## 7.1 Regional Geologic Setting

The Mankayan Mineral District is situated on the eastern limb of a broad north-trending anticline whose core is the Bagon Intrusive Complex. The intrusive complex forms the backbone of Luzon Central Cordillera and is made up of gabbro, diorite/tonalite, trondhjemite and aplites. The eastern flank of the anticline consists of gentle to moderately steep east-dipping, north to NE-trending layered volcanic, clastic and volcaniclastic rocks.

The oldest exposed unit in the layered column is the Cretaceous-Paleocene Lepanto Metavolcanics, a submarine volcanic pile, probably of an ophiolitic origin (Ringenbach et. al., 1990), composed of basaltic-diabasic flows and pillow lavas with the upper portions intercalated with spilites, cherts and narrow dacitic to andesitic dikes. The regional metamorphism of this rock unit into greenschist facies is probably partly related to high heat flow at its point of origin during ophiolite generation (Ringenbach, et al., 1990).

## 7.2 Stratigraphy

The stratigraphy of MMD has been summarized by Gonzales (1956, 1959), Sillitoe and Angeles (1985), Concepcion and Cinco (1989), Garcia (1991), and Claveria (1997). The district is underlain by the Late Cretaceous to Middle Miocene volcanic and volcaniclastic sedimentary sequences of the Lepanto volcanics, Apaoan volcaniclastics and Balili volcaniclastics. These were intruded by the Middle Miocene Bagon tonalite intrusive complex. During the Pliocene, eruption of the Imbanguila dacite porphyry and related pyroclastic rocks preceded the formation of the 1.4 Ma FSE porphyry Cu-Au deposit (Arribas et al., 1995; Hedenquist et al., 1998). The Imbanguilia units are partly host to the FSE porphyry Cu-Au, Lepanto enargite and Victoria-Teresa gold deposits. The Pleistocene Bato dacite porphyry and pyroclastics, together with the Recent Lapangan tuff cover most of the porphyry and epithermal deposits in the district (Figure 7-1).

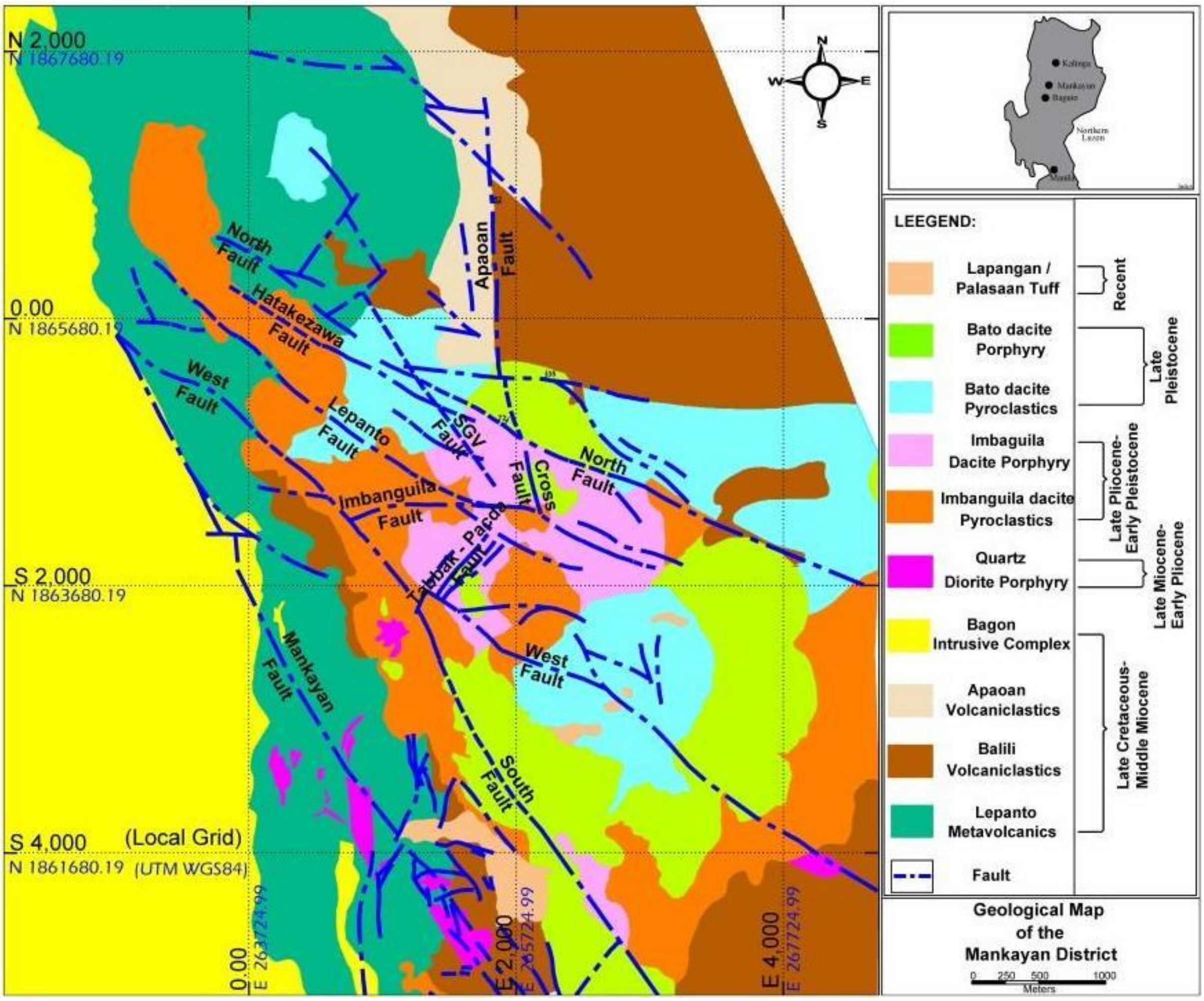



Figure 7-1. Map of the Mankayan district stratigraphy and major fault structures.

## 7.3 Structural Geology

The Mankayan district has been dissected by a series of faults generated by wrenching along the northern splays of the Philippine Fault. The north-northwest trending Abra River Fault is one such splay, and sinistral strike-slip movements along it have generated northwest and northeast trending secondary conjugate shears, east-west trending tensional normal faults, and north-south trending extensional normal faults. These faults helped to localize porphyry and epithermal deposits in the Mankayan district. Palidan, Honeycomb, Matulinak, and Buaki porphyry deposits are aligned along N15°-25°W trending shear parallel to the Abra River Fault. The Far Southeast, Bulalacao and Guinaoang porphyry deposits and the Lepanto enargite orebody were emplaced along the N45°-60°W trending Lepanto fault and subsidiary structures, wherease the Lepanto enargite branch veins are hosted by N80°E-E/W-N80°W trending tensional structures. The Carmen and Elena enargite veins are hosted by N45°-60°E shears. The Victoria intermediate sulfidation epithermal gold – silver – base metal veins are hosted by a combination of N45°-60°E and N45°-60°W trending shears and N80°E-N80°W trending tensional faults, whereas the Teresa intermediate sulfidation gold-silver veins are hosted by N5°E-N15°W trending extensional faults (Figure 7-2).

## 7.4 Mineralization

There are three mineralization styles found in the Mankayan district, namely: 1) porphyry Cu-Au; 2) high sulfidation epithermal Cu-Au; and 3) intermediate sulfidation epithermal Au-Ag. The quartz – pyrite – gold veins are a transitional style of mineralization, containing both high and intermediate sulfidation state features in the same structures. The most studied examples of these mineralization styles are the FSE porphyry Cu-Au, the Lepanto high sulfidation epithermal Cu-Au and the Victoria intermediate sulfidation epithermal Au-Ag (Figure 7-2).

### 7.4.1 Far Southeast (FSE) porphyry Cu-Au

The FSE deposit is a deeply concealed porphyry deposit situated immediately east of the Lepanto enargite and north of the Victoria. It was discovered by Lepanto in 1980. The FSE has since been evaluated by more than 200 diamond drill holes under joint venture partnerships with Galactic Resources, Conzinc Rio Tinto of Australia (CRA) and Gold Fields of South Africa (GFA). On September 2012, GFA publicly announced an inferred resource of 892 Mt at 0.5 % Cu and 0.7 g/t Au, equivalent to 19.8 Moz Au and 4.6 Mt Cu (Gaibor et al., 2013).

The porphyry mineralization is hosted in a quartz diorite-dacite complex that intrudes the Lepanto basaltic basement volcanics. The intrusion complex was emplaced at the intersection of the Lepanto fault with the Imbanguila fault. Mineralization in FSE is associated with quartz – anhydrite vein – stockwork system, the reopening of which has hosted chalcopyrite, bornite and chalcocite copper ore minerals with magnetite and/or pyrite. This was accompanied by 3 main alteration phases: 1) potassic alteration consisting of early biotite-magnetite assemblage mostly encountered at deeper levels; 2) sodic alteration consisting of sericite (paragonite)-chlorite-albite (SCA) which overprints potassic alteration; and 3) intermediate argillic alteration consisting of sericite (muscovite)-chlorite-illitic clay (SCC) which grades outwards from the SCA alteration (Hedenquist et. al, 1998; Gaibor et al., 2013). The highest Cu and Au grades in FSE are found in zones of intense quartz-anhydrite veining with SCA alteration developed within the quartz diorite. Latest findings shows that the dominant porphyry veining orientation is parallel to the Imbanguila fault (Gaibor et al., 2013).

### 7.4.2 Lepanto high sulfidation epithermal Cu-Au

The enargite-luzonite breccia veins have an aggregate strike length of about 2.5 km, hosted within dilational segments of the NW trending Lepanto-Northwest wrench fault couple (main ore bodies) and their associated east-west trending tensional structures (Branch Veins and Easterlies). Mushroom-shaped to stratiform bonanza orebodies are also found where the faults intersect the contact between the basement volcanics-volcaniclastics and the overlying Imbanguila dacite pyroclastics (Gonzales, 1959; Garcia and Bongolan, 1989).

Mineralization in the Lepanto deposit consists of: 1) early stage enargite-luzonite-pyrite as open space fillings in hydrothermal breccias, tensional gashes and zones of vuggy residual quartz; 2) intermediate stage tennantite- chalcopyrite-sphalerite overprinted on the earlier Cu ore minerals as replacements, intergrowths and crosscutting veinlets; and 3) late stage gold-telluride hosted on digenite that preferably replaces pyrite rather than enargite and luzonite. The gold occurs in native form, electrum, calaverite, and petzite. Au and Ag bearing guanajuatite ($Bi_2Se_3$) grains were also observed with colusite hosted in digenite (Tejada, 1989; Imai et al., 1999; Claveria, 2001). Alteration associated with the Lepanto enargite mineralization consists of fracture-controlled central zone of vuggy residual quarz, which grades outward into a zone of dickite-alunite-pyrophyllite-diaspore, thru to a zone of illite-smectite, and into an outer zone of chlorite-epidote. Ore mineralization is almost entirely confined within the central zones of advanced argillic alteration (Claveria, 2001).

### 7.4.3 Victoria intermediate sulfidation epithermal Au-Ag

The Victoria deposit, located immediately south of the FSE deposit, is a vein-type intermediate sulfidation epithermal Au-Ag deposit which has a published resource of 17.28 Mt at 7.71 g/t Au and 0.35 % Cu. It was discovered in 1995, opened up in 1996 and started producing in 1997 – a record period of only 18 months from discovery to production (Cuison et al., 1998; Sillitoe, 2000; Claveria, 2001; Sillitoe and Hedenquist, 2003). The gold veins of Victoria are hosted mainly in dacite pyroclastics. Vein gangue consists of anhydrite/gypsum > quartz at the eastern and southern sections, quartz > anhydrite/gypsum > rhodochrosite/siderite at the central section and quartz > rhodochrosite/siderite at the northern and western sections. Unlike the wide alteration haloes of the enargite orebodies, the wallrock alteration at Victoria is limited to narrow zones along vein selvages, moving outwards from quartz to illite-smectite and then to chlorite (Claveria, 2001). Gold occurs in native form, and with silver in electrum and tellurides (calaverite, hessite, petzite, sylvanite, and stützite). Deposit-wide the precious metal mineralization is associated with intermediate sulfidation state mineral assemblages consisting of sphalerite-galena-chalcopyrite with subordinate tennantite-tetrahedrite (Claveria, 2001). The eastern and southern sections of the deposit contain more abundant tennantite-tetrahedrite, mixed with lesser amounts of high sulfidation state mineral assemblages consisting of early pyrite-bornite-covellite and late enargite-luzonite-famatinite with minor colusite-nekrasovite and stannoidite-mawsonite and occasional bismuthinite, stibnite, emplectite, and chalcostibite (Tanaka, 2012).

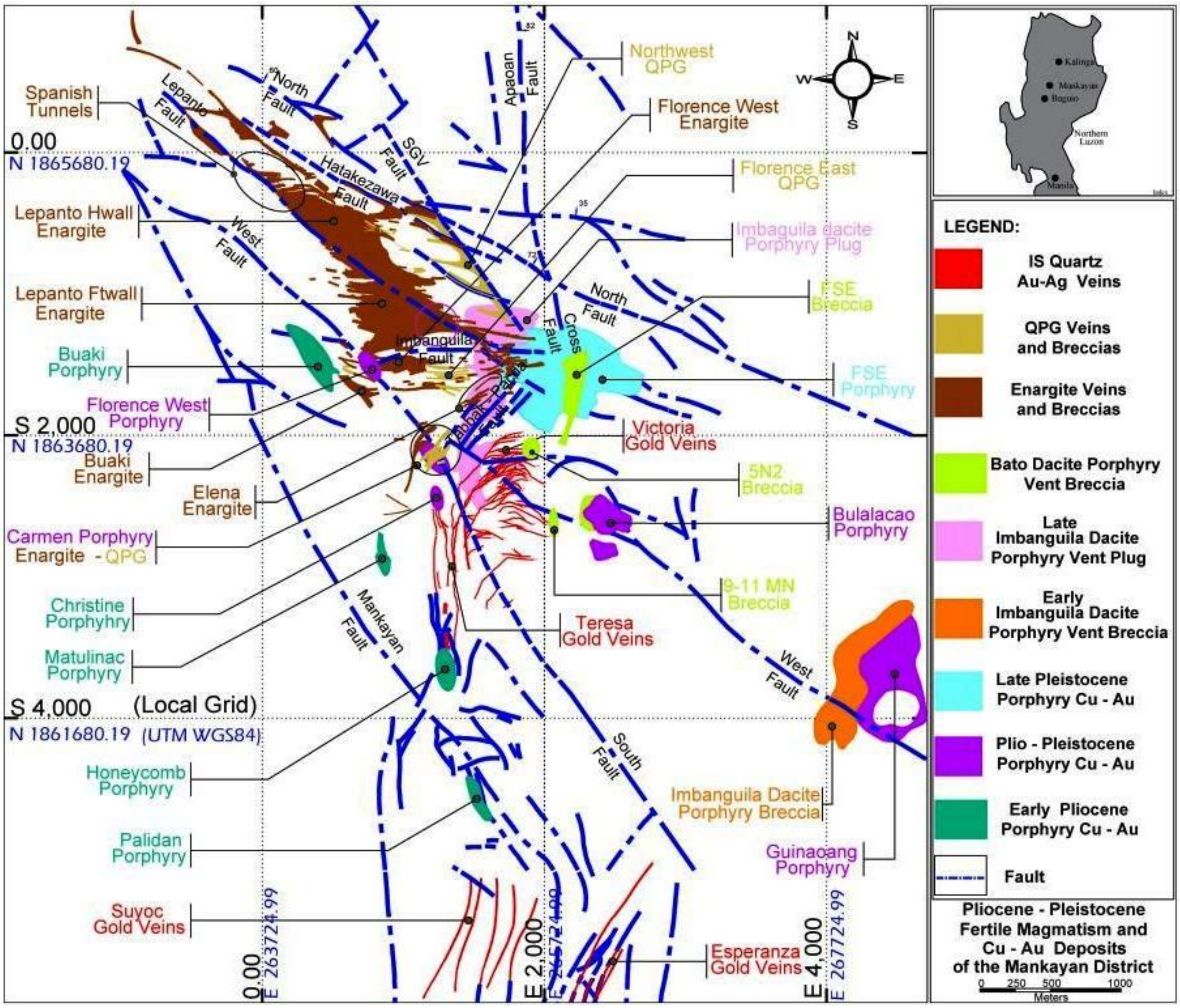



Figure 7-2. Map of the Mankayan district showing locations of the Far Southeast porphyry Cu-Au, enargite and quartz – pyrite – gold high sulfidation epithermal Cu-Au and Victoria-Teresa intermediate sulfidation epithermal Au-Ag deposits with respect to the major structures in the area.

## 8.0 MINERAL PROPERTY GEOLOGY

There three world renowned copper and gold deposits in Mankayan Mineral District, northern Luzon, Philippines. These are the Enargite-Luzonite-Gold Deposit, the Far Southeast Porphyry Copper Deposit and the Victoria-Teresa Gold-Silver Deposit. There are other copper and gold prospects identified in the district and this further posts a challenge in the search for new big deposits.

### 8.1 Rock Types and Geological Relationship

The Lepanto basement andesite and the Balili volcaniclastic sequence underlie the Mankayan Mineral District. They are intruded by the tonalitic to gabbroic Bagon Intrusive followed later by diorite-quartz diorite intrusions. The diatreme emplacement of the dacite pyroclastics and porphyries took place in a much later volcanic event. Most of the faults found in the district form a conjugate fracture pattern dominated by north and northwest trending shears, east-west trending extensional fractures and few north-south trending fissures.

The late Miocene-early Pliocene Imbanguila dacite pyroclastics and porphyries predominantly host the major veins of the Victoria gold deposit. There are few narrow veins hosted by the middle Miocene Balili volcaniclastics and the pre-Eocene Lepanto metavolcanics.

The Victoria gold deposit lies within the LCMC property, which also bounds the two well-known Cu-Au deposits, the Enargite epithermal copper (+gold) and the FSE porphyry copper (+gold) deposits. The gold deposit could have some genetic associations with the Enargite deposit and probably indirectly with the FSE porphyry system. It is relatively apparent that the Victoria quartz-gold-base metal veins could have occurred similarly as the quartz-gold roots overprinting the enargite mineralization. This overprinting signifies the waning stages of the entire hydrothermal system.

## 8.2 Property Geology Description

The enargite-luzonite-gold deposit is characteristically a high sulfidation vein-replacement type of mineralization. It is hosted by andesites and dacitic rocks. The principal ore minerals are enargite and luzonite, with significant presence of tennantite-tetrahedrite, base metals, electrum and tellurides. Pervasive alteration zonations are commonly observed from silicification outward to advance argillic then to propylitic zone. Enargite mineralization is related to dilational structures.

The FSE porphyry-copper deposit is a deep-seated bell-shaped deposit with strong zonation features both in alteration and sulfide mineralization. It is centered on a quartz diorite intrusive complex characterized by the presence of a mineralized melanocratic variety and a relatively barren leucocratic variety. The deposit is truncated by a north trending hydrothermal breccia pipe, which in itself is also mineralized with copper and gold.

The Victoria vein systems are divided into zones based on continuity. In each zone are major veins and associated spits. The veins generally trend east-northeast with 75-80 dips towards the south. The longest vein can be traced fairly continuously for a horizontal distance of about 600 meters. The vertical persistence of major veins exposed on three (3) level drives has a range of 150 meters and can reach as much as 400 meters based on drill hole intercepts. The vein widths vary from 2 to 8 meters. Right lateral movements of either the NW or NE shear faults could have produced the east trending tensional fractures. The development of ore shoot patterns was recognized and has been helpful to the mining operations. Cymoid loops with defined pinch and swell features are noted both laterally and vertically. Complementing the structural pattern is the distribution of gold values along veins where lateral and vertical continuity is also observed.

## 8.3 Stratigraphy, Structure and Mineralization

The Mankayan Mineral District lies within a 150-km long mineralized belt in the Central Cordillera. This belt is also manifested by the presence of intrusives of intermediate calc-alkaline composition. It is apparent that the distributions of Cu-Au districts are related to the occurrences of the calc-alkaline intrusives and to the Philippine Fault system. Immediately west of the Mankayan District is the Abra River Fault, which is north trending and one of the northern splays of the Philippine Fault.

The distribution of the different lithologies underlying the Mankayan Mineral District is shown in Figure 7-1. The figure shows the major rock units consisting of the Dacite Complexes (Imbanguila and Bato), the Volcaniclastics (Balili and Apaoan), the Lepanto Metavolcanics and the Bagon Intrusive Complex.

The oldest exposed lithological unit in the district is the Cretaceous-Paleogene Lepanto metavolcanics. It was proposed to be of ophiolitic origin (Riggenbach et.al., 1990). It is a submarine volcanic pile made up of andesitic-basaltic flows and pillow lavas (with intercalated spilites and cherts), intruded by narrow dikes composed of diabases, andesites and few dacites. This unit has undergone partial low-grade metamorphism.

Tectonic events probably related to major movements along the Philippine Fault resulted to the emplacement of Early Miocene Bagon Intrusive Complex along the Abra River Fault, which is considered a splay of the Philippine Fault. This intrusive is predominantly tonalitic in composition but variations of gabbroic to dioritic compositions are also observed. It also forms the core of a broad north trending anticline with the Mankayan Mineral District found at the eastern limb of the anticline.

Sedimentary and volcaniclastic rocks unconformably overly the andesitic basement. The lower member is made up of thin-bedded red and green sandstones, shales and volcaniclastics (Apaoan Sequence). The upper member is made up of basal polymictc conglomerates (with andesitic clasts and matrices), interbedded sandstone and shale, few andesitic–dacitic flows, andesitic breccias, tuffs and limestones (Balili Sequence).

The deposition of the volcaniclastics was followed by the intrusion of diorite and quartz diorite complexes which brought about the high level emplacements of some porphyry copper-gold deposits. There are two belts of quartz diorite complexes. One is a west-northwest trending FSE belt consisting of the Guinaoang and FSE deposits and the other is a north trending Nayak belt consisting of the Buaki-Pacda, Nayak and Palidan prospects.

The dacite complex consists of pyroclastics, which is made up of dacitic breccias, lapilli and lithic tuffs intruded by dacitic porphyry dikes and domes. This corresponds to the early to late stage units of the Makayan diatreme of Baker (1992), the diatremes and endogenous domes of Sillitoe and Angeles (1985) and the dacite pyroclastics and porphyries (Imbanguila and Bato) of Garcia and Bongolan (1989). The Imbanguila dacites are host to Enargite, FSE and Victoria mineralization. Bato dacites are however barren of any mineralization (being post-mineralization dacites of Pliocene to late Pleistocene age). It was noted that the Imbanguila and Bato dacites apparently have no distinct differences in composition implying a possible single source (Hedenquist et.al., 1998).

The major lineaments around the district are oriented mostly towards the northwest southeast with few trending northeast southwest. Most of the faults found in the district form a conjugate fracture pattern dominated by north and northwest trending shears, east-west trending extensional fractures and few north-south trending fissures. The large or major faults found in the district are those associated with the Philippine fault as northern splays. The Abra River fault is one of the major structures, which cuts through the Mankayan Mineral District. Prominent triangular facets are commonly observed along the fault zone. Previous interpretations on the structural set up of the Mankayan district (e.g. Baker, 1992; Corbett and Leach, 1994) have mentioned the presence of dilational structures, which were correlated to the different ore occurrences in the area. These extensional structures were also observed in known deposits such as in El Indio, Chile and in Acupan, Philippines. Forming part of the Abra River Fault is the Lepanto Fault that outcrops inside the Lepanto mine area. The Lepanto Fault is considered the main hydrothermal mineralization structure acting as passageway of sulfide rich fluids. The Lepanto fault, which host the enargite mineralization, is also important to the FSE related mineralization. Other northwest southeast structures occur as branch veins, which also carries mineralization. The major northwest faults parallel to the Lepanto fault are the North shear and the Hatekazawa faults. Another prominent fault is the Pusdo Fault located east of Mankayan.

