The Ponce Enriquez Project

Conceptual Pre-Feasibility

ZAPPA RESOURCES LTD.

CAMBIOR

June, 1997

THE PONCE ENRIQUEZ PROJECT
CONCEPTUAL PRE-FEASBILITY STUDY

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EXECUTIVE SUMMARY

Introduction

Cambior has been mandated by Zappa Resources from Vancouver to complete a comnceptual prefeasibility study on its Ponce Enriquez project which includes the Papa Grande and Molopongo concenssions. Zappa resources identified the Ponce Enriquez district in 1991. These three deposits have been identified as bulk tonnage, low grade, open pittable deposits. The deposits are located in southern Ecuador, some five kilometres east of the Panamerican highway. Distance is 140 km by road to Guayaquil to the northwest and 50 km to the southwest lies Machala another port-town.

The present report presents a conceptual pre-feasibility study on the Papa Grande and Mollopongo concessions, with the objective to identify the possibilities and potentials of mining and processing the Papa Grande and Mollopongo deposits in a combined operation. Chapter 1 introduces the project in terms of geographical, legal and financial background. The geology as well as the generated mineral inventory of the two deposits based on the drillhole data to date, are presented in chapter two. The mine plan and operating strategy based on a production of five million tonnes of plant feed per annum are addressed in chapter three. Chapter four presents the process plant design based on data obtained in the metallurgical test program and on data obtained from similar operations. The tailings impoundment is described in chapter five and its design is based on literature and data obtained from similar operations