## 9.0 MINERALIZATION IN THE MINERAL PROPERTY

There are three types of mineralization in the Mankayan Mineral District. These are the porphyry coppers (e.g. FSE deposit, Bulalacao prospect, Guinaoang deposit, Buaki-Palidan prospects), the enargite-luzonite vein replacements (e.g. Lepanto Enargite deposit), and the quartz-gold-base metal veins (e.g. Suyoc deposit, Nayak-Palidan prospects, quartz-gold zones in enargite, Victoria gold deposit). Concepcion and Cinco (1989) were able to discern two- (2) porphyry copper belts and are identified as exploration targets. These are the FSE belt (FSE, Bulalacao and Guinaoang) and the Nayak belt (Buaki, Nayak and Palidan).

### 9.1 Mineralization Types Deposit Example

#### 9.1.1 The Enargite-Luzonite-Gold Deposit

A classic example of an acid-sulfate or high sulfidation type of epithermal mineralization is the Lepanto Cu-Au (enargite) deposit. The enargite ore body is made up of essentially the main breccia ore and different branch veins. In the main ore body, the ore occurs as breccia or as open space infillings, as matrices and fragments in breccia and as replacements in dominantly fractured and silicified host rocks. The branch veins trend oblique from the main ore body. These are the foot wall and the hanging wall branch veins. Most of the ore occur as tensional fracture infillings. Banding, crustification and comb structures are very common. Other ore occurrences are the Easterlies, the bonanza stratiform and stratabound ore zones and the northwest ore zones.

The enargite-luzonite mineralization is located on a dilational jog with the Lepanto fault being a major dilational structure between the main trace of the Abra River fault at the east. Corbett and Leach (1997) have classified the enargite deposits to be one of the structurally controlled high sulfidation systems. The presence of dilational fault system has created permeabilities (as ideal channel ways) where lateral outflows of solutions take place. Ore deposition is more evident along receptive zones brought about by profuse brecciation and “horsetailing” along the fault zones.

Distinguishable alteration zonation patterns are observed from the center of the vein towards the outermost unaltered wall rock. Silicification (and residual silica) is observed adjacent to the veins and grades into advance argillic alteration. Intermediate argillic-sericitic alteration forms an outer contiguous zone to advance argillic alteration. The propylitic alteration constitutes the farthest alteration zone. The development of the high sulfidation alteration in the enargite deposit could have been brought about by the interaction of predominantly magmatic vapor with meteoric waters. The varying intensity of fluid-rock interaction, taking into consideration the pH of the fluids would form the alteration zonation (Claveria, 1997).

Mineralization, especially copper, occurs in the form of enargite and luzonite. Associated minerals such as tennantite-tetrahedrite, chalcopyrite and covellite are found in minor amounts. Gold (and silver) occurs as electrum and tellurides (Gonzales, 1959; Claveria and Hedenquist, 1994). Gangue minerals are quartz, kaolinite or dickite, alunite, barite and anhydrite. In a paragenetic study made by Claveria (1997) on the sulfides, two (2) episodes of mineralization were mentioned. The first is the residual silica-sulfide (sulfosalt) episode followed by the sulfide-sulfate-veining episode. In each episode, consistent stages of sulfide evolution are observed. These are the enargite-luzonite-pyrite stage, followed by tennantite-chalcopyrite-sphalerite stage and a late gold-telluride stage. These stages conform with an earlier paragenetic study (Claveria and Hedenquist, 1994) on two (2) stages of mineralization leading to the formation of gold electrum and tellurides. Figure 4 shows the observed paragenetic sequence in the formation of minerals related to the enargite mineralization.

Quartz-gold epithermal veins are found to occur in the enargite mineralization. They occur in zones made up of auriferous pyrite-quartz stringers. Garcia (1991) observed localized occurrences of these gold veins in the enargite mineralization, 1) as zones occurring below or peripheral to the main enargite ore body, 2) as steeply dipping zones crosscutting the enargite body, 3) as roots of branch veins, and 4) as zones crosscutting enargite related alteration. These epithermal veins commonly have an assemblage of pyrite-galena-spahalerite-gold. The formation of the quartz-gold epithermal veins could be attributed to the apparent waning stages of the hydrothermal system manifested by changes in the composition of the fluids from magmatic to meteoric, resulting to the formation of near-neutral pH conditions.

Figure 9-1 and Figure 9-2 below illustrate the spatial relationship and occurrence of enargite and quartz-pyrite-gold mineralization in Florence, Buaki, Elena, Carmen and NW QPG with respect to structural and lithological controls (Subang et a., in prep).

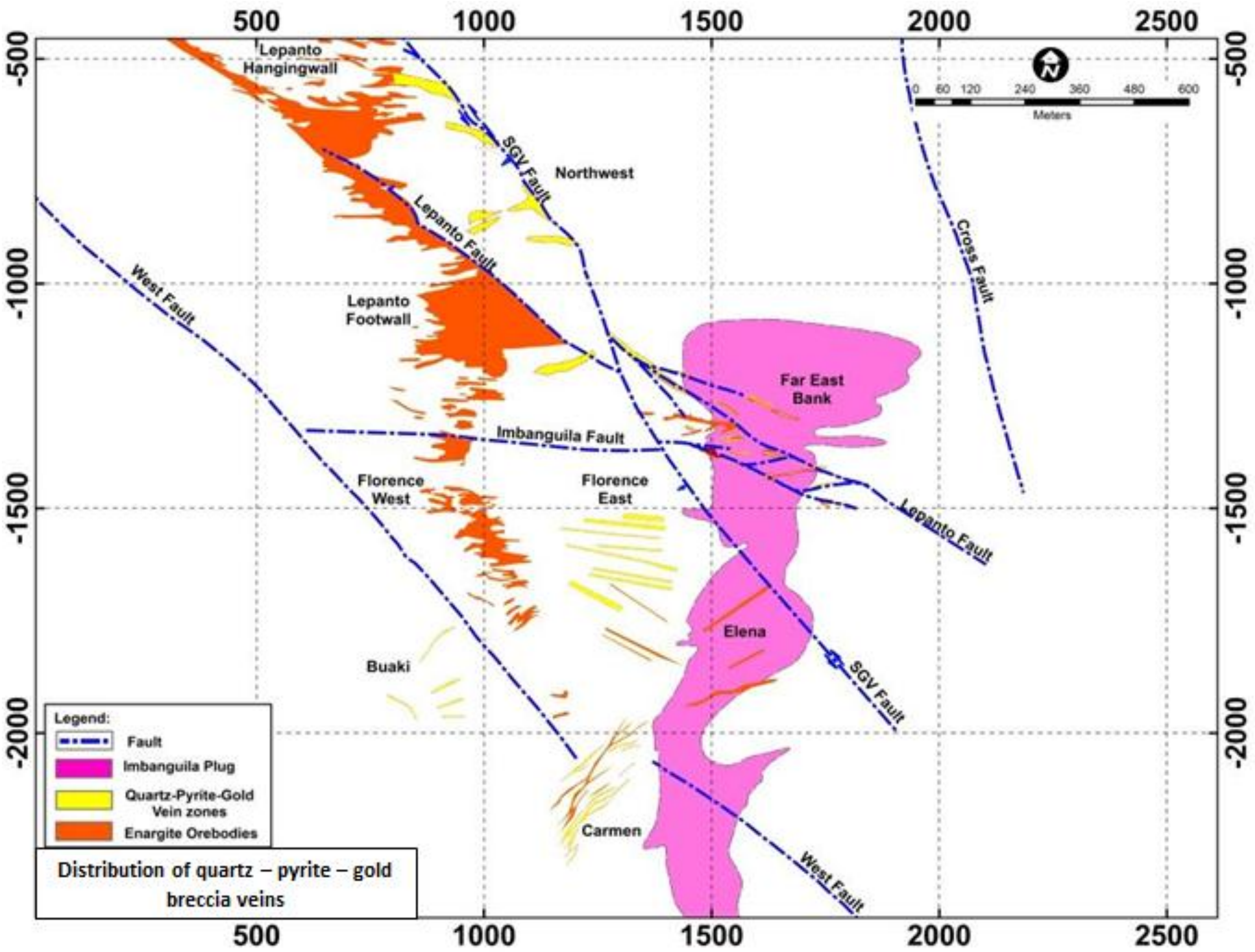



Figure 9-1. Footprint of the enargite and quartz – pyrite – gold breccia vein mineralization at 900L at the areas of Northwest, Elena, Florence East and West, Carmen, and Buaki. These deposits are generally clustered along a north-northwest band that lies in-between the band of main enargite orebodies at the west and the Imbanguila vent at the east.

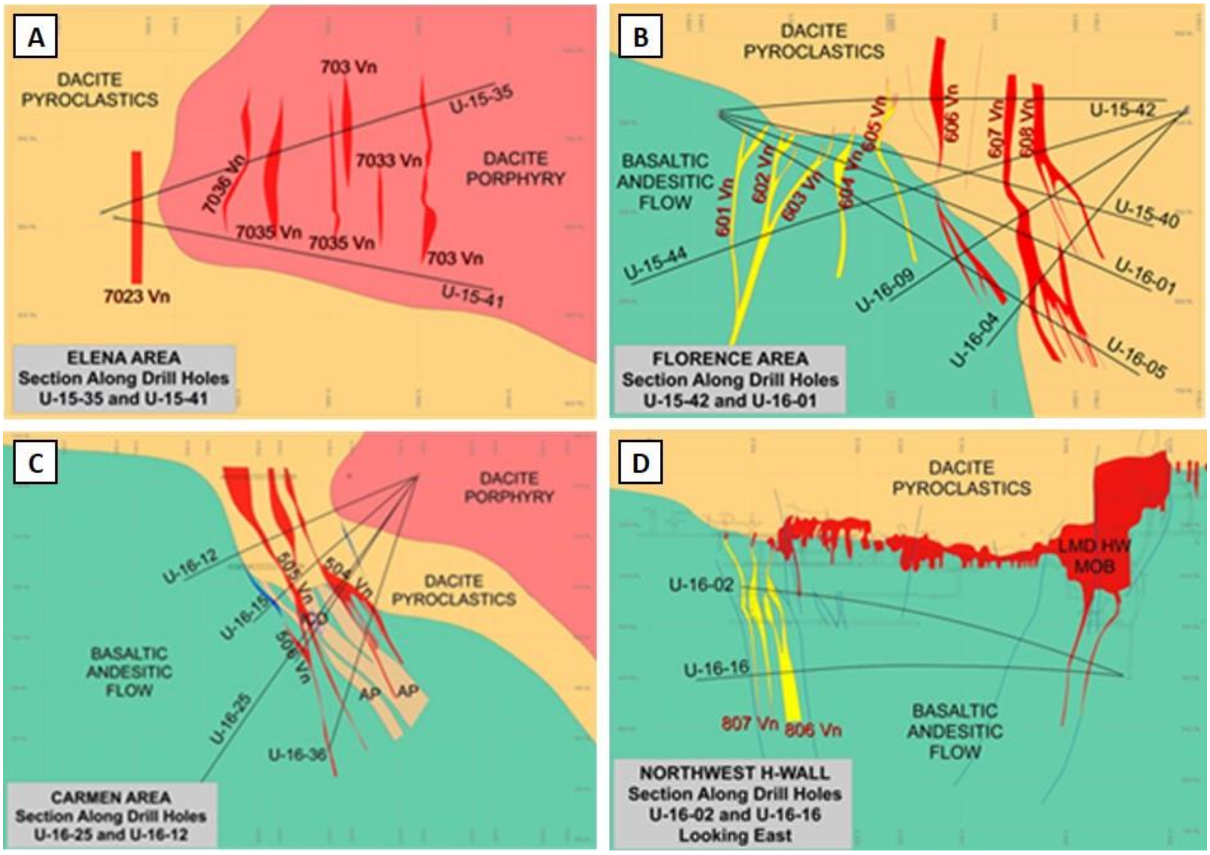



Figure 9-2. Cross sections across enargite and quartz – pyrite – gold veins at different parts of the dacitic dome-diatreme architecture. At the vent center (**A**), veins are characteristically narrow (<1m to 5m wide), widely spaced and due to the impermeable nature of the dacite porphyry plug. At the vent margin (**B** and **C**), occupied by phreato-magmatic breccias which are more permeable due to their clastic nature, the veins are relatively thicker (1m to 15m wide). At the basement country rocks (**C** and **D**), the veins have individual widths of 1m to 10m, but could form a group of closely spaced veins of up to 100m wide in a cymoid loop configuration with multiple tensional gashes. At the shallow dipping contact zones (**D**) between the basement volcanics and overlying diatreme apron breccias that were intersected by vertical feeder faults, individual ore zone dimensions at the Lepanto enargite deposit could be as much as 30-100m wide, 150-250m long and 150-200m deep, forming mushroom-shaped orebodies.

### 9.1.2 Far South East Copper-Gold Deposit

Most of the FSE Cu-Au mineralisation is hosted in the intrusion complex and to a lesser extent the basaltic country rocks of the Lepanto volcanic unit. The mineralization is characterized by disseminated sulfides along hairline micro-fractures, and multiple sulfide-bearing vein sets which show strong spatial and temporal variations. Hydrothermal alteration related to the porphyry mineralization is intense and overprinted by epithermal style alteration related to the overlying Enargite deposits and Victoria veins.

The main alteration related to the porphyry system consists of several different phases and mineral assemblages. Early potassic alteration is characterized by biotite-magnetite assemblages occurs at depth, predominantly in the quartz diorite and surrounding basaltic country rocks. This is overprinted by a sodic assemblage of sericite (paragonite)-chlorite-albite (SCA) which grades outwards into sericite (muscovite)-chlorite-illite alteration (SCC). The SCA alteration is associated with the most intense development of stockwork mineralization and coincides closely with the higher Au and Cu grades. Phyllic alteration overprints the SCA and SCC alteration and is characterized by sericite-quartz-anhydrite, with varying amounts of pyrophyllite in the upper part of the phyllic zone. The latter mineral indicates a transition to advanced argillic alteration at higher levels in the system closer to the enargite ore bodies of the Lepanto mine. Phyllic alteration is also intensely developed in the central phreatomagmatic breccia pipe. More distal propylitic alteration surrounds the above mentioned alteration assemblages. Calc-silicate alteration consisting of diopside-garnet±epidote assemblages also occurs locally at depth in the basaltic rocks of the Lepanto volcanic unit close to intrusion contacts.

Mineralization is mainly associated with a multi-episode vein stockwork system, in which re-opening of veins occurred with precipitation of polyphase copper sulfides. There is widespread evidence for metal remobilisation during later phases, which has implication for zones of metal enrichment and metal depletion.

Sulfide zonation is observed and is characterized by bornite-chalcopyrite-magnetite in the potassic core, chalcopyrite-magnetite-hematite-pyrite-molybdenite in the chlorite-illite zones and chalcopyrite-pyrite-hematite in the propylitic zone. Gold occurs in native form and is intimately associated with chalcopyrite-bornite, and in most cases show positive correlation with copper and magnetite. In the hydrothermal breccia pipe, the related sulfide zonations are characterized by chalcopyrite-magnetite-pyrite-bornite-molybdenite in the deeper sericitic-illite zone of the breccia, and chalcopyrite-pyrite-hematite-enargite-covellite-molybdenite at the upper advance argillic zones of the breccia. The major controlling structures for the localization of the deposit are the west-northwest trending Lepanto and east-west trending extension of Imbanguila Faults, as well as the north to northwest trending Cross Fault.

The highest Au and Cu grades occur in the sodic alteration zone (SCA) within the quartz diorite and are associated with the most intense development of quartz vein stockworks. Where stockworks are well-developed the veins show no preferred orientation, but where less well-developed the veins tend to be orientated parallel or sub-parallel to the Imbanguila fault zone (110 – 120 deg).

Five veins categories have been recognised based upon age relationships and mineralogy. Contact relationships between veins are very complex because of overprinting alteration and vein associations.

- Type 1 veins are grey coloured quartz-anhydrite veins, a few millimetres to centimetres in width which mainly carry bornite and chalcopyrite, and rarely chalcocite, covellite and digenite in the deeper parts of the porphyry system.
- Type 2 veins carry chalcopyrite and bornite, molybdenite and are related with the highest copper and gold grades and range from a few millimetres up to a metre in width. They have a characteristic lavender colour hue due to very fine haematite crystals contained in abundant fluid inclusions in the quartz.
- Type 3 veins are generally seen as a reopening in the type 1 and 2 veins. They mainly carry bornite, chalcopyrite and less commonly chalcocite, as well as molybdenite. Rarely gold is seen in this type of veins.

- Type 4 veins are the last veins that were related with the porphyry fluids. They are composed of magnetite, chalcopyrite and pyrite, with minor quartz and anhydrite. Magnetite is dominant at depth, giving way to chalcopyrite in the middle zones, and to pyrite in the top of the deposit, all of them overprinting the previous veins.
- Type 5 veins are of epithermal character and consist of two contrasting types. High sulphidation veins (type 5a) are composed of quartz - anhydrite with pyrite, enargite and less commonly baryte. Intermediate sulphidation quartz - anhydrite –carbonate veins (type 5b) contain sphalerite, galena and minor thetrahedrite-tenantite. Both of these vein types cross-cut the porphyry veins and overprint the porphyry alteration.

In the upper parts of the deposit in the phyllic alteration zone disseminated bornite, chalcocite and minor chalcopyrite occurs along micro-fractures and is believed to be the result of late-stage enrichment due to metal remobilization from lower in the deposit.

Gold is rarely seen. It occurs as native gold and in tellurides which include calaverite, hessite, and petzite. Some gold grains are associated with palladium.

The FSE deposit is recognized as one of the largest deep-seated porphyry copper orebody. Since the deposit has a high temperature gradient, successful mining would require sophisticated refrigeration. Additional studies on the project are now being reviewed to address this issue as well as the mining method.

### 9.1.3 The Victoria Gold Deposit

The epithermal quartz-gold-base metal veins occur along tensional structures and it is common to observe crustiform and banded and breccia infilling textures with few gradational features and partial replacements among the sulfides and gangue minerals. It is an open space infilling type of mineralization. The predominant base metals present are sphalerite, galena and chalcopyrite. In relatively high gold zones, the abundant sulfides are sphalerite and galena. In relatively high copper zones, there is an abundance of chalcopyrite (in some portions massive) with associated tetrahedrite.

Gold is associated with quartz and sulfides specifically sphalerite, galena and chalcopyrite. It occurs in clusters or peppered randomly in quartz. Sphalerite is abundant in most of the gold rich samples. It is inferred that gold occurs in the lattices of sphalerite. Color differences in sphalerite are observed with the yellow (-green) variety being more abundant than the reddish (-brown) type. The sphalerite varieties occur separately in bands and in most cases interlocking with each other. Based from XRD analyses, the sphalerite has the characteristics of the high temperature wurtzite. Galena is always associated with sphalerite but less in abundance. There are however some portions where they appear massive with no sphalerite. Chalcopyrite occurs either as separate bands from or associated with sphalerite-galena (Figure 7A). In most cases tetrahedrite is always associated with chalcopyrite. Chalcopyrite and tetrahedrite appears contemporaneous with sphalerite and galena but in some portions the former cuts the latter sulfides. Pyrite is a ubiquitous sulfide mineral. In some grains, chalcopyrite (and some sphalerite) replaces pyrite.

Copper occurrences (e.g. with a cut off of 0.2%) apparent have lateral and vertical continuity throughout the individual zones and veins. With this observation and using an arbitrary Cu cut-off grade of 0.5%, Victoria could appropriately be classified as a "copper rich gold deposit". The massive appearance of chalcopyrite, tetrahedrite and pyrite with few occurrences of bornite and chalcocite identified copper rich veins. These associated copper ore minerals either occur together, partly with some replacement features or are segregated in bands. Chalcopyrite and tetrahedrite also occur as open space in-fillings in veins and in breccia matrices (with colloform banding textures) mostly associated with bladed and crustiform quartz. Few occur as disseminated grains scattered throughout the silicified host rock. There are some veins that are composed mainly of massive chalcopyrite (and few tetrahedrite) with a thickness reaching to about 8 to 10 cm. Bornite and chalcocite are not abundantly observed. Bornite, occurring in blebs, is found associated with chalcopyrite and tetrahedrite. There are portions where they also occur in bands. Chalcocite, characteristically sooty, is observed in very few samples.

The close association between chalcopyrite, tetrahedrite, galena and sphalerite manifests a contemporaneous stage of formation. There are however few portions where chalcopyrite (and tetrahedrite) occur in micro-fractures cutting sphalerite and pyrite grains, with partial replacements (e.g. projecting a brecciated pyrite grain with chalcopyrite in-fillings). Chalcocite occurs as replacement mineral after chalcopyrite, tetrahedrite and bornite.

Among wider veins, brecciation features are commonly observed. Sulfides, carbonates and quartz support the angular and subrounded altered hostrock fragments. Banded massive sulfides occur along the margins of the altered fragments. Rhodochrosite follows the deposition of the massive bands of galena-sphalerite-chalcopyrite. There are portions where rhodochrosite is found in alternating bands with the sulfides. Quartz is the predominant mineral in the veins. They occur in massive veins with some portions grading into open space crustiform quartz. Sulfide grains are sometimes observed as open space infillings scattered in voids left by the crustiform quartz. There are fragments of rhodochrosite (some with sulfides) enveloped by quartz. Gypsum and anhydrite are found as fracture infillings and as veinlets with some containing sulfide blebs.

In the distribution of the different vein minerals, it was observed that the high amounts of sulfides (and gold) are closely associated with abundant carbonates (+quartz). A vertical trend among carbonates however shows decreasing amounts as one goes from higher to lower elevations. At lower elevations sulfides are more associated with quartz. Initial observations indicate a general carbonate distribution trend with a drift towards the north-northwest from lower to higher elevations. Such drift manifests the southeast moderately dipping vein structures. There is also a general increase of sulfate occurrence with increasing elevations.

In general there are three stages of mineralization based on preliminary paragenetic studies (Figure 8). These are the early quartz (-gold) stage followed by a carbonate stage and a late gypsum stage. Prior to the gypsum stage, it is common to observe a late quartz event partly cross cutting the early quartz-sulfides and replacing the carbonates. This late quartz is characteristically unmineralized. The abundance of base metals relatively decreases towards the gypsum stage. Among the sulfides, initial observations on the paragenetic association of the Cu-Pb-Zn sulfides show that they were deposited at the same stage of mineralization. Such stage is characterized by different times of sulfide deposition producing the banded structures. In general, the sequence of deposition starts (from wall rock) with tetrahedrite (+ bornite + chalcopyrite) ± chalcopyrite (+ tetrahedrite) ± galena-sphalerite (+ chalcopyrite) ± open space deposition of quartz, carbonates and sulfates. With respect to individual sulfides, in a single depositional stage, there would be an early contemporaneous formation of chalcopyrite, tetrahedrite (+ bornite), galena and sphalerite, and followed much later by the replacement stage of chalcocite.

Quartz and sphalerite crystals show temperatures of formation ranging from 180.9 to 227.8°C based from the initial fluid inclusion studies made by MGB-Petrolab (1996). Most of the samples contain fluid rich inclusions hosted by quartz and few by sphalerite. The inclusions are mostly primary in origin. Based on homogenization temperature readings, the temperatures for quartz formation cover a wide range from 180.9 to 218.0 °C. Sphalerite could have been deposited from hydrothermal fluids at temperatures 184.2 to 227.5 °C. Copper mineralization could have taken place also at this temperature as indicated by the association of chalcopyrite and sphalerite. The homogenization temperature readings for quartz exhibit a bimodal distribution indicating more than one depositional stage. This is apparently confirmed by the observed presence of late stage quartz veins.

The zonation of sulfide-sulfosalt mineralization associated with Au deposition in the Victoria is reflected by a corresponding zonation in Ag and Cu grade distribution. Global mine assay values for Au, Ag and Cu projected on 900L show that while zones of low and high grade Au are evenly distributed within the deposit, zones of Ag and Cu exhibit a general increase in values to the southeast, corresponding to the increase in argentiferous and cupriferous higher sulfidation state sulfosalts. Ore mineragraphy of vein samples also show that, towards the southeast sections of Victoria, the occurrence of native Au-electrum decreases while the occurrence of Au/Ag-tellurides (as inclusions locked mostly in tennantite-tetrahedrite and chalcopyrite) increases. This increase in tellurides, which was observed by Tanaka (2012) to be associated with bismuth- and tin-bearing minerals (bismuthinite, emplectite, colusite-nekrasovite and stannoidite-mawsonite), suggests increasing content of magmatic component in the southeast Victoria mineralization that were possibly derived from spatially associated andesitic-dacitic porphyries (Giggenbach, 1981; Simmons et al., 1987; Henley, 1990; Jensen and Barton, 2000; Cooke et al., 2001; Cooke and McPhail). Since the Victoria veins are temporally linked to the Bato enargite-mineralized diatreme vent breccias that form the eastern boundary of the veins, it is highly possible that there is a close genetic link between them. The cyclic intrusion of dacitic finger porphyries during the waning stages of the Bato volcanism could have contributed heat, magmatic fluids, CO2 and H2S gases and metals (Au, Te, Bi, and Sn) to the hydrothermal system that generated the Victoria intermediate sulfidation epithermal Au-Ag deposit.

# 10.0 EXPLORATION

## 10.1 Drilling, Logging and Sampling

### 10.1.1 Drilling Programs

The deposits within the Lepanto mine are defined principally by underground diamond drillholes and by some surface diamond drillholes. During the enargite mining operations from 1956 to 1996, aggressive drilling campaign was carried out targeting the different enargite ore bodies. When Lepanto shifted to gold mining beginning 1997, majority of the drillholes had been focused in the exploration and definition of the Victoria and Teresa veins, while enargite drilling became limited to a few exploratory holes only. Now that the Victoria and Teresa gold ores are nearing depletion, Lepanto has reverted to drilling the remaining enargite ore bodies starting 2015 up to present with the primary aim of blocking new copper-gold resources that will help augment the life of the Lepanto mine.

The table below summarizes the total number and length of all of Lepanto drillholes based on year of drilling and deposit. Enargite-related deposits pertain to enargite ore bodies such as Buaki Enargite, Carmen, Cristine Enargite, Elena, Enargite Main, Florence, Florence West, Florence East, Northwest, SGV and NW QPG.

Table 10-1. Summary of all Lepanto drillholes.

| Year | Deposit/Area | No. of DH | Length (m) |
|---|---|---|---|
| 1956 - 1996 | Enargite-related | 864 | 133,847.81 |
| | Buaki | 13 | 2,764.96 |
| | Bulalacao | 16 | 9,727.85 |
| | Cristine | 13 | 3,327.65 |
| | Far Southeast | 106 | 68,073.87 |
| | Madaymen | 6 | 2,759.90 |
| | Navajo | 2 | 809.10 |
| | Nayak | 2 | 360.51 |
| | Palasaan | 16 | 5,392.14 |
| | Teresa | 37 | 6,541.10 |
| | Victoria | 15 | 6,099.66 |
| | Undefined | 3 | 1,199.75 |
| *Sub-total* | | *1,093* | *240,904.30* |
| | | | |
| 1997 - 2014 | Enargite-related | 86 | 22,242.96 |
| | Buaki | 4 | 1,319.50 |
| | Bulalacao | 10 | 8,624.90 |
| | Cristine | 4 | 1,080.30 |
| | Fatima | 5 | 4,612.40 |
| | Matulinac | 1 | 500.60 |
| | Teresa | 352 | 92,802.90 |
| | Victoria | 486 | 128,554.57 |
| *Sub-total* | | *948* | *259,738.13* |
| | | | |
| 2015 - present | Enargite-related | 230 | 48,808.30 |
| | HCG | 8 | 1,558.20 |
| | Honeycomb | 1 | 163.60 |
| | Teresa | 43 | 3,810.00 |
| | Victoria | 55 | 5,434.85 |
| *Sub-total* | | *337* | *59,774.95* |
| | | | |
| **Grand Total** | | **2,378** | **560,417.38** |

### 10.1.2 Drillhole Spacing and Length

The ore bodies covered in the updated enargite-QPG resource estimates were drilled at variable spacing. During the enargite mining operations, majority of the holes were drilled between 1050L and 850L underground mining levels. When the exploration of the enargite-QPG ore bodies resumed in 2015, drilling has been constrained dominantly at 900L with some holes collared at 1150L, 950L and 700L. Approximate drillhole spacing, orientation and length are as follows:

| | |
|---|---|
| Carmen | 30 m spacing between 1150L and 1050L; 20 m spacing between 1000L and 850L; horizontal and vertical fan drilling oriented NW-SE; average drillhole length is 230 m |
| Florence | 50 m spacing between 1100L and 1050L; 20 m to 30 m spacing between 1000L and 850L; variable drill orientation but dominantly N-S; average drillhole length is 220 m |
| Elena | 50 m to 60 m spacing between 1000L and 900L; horizontal and vertical fan drilling oriented NW-SE; average drillhole length is 320 m |
| NW QPG | 35 m to 50 m spacing between 1000L and 950L and between 850L and 800L; 15 m to 20 m spacing at 900L; variable drill orientation but mostly N-S and NW-SE; average drillhole length is 210 m |
| Easterlies | 80 m spacing at 700 m; NE-SW orientation; average drillhole length is 180 m |

The current drilling program of Lepanto for its Copper-Gold Project is focused mainly on exploration and resource definition drilling hence the present drill spacing is still relatively wide. Lepanto is yet to employ twin hole drilling for testing historical data, checking the validity of assays or verifying significant drill intercepts.

### 10.1.3 Drilling Technique and Equipment

Majority of the diamond drilling activities in Lepanto have been carried out by the Diamond Drilling Corporation of the Philippines (DDCP), a 100% subsidiary of Lepanto Consolidated Mining Co. DDCP has been using various rigs from Boart Longyear including LM55, LM90, Kempe and Meter Eater for diamond coring.

In 2015 and 2016, Lepanto commissioned Major Drilling Group International (MDGI) to conduct drilling of some of the enargite-QPG holes at NW QPG, Carmen and Florence. MDGI used STM-1500 and LM-90 drill machines for diamond coring.

From 2016 up to present, Lepanto has been also engaging the services of Drill Corp of the Philippines (DCP) in the drilling of its enargite-QPG holes at Florence West and Florence Buaki areas. DCP has been using Diamec machines for diamond drilling.

All three drilling contractors utilized triple tube diamond coring and produced non-oriented drill cores of sizes PQ (82 mm), HQ (61 mm) and NQ (45 mm). Depending on drilling machine capacity and ground condition, drill runs range from less than 1.5 m in the shallow levels to 3.0 m going deeper.

### 10.1.4 Drillhole Data Collection

#### *10.1.4.1 Drillhole Collar Survey*

Based on the drill program prepared by the Exporation Department, the collar position of the proposed drillhole is located underground by the Survey team of the Mine Engineering Department. The Survey crew uses a high precision Total Station survey tool from Leica Instruments to determine the collar location and mark the drillhole azimuth's foresight and backsight. When drilling is completed, the Survey crew re-survey's the collar position for the final collar location.

#### *10.1.4.2 Downhole Survey*

There are no clear records how downhole surveys were conducted on historical drillholes. Looking at the survey table of the drillhole database, majority of the drillholes from 1994 and older do not have actual downhole survey and instead adopted the hole's collar survey for its downhole azimuth and inclination.

While Lepanto employed several proper survey tools for the more recent holes, a substantial number of drillholes were still surveyed using the crude Acid-Etched technique especially at times when the survey tools were unavailable or down.

The recent enargite-QPG drillholes from 2015 up to present were surveyed using proper survey tools at distance 15 meters from collar and at every 50 meters distance downhole. Aside from the downhole azimuth and inclination, the survey tools also measure the drillhole temperature, magnetic field strength, magnetic dip and roll angle.

The table below summarizes the downhole survey methods and tools used by Lepanto over the years of drilling.

Table 10-2. Survey method and tools used by Lepanto for its drillholes.

| Survey Method/Tool | Years |
|---|---|
| Acid-Etched | 1972-1973; 1995-2014 |
| Eastman | 2000 |
| Tropari | 1985; 1996-1999 |
| Maxibor | 2002-2011 |
| Compaq Proshot | 2014-2015 |
| Reflex | 2015-2016 |
| Camteq | 2016 |
| Sling Shot | 2016-2017 |

#### *10.1.4.3 Drill Core Recovery*

Drill core recovery data is collected systematically by assigned geotechnical aides at the core shed. Core recovery is recorded on a standard geotechnical logging form and later encoded in spreadsheet format. Digital encoding of core recovery, however, has been done and completed only for drillholes from 2015 up to present. The core recovery data for the 2014 drillholes and older are only recorded in paper.

Summarized below is the drill meterage versus core recovery for period January 2015 up to June 2017.

Table 10-3. Drilling meterage vs recovery of drillholes from 2015 to June 2017.

| Year | Drilled (m) | Recovered (m) | % Recovery |
|---|---|---|---|
| 2015 | 13,680.40 | 12,180.04 | 89.03% |
| 2016 | 27,108.40 | 23,703.57 | 87.44% |
| 2017 (Jan to Jun) | 8,343.70 | 7,306.44 | 87.57% |
| **TOTAL** | **49,132.50** | **43,190.05** | **87.91%** |

### *10.1.4.4 Drill Core Photography*

Once the drill cores arrive at the core house they are again cleaned using a water hose with careful consideration on argillized and faulted sections. The core boxes are then placed inside an enclosure to regulate lighting while being systematically photographed in their wet condition using a digital camera (Figure 10-1).

Figure 10-1. Sample photograph of wet drill cores.

### *10.1.4.5 Geological Logging*

Detailed geological logging of drill cores is completed routinely at the Lepanto Exploration core house.

A standard Geological Logging Sheet is used by highly trained logging geologists to capture important geological data from drill cores. The logging sheet contains a column for Graphical Log, a detailed description of the core, abbreviated lithological coding, a checklist of alteration minerals, mineralization, oxidation and veining or structures present. Geological logging is normally carried out using paper and pencil and then later digitized by the logging geologist.

Figure 10-2. Geological logging of drill cores.

*10.1.4.6 Geotechnical Logging*

Detailed geotechnical logging is carried out by a skilled Geotechnical Aide using a standard Geotechnical Logging Form. The form includes columns for drill run intervals and corresponding core recovery, RQD, intact rock strength, number of defects and number of defect sets, defect type, roughness, fracture infill type, infill thickness and defect surface weathering. All geotechnical data are later encoded in a spreadsheet format by an assigned personnel.

Figure 10-3. Geological assistant measuring recovery of drill core.

*10.1.4.7 Bulk Density Measurements*

For many years, routine bulk density measurements for drill cores was discontinued in Lepanto. As a result, the mineral resource estimates which had been updated annually used constant historical density values that were long ago derived from mine samples and might or might no longer be applicable for current estimations.

In the second-half of 2016, Exploration Department initiated routine dry bulk density (DBD) measurements for recent enargite-QPG drill cores. The steps are carried out by collecting around 10 cm length of drill core piece from every meter from the vein, the hanging wall and the footwall. The sample is then dried, weighed and coated with wax to seal off the vugs and voids present in the core samples. The waxed sample is then weighed again and afterwards immersed into a glass filled with water. The density of the sample is determined using the Water Displacement Method (Archimedes Principle).


Figure 10-4. Steps in measuring bulk density of drill core samples. Core specimen is first dried either under the sun or halogen lamp, weighed and then coated with wax. The waxed sample is again weighed and then immersed in a glass filled with water. The volume and weight of the water displaced by the sample is then measured.

### 10.1.5 Drill Core Sampling

Once detailed geological logging is completed, the logging geologists mark up the side of the core box at appropriate intervals for cutting and sampling. Markings are placed on the edge of the core box immediately adjacent to the sample interval using a red permanent marker pen with arrows indicating the start and end of each sample interval.

Sampling interval depends on the type of mineralization or alteration being sampled and core recovery. When sampling epithermal veins, the minimum sampling length is 20 cm while the maximum sampling length is 1 meter. When sampling porphyry mineralization or pervasive chloritized zone with veinlets, the maximum sampling length is 2 meters. At times when core recovery is low, the whole length of drill run is sampled.

Once sample marking is completed, drill core is delivered to the core cutting room in preparation for splitting. Core samples are cut into halves lengthwise using diamond core saws. One half of the drill core is placed in a plastic sample bag with a corresponding sample tag and later sealed off with plastic tie. The other half of the core is returned to the core tray for future reference.

Figure 10-5. Drill core sampling procedures. After logging, the core box is marked of the sampling interval. Afterwards, the cores are split into halves lengthwise. One half side is placed inside a plastic bag with a corresponding sample tag and then sealed off using a plastic tie.

### 10.1.6 Drill Core Storage

Un-sampled drill cores left in the core house are systematically stored according to drillhole name and depth in vertical stacks.

Figure 10-6. Core boxes in storage with the drillhole number, depth interval and box number. Core boxes are arranged orderly in vertical stacks.

## 10.2 Underground Sampling

Samples from underground openings are routinely collected by the Exploration Geologic Aides. Sampling starts by first locating a controlled or surveyed point underground that will serve as the reference point when gathering underground samples. Veins and structures encountered underground are normally sampled but there are cases such as when the opening is being driven in a relatively unexplored ground, even the rocks from the walls of the opening are collected.

Prior to channel sampling, the breaking width of the panel, true width of the vein or structure are recorded. Afterwards, the number of samples to be collected from the vein or structure is determined by dividing the vein or structure into portions not greater than 0.8 m. Channel sampling starts from the footwall to the hanging wall at breast height of the sampler. Each channel must be 6.0 inches in height and 2.0 inches in depth. A canvas is placed on the ground below the vein being sampled to catch the rock fragments falling from the channel. The collected rock fragments in the canvas are crushed to 1-2 inches diameter size, mixed and then quartered. The two opposite quarters are transferred into a cloth sample bag and assigned a sample ticket. Descriptions related to the geological characteristics of the sample are recorded on the corresponding sample ticket leaf.

Channel samples from veins or structures are normally collected from the face of the panel but at times when face sampling is not possible, samples from the roof or back of the opening are collected instead.

Upon reaching the core house office, the geologic aides must accomplish the Sample Description Form and plot the samples on the 1:200 m plan maps.

## 10.3 Sample Preparation, Analyses and Security

### 10.3.1 Security and Chain of Custody of Samples

Drill core sample splits are arranged orderly according to sample number and are stored in the core house room until they are ready to be shipped to the laboratory for analysis.

Lepanto engages the services of two assay laboratories for the analysis of its drill cores, one is Lepanto Assay Laboratory located within the mine site and the other is Intertek Laboratory in Muntinlupa,. If the core samples will be sent to the Lepanto Assay Laboratory, an assigned Exploration Supervisor will prepare two copies of the Assay Request Form (FRM-EXP-008) listing the indiviual sample numbers included in the batch, type of sample, elements to be analyzed, and other instructions for the laboratory. Upon delivery to the assay laboratory, a laboratory representative checks the samples and countersigns the request form and returns one of the two copies to the Exploration personnel present for filing. Meanwhile, if the core samples will be sent to Intertek Laboratory, a standard Sample Submission Form from Intertek will be filled out by an assigned geologist and signed off by the Exploration Manager. Once the samples arrived in Muntinlupa, the laboratory representative assigns a laboratory reference/work order number to the sample batch and countersigns the Sample Submission Form. Intertek also sends via email a Sample Receipt Confirmation form to the Exploration Manager.

All channel samples collected by the Exploration Samplers from underground are directly delivered to the Lepanto Assay Laboratory for analysis. Prior to delivery, an assigned sampler fills out and signs two copies of the standard Sample Submission Form (FRM-ASY-013A). Upon delivery to the Lepanto laboratory, a laboratory representative receives and checks the samples and countersigns the sample submission form and returns one of the two copies to the Exploration Sampler for filing.

### 10.3.2 Preparation and Assay Facility

All samples, whether from drillhole or channel cut, collected prior to 2015 were prepared and analyzed at the Lepanto Assay Laboratory.

When Lepanto resumed the exploration of its copper-gold ore bodies in 2015, the high sample volume generated from drilling and the limited element determination capability of the Lepanto assaying facility compelled the Lepanto management to engage the services of an additional assay laboratory for sample analysis.

The Lepanto Assay Laboratory still serves as the primary laboratory for Lepanto samples while Intertek Laboratory, an ISO 17025:2005 accredited company in Muntinlupa, serves as the secondary laboratory for sample preparation and additional multi-element determination including Ag, Pb, Zn, and As.

### 10.3.3 Sample Preparation

*10.3.3.1 Lepanto Assay Laboratory*

The core samples together with the sample ticket are placed in steel drying pans and are dried at 105°C. The samples are then crushed in a jaw crusher in two stages. Primary crushing output must be ½ inch while secondary crushing output must be 10 mesh. A screen test on 2 to 4 crushed samples per batch is carried out at random to ensure that the crushed samples are of acceptable grain size.

The crushed samples from the secondary crushing are then split with a rifle splitter to produce a 1.0 kg sample for pulverizing. The residual crushed materials or the coarse rejects are later retrieved by the Exploration personnel and stored at the Lepanto core house.

The 1.0 kg sample is pulverized until 90% passes 200 mesh. A screen test on 2 to 4 pulverized samples per batch is carried out at random to ensure that the pulverized samples are of acceptable grain size.

*10.3.3.2 Intertek Laboratory*

The core samples are placed in steel trays and are dried at 105°C. The samples are then crushed in a jaw crusher until 90% of the crushed samples is finer than 2 mm. The crushed samples are then split with a rifle splitter to produce a 1.5 kg sample for pulverizing. The residual crushed materials are stored in the laboratory as coarse reject samples.The 1.5 kg crushed sample is pulverized until 95% is finer than 200 mesh.

### 10.3.4 Analytical Methods Used

*10.3.4.1 Lepanto Assay Laboratory*

The analytical method used by Lepanto Assay Laboratory for gold and silver determinations is fire assay commonly followed by gravimetric finish. Sometimes atomic absorption spectrophotometer (AAS) is used if gold and silver contents are lower than 0.03 g/t. AAS is also employed for the quantitative analysis of other elements including copper, lead, zinc and antimony. The detection limits of the elements analyzed in the Lepanto laboratory are listed in the table below:

Table 10-4. Lepanto Assay Laboratory minimum detection limits for gravimetric and AAS methods.

| *Method* | Fire Assay-Gravimetric | | | AAS | | | | |
|---|---|---|---|---|---|---|---|---|
| *Element* | Au | Ag | As | Au | Cu | Pb | Zn | Sb |
| *Units* | ppm | ppm | ppm | ppm | ppm | ppm | ppm | ppm |
| *Minimum Detection Limit* | 0.03 | 0.03 | 70 | 0.005 | 10 | 10 | 10 | 10 |

The basic procedure for fire assaying involves mixing a 30 g aliquot of pulverized sample material with 150 g of flux. The sample is then placed inside a furnace pre-heated to 1000 °C for about 45 to 55 minutes. Afterwards, the melted sample is poured into a conical mould and then left to cool and solidify. The lead button is separated from the slag by hammering and then weighed. The button is then placed into a pre-heated cupel and then into the furnace at 850°C. After cupellation, the dore is extracted from the cupel, flattened and then placed in a 15 ml porcelain crucible to mix with a nitric acid – water parting solution. The recovered gold bead after parting is annealed into the furnace until the bead turns yellow. The gold beads are then left to cool and then weighed. The assay results are sent to the assigned Exploration geologist through email as CSV files for direct import into the database.

### *10.3.4.2 Intertek Laboratory*

Intertek applies two sets of methods for assaying depending on Lepanto's purpose of analysis. For standard drill core analysis, a 50 g aliquot of the pulp sample is analyzed for gold by fire assay combined with gravimetric finish. Pulp samples are also analyzed for a suite of five elements by three acid digestion ($HCI/HNO_3/HCIO_4$) with AAS finish. The method codes used by Intertek for gold and multi-element analyses are FA50/GR and 3AH1/AA, respectively. The detection limits of the elements determined for standard drill core analysis are listed in the table below:

Table 10-5. Intertek detection limits for FA50/GR and 3AH1/AA analyses.

| *Method* | FA50/GR | 3AH1/AA | 3AH1/AA | 3AH1/AA | 3AH1/AA | 3AH1/AA |
|---|---|---|---|---|---|---|
| *Element* | Au | Ag | As | Cu | Pb | Zn |
| *Units* | ppm | ppm | ppm | ppm | ppm | ppm |
| *Minimum Detection Limit* | 0.02 | 0.5 | 100 | 10 | 10 | 10 |
| *Maximum Detection Limit* | | 1,000 | 100,000 | 100,000 | 200,000 | 200,000 |

For ore characterization analysis, the gold content is determined by fire assay with AAS finish from a 50 g aliquot of pulp sample. A suite of 60 elements are also determined from the pulp sample using four acid digestion ($HCI/HNO_3/HCIO_4/HF$) followed by ICP-OES and ICP-MS. The method codes used by Intertek for gold and multi-element analyses are FA50/AA and 4A/OM20, respectively. The detection limits of the elements determined for ore characterization analysis are listed in the table below:

Table 10-6. Intertek detection limits for FA50/AA and 4A/OM20 analyses.

| Element | Minimum Detection Limit (ppm) | | Maximum Detection Limit (ppm/pct) | Element | Minimum Detection Limit (ppm) | | Maximum Detection Limit (ppm/pct) | Element | Minimum Detection Limit (ppm) | | Maximum Detection Limit (ppm/pct) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Au | 0.005 | | | | | | | | | | |
| Ag | 0.05 | - | 500 | Hf | 0.05 | - | 2000 | Sb | 0.05 | - | 1% |
| Al | 50 | - | 15% | Ho | 0.01 | - | 2000 | Sc | 0.1 | - | 5000 |
| As | 0.5 | - | 1% | In | 0.005 | - | 2000 | Se | 0.5 | - | 1% |
| Ba | 0.1 | - | 5000 | K | 20 | - | 10% | Sm | 0.01 | - | 5000 |
| Be | 0.05 | - | 2000 | La | 0.01 | - | 5000 | Sn | 0.1 | - | 2000 |
| Bi | 0.01 | - | 1% | Li | 0.1 | - | 5000 | Sr | 0.05 | - | 1% |
| Ca | 50 | - | 40% | Lu | 0.005 | - | 2000 | Ta | 0.01 | - | 2000 |
| Cd | 0.02 | - | 2000 | Mg | 20 | - | 40% | Tb | 0.005 | - | 2000 |
| Ce | 0.01 | - | 1% | Mn | 1 | - | 2% | Te | 0.05 | - | 2000 |
| Co | 0.1 | - | 1% | Mo | 0.1 | - | 1% | Th | 0.01 | - | 5000 |
| Cr | 1 | - | 2% | Na | 20 | - | 10% | Ti | 5 | - | 2% |
| Cs | 0.05 | - | 2000 | Nb | 0.05 | - | 2000 | Tl | 0.02 | - | 2000 |
| Cu | 0.5 | - | 2% | Nd | 0.01 | - | 5000 | Tm | 0.01 | - | 2000 |
| Dy | 0.01 | - | 2000 | Ni | 0.5 | - | 2% | U | 0.01 | - | 1% |
| Er | 0.01 | - | 2000 | P | 50 | - | 5% | V | Jan-00 | - | 5000 |
| Eu | 0.01 | - | 2000 | Pb | 0.5 | - | 1% | W | Jan-00 | - | 2000 |
| Fe | 100 | - | 50% | Pr | 0.005 | - | 5000 | Y | 0.05 | - | 2000 |
| Ga | 0.05 | - | 2000 | Rb | 0.05 | - | 2000 | Yb | 0.01 | - | 2000 |
| Gd | 0.01 | - | 2000 | Re | 0.002 | - | 2000 | Zn | 1 | - | 2% |
| Ge | 0.05 | - | 2000 | S | 50 | - | 10 | Zr | 0.1 | - | 2000 |

The assay results are sent to the assigned Exploration Geologist and Exploration Manager by email as CSV files for direct import into the database. Hard copy of the assay results are also sent to the Makati Office for filing. The analytical results of laboratory internal control standards are also reported with each batch of samples analyzed.

### 10.3.5 Quality Assurance/Quality Control

Quality control samples are inserted within the sample batch and submitted routinely in order to monitor sampling, laboratory sample preparation, analytical accuracy, and precision. In the same way the primary and check laboratories conduct their own tests of internal standards, blanks, and duplicate samples on a routine basis according to laboratory procedures to ensure integrity of assay results.

During the enargite mining operations prior to year 1997, Lepanto had not implemented QAQC protocols in either of its exploration or mine samples. Application of QAQC measures only began during the Victoria-Teresa gold mining operations, however, QAQC monitoring has not been continuous through the years and available records and reports related to QAQC checks are limited. During the resumption of copper-gold exploration in early 2015, the Exploration team tried to revive the implementation of QAQC insertion in its samples. Unfortunately, the procedures in the recording and monitoring of QC materials at that time was not yet well established, hence the actual QAQC monitoring only began in the later part of the year.

The following discussions on the performance of the Lepanto Assay and Intertek laboratories with respect to QC materials cover the period between late 2015 and July 2017.

### *10.3.5.1 QAQC Protocols on Sample Preparation*

Sample preparation protocols are set up to ensure that the correct particle size and sample size reduction schemes are used in order to produce a representative sample. The Lepanto Assay Laboratory undertakes screen tests on crushed and pulverized products at a rate of 2 to 4 samples per batch.

### *10.3.5.2 QAQC Protocols on Sample Analysis*

The Exploration Department monitors data precision, accuracy and contamination through the use of Certified Reference Materials (CRM), Blank, Field Duplicate, and procedures designed to ensure correctness of sample preparation and chemical analysis. An assigned geologic assistant is responsible for the insertion of the quality control samples. A total of 2,179 QC materials have been sent and analyzed with the samples from the Lepanto Copper-Gold Project at the Lepanto Assay and Intertek laboratories between late 2015 and mid-2017 (Table 10-7).

Table 10-7. Number of QC samples analyzed by the Lepanto Assay and Intertek laboratories.

| Laboratory | CRM | Field Blank | Field Duplicate |
|---|---|---|---|
| Lepanto Assay | 466 | 458 | 307 |
| Intertek | 333 | 299 | 316 |
| Total | 799 | 757 | 623 |

### *10.3.5.3 Certified Reference Materials*

Certified reference materials (CRM), also called standards, are composed of pulp samples with element concentrations certified by international laboratories. These are submitted to check the accuracy of the laboratory analyses.

Between November 2015 and April 2016, Lepanto used three kinds of internal standards namely FSE-ST1, FSE-ST2 and FSE-ST3. These three standards were prepared by Ore Research & Exploration Pty Ltd (OREAS) from laboratory sample rejects (95% <2mm) of FSE core samples. The certified values of the internal standards are summarized in Table 10-8 below.

From May 2016 onwards, Lepanto has been using three kinds of commercial CRM’s purchased from OREAS. The three CRM’s called OREAS 600, OREAS 601 and OREAS 604 were prepared from a high sulfidation epithermal gold-silver-copper bearing ore from Evolution Mining’s Mount Carlton Operation in Queensland, Australia. The certified values of the commercial standards are summarized in Table 10-8 below.

Table 10-8. Certified values Au and Cu values of the CRM's used by Lepanto.

| Certifying Company | Reference Material Type | CRM Name | No. of Samples | Certified Values | | | |
|---|---|---|---|---|---|---|---|
| | | | | Au (g/t) | Std Dev | Cu (pct) | Std Dev |
| Internal Standard certified by OREAS | FSE Porphyry Cu-Au | ST1 | 48 | 0.428 | 0.018 | 0.708 | 0.025 |
| | | ST2 | 52 | 0.933 | 0.034 | 0.659 | 0.02 |
| | | ST3 | 52 | 1.98 | 0.06 | 0.734 | 0.015 |
| OREAS | High sulfidation epithermal Ag-Cu-Au | 600 | 227 | 0.2 | 0.006 | 0.0482 | 0.00226 |
| | | 601 | 218 | 0.78 | 0.031 | 0.101 | 0.004 |
| | | 604 | 202 | 1.43 | 0.055 | 2.16 | 0.049 |

CRMs are submitted blind to both Lepanto and Intertek laboratories at a rate of one per 30 samples. Tolerance limits are set at two standard deviation (SD) from the true value of the reference material. CRMs that exceed ±2SD are deemed failed. The sample batch where the failed CRM belongs to are re-analyzed.

Figure 10-7 and Figure 10-8 show the performance of the Lepanto Assay Laboratory and Intertek, respectively, in analyzing the CRM's. Majority of the results of CRM submissions are within the prescribed 2SD rule, except for some samples that plotted beyond the red line. In such cases the sample batch was re-sent to the laboratory for re-analysis.

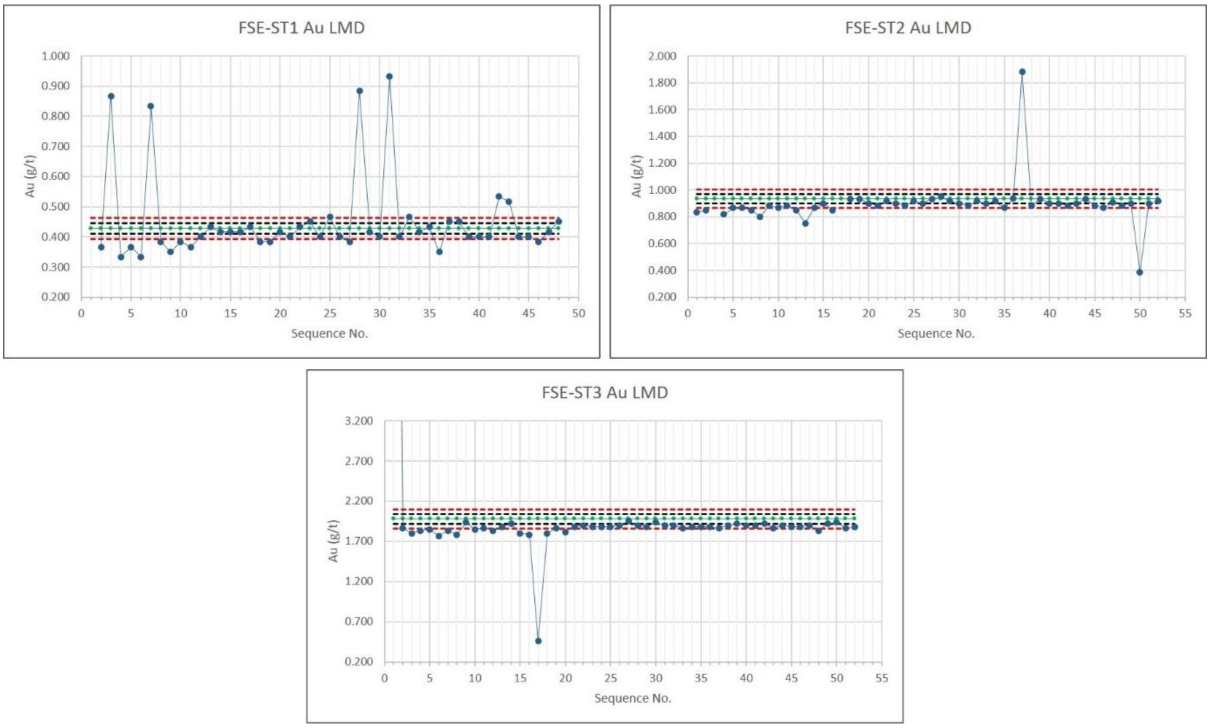



Figure 10-7. Performance of Lepanto Assay Laboratory in gold CRM analysis using the FSE-ST QC materials. Blue line represents the Au value analyzed, green line represents the true value of the CRM, black line represents 1SD and red line represents 2SD.

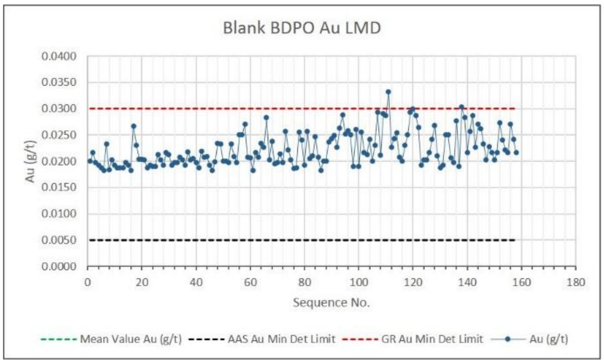

Figure 10-8. Performance of Intertek Laboratory in gold and copper CRM analysis using the OREAS 600, 601 and 604 QC materials. Blue line represents the Au and Cu values analyzed, green line represents the true value of the CRM, black line represents 1SD and red line represents 2SD.

### *10.3.5.4 Blanks*

Lepanto inserts blank materials within a sample batch to monitor and measure contamination during sample preparation. Blanks are inserted at a rate of one in every 30 samples.

Prior to May 2016, Lepanto utilized blank samples sourced from the un-mineralized Bato Dacite Porphyry (BDPO) in Brgy. Bulalacao, Mankayan. From May 2016 onwards, Lepanto has been using un-mineralized tonalitic to dacitic materials from the Bagon Intrusive Complex (BGIC) in Brgy. Sapid, Mankayan as blank samples. Based on the 38-element suite analysis of Intertek, BGIC blank has mean values of 0.0025 ppm gold and 7.43 ppm copper.

Figure 9-19 and Figure 9-20 show the performance of the Lepanto Assay Laboratory and Intertek in analyzing field blanks. Majority of the field blanks analyzed plot below or on the threshold limit which is equal to the minimum detection limit of 0.03 ppm gold for Lepanto Assay Laboratory and 0.02 ppm for Intertek. Blanks samples that plot above the threshold limit indicate possible contamination during sample preparation and are investigated to determine the source of error and if re-analysis is needed.



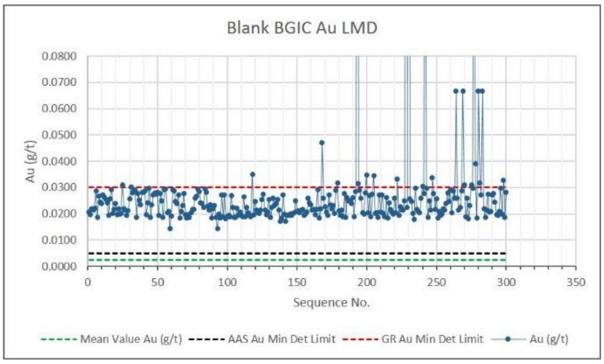




Figure 10-9. Gold assay results of BDPO and BGIC blanks analyzed by Lepanto Assay Laboratory. Blue line represents the Au values analyzed, green line represents the Au mean value of BGIC blank samples, black line represents Lepanto Assay's lowest detection limit for AAS method and red line represents Lepanto Assay's lowest detection limit for GR method.

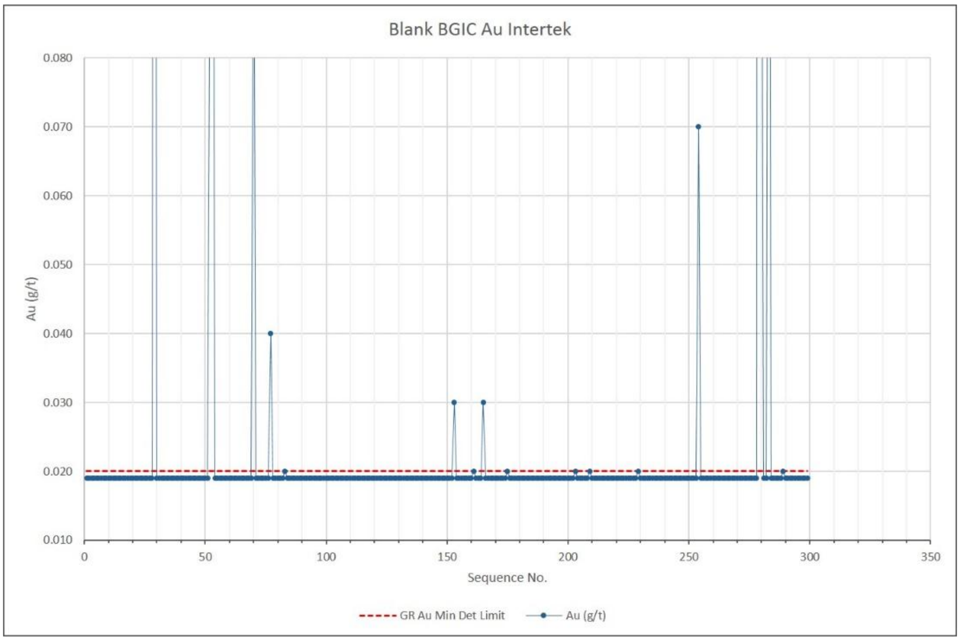



Figure 10-10. Gold assay results of BGIC blanks analyzed by Intertek. Blue line represents the Au values analyzed and red line represents Intertek's lowest detection limit for GR method.

### *10.3.5.5 Field Duplicates*

Lepanto collects and sends the second half of the cores as field duplicate QC materials in order to measure the precision of laboratory preparation and analysis. Field duplicates are collected and inserted within a sample batch at a frequency of one per 30 samples. Assay results of the original sample are compared with the field duplicates using absolute relative percent difference (ARPD) plots. Ninety percent of the samples should reasonably report ≤30% ARPD for both gold and copper.

Figure 10-11 below show the gold and copper assays of field duplicates analyzed by the Lepanto Assay Laboratory. The analyses of duplicate pairs show fair correlation for gold at $R^2 = 0.8235$ and copper at $R^2 = 0.7438$ with respect to the red dash line ($R^2 = 1.0$). Deviation from the parity line can be attributed to natural variation in the mineralization in the core itself. This is also described by the ARPD plot below wherein only 60% of the sample pairs have differences in assays lower than 30%.

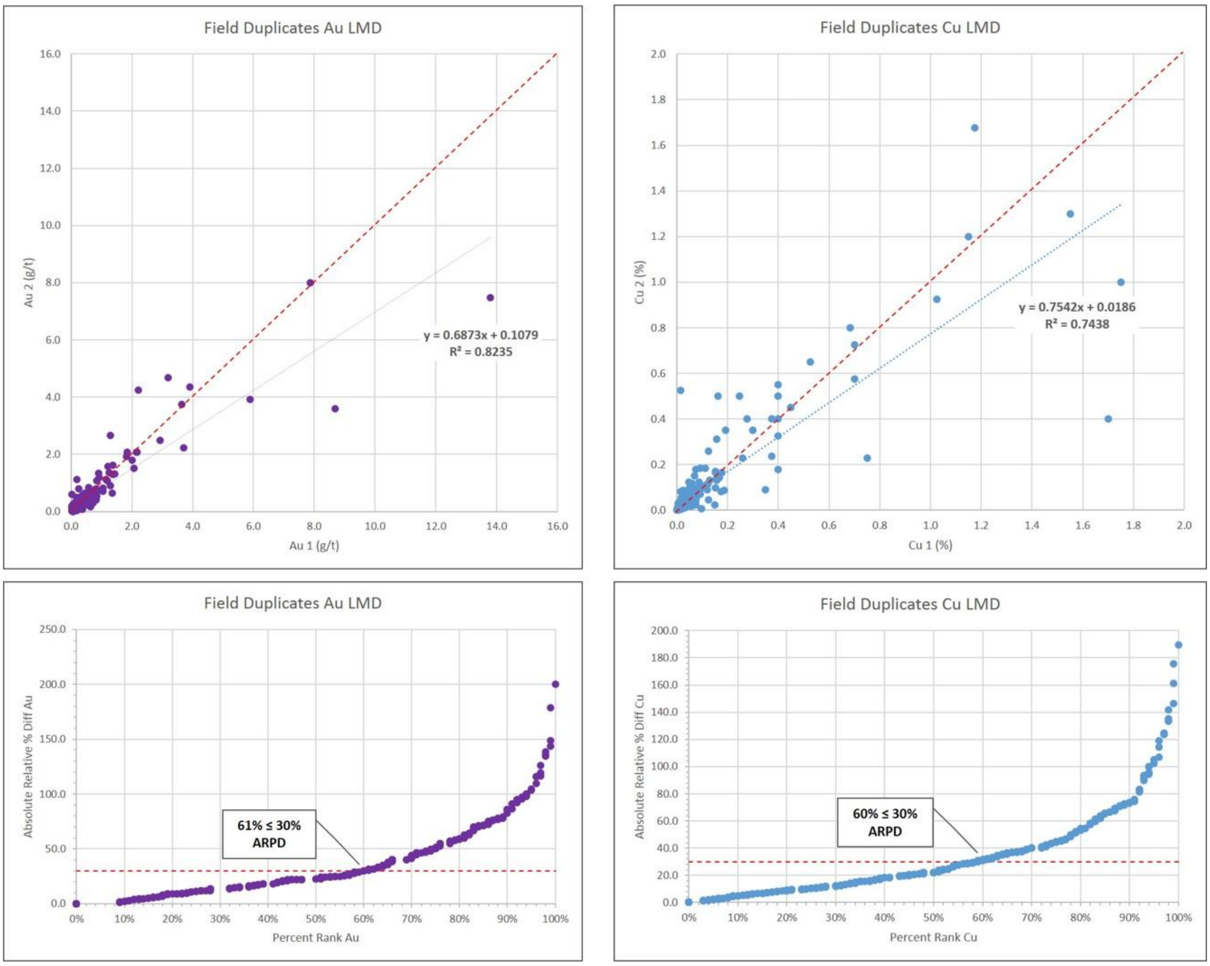



Figure 10-11. Plots showing results of analysis of field duplicates by Lepanto Assay Laboratory.

Figure 10-12 presents the performance of Intertek Laboratory in terms of field duplicate analysis. Precision of gold determination is almost the same as that of the Lepanto laboratory with $R^2 = 0.8083$. Precision of copper determination meanwhile is slightly better at $R^2 = 0.9232$. The percentage of sample pairs that has grade difference less than 30% also improved to more than 70% but still below the prescribed 90% limit.

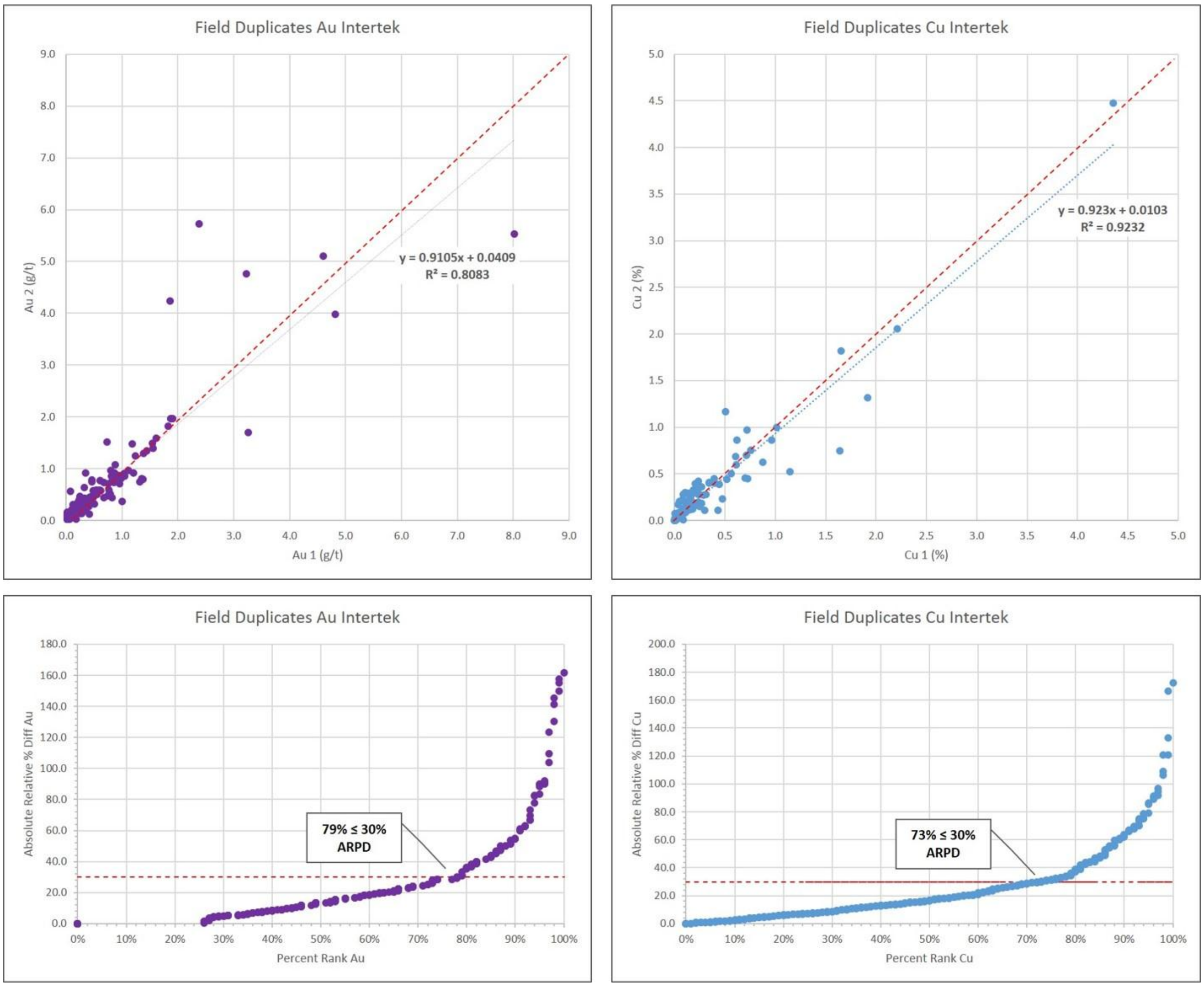



Figure 10-12. Plots showing results of analysis of field duplicates by Intertek Laboratory.

## 11.0 MINERAL RESOURCE ESTIMATION

The updated mineral resource estimates of Lepanto cover the Carmen, Florence, Elena, NW QPG and Easterlies ore bodies collectively called enargite-QPG. The latest resource estimates is the ninth of the estimation runs carried out by the Lepanto Exploration team since the company started its in-house resource estimates in June 2016. The latest resource update also referred to as Run 9A was completed in July 2017.

All resource estimation processes such as database validation, geological modeling, geostatistical analysis, block modeling and estimation were carried out using GEMS v6.5 software.

### 11.1 Database Used in the Resource Estimation

The updated mineral resource estimate is based on all drillhole data available on June 07, 2017 as well as all channel cut data available on May 31, 2017.

The Exploration Department maintains a database of all drillholes obtained from various sources namely: (1) the recently validated 2015 Database Project which mainly includes historic up to 2014 drillholes; (2) Geologist Roma Gonzales who compiles all Exploration drillhole data generated from 2015 up to present; and (3) Resource Geologist Michelle Dela Cruz who compiles all Mine Geology drillhole data generated from 2015 up to present. A total of 2,378 drillholes collared at different areas within the Lepanto tenements are included in the current database (Appendix 1).

The database for historical channel cut samples was sourced from Michelle Dela Cruz of the Mine Geology Mineral Resource Section. Meanwhile, the channel cut samples collected from 2015 to present that have been collected by the Exploration samplers are being compiled by Roma Gonzales while those that have been collected by the Mine Geology samplers are being compiled Michelle Dela Cruz. A total of 121,865 channel cut samples collected from different areas in the mine are included in the current database (Appendix 2).

Validated drillhole and channel cut databases contain a tabulation of all information relevant to the undertanding of the exploration results. Both databases consist of three main tables which include Header, Survey and Assay. Additional four tables reflecting the geology of the drillhole are included in the drillhole database namely Lithology, Alteration, Mineralization and Structure. All of these tables are stored as a comma separated file prior to import into the GEMS software. Table 11-1 and Table 11-2 list the important data contained in each table for drillhole and channel cut, respectively.

Table 11-1. List of data per drillhole table.

| Table | Drillhole Data |
|---|---|
| Header | Hole-ID, Local X-Y-Z, Length, Level, Area, Date Start, Date End, Geologist, Source |
| Survey | Hole-ID, Distance, Azimuth, Dip, Survey Type, Temperature, Gravity, Magnetic Field, Magnetic Dip, Roll |
| Assay | Hole-ID, From, To, Au, Cu, CuEq, Pb, Zn, As, Sb, Ag, Recovery, Length, Chapa No., Laboratory, Au Method, Cu Method, Batch No., Date |
| Lithology | Hole-ID, From, To, Length, Formation, Lithology, LithCode |
| Alteration | Hole-ID, From, To, Length, Alteration, Assemblage, AltCode |
| Mineralization | Hole-ID, From, To, Length, Veining, Vein Style, Vol Pct of En, Py, Sp, Cp, Cv, Gn, Lz, Cc, Bn, Tn-Td |
| Structure | Hole-ID, From, To, Length, Structure, Structure Code |

Table 11-2. List of data per channel sample table.

| Table | Channel Cut Data |
|---|---|
| Header | Hole-ID, Local X-Y-Z, Length, Area, Mining Block, Panel Width, Date, Source |
| Survey | Hole-ID, Distance, Azimuth, Dip |
| Assay | Hole-ID, From, To, Length, Cu, Au, Ag, CuEq, Chapa No. |

### 11.1.1 Drillhole Data

The drillholes used for the resource update only include those that intersected or within the immediate periphery of the interpreted Carmen, Florence, Elena, NW QPG and Easterlies ore bodies. Out of the overall 2,378 drillholes in the database, 981 drillholes or 41% were used for the resource estimation. The drillholes are all diamond drills and were collared both from surface and underground.

The breakdown of the drillholes per area and drilling period is shown in Table 11-3 below. The drillholes that defined the Easterlies deposit fall under the NW QPG area in this table.

Table 11-3. Enargite-QPG drillhole database summary.

| Area | Historical DH pre-2015 | | Exploration DH 2015 - present | | Mine Geology DH 2015 - present | | TOTAL | |
|---|---|---|---|---|---|---|---|---|
| | No. of DH | Length (m) | No. of DH | Length (m) | No. of DH | Length (m) | No. of DH | Length (m) |
| Carmen | 59 | 13,605.22 | 51 | 11,083.30 | 7 | 673.30 | 117 | 25,361.82 |
| Florence | 111 | 20,225.59 | 73 | 16,646.30 | | | 184 | 36,871.89 |
| Elena | 64 | 21,014.96 | 14 | 4,406.20 | | | 78 | 25,421.16 |
| NW QPG | 517 | 69,414.84 | 78 | 15,139.20 | 7 | 860.00 | 602 | 85,414.04 |
| **Total** | **751** | **124,260.61** | **216** | **47,275.00** | **14** | **1,533.30** | **981** | **173,068.91** |

### 11.1.2 Channel Cut Data

All channel cut samples, either historic or recent, that were collected from Carmen, Florence, Elena, NW QPG and Easterlies ore bodies were used as guides in defining the morphology of the enargite-QPG mineralization. However, only those that were gathered from 2001 onwards were utilized during grade interpolation mainly because of the greater confidence in the collection and analysis of the more recent samples compared to the historic channel cuts. Out of the overall 121,865 channel samples in the database, 25,558 channel cuts or 21% were used for the resource estimation.

Summarized in the table below are the channel cut samples collected from 2001 up to present according to area.

Table 11-4. Enargite-QPG channel cut database summary.

| Area | 2001-2008 | | 2015 - present | | TOTAL | |
|---|---|---|---|---|---|---|
| | No. of DH | Length (m) | No. of DH | Length (m) | No. of DH | Length (m) |
| Carmen | 10,881 | 18,181.24 | 702 | 516.60 | 11,583 | 18,697.84 |
| Florence | 5,720 | 9,100.35 | 597 | 405.20 | 6,317 | 9,505.55 |
| Elena | 3,614 | 5,818.30 | | | 3,614 | 5,818.30 |
| NW QPG | 993 | 1,317.61 | 3,051 | 2,283.50 | 4,044 | 3,601.11 |
| **Total** | **21,208** | **34,417.50** | **4,350** | **3,205.30** | **25,558** | **37,622.80** |

## 11.2 Database Validation and Integrity

Lepanto initiated in 2015 the so-called Database Project which aimed to validate the existing drillhole database and capture all other data especially those related to the enargite mining period that were not yet included in the database. The new database generated from the project revealed some data that were far different from the previous database (e.g. collar location changed from few meters to hundreds of meters, different logging or assay intervals, etc.). Due to the significant discrepancies noted between the two databases, and as recommended by the consulting Resource Geologist of Lepanto, the Exploration team carried out a review of the original drill logs and assay reports to verify the correct data to be adopted.

Both historical and recent drillhole and channel cut data were validated through manual verification and automated procedures using combination of Excel, GEMS and Leapfrog. The discussion below describes the different errors encountered during validation and the procedures undertaken to correct them.

*a. Collar location was changed*

Initial validation check was done by comparing all the header tables in the databases above using Excel. Hole-ID’s common among header tables were extracted and afterwards the differences between the recorded coordinates were calculated. Differences in easting, northing and elevation that were less than 0.5 meter were ignored and the data from the 2015 Database Project were selected for the final header table. Meanwhile, differences in coordinates that were greater than 0.5 meter were re-checked against the data recorded in the original log sheets. If log sheets were no longer available, the coordinates of drill hole were obtained from registered maps. If both log sheets and map were missing, the logbook containing the handwritten master list of all drill holes of LMD was referred to. The final coordinates adopted can be found in the Remarks column.

*b. Duplicate collar and surveys*

This error was commonly encountered in Leapfrog database validation. It was observed to occur when two or more drillholes have exactly the same collar coordinates and the same collar surveys (no other downhole survey) but different hole lengths (i.e. re-drilled hole). In Lepanto, re-drilled holes are named by adding a letter to the ID of the first hole (e.g. U-08-03, U-08-03A, U-08-03B, etc.)

In order to rectify this error, the easting and northing coordinates of the drill holes were adjusted by 0.1 meter increment from youngest to oldest *excluding* the last re-drilled hole. In the above example, U-08-03B is the last hole, hence, its collar coordinates are not changed. Meanwhile, the collar coordinates of U-08-03A are changed by 0.1 meter while the collar coordinates of U-08-03 are changed by 0.2 meter. Adjustment of coordinates were done in the Header table with additional notes in the Remarks column.

*c. Wedge found (possible duplicate collar)*

This error likewise appeared in Leapfrog validation. Similar to the above, this error happens when two or more drillholes have exactly the same collar coordinates and collar surveys but different downhole surveys (i.e. wedged/deflected hole). The same correction as described in the first case above was applied to resolve this error.

*d. Out of sequence interval / Interval overlaps another interval*

This error was encountered both in GEMS and in Leapfrog database validation. This was corrected by re-checking the original (hard copy) of drill logs or assay reports.

*e. Interval overlaps an interval in a wedge hole*

This error appeared in Leapfrog database validation and occurred in holes described in item C above. This error was corrected once collar coordinates of the wedged holes were adjusted.

*f. A wedge hole has conflicting data*

This error appeared in Leapfrog database validation and occurred in holes described in item C above. This error was corrected once collar coordinates of the wedged holes were adjusted.

*g. Re-drilled data has conflicting data*

This error appeared in Leapfrog database validation and occurred in holes described in item B above. This error was corrected once collar coordinates of the wedged holes were adjusted.

*h. No interval defined / No samples for collar*

This error was encountered both in GEMS and in Leapfrog database validation. This is technically not an error but only a warning which tells that there are missing intervals in some of the drill holes which indicates that there are no samples collected in those distances. This warning was ignored.

## 11.3 Geological Interpretation

Geological interpretation of the Carmen, Florence, Elena, NW QPG and Easterlies ore bodies was carried out based mainly on the dominant mineralization style that is either quartz-pyrite-gold (QPG) or enargite. Mineralization style was determined by color, sulfide mineralogy and geochemistry described as follows:

| | |
|---|---|
| Quartz-Pyrite-Gold | dominantly light-colored; characterized by white coarse crystalline quartz or gray crustiform fine quartz and colloform chalcedony; consists of pyrite + sphalerite + galena + minor tennatite/tetrahedrite ± chalcopyrite ± bornite; contains 100-5000 ppm As, ≥10 ppm Ni and Co, ≤200 ppm Zn, ≤1 ppm Cd |
| Enargite | dominantly dark-gray in color; characterized by pyrite + enargite + luzonite with brecciated white quartz as clasts (except in Florence); contains ≥5000 ppm As, ≥10 ppm Te, Se, Sn, ≥5 ppm Bi |

### 11.3.1 Geological Modeling

Wireframing in GEMS was performed based on the geological interpretation made by the Project Geologists on both parallel vertical sections and plan maps. The enargite-QPG mineralization was delineated based on the raw assay data of drillholes and channel cut samples using a minimum grade of 1.0% CuEq, where CuEq = Cu% + (Au g/t x 1.63).

A total of 144 separate wireframes were constructed for the enargite-QPG mineralization (Appendix 3). These mineralized solids were grouped into separate domains of similar orientation as follows:

Table 11-5. List of domains per area.

| Area | Domain | Strike (Az) | Dip | Dip Direction |
|---|---|---|---|---|
| Carmen | 51 | 40 | -65 | SE |
| | 52 | 290 | -85 | NE |
| Florence | 61, 611 | 280 | -80 | SW |
| | 62, 622 | 65 | -75 | SE |
| | 63, 633 | 305 | -75 | SW |
| Elena | 71, 711 | 60 | -80 | SE |
| | 72, 722 | 290 | -75 | SW |
| NW QPG | 81 | 280 | -70 | SW |
| Easterlies | 91 | 295 | -87 | SW |
| | 92 | 75 | -87 | SE |

### 11.3.2 Model Dimensions

The mineralized domains comprising the enargite-QPG ore bodies cover a lateral area of approximately 1.9 km along the north by 1.2 km along the east and a vertical extent of 400 meters. Table 11-6. Extents of mineralization wireframes by deposit.Table 11-6 shows the dimensions of the mineralized domains by deposit while Figure 11-1 and Figure 11-2 illustrate the relative locations of the Enargite-QPG ore bodies in plan view and 3D space.

Table 11-6. Extents of mineralization wireframes by deposit.

| Area | Strike Length (m) | Underground Levels | Vertical Extent (m) | Remarks |
|---|---|---|---|---|
| Carmen | 230 | 1250L - 850L | 400 | |
| Florence | 80 - 100 | 1250L - 750L | 60 - 80 | veins are typically short and assumes a SW to S directed plunge following the contact between LPMV and IDBX |
| Elena | 180 | 980L - 810L | 170 | one vein extends up to 1130L |
| NW QPG | 100 - 300 | 1100L - 700L | 60 - 300 | |
| Easterlies | 200 - 500 | 680L - 630L | 50 | |

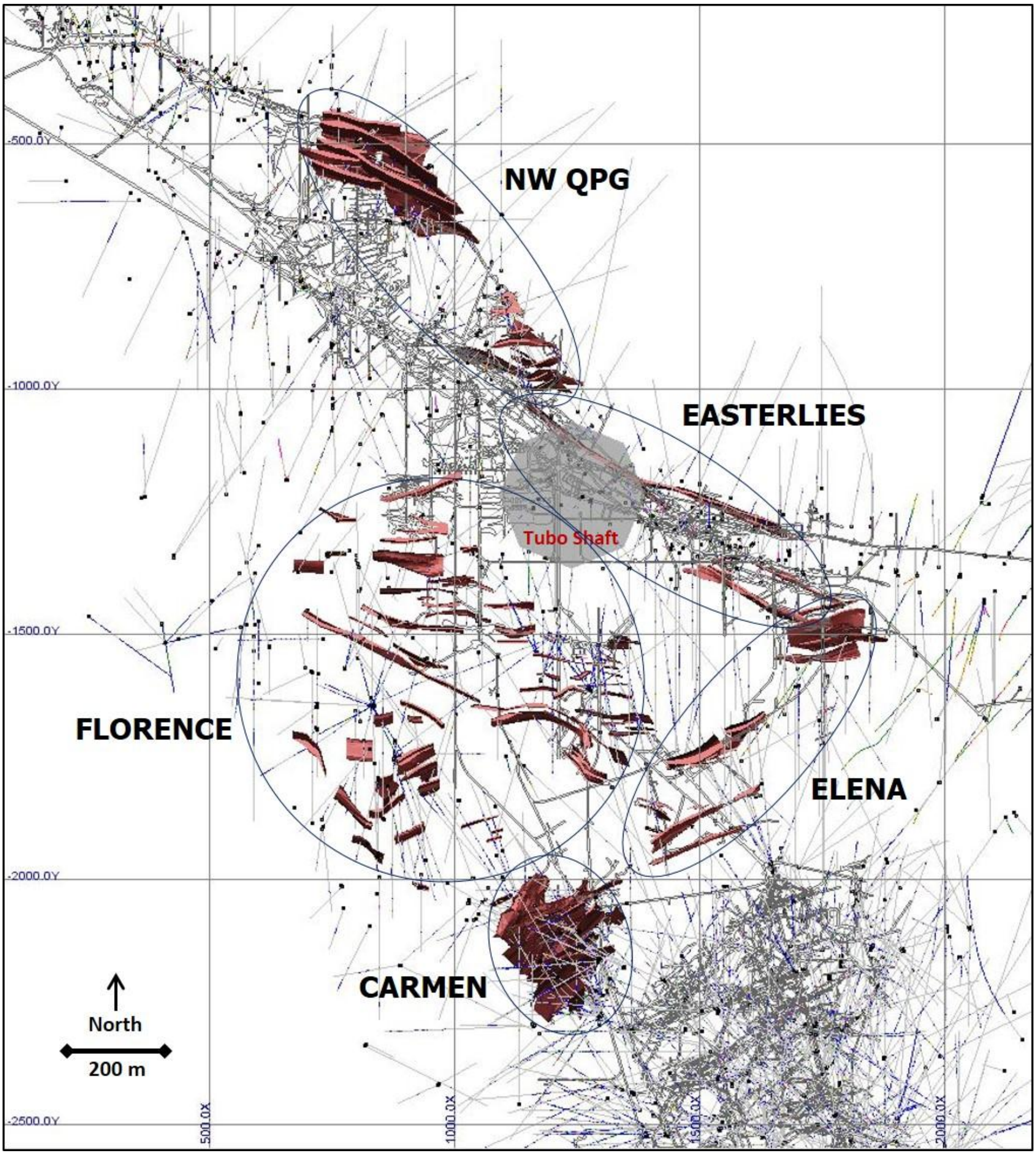



Figure 11-1. Plan view of the enargite-QPG ore bodies.

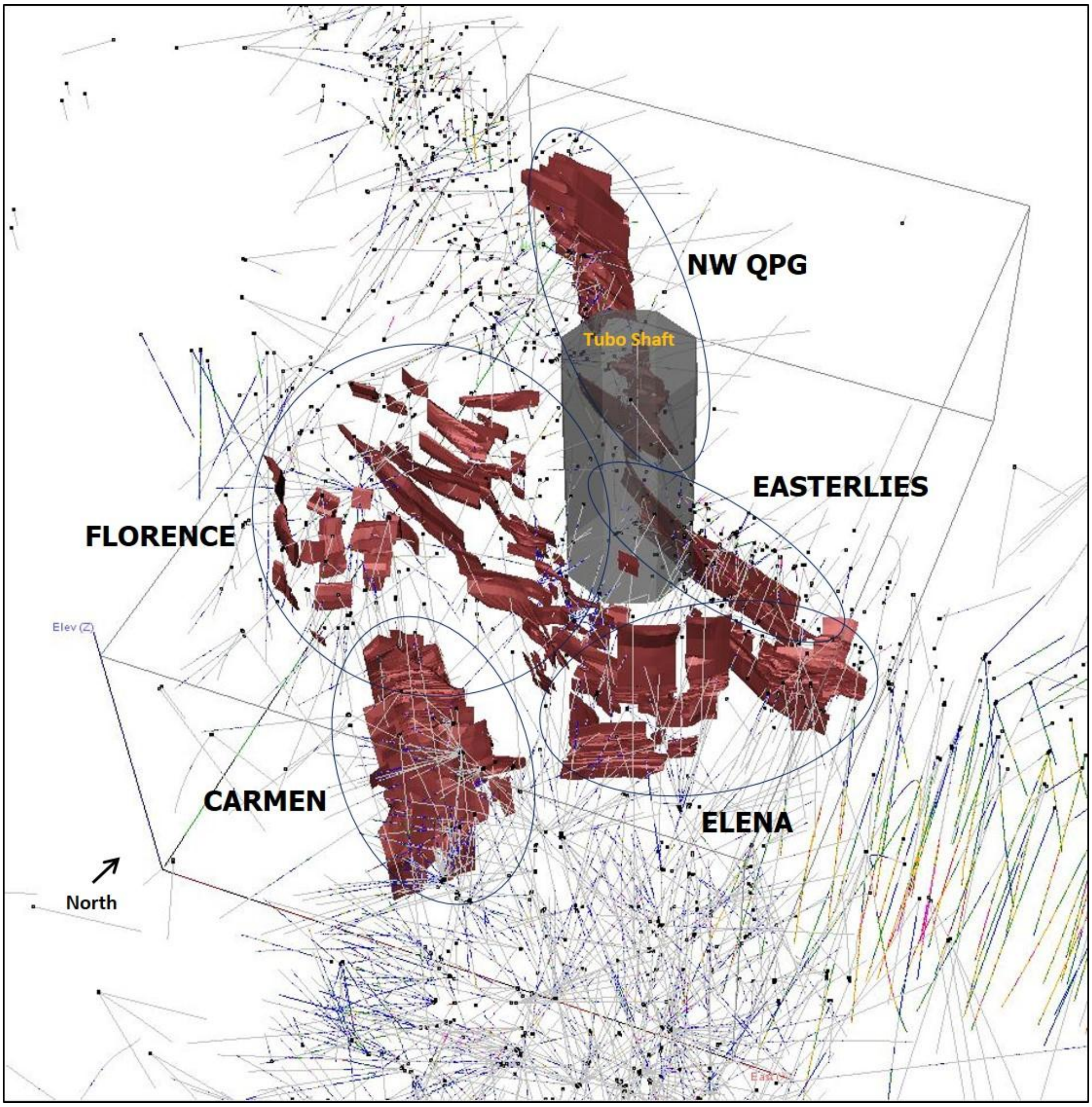



Figure 11-2. Three-dimensional view of the enargite-QPG ore bodies looking northwest.

## 11.4 Dry Bulk Density for Resource Estimation

The updated resource estimates applied a constant dry bulk density value of 2.7 t/$m^3$ for all enargite-QPG ores. This value was derived from historical density measurements of ores during the enargite mining operation until early 1997. The 2.7 t/$m^3$ density was also applied during the brief period when part of the Enargite deposit was briefly re-opened between 2007 and 2008.

In the second-half of 2016, Exploration Department initiated routine dry bulk density (DBD) measurements for recent enargite-QPG drill cores. The procedure is intermittently ongoing until sufficient measurements have been made to produce statistically representative DBD value. The latest summary as of 31 December 2016 shows an average of 2.72 from 849 enargite and/or QPG vein samples from drill cores. Consequently, the decision was to retain the historical 2.7 t/$m^3$ DBD value and thus be in the slightly conservative side.

As of end of year 2016, a total of 1,508 combined vein and wallrock samples were analyzed in the intermittently ongoing DBD testing. Based on the DBD database, moisture content of the raw core sample prior to drying is negligible. Nevertheless, samples are dried to ensure moisture content does not affect the bulk density determinations.

## 11.5 Geostatistical Analyses

### 11.5.1 Compositing

Compositing of raw assay data was undertaken in order to obtain an even representation of sample grades and to eliminate any bias into the data analysis due to variable sample length. The appropriate compositing lengths for the drillhole and channel cut samples were determined based on the dominant sample lengths.

A 1.0-m compositing length was applied for both drillholes and channel cut samples except for underground wall samples collected from 2015 to present which were composited at 0.5 m length.

The composites were only calculated for portions of drillholes and channel samples which fall within the wireframe. When the last sample in a hole or channel cut was less than 1.0 m, or 0.5 m in the case of a wall sample, the length of that sample was ignored.

### 11.5.2 Basic Statistics

Univariate statistical analysis of the composited drillhole data per domain was performed to characterize the variability of sample grades within the total population and to visualize the population distribution. Table 11-7, Table 11-8, Table 11-9 and Table 11-10 list the basic statistics for the gold and copper grades of all drillhole and channel sample composites. Domains that do not have entries indicate lack of composite samples inside the wireframes.

Table 11-7. Basic statistics of composited drillhole gold grades by area and domain.

| **Area** | **CARMEN** | | **FLORENCE** | | | | | | **ELENA** | | | | **NW QPG** | **EASTERLIES** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domain | **51** | **52** | **61** | **611** | **62** | **622** | **63** | **633** | **71** | **711** | **72** | **722** | **81** | **91** | **92** |
| No. of Samples | 1125 | 5 | 552 | 10 | 113 | | 238 | | 56 | | | | 1128 | 184 | 23 |
| Minimum | 0.00 | 0.75 | 0.00 | 0.30 | 0.07 | | 0.00 | | 0.05 | | | | 0.00 | 0.00 | 0.30 |
| Maximum | 98.61 | 2.77 | 18.92 | 2.89 | 91.03 | | 7.89 | | 14.73 | | | | 861.61 | 91.89 | 17.25 |
| **Mean** | **1.67** | **1.80** | **1.62** | **0.97** | **5.00** | | **1.34** | | **2.26** | | | | **4.73** | **3.38** | **4.38** |
| Median | 0.82 | 1.43 | 1.03 | 0.90 | 1.03 | | 0.96 | | 1.26 | | | | 1.38 | 1.30 | 1.27 |
| Variance | 22.92 | 0.64 | 5.15 | 0.51 | 244.93 | | 1.64 | | 9.13 | | | | 1389.94 | 65.31 | 28.16 |
| Standard Deviation | 4.79 | 0.80 | 2.27 | 0.72 | 15.65 | | 1.28 | | 3.02 | | | | 37.28 | 8.08 | 5.31 |
| **Coefficient of Variation** | **2.87** | **0.44** | **1.41** | **0.74** | **3.13** | | **0.95** | | **1.34** | | | | **7.88** | **2.39** | **1.21** |
| 10.0 Percentile | 0.26 | 0.75 | 0.27 | 0.31 | 0.31 | | 0.34 | | 0.21 | | | | 0.58 | 0.40 | 0.45 |
| 20.0 Percentile | 0.39 | 1.05 | 0.48 | 0.40 | 0.51 | | 0.51 | | 0.27 | | | | 0.77 | 0.69 | 0.62 |
| 30.0 Percentile | 0.53 | 1.35 | 0.62 | 0.49 | 0.69 | | 0.69 | | 0.39 | | | | 0.96 | 0.86 | 0.62 |
| 40.0 Percentile | 0.68 | 1.39 | 0.77 | 0.67 | 0.86 | | 0.69 | | 0.55 | | | | 1.15 | 1.17 | 0.83 |
| 50.0 Percentile (median) | 0.82 | 1.43 | 1.03 | 0.90 | 1.03 | | 0.96 | | 1.26 | | | | 1.38 | 1.30 | 1.27 |
| 60.0 Percentile | 1.03 | 2.07 | 1.29 | 1.00 | 1.21 | | 1.03 | | 1.37 | | | | 1.71 | 1.71 | 2.54 |
| 70.0 Percentile | 1.30 | 2.70 | 1.54 | 1.08 | 1.81 | | 1.47 | | 1.86 | | | | 2.29 | 2.69 | 5.41 |
| 80.0 Percentile | 1.71 | 2.74 | 2.06 | 1.17 | 2.54 | | 1.77 | | 3.09 | | | | 3.28 | 3.79 | 8.40 |
| 90.0 Percentile | 2.71 | 2.77 | 3.20 | 2.06 | 3.74 | | 3.09 | | 7.34 | | | | 5.24 | 7.39 | 13.68 |
| 95.5 Percentile | 4.75 | 2.77 | 5.00 | 2.89 | 46.01 | | 4.11 | | 8.23 | | | | 9.48 | 12.50 | 15.47 |
| 96.0 Percentile | 5.12 | 2.77 | 5.32 | 2.89 | 46.01 | | 4.11 | | 8.57 | | | | 10.50 | 13.03 | 15.47 |
| 96.5 Percentile | 5.56 | 2.77 | 5.58 | 2.89 | 66.53 | | 4.14 | | 8.57 | | | | 11.64 | 14.50 | 15.47 |
| 97.0 Percentile | 6.56 | 2.77 | 6.06 | 2.89 | 72.04 | | 4.37 | | 8.57 | | | | 13.19 | 14.50 | 15.47 |
| 97.5 Percentile | 7.92 | 2.77 | 6.25 | 2.89 | 72.04 | | 4.67 | | 11.65 | | | | 15.47 | 15.70 | 15.47 |
| 98.0 Percentile | 9.63 | 2.77 | 11.27 | 2.89 | 77.54 | | 5.00 | | 11.65 | | | | 20.59 | 16.90 | 17.25 |
| 98.5 Percentile | 15.19 | 2.77 | 11.76 | 2.89 | 77.54 | | 5.44 | | 11.65 | | | | 26.75 | 18.70 | 17.25 |
| 99.0 Percentile | 17.96 | 2.77 | 12.66 | 2.89 | 84.93 | | 7.57 | | 11.65 | | | | 39.26 | 34.14 | 17.25 |
| 99.5 Percentile | 26.15 | 2.77 | 16.70 | 2.89 | 84.93 | | 7.89 | | 14.73 | | | | 55.64 | 70.31 | 17.25 |

Table 11-8. Basic statistics of composited drillhole copper grades by area and domain.

| **Area** | **CARMEN** | | **FLORENCE** | | | | | | **ELENA** | | | | **NW QPG** | **EASTERLIES** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domain | **51** | **52** | **61** | **611** | **62** | **622** | **63** | **633** | **71** | **711** | **72** | **722** | **81** | **91** | **92** |
| No. of Samples | 1125 | 5 | 552 | 10 | 113 | | 238 | | 56 | | | | 1128 | 184 | 23 |
| Minimum | 0.00 | 0.01 | 0.01 | 0.15 | 0.01 | | 0.02 | | 0.06 | | | | 0.00 | 0.01 | 0.05 |
| Maximum | 7.440 | 0.060 | 19.550 | 6.880 | 5.790 | | 6.530 | | 4.820 | | | | 10.320 | 6.330 | 4.850 |
| **Mean** | **0.578** | **0.020** | **1.256** | **1.388** | **0.927** | | **1.063** | | **1.883** | | | | **0.457** | **0.817** | **1.539** |
| Median | 0.250 | 0.010 | 0.750 | 0.620 | 0.600 | | 0.545 | | 1.445 | | | | 0.130 | 0.290 | 0.950 |
| Variance | 0.631 | 0.000 | 2.665 | 3.609 | 1.250 | | 1.400 | | 1.569 | | | | 0.938 | 1.508 | 2.130 |
| Standard Deviation | 0.794 | 0.020 | 1.633 | 1.900 | 1.118 | | 1.183 | | 1.253 | | | | 0.968 | 1.228 | 1.460 |
| **Coefficient of Variation** | **1.374** | **1.000** | **1.300** | **1.369** | **1.206** | | **1.113** | | **0.665** | | | | **2.120** | **1.503** | **0.949** |
| 10.0 Percentile | 0.04 | 0.01 | 0.07 | 0.26 | 0.10 | | 0.15 | | 0.67 | | | | 0.02 | 0.04 | 0.20 |
| 20.0 Percentile | 0.07 | 0.01 | 0.23 | 0.44 | 0.18 | | 0.28 | | 0.79 | | | | 0.03 | 0.10 | 0.34 |
| 30.0 Percentile | 0.12 | 0.01 | 0.35 | 0.51 | 0.29 | | 0.35 | | 1.05 | | | | 0.05 | 0.12 | 0.43 |
| 40.0 Percentile | 0.17 | 0.01 | 0.57 | 0.53 | 0.47 | | 0.40 | | 1.33 | | | | 0.08 | 0.17 | 0.47 |
| 50.0 Percentile (median) | 0.25 | 0.01 | 0.75 | 0.62 | 0.60 | | 0.55 | | 1.45 | | | | 0.13 | 0.29 | 0.95 |
| 60.0 Percentile | 0.42 | 0.01 | 0.95 | 0.80 | 0.82 | | 0.80 | | 1.81 | | | | 0.20 | 0.45 | 1.64 |
| 70.0 Percentile | 0.62 | 0.01 | 1.38 | 1.12 | 0.95 | | 1.22 | | 2.30 | | | | 0.35 | 0.73 | 1.84 |
| 80.0 Percentile | 0.93 | 0.04 | 1.98 | 1.67 | 1.19 | | 1.66 | | 3.38 | | | | 0.57 | 1.26 | 2.99 |
| 90.0 Percentile | 1.52 | 0.06 | 2.99 | 4.44 | 2.04 | | 2.75 | | 3.76 | | | | 1.05 | 2.82 | 4.25 |
| 95.5 Percentile | 2.08 | 0.06 | 4.34 | 6.88 | 4.17 | | 3.54 | | 4.30 | | | | 2.13 | 3.83 | 4.55 |
| 96.0 Percentile | 2.17 | 0.06 | 4.40 | 6.88 | 4.17 | | 3.55 | | 4.80 | | | | 2.42 | 3.90 | 4.55 |
| 96.5 Percentile | 2.35 | 0.06 | 5.01 | 6.88 | 4.44 | | 3.91 | | 4.80 | | | | 2.61 | 3.92 | 4.55 |
| 97.0 Percentile | 2.55 | 0.06 | 5.44 | 6.88 | 4.73 | | 4.27 | | 4.80 | | | | 2.73 | 3.92 | 4.55 |
| 97.5 Percentile | 2.83 | 0.06 | 6.03 | 6.88 | 4.73 | | 4.48 | | 4.81 | | | | 3.00 | 3.94 | 4.55 |
| 98.0 Percentile | 3.29 | 0.06 | 6.44 | 6.88 | 5.29 | | 4.68 | | 4.81 | | | | 3.46 | 4.66 | 4.85 |
| 98.5 Percentile | 3.54 | 0.06 | 7.01 | 6.88 | 5.29 | | 4.74 | | 4.81 | | | | 4.24 | 5.38 | 4.85 |
| 99.0 Percentile | 3.74 | 0.06 | 7.50 | 6.88 | 5.78 | | 6.30 | | 4.81 | | | | 4.83 | 5.75 | 4.85 |
| 99.5 Percentile | 4.50 | 0.06 | 8.05 | 6.88 | 5.78 | | 6.42 | | 4.82 | | | | 6.70 | 6.23 | 4.85 |

Table 11-9. Basic statistics of composited channel gold grades by area and domain.

| **Area** | **CARMEN** | | **FLORENCE** | | | | | | **ELENA** | | | | **NW QPG** | **EASTERLIES** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domain | **51** | **52** | **61** | **611** | **62** | **622** | **63** | **633** | **71** | **711** | **72** | **722** | **81** | **91** | **92** |
| No. of Samples | 11234 | | 968 | 508 | 294 | 4 | 266 | 747 | 2748 | 729 | 88 | 90 | 542 | | |
| Minimum | 0.00 | | 0.11 | 0.00 | 0.00 | 3.77 | 0.00 | 0.17 | 0.00 | 0.00 | 0.13 | 0.07 | 0.07 | | |
| Maximum | 330.65 | | 32.70 | 9.09 | 32.40 | 8.23 | 12.00 | 28.67 | 423.60 | 116.57 | 18.82 | 14.63 | 204.10 | | |
| **Mean** | **3.59** | | **1.55** | **1.67** | **2.10** | **6.00** | **2.16** | **1.97** | **2.88** | **1.42** | **1.29** | **1.49** | **6.12** | | |
| Median | 1.81 | | 0.97 | 1.27 | 0.86 | 6.00 | 1.03 | 1.33 | 1.03 | 0.69 | 0.69 | 1.07 | 2.71 | | |
| Variance | 61.73 | | 5.99 | 1.57 | 19.23 | 4.97 | 8.39 | 4.59 | 150.90 | 38.49 | 6.88 | 4.56 | 178.26 | | |
| Standard Deviation | 7.86 | | 2.45 | 1.25 | 4.39 | 2.23 | 2.90 | 2.14 | 12.28 | 6.20 | 2.62 | 2.13 | 13.35 | | |
| **Coefficient of Variation** | **2.19** | | **1.58** | **0.75** | **2.09** | **0.37** | **1.34** | **1.09** | **4.26** | **4.36** | **2.03** | **1.43** | **2.18** | | |
| 10.0 Percentile | 0.69 | | 0.37 | 0.57 | 0.34 | 0.00 | 0.00 | 0.57 | 0.34 | 0.29 | 0.30 | 0.36 | 0.90 | | |
| 20.0 Percentile | 1.02 | | 0.52 | 0.80 | 0.34 | 3.77 | 0.00 | 0.73 | 0.55 | 0.34 | 0.39 | 0.48 | 1.28 | | |
| 30.0 Percentile | 1.23 | | 0.68 | 0.96 | 0.51 | 3.77 | 0.26 | 0.93 | 0.69 | 0.34 | 0.46 | 0.66 | 1.62 | | |
| 40.0 Percentile | 1.47 | | 0.80 | 1.17 | 0.69 | 6.00 | 0.69 | 1.13 | 0.86 | 0.51 | 0.50 | 0.77 | 2.21 | | |
| 50.0 Percentile (median) | 1.81 | | 0.97 | 1.27 | 0.86 | 6.00 | 1.03 | 1.33 | 1.03 | 0.69 | 0.69 | 1.07 | 2.71 | | |
| 60.0 Percentile | 2.27 | | 1.12 | 1.54 | 1.06 | 6.00 | 1.37 | 1.70 | 1.37 | 0.69 | 0.87 | 1.23 | 3.63 | | |
| 70.0 Percentile | 2.91 | | 1.43 | 1.89 | 1.49 | 8.23 | 2.40 | 2.02 | 2.03 | 0.96 | 1.13 | 1.57 | 5.03 | | |
| 80.0 Percentile | 4.20 | | 1.80 | 2.23 | 2.06 | 8.23 | 4.11 | 2.77 | 3.09 | 1.20 | 1.44 | 1.89 | 7.98 | | |
| 90.0 Percentile | 7.20 | | 2.85 | 3.17 | 3.95 | 8.23 | 5.20 | 3.63 | 6.17 | 1.97 | 1.84 | 2.39 | 12.30 | | |
| 95.5 Percentile | 12.00 | | 4.59 | 4.24 | 10.52 | 8.23 | 9.60 | 5.60 | 11.09 | 3.52 | 2.27 | 3.35 | 20.99 | | |
| 96.0 Percentile | 12.70 | | 5.10 | 4.42 | 10.86 | 8.23 | 9.80 | 6.44 | 12.17 | 3.70 | 2.27 | 3.35 | 21.51 | | |
| 96.5 Percentile | 14.05 | | 5.67 | 4.55 | 11.83 | 8.23 | 10.80 | 6.67 | 13.20 | 4.25 | 5.14 | 3.43 | 25.12 | | |
| 97.0 Percentile | 15.20 | | 6.60 | 4.95 | 12.39 | 8.23 | 11.00 | 7.50 | 14.92 | 5.41 | 5.14 | 3.43 | 30.45 | | |
| 97.5 Percentile | 17.41 | | 7.34 | 5.04 | 13.19 | 8.23 | 11.20 | 7.78 | 15.90 | 7.10 | 11.89 | 9.03 | 31.16 | | |
| 98.0 Percentile | 19.80 | | 8.88 | 5.31 | 13.45 | 8.23 | 11.49 | 8.43 | 18.22 | 7.50 | 11.89 | 9.03 | 34.89 | | |
| 98.5 Percentile | 23.20 | | 9.49 | 6.12 | 27.43 | 8.23 | 11.55 | 9.51 | 20.32 | 9.65 | 17.30 | 14.63 | 37.39 | | |
| 99.0 Percentile | 29.60 | | 10.95 | 7.03 | 30.69 | 8.23 | 11.60 | 11.68 | 24.00 | 14.20 | 17.30 | 14.63 | 53.81 | | |
| 99.5 Percentile | 44.00 | | 15.91 | 7.72 | 32.32 | 8.23 | 12.00 | 13.11 | 31.71 | 17.03 | 18.82 | 14.63 | 80.91 | | |

Table 11-10. Basic statistics of composited channel copper grades by area and domain.

| **Area** | **CARMEN** | | **FLORENCE** | | | | | | **ELENA** | | | | **NW QPG** | **EASTERLIES** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domain | **51** | **52** | **61** | **611** | **62** | **622** | **63** | **633** | **71** | **711** | **72** | **722** | **81** | **91** | **92** |
| No. of Samples | 11234 | | 968 | 508 | 294 | 4 | 266 | 747 | 2748 | 729 | 88 | 90 | 542 | | |
| Minimum | 0.00 | | 0.00 | 0.03 | 0.04 | 1.90 | 0.04 | 0.03 | 0.01 | 0.02 | 0.07 | 0.01 | 0.00 | | |
| Maximum | 47.000 | | 15.350 | 14.650 | 7.000 | 2.000 | 4.500 | 17.550 | 22.800 | 14.000 | 10.700 | 15.700 | 15.900 | | |
| **Mean** | **2.215** | | **1.807** | **2.407** | **1.065** | **1.950** | **1.118** | **2.806** | **2.313** | **2.375** | **2.389** | **3.435** | **0.490** | | |
| Median | 1.600 | | 1.060 | 1.920 | 0.720 | 1.950 | 0.785 | 1.700 | 1.735 | 1.960 | 1.715 | 1.610 | 0.120 | | |
| Variance | 6.468 | | 4.066 | 4.540 | 1.154 | 0.003 | 0.968 | 8.899 | 5.223 | 3.222 | 5.249 | 14.619 | 1.250 | | |
| Standard Deviation | 2.543 | | 2.016 | 2.131 | 1.074 | 0.050 | 0.984 | 2.983 | 2.285 | 1.795 | 2.291 | 3.823 | 1.118 | | |
| **Coefficient of Variation** | **1.148** | | **1.116** | **0.885** | **1.008** | **0.026** | **0.880** | **1.063** | **0.988** | **0.756** | **0.959** | **1.113** | **2.283** | | |
| 10.0 Percentile | 0.28 | | 0.16 | 0.35 | 0.11 | 0.00 | 0.16 | 0.24 | 0.29 | 0.45 | 0.28 | 0.14 | 0.00 | | |
| 20.0 Percentile | 0.55 | | 0.30 | 0.73 | 0.18 | 1.90 | 0.27 | 0.57 | 0.59 | 0.90 | 0.61 | 0.42 | 0.00 | | |
| 30.0 Percentile | 0.90 | | 0.52 | 0.96 | 0.26 | 1.90 | 0.40 | 0.86 | 1.00 | 1.30 | 0.89 | 0.96 | 0.04 | | |
| 40.0 Percentile | 1.30 | | 0.79 | 1.37 | 0.41 | 1.95 | 0.59 | 1.06 | 1.40 | 1.60 | 1.24 | 1.37 | 0.07 | | |
| 50.0 Percentile (median) | 1.60 | | 1.06 | 1.92 | 0.72 | 1.95 | 0.79 | 1.70 | 1.74 | 1.96 | 1.72 | 1.61 | 0.12 | | |
| 60.0 Percentile | 1.90 | | 1.61 | 2.43 | 1.06 | 1.95 | 1.20 | 2.60 | 2.20 | 2.40 | 2.19 | 2.93 | 0.19 | | |
| 70.0 Percentile | 2.40 | | 2.23 | 3.08 | 1.50 | 2.00 | 1.40 | 3.44 | 2.70 | 3.00 | 3.03 | 4.38 | 0.33 | | |
| 80.0 Percentile | 3.20 | | 3.00 | 3.75 | 1.90 | 2.00 | 1.90 | 4.74 | 3.40 | 3.50 | 3.90 | 6.06 | 0.65 | | |
| 90.0 Percentile | 4.70 | | 4.27 | 4.78 | 2.40 | 2.00 | 2.75 | 6.57 | 4.82 | 4.80 | 5.12 | 9.15 | 1.25 | | |
| 95.5 Percentile | 6.80 | | 6.10 | 6.58 | 3.22 | 2.00 | 3.00 | 9.45 | 6.80 | 6.00 | 8.15 | 12.60 | 2.72 | | |
| 96.0 Percentile | 7.16 | | 6.35 | 6.60 | 3.39 | 2.00 | 3.10 | 9.78 | 6.95 | 6.20 | 8.15 | 12.60 | 2.80 | | |
| 96.5 Percentile | 7.85 | | 6.50 | 6.80 | 3.51 | 2.00 | 3.30 | 10.48 | 7.30 | 6.30 | 8.90 | 12.95 | 2.90 | | |
| 97.0 Percentile | 8.20 | | 6.70 | 7.45 | 3.70 | 2.00 | 3.45 | 11.10 | 8.15 | 6.50 | 8.90 | 12.95 | 3.22 | | |
| 97.5 Percentile | 8.80 | | 7.03 | 8.03 | 3.80 | 2.00 | 3.50 | 11.40 | 8.62 | 6.78 | 9.75 | 14.50 | 3.35 | | |
| 98.0 Percentile | 9.75 | | 7.53 | 8.20 | 4.15 | 2.00 | 3.70 | 12.30 | 9.15 | 6.90 | 9.75 | 14.50 | 3.57 | | |
| 98.5 Percentile | 11.00 | | 8.15 | 8.23 | 4.80 | 2.00 | 4.00 | 13.00 | 9.90 | 7.58 | 10.60 | 15.70 | 3.88 | | |
| 99.0 Percentile | 12.00 | | 10.00 | 11.70 | 4.80 | 2.00 | 4.30 | 13.45 | 11.50 | 8.60 | 10.60 | 15.70 | 4.53 | | |
| 99.5 Percentile | 17.20 | | 11.18 | 12.35 | 5.90 | 2.00 | 4.50 | 14.80 | 14.56 | 9.80 | 10.70 | 15.70 | 6.31 | | |

### 11.5.3 Top-cut

Top-cuts grades were applied to both drillhole and channel samples in order to reduce the effect of extreme high grade samples during grade interpolation. Statistical parameters such as coefficient of variation (CoV), mean plots, metal loss and percentage of capped data were used as guides to determine the appropriate top-cut grade. Following the general rule of thumb in compositing, composited assay data with CoV greater than 1.2 were capped, the amount of metal loss after application of top-cut (mean capped grades divided by the mean composite grades) should be less than 10% and the percentage of capped data relative to the total assay population should be less than 5%.

Drillhole samples that have high gold and copper grades were capped at the 99$^{th}$ and 98.5$^{th}$ percentile, respectively. Meanwhile, channel samples with high gold grades were capped at the 98$^{th}$ percentile. The copper grades of channel samples have CoV's that are less than 1.2 and thus were not capped.

Table 11-11 below shows the top-cut grades applied for the extreme high grade samples from drillholes and channel cuts.

Table 11-11. Top-cut grades of gold outliers.

| Deposit | Domain | DRILLHOLE | | | | CHANNEL CUT | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Au (g/t) | | Cu (%) | | Au (g/t) | | Cu (%) | |
| | | Max | Cap | Max | Cap | Max | Cap | Max | Cap |
| Carmen | 51 | 98.61 | 18 | 7.44 | 5 | 330.65 | 23 | 47 | *None* |
| | 52 | 2.77 | *None* | 0.06 | *None* | | | | |
| Florence | 61 | 18.93 | 12 | 19.55 | 8 | 32.7 | 8 | 15.35 | *None* |
| | 611 | 2.89 | *None* | 6.88 | 6 | 9.09 | *None* | 14.65 | *None* |
| | 62 | 91.03 | 15 | 5.79 | *None* | 32.4 | 20 | 7 | *None* |
| | 622 | | | | | 8.23 | *None* | 2 | *None* |
| | 63 | 7.89 | *None* | 6.53 | *None* | 12 | 10 | 4.5 | *None* |
| | 633 | | | | | 28.67 | *None* | 17.55 | *None* |
| Elena | 71 | 14.73 | 10 | 4.83 | *None* | 423.6 | 23 | 22.8 | *None* |
| | 711 | | | | | 116.57 | 17 | 14 | *None* |
| | 72 | | | | | 18.83 | 13 | 10.7 | *None* |
| | 722 | | | | | 14.63 | 6 | 15.7 | *None* |
| NW QPG | 81 | 861.61 | 20 | 10.32 | 4 | 204.1 | 31 | 15.9 | 3 |
| Easterlies | 91 | 91.89 | 23 | 6.33 | 4 | 22.53 | *None* | 0.2 | *None* |
| | 92 | 17.25 | *None* | 4.85 | *None* | | | | |

## 11.6 Variography

A separate semi-variogram analysis for capped gold and copper samples per mineralized domain was carried out to understand the grade continuity between samples according to their separation distance and orientation. Two types of variogram were calculated and modeled. The first type was linear variogram which determined the value of nugget effect and the second type was directional variogram which determined the orientation and maximum distance of grade continuity in three dimensions.

### 11.6.1 Linear Semi-variogram

Linear or downhole semi-variogram analysis was conducted to determine the value of nugget effect for later directional variogram modeling. The nugget effect describes the difference between sample grades when their separation distance is zero or almost negligible. The nugget effect derived from linear variography is summarized in Table 11-12, Table 11-13, Table 11-14 and Table 11-15.

### 11.6.2 Directional Semi-variogram

Directional semi-variogram analysis was performed to understand the anisotropy of the data or the variability of samples with respect to distance and direction. Variogram maps of 7.5 degree angular increment were created to aid in determining the orientation of samples that has the lowest variability for the longest range (orientation of maximum continuity of mineralization). Two variogram maps were generated namely primary variogram map which determined the orientation of the major axis or strike of mineralization, and secondary variogram map which determined the orientation of the semi-major and minor axes. The major, semi-major, and minor axes correspond to the axes of the search ellipsoid used in estimation. The results of the semi-variogram analysis are also summarized in Table 11-12, Table 11-13, Table 11-14 and Table 11-15.

Table 11-12. Variogram parameters for drillhole gold grades.

| Area | Domain | Principal Azimuth | Principal Dip | Intermediate Azimuth | Nugget Effect (C0) | Major Axis | Semi-major Axis | Minor Axis | Total Sill |
|---|---|---|---|---|---|---|---|---|---|
| Carmen | 51 | 223.2 | 6.8 | 324.8 | 0.2 | 25 | 15 | 5 | 5.1 |
| | 52 | 290.0 | 0.5 | 0.0 | 0.1 | 20 | 10 | 5 | 1.1 |
| Florence | 61,611 | 278.7 | -7.4 | 163.1 | 0.1 | 45 | 23 | 12 | 4.3 |
| | 62,622 | 241.0 | -14.5 | 108.0 | 0.2 | 23 | 12 | 5 | 15.4 |
| | 63,633 | 303.8 | -4.3 | 183.9 | 0.1 | 45 | 27 | 25 | 1.8 |
| Elena | 71,711 | 240.2 | 1.0 | 333.8 | 0.3 | 20 | 10 | 5 | 1.4 |
| | 72,722 | No data points | | | | | | | |
| NW QPG | 81 | 274.8 | -14.1 | 142.5 | 0.5 | 25 | 10 | 5 | 39.7 |
| Easterlies | 91 | 294.2 | -15.0 | 141.2 | 0.0 | 50 | 40 | 30 | 13.7 |
| | 92 | 75.0 | 0.5 | 0.0 | 0.0 | 20 | 10 | 5 | 1.0 |

Table 11-13. Variogram parameters for drillhole copper grades.

| Area | Domain | Principal Azimuth | Principal Dip | Intermediate Azimuth | Nugget Effect (C0) | Major Axis | Semi-major Axis | Minor Axis | Total Sill |
|---|---|---|---|---|---|---|---|---|---|
| Carmen | 51 | 223.0 | 6.3 | 323.8 | 0.1 | 30 | 20 | 5 | 0.9 |
| | 52 | 290.0 | 0.5 | 0.0 | 0.0 | 20 | 10 | 5 | 1.0 |
| Florence | 61,611 | 280.9 | 4.9 | 42.3 | 0.0 | 55 | 48 | 43 | 2.1 |
| | 62,622 | 249.0 | 14.5 | 10.1 | 0.0 | 25 | 20 | 6 | 0.4 |
| | 63,633 | 303.7 | -4.8 | 196.3 | 0.1 | 52 | 33 | 13 | 1.6 |
| Elena | 71,711 | 240.2 | 1.0 | 333.8 | 0.1 | 20 | 10 | 5 | 0.7 |
| | 72,722 | No data points | | | | | | | |
| NW QPG | 81 | 274.8 | -14.1 | 142.5 | 0.0 | 15 | 7 | 3 | 1.8 |
| Easterlies | 91 | 295.4 | 8.0 | 111.8 | 0.0 | 50 | 30 | 25 | 1.1 |
| | 92 | 75.0 | 0.5 | 0.0 | 0.0 | 20 | 10 | 5 | 1.0 |

Table 11-14. Variogram parameters for channel cut gold grades.

| Area | Domain | Principal Azimuth | Principal Dip | Intermediate Azimuth | Nugget Effect (C0) | Major Axis | Semi-major Axis | Minor Axis | Total Sill |
|---|---|---|---|---|---|---|---|---|---|
| Carmen | 51 | 220.4 | 0.9 | 312.6 | 0.1 | 10 | 7 | 3 | 8.1 |
| | 52 | No data points | | | | | | | |
| Florence | 61,611 | 278.7 | -7.4 | 179.2 | 0.0 | 20 | 12 | 8 | 2.3 |
| | 62,622 | 242.9 | -7.7 | 126.3 | 0.0 | 7 | 4 | 3 | 11.0 |
| | 63,633 | 303.0 | -7.2 | 169.3 | 0.1 | 24 | 8 | 6 | 7.3 |
| Elena | 71,711 | 240.2 | 1.0 | 333.8 | 0.1 | 20 | 10 | 5 | 4.4 |
| | 72,722 | 290.3 | 1.0 | 23.9 | 0.1 | 20 | 12 | 5 | 2.5 |
| NW QPG | 81 | 279.8 | -0.5 | 188.7 | 0.3 | 10 | 5 | 3 | 10.9 |
| Easterlies | 91 | 294.2 | -15.0 | 141.2 | 0.0 | 15 | 10 | 5 | 1.0 |
| | 92 | No data points | | | | | | | |

Table 11-15. Variogram parameters for channel cut copper grades.

| Area | Domain | Principal Azimuth | Principal Dip | Intermediate Azimuth | Nugget Effect (C0) | Major Axis | Semi-major Axis | Minor Axis | Total Sill |
|---|---|---|---|---|---|---|---|---|---|
| Carmen | 51 | 220.4 | 0.9 | 312.7 | 0.1 | 10 | 7 | 5 | 1.8 |
| | 52 | No data points | | | | | | | |
| Florence | 61,611 | 278.7 | -7.4 | 179.2 | 0.0 | 16 | 8 | 6 | 2.3 |
| | 62,622 | 242.9 | -7.7 | 126.3 | 0.0 | 14 | 9 | 4 | 0.9 |
| | 63,633 | 303.7 | -4.8 | 181.1 | 0.0 | 14 | 11 | 8 | 0.9 |
| Elena | 71,711 | 240.2 | 1.0 | 337.6 | 0.0 | 15 | 10 | 5 | 0.9 |
| | 72,722 | 290.3 | 1.0 | 23.9 | 0.0 | 10 | 5 | 3 | 3.2 |
| NW QPG | 81 | 279.8 | -0.5 | 188.1 | 0.0 | 10 | 5 | 3 | 2.9 |
| Easterlies | 91 | 294.2 | -15.0 | 141.2 | 0.0 | 15 | 10 | 5 | 1.0 |
| | 92 | No data points | | | | | | | |

## 11.7 Estimation Parameters and Method

### 11.7.1 Estimation Technique for Grade Interpolation

The early in-house resource estimates of the enargite-QPG ore bodies used the inverse distance squared (IDS) method for gold and copper interpolation. This technique of grade interpolation was applied following the method used by Lepanto's consulting Resource Geologist in his initial resource estimates and for the purpose of consistency when comparing the resource updates against the earlier estimates (Orssich, 2014).

While IDS method is still an acceptable technique in resource estimation, majority of the resource geologists nowadays prefer to use the ordinary kriging (OK) method in grade interpolation. This technique is considered more superior compared to other methods because it considers the nugget effect and its algorithm uses 3D variograms to automatically eliminate the bias caused by data clustering.

In March 2017, the Exploration team conducted a re-estimation of the enargite-QPG mineral resource using the OK method and compared its results against the earlier estimates by IDS. Comparison of the two estimates show that OK resulted to slightly higher tonnage but the global gold and copper resource grades derived from the two methods do not vary significantly (Abrenica, 2017).

The updated resource estimates of the enargite-QPG deposits that are presented in this report applied the ordinary kriging method for gold and copper interpolation.

### 11.7.2 Search Parameters

#### *11.7.2.1 Search Ellipse Distance*

Four interpolation search passes were used to assign values for gold and copper to blocks within the wireframes. Pass 1 used a one variogram range search radius for drillhole samples. Pass 2 used a one variogram range search radius for channel cut samples. Passes 3 and 4 used 50.0 m and 75.0 m search radii along strike, respectively, while maintaining anisotropic ratios using drillhole samples. In GEMS, only blocks that have not been assigned values in previous runs are assigned values in subsequent runs. This means that Pass 1 has priority over Pass 2 which has priority over Pass 3, and so on. The dimensions of the search ellipses are summarized in Table 11-16 and Table 11-17.

Table 11-16. Search distance parameters for gold (in meters).

| Area | Domain | Drillhole | | | Channel Cut | | | Drillhole | | | Drillhole | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1st Pass | | | 2nd Pass | | | 3rd Pass | | | 4th Pass | | |
| | | Major Range | Semi-Major Range | Minor Range | Major Range | Semi-Major Range | Minor Range | Major Range | Semi-Major Range | Minor Range | Major Range | Semi-Major Range | Minor Range |
| Carmen | 51 | 25 | 15 | 5 | 10 | 7 | 3 | 50 | 30 | 10 | 75 | 45 | 15 |
| | 52 | 20 | 10 | 5 | - | - | - | 50 | 25 | 10 | 75 | 38 | 19 |
| Florence | 61 | 45 | 23 | 12 | 20 | 12 | 8 | 50 | 25 | 15 | 75 | 38 | 20 |
| | 62 | 23 | 12 | 5 | 7 | 4 | 3 | 50 | 25 | 10 | 75 | 39 | 16 |
| | 63 | 45 | 27 | 25 | 24 | 8 | 6 | 50 | 30 | 28 | 75 | 45 | 42 |
| Elena | 71 | 20 | 10 | 5 | 20 | 10 | 5 | 50 | 25 | 10 | 75 | 38 | 19 |
| | 72 | - | - | - | 20 | 12 | 5 | - | - | - | - | - | - |
| NW QPG | 81 | 25 | 10 | 5 | 10 | 5 | 3 | 50 | 20 | 10 | 75 | 30 | 15 |
| Easterlies | 91 | 50 | 40 | 30 | 15 | 10 | 5 | 50 | 40 | 30 | 75 | 60 | 45 |
| | 92 | 20 | 10 | 5 | - | - | - | 50 | 25 | 10 | 75 | 38 | 19 |

Table 11-17. Search distance parameters for copper (in meters).

| Area | Domain | Drillhole | | | Channel Cut | | | Drillhole | | | Drillhole | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1st Pass | | | 2nd Pass | | | 3rd Pass | | | 4th Pass | | |
| | | Major Range | Semi-Maj Range | Minor Range | Major Range | Semi-Maj Range | Minor Range | Major Range | Semi-Maj Range | Minor Range | Major Range | Semi-Maj Range | Minor Range |
| Carmen | 51 | 30 | 20 | 5 | 10 | 7 | 5 | 50 | 30 | 10 | 75 | 50 | 13 |
| | 52 | 20 | 10 | 5 | - | - | - | 50 | 25 | 10 | 75 | 38 | 19 |
| Florence | 61 | 55 | 48 | 43 | 16 | 8 | 6 | 55 | 48 | 43 | 75 | 65 | 59 |
| | 62 | 25 | 20 | 6 | 14 | 9 | 4 | 50 | 40 | 15 | 75 | 60 | 18 |
| | 63 | 52 | 33 | 13 | 14 | 11 | 8 | 52 | 33 | 13 | 75 | 48 | 19 |
| Elena | 71 | 20 | 10 | 5 | 15 | 10 | 5 | 50 | 25 | 10 | 75 | 38 | 19 |
| | 72 | - | - | - | 10 | 5 | 3 | - | - | - | - | - | - |
| NW QPG | 81 | 15 | 7 | 3 | 10 | 5 | 3 | 50 | 25 | 10 | 75 | 35 | 15 |
| Easterlies | 91 | 50 | 30 | 25 | 15 | 10 | 5 | 50 | 30 | 25 | 75 | 45 | 38 |
| | 92 | 20 | 10 | 5 | - | - | - | 50 | 25 | 10 | 75 | 38 | 19 |

*11.7.2.2 Number of Samples*

Passes 1, 2, 3 and 4 used a minimum number of samples of 4, 3, 2 and 2 respectively; and a maximum number of samples of 12, 12, 10 and 10, respectively, for both gold and copper.

### 11.7.3 Volume and Tonnage Calculation

GEMS software uses its built-in function called Volumetrics to estimate volumes of materials. Volumetrics employs a numerical integration technique known as needling that involves piercing the data objects with thousands of needles. Each needle has a weighting based on spacing and orientation and are always generated perpendicular to a specific plane. The more needles used, the better the accuracy.

Volume calculation was performed by constraining the needles *within* the geology solid/wireframes. In this method, GEMS only sums up the volumes from the penetration point to the exit point with the geology solid. Therefore if a block happened to occupy only a portion of the solid, the portion of the block that is inside the solid will be included in the volume estimation while the remaining outside portion will be disregarded. An integration level of 10, equivalent to 100 needles per block, was applied in volume estimation.

The tonnages reported in the updated enargite-QPG mineral estimates were estimated on a dry basis and are expressed as dry metric tonnes.

## 11.8 Block Modeling

### 11.8.1 Block Model Dimensions

The updated enargite-QPG block model is non-rotated and consists of regular shaped blocks measuring 4x4x4 m (X-Y-Z). The choice of block size was based primarily on the recommendation of the Mine Engineering Team for their mine planning studies.

The tables below summarize the characteristics of the enargite-QPG block model. The block model origin was defined based on the minimum easting and northing coordinates and the maximum elevation.

Table 11-18. Dimensions for the enargite-QPG block model.

| | **Coordinates** | | | **No. of Blocks** | | | **Block Size** | | | **Block Rotation** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Easting** | **Northing** | **Elevation** | **Column** | **Row** | **Level** | **Column** | **Row** | **Level** | |
| | **(X)** | **(Y)** | **(Z)** | **(X)** | **(Y)** | **(Z)** | **(X)** | **(Y)** | **(Z)** | |
| Minimum | 500 | -2405 | 560 | 380 | 520 | 200 | 4 | 4 | 4 | 0 |
| Maximum | 2020 | -325 | 1360 | | | | | | | |

### 11.8.2 Block Model Attributes and Coding

The primary block model attributes created in the enargite-QPG block model for coding and estimation are summarized in Table 11-19.

Table 11-19. Block attributes for the enargite-QPG block model.

| Block Attribute | Data Type | Description | Blocks Updated From |
|---|---|---|---|
| domain | Integer | mineralized domain/ rock code | Geology Solids |
| density_2.7 | Single | bulk density (constant 2.7) | Geology Solids |
| au | Single | gold grade ordinary kriging estimate | Kriging Interpolation |
| cu | Single | copper grade ordinary kriging estimate | Kriging Interpolation |
| cueq_1.63 | Single | cueq = cu + (au x 1.63) | Block Manipulation |
| class_75m | Integer | resource category; 2=indicated; 3=inferred; 4=potential/geologic | Block Manipulation |
| vol%unclip | Single | percent block volume inside unmined vein wireframe | Geology Solids |
| vol%clip | Single | percent block volume inside mined vein wireframe | Geology Solids |
| dist_to_dh_p1 | Single | distance of block to nearest drillhole composite for Pass 1 | Kriging Interpolation |
| dist_to_ch_p2 | Single | distance of block to nearest channel sample composite for Pass 2 | Kriging Interpolation |
| dist_to_dh_p3 | Single | distance of block to nearest drillhole composite for Pass 3 | Kriging Interpolation |
| dist_to_dh_p4 | Single | distance of block to nearest drillhole composite for Pass 4 | Kriging Interpolation |
| pass | Integer | interpolation pass | Kriging Interpolation |
| z_bv | Single | block variance | Kriging Interpolation |
| z_gtcp | Single | grade of true closest point | Kriging Interpolation |
| z_kv | Single | kriging variance | Kriging Interpolation |
| z_mds | Single | mean distance for samples used | Kriging Interpolation |
| z_nh | Single | number of holes used | Kriging Interpolation |
| z_npe | Single | number of points used for the estimate | Kriging Interpolation |
| z_nps | Single | number of points inside the search | Kriging Interpolation |
| z_sr | Single | slope of regression | Kriging Interpolation |

## 11.9 Resource Classification

The enargite-QPG mineral resource is currently classified as under indicated and inferred levels of confidence only due to the use of historical data and relatively wide spaced drilling pattern.

The criteria used by Lepanto to classify the resource blocks were based mainly on the distances obtained from the variogram analyses. The indicated resource are defined by blocks that are within one variogram strike distance of two data points, either drill hole or channel cut, while the inferred resource are defined by blocks that are within 75.0 meters of two data points, either drill hole or channel cut. All blocks beyond the inferred resource are classified as potential or geologic resource.

Figure 11-3 presents the enargite-QPG block model according to resource classification. The potential or geologic resource, colored in gray, represents areas that require future exploration drilling and potential additional resource tonnage.

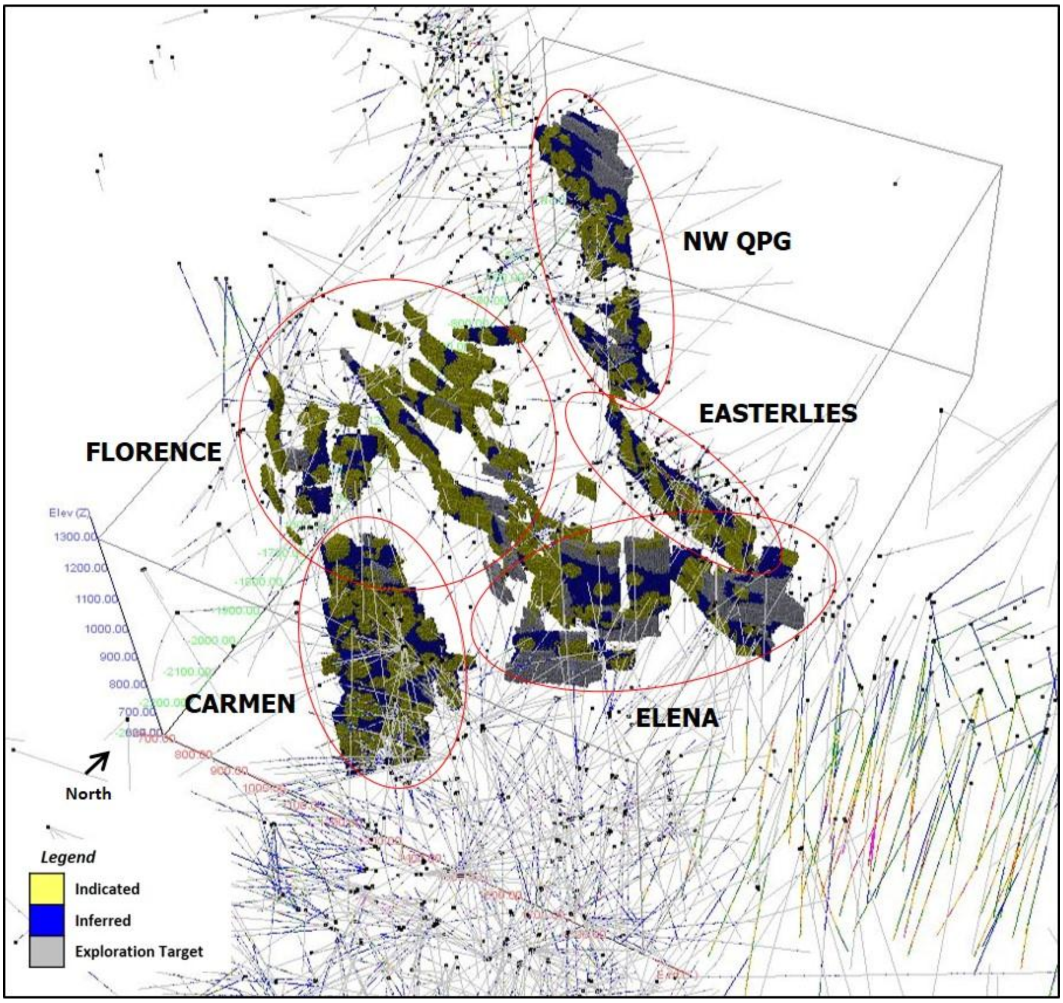



Figure 11-3. Resource classification block model for the enargite-QPG ore bodies looking northwest. Exploration Target is not part of the mineral resource.

## 11.10 Mineral Resource Estimates

### 11.10.1 Cut-off Grade

The cut-off grade used for the updated resource estimates is 1.0% CuEq, where CuEq = Cu% + (Au g/t x 1.63).

### 11.10.2 Mining Factors or Assumptions

No mining factors have been applied to the in situ grade of this mineral resource.

### 11.10.3 Metallurgical Factors or Assumptions

No metallurgical factors have been applied to the in situ grade of this mineral resource.

### 11.10.4 Mineral Resource Tabulation

The mineral resource estimates for the enargite-QPG ore bodies are tabulated in the tables below.

Table 11-20 presents the global enargite-QPG resource based on 1.0% CuEq cut-off while shows the resource estimates of individual deposit according to resource classification using the same 1.0% CuEq cut-off.

Gold content is reported in troy ounces (oz) where 1 oz = 31.10347 g while copper content is reported in avoirdupois pounds (lb) where 1 lb = 453.59237 g.

Table 11-20. Mineral resource estimates for the enargite-QPG ore bodies based on 1.0% CuEq cut-off grade.

| Classification | Tonnage (kT) | Au (g/t) | Cu (%) | koz Au | klb Cu |
|---|---|---|---|---|---|
| **INDICATED** | 6,861 | 1.956 | 0.910 | 431 | 137,647 |
| **INFERRED** | 885 | 2.113 | 0.789 | 60 | 15,378 |
| **Total** | **7,746** | **1.974** | **0.896** | **492** | **153,025** |

Table 11-21. Mineral resource of individual enargite-QPG deposits according to resource classification using a cut-off of 1.0% CuEq.

| Area | Classification | Tonnage (kT) | Au (g/t) | Cu (%) | koz Au | klb Cu |
|---|---|---|---|---|---|---|
| **Carmen** | Indicated | 2,184 | 1.770 | 0.625 | 124 | 30,098 |
| **Florence** | Indicated | 2,118 | 1.672 | 1.371 | 114 | 64,000 |
| **Elena** | Indicated | 440 | 2.045 | 1.875 | 29 | 18,188 |
| **NW QPG** | Indicated | 1,646 | 2.508 | 0.463 | 133 | 16,797 |
| **Easterlies** | Indicated | 474 | 2.085 | 0.820 | 32 | 8,564 |
| **TOTAL** | | **6,861** | **1.956** | **0.910** | **431** | **137,647** |

| Area | Classification | Tonnage (kT) | Au (g/t) | Cu (%) | koz Au | klb Cu |
|---|---|---|---|---|---|---|
| **Carmen** | Inferred | 301 | 1.652 | 0.458 | 16 | 3,034 |
| **Florence** | Inferred | 82 | 1.959 | 1.135 | 5 | 2,062 |
| **Elena** | Inferred | 154 | 1.871 | 1.557 | 9 | 5,272 |
| **NW QPG** | Inferred | 281 | 2.734 | 0.610 | 25 | 3,775 |
| **Easterlies** | Inferred | 67 | 2.318 | 0.831 | 5 | 1,234 |
| **TOTAL** | | **885** | **2.113** | **0.789** | **60** | **15,378** |

| | | | | | |
|---|---|---|---|---|---|
| **GRAND TOTAL** | **7,746** | **1.974** | **0.896** | **492** | **153,025** |

### 11.10.5 Additional Geologic Resource

Additional geologic or potential copper-gold mineral resources have been likewise defined based on ongoing drilling as well as historic drillhole and underground stope data from abandoned mined areas. The additional geologic resource has been estimated at around 7.29 million tonnes with a grade of 2.02 g/t Au and 1.69% Cu. Increased drilling program is recommended in this areas in order upgrade the resources into inferred and indicated categories. The details of these potential mineral resources are listed in Table 11-22.

Table 11-22. Additional potential copper-gold resources.

| Area | Tonnage (kT) | Au (g/t) | Cu (%) | Remarks |
|---|---|---|---|---|
| Carmen | 400 | 1.549 | 0.471 | Consists of blocks from Run 9A that were interpolated using less than 2 points within the 75 m search radius. Cut-off grade applied is 1.0% CuEq. |
| Florence | 424 | 2.022 | 1.470 | |
| Elena | 290 | 1.878 | 1.717 | |
| NW QPG | 719 | 2.504 | 0.680 | |
| Easterlies | 133 | 1.711 | 0.562 | |
| NW Enargite | 1,088 | 1.062 | 2.524 | Derived from LeCCa Project; tonnages were calculated from actual vein width and total lateral ore exporsures on silled-out areas; grades were estimated manually using prismoidal averaging; declared on Jan 01, 2017 and certified by a Competent Person in Mar 2017. |
| Yolanda | 1,407 | 2.542 | 1.088 | |
| Claudia | 115 | 2.529 | 1.998 | |
| Footwall Branch Veins | 2,478 | 2.005 | 2.156 | Tonnages and grades were manually estimated based on last stope cut dimensions and samples' grades. |
| 940 Shaft | 236 | 2.821 | 2.680 | |
| **Total** | **7,288** | **2.017** | **1.694** | |

## 11.11 Estimation Validation

The enargite-QPG block model was validated using two methods to check the accuracy of the estimation process. The validation methods employed include (1) visual comparison of the block grades against the composite grades; and (2) generation of grade tonnage curves.

### 11.11.1 Visual Validation

The estimated grades generated by the ordinary kriging estimation were validated by visually comparing the block grades with the composited and capped drillhole and channel sample grades on a series of 20 m spaced north-looking vertical sections through the enargite-QPG block model. From visual inspection, the block model grades and drillhole and channel sample grades show reasonable correlation.

Figure 11-4 and Figure 11-5 display an example of vertical section from the gold and copper block model comparing the block grades and the sample composite capped grades. The section envelope is ± 6 meters.

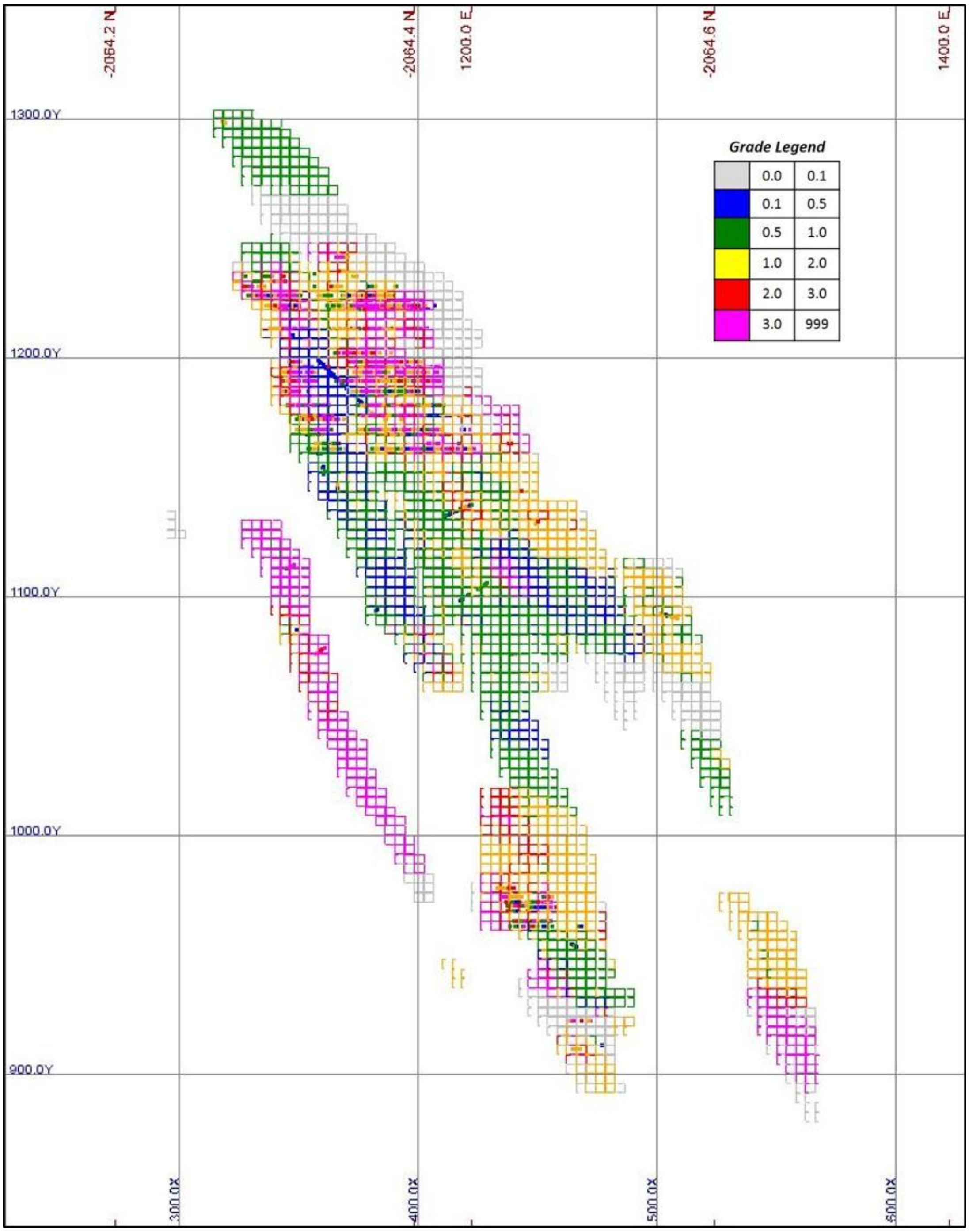



Figure 11-4. Vertical section through the enargite-QPG block model comparing the block gold grade estimates with samples' gold assay data. North direction is perpendicular to the page.

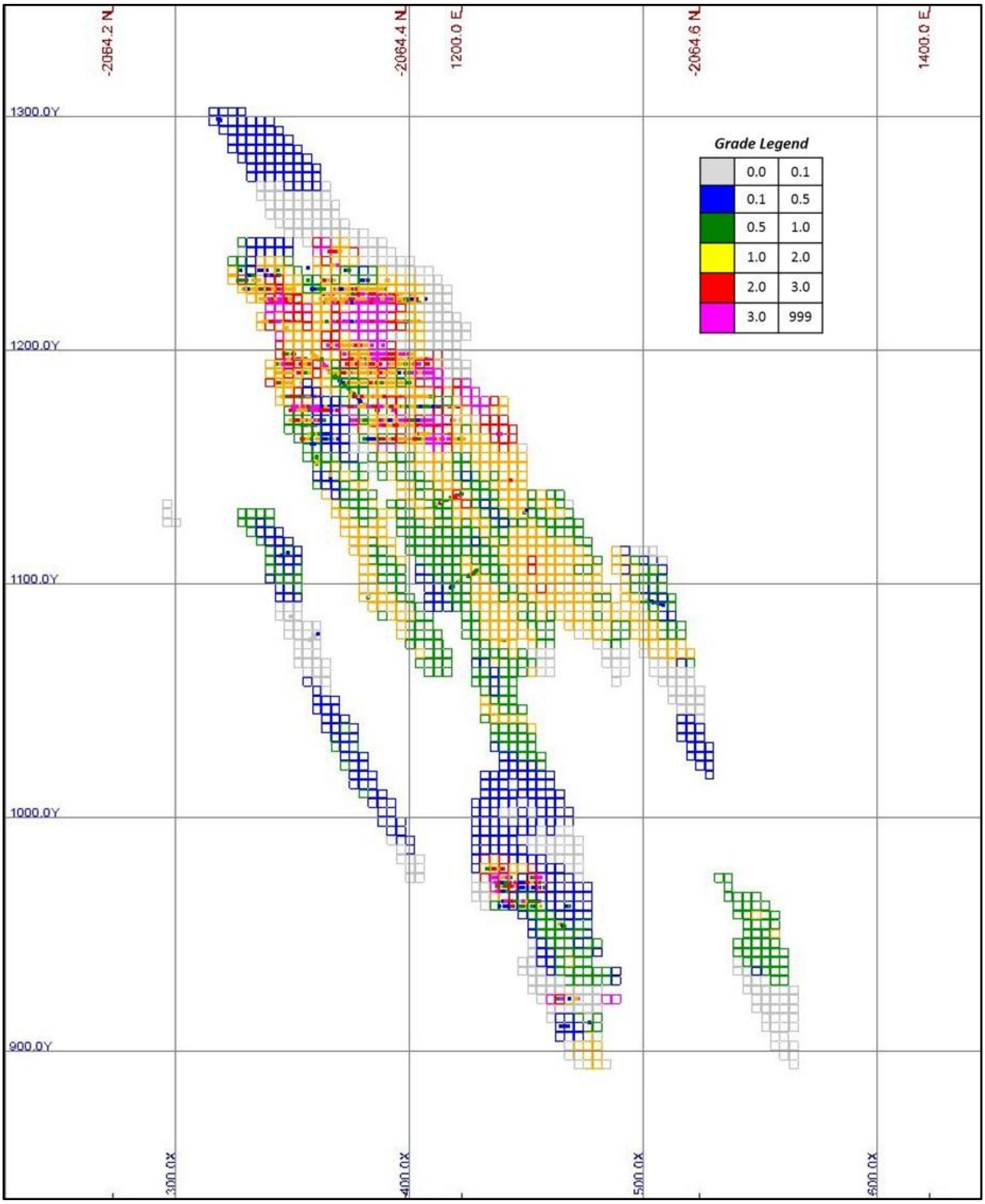



Figure 11-5. Vertical section through the enargite-QPG block model comparing the block copper grade estimates with samples' copper assay data. North direction is perpendicular to the page.

### 11.11.2 Grade-Tonnage Curves

Grade-tonnage curves for the enargite-QPG resource were generated to check mainly if the reported resource tonnage and grades are reflected in the graphs (Figure 11-6).

In addition to validation purposes, grade-tonnage curves can likewise serve as tools to easily visualize the sensitivity of available tonnage and grades at various cut-off grades.

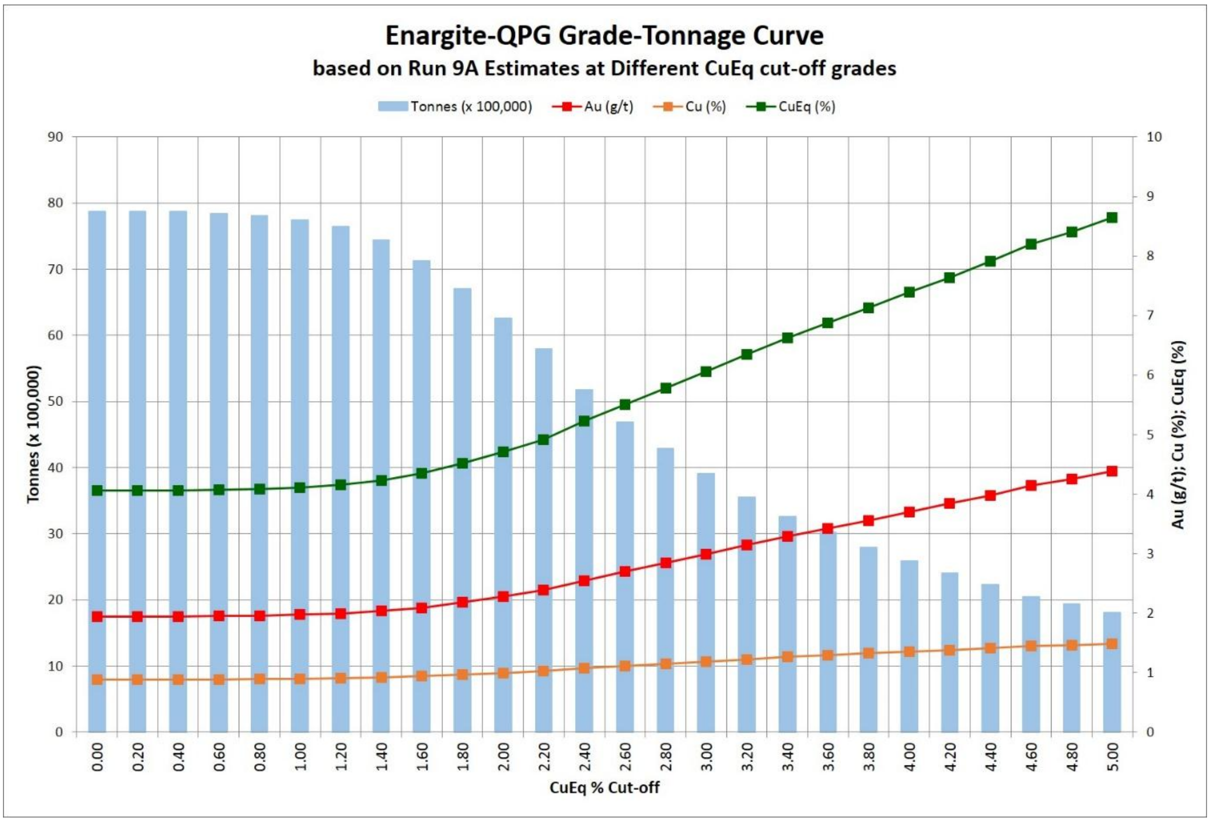



Figure 11-6. Grade-tonnage curves for the enargite-QPG resource at different % CuEq cut-offs.

# 12.0 INTERPRETATION AND CONCLUSIONS AND RECOMMENDATIONS

## 12.1 INTERPRETATION AND CONCLUSIONS

Since Lepanto resumed its exploration and evaluation of its copper-gold resources in 2015 through combined underground drilling, sill-out drive opening and review of historical data from the enargite mining period, the Company has successfully delineated a total indicated resource of 6.86 million tonnes averaging 1.96 g/t Au and 0.91% Cu and an inferred resource of 0.89 million tonnes grading 2.11 g/t Au and 0.79% Cu.

Based on the assessment and evaluation of all the data and information reported herein, the recent resource estimates completed by Lepanto is a result of diligent and systematic geological work, systematic drilling programs, and maintenance of a functional geological database. The technical report prepared by the Lepanto Exploration team for review of the Competent Person shows adherence to the rules and regulations set by the PMRC in reporting exploration results and mineral resources.

## 12.2 RECOMMENDATIONS

The following comments and recommendations have been made regarding the existing resource in Lepanto's Copper-Gold Project and the potential for new discoveries:

- While the current mineral resource reported is categorized as indicated and inferred classifications only, 89% of the tonnage is under indicated. Since the bulk of the resource can be utilized for ore reserve estimations as per PMRC guidelines, it is recommended that mine planning studies be undertaken to determine optimal total mine program, including mine development and mine schedule options.
- A drill infill program is required to improve the confidence of the resource.
- Maintain procedures for determining bulk density from core samples to build a more representative density data set covering differences in rock type, alteration and vein mineralization.
- Due to the nature of occurrence of gold and copper in the enargite-QPG ore bodies, geometallurgy must be carefully studied to ascertain optimal processing options.

Further exploration through drilling of the porphyry mineralization recognized in the current high sulfidation copper-gold drill cores is strongly recommended to confirm its lateral and vertical extents and be able to estimate its additional potential resource and reserves.

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## 14.0 APPENDICES

*Appendix 1. Lepanto drillhole database statistics.*

| Historical to 2014 | | |
|---|---|---|
| **Area** | **No. of DH** | **Length (m)** |
| Buaki | 41 | 6,823.77 |
| Carmen | 59 | 13,605.22 |
| Cristine | 56 | 15,096.35 |
| Elena | 64 | 21,014.96 |
| Enargite | 38 | 9,022.11 |
| Fatima | 122 | 57,936.63 |
| Felicia | 83 | 25,761.35 |
| FlorNorth | 52 | 8,790.11 |
| FlorWest | 18 | 4,611.71 |
| Northwest | 130 | 18,345.45 |
| NWQPG | 517 | 69,414.84 |
| Teresa | 190 | 45,328.18 |
| Victoria | 494 | 119,523.72 |
| Undefined | 177 | 85,368.03 |
| **Grand Total** | **2,041** | **500,642.43** |

| Exploration 2015 to present | | |
|---|---|---|
| **Area** | **No. of DH** | **Length (m)** |
| Buaki | 8 | 1,675.10 |
| Carmen | 51 | 11,083.30 |
| Elena | 14 | 4,406.20 |
| Florence | 65 | 14,971.20 |
| NW QPG | 78 | 15,139.20 |
| **Grand Total** | **216** | **47,275.00** |

| Mine Geology 2015 to present | | |
|---|---|---|
| **Area** | **No. of DH** | **Length (m)** |
| CARMEN | 7 | 673.30 |
| HCG | 8 | 1,558.20 |
| Honeycomb | 1 | 163.60 |
| NW QPG | 4 | 423.90 |
| QPG | 3 | 436.10 |
| Teresa | 43 | 3,810.00 |
| VICTORIA | 42 | 4,285.70 |
| Victoria Deeps | 13 | 1,149.15 |
| **Grand Total** | **121** | **12,499.95** |

*Appendix 2. Lepanto channel cut database statistics.*

| Historical to 2000 | | |
|---|---|---|
| **Area** | **No. of CH Samples** | **Length (m)** |
| Carmen | 2,865 | 3,286.30 |
| Cristine | 77 | 65.14 |
| Easterlies | 3,636 | 6,715.86 |
| Elena | 1,475 | 2,425.92 |
| Felicia | 7 | 7.30 |
| Florence | 5,781 | 9,178.13 |
| Northwest | 2,067 | 3,882.63 |
| NW QPG | 52,920 | 88,633.03 |
| Teresa | 4,270 | 4,341.99 |
| Victoria | 8,504 | 7,943.82 |
| **Grand Total** | **81,602** | **126,480.12** |

| 2001 to 2008 | | |
|---|---|---|
| **Area** | **No. of CH Samples** | **Length (m)** |
| Buaki | 927 | 1,618.89 |
| Carmen | 10,881 | 18,181.24 |
| Cristine | 22 | 26.00 |
| Elena | 3,614 | 5,818.30 |
| Enargite | 122 | 154.70 |
| FlorNorth | 4,619 | 7,226.66 |
| FlorWest | 174 | 254.80 |
| Northwest | 14,524 | 27,236.65 |
| NWQPG | 993 | 1,317.61 |
| Victoria | 37 | 41.94 |
| **Grand Total** | **35,913** | **61,876.79** |

| 2015 to present | | |
|---|---|---|
| **Area** | **No. of CH Samples** | **Length (m)** |
| Carmen | 702 | 516.60 |
| FlorNorth | 597 | 405.20 |
| NWQPG | 3,051 | 2,283.50 |
| **Grand Total** | **4,350** | **3,205.30** |

*Appendix 3. List of wireframes per area.*

| Area | Vein Tag | Domain |
|---|---|---|
| Carmen | 501 | 51 |
| Carmen | 502 | 51 |
| Carmen | 503 | 51 |
| Carmen | 504 | 51 |
| Carmen | 505 | 51 |
| Carmen | 506 | 51 |
| Carmen | 507 | 51 |
| Carmen | 509 | 52 |
| Carmen | 510 | 51 |
| Carmen | 5011 | 51 |
| Carmen | 5012 | 51 |
| Carmen | 5013 | 51 |
| Carmen | 5014 | 51 |
| Carmen | 5021 | 51 |
| Carmen | 5023 | 51 |
| Carmen | 5024 | 51 |
| Carmen | 5031 | 51 |
| Carmen | 5033 | 51 |
| Carmen | 5034 | 51 |
| Carmen | 5041 | 51 |
| Carmen | 5042 | 51 |
| Carmen | 5051 | 51 |
| Carmen | 5052 | 51 |
| Carmen | 5053 | 51 |
| Carmen | 5054 | 51 |
| Carmen | 5061 | 51 |
| Carmen | 5071 | 51 |
| Carmen | 5091 | 51 |
| Florence | 601 | 61 |
| Florence | 602 | 61 |
| Florence | 603 | 61 |
| Florence | 604 | 61 |
| Florence | 606 | 61 |
| Florence | 608 | 61 |
| Florence | 610 | 61 |
| Florence | 611 | 61 |
| Florence | 614 | 633 |
| Florence | 615 | 611 |
| Florence | 616 | 61 |
| Florence | 617 | 633 |
| Florence | 618 | 633 |
| Florence | 619 | 633 |
| Florence | 620 | 61 |
| Florence | 621 | 61 |
| Florence | 622 | 62 |
| Florence | 623 | 63 |
| Florence | 624 | 61 |
| Florence | 625 | 61 |

| Area | Vein Tag | Domain |
|---|---|---|
| Florence | 629 | 61 |
| Florence | 631 | 62 |
| Florence | 632 | 62 |
| Florence | 633 | 62 |
| Florence | 635 | 62 |
| Florence | 636 | 62 |
| Florence | 638 | 63 |
| Florence | 639 | 63 |
| Florence | 640 | 62 |
| Florence | 641 | 63 |
| Florence | 6010 | 611 |
| Florence | 6012 | 61 |
| Florence | 6013 | 61 |
| Florence | 6014 | 61 |
| Florence | 6016 | 61 |
| Florence | 6018 | 61 |
| Florence | 6030 | 61 |
| Florence | 6031 | 61 |
| Florence | 6032 | 63 |
| Florence | 6033 | 611 |
| Florence | 6034 | 63 |
| Florence | 6035 | 611 |
| Florence | 6036 | 611 |
| Florence | 6037 | 611 |
| Florence | 6038 | 611 |
| Florence | 6041 | 61 |
| Florence | 6042 | 61 |
| Florence | 6043 | 61 |
| Florence | 6044 | 61 |
| Florence | 6051 | 611 |
| Florence | 6081 | 61 |
| Florence | 6150 | 61 |
| Florence | 6201 | 61 |
| Florence | 6202 | 61 |
| Florence | 6211 | 61 |
| Florence | 6212 | 61 |
| Florence | 6310 | 62 |
| Florence | 6311 | 62 |
| Florence | 6322 | 622 |
| Florence | 6391 | 63 |
| Florence | 60121 | 61 |
| Florence | 60140 | 61 |
| Florence | 60141 | 61 |
| Florence | 60181 | 61 |
| Florence | 63131 | 61 |
| Elena | 701 | 71 |
| Elena | 702 | 71 |
| Elena | 703 | 71 |

| Area | Vein Tag | Domain |
|---|---|---|
| Elena | 704 | 711 |
| Elena | 7011 | 71 |
| Elena | 7012 | 71 |
| Elena | 7021 | 71 |
| Elena | 7022 | 711 |
| Elena | 7031 | 722 |
| Elena | 7032 | 72 |
| Elena | 7033 | 72 |
| Elena | 7034 | 722 |
| Elena | 7035 | 711 |
| Elena | 7036 | 71 |
| NW QPG | 801 | 81 |
| NW QPG | 802 | 81 |
| NW QPG | 806 | 81 |
| NW QPG | 807 | 81 |
| NW QPG | 808 | 81 |
| NW QPG | 8021 | 81 |
| NW QPG | 8023 | 81 |
| NW QPG | 8061 | 81 |
| NW QPG | 8062 | 81 |
| NW QPG | 8063 | 81 |
| NW QPG | 8064 | 81 |
| NW QPG | 8065 | 81 |
| NW QPG | 8071 | 81 |
| NW QPG | 8072 | 81 |
| NW QPG | 8074 | 81 |
| NW QPG | 80160 | 81 |
| NW QPG | 80161 | 81 |
| NW QPG | 80162 | 81 |
| NW QPG | 80163 | 81 |
| NW QPG | 80164 | 81 |
| NW QPG | 80221 | 81 |
| NW QPG | 80222 | 81 |
| Easterlies | 901 | 91 |
| Easterlies | 902 | 91 |
| Easterlies | 903 | 91 |
| Easterlies | 904 | 91 |
| Easterlies | 905 | 91 |
| Easterlies | 906 | 91 |
| Easterlies | 907 | 91 |
| Easterlies | 908 | 91 |
| Easterlies | 909 | 91 |
| Easterlies | 910 | 91 |
| Easterlies | 9021 | 92 |
| Easterlies | 9081 | 92 |
| Easterlies | 9082 | 92 |
| Easterlies | 9083 | 92 |
| Easterlies | 9084 | 92 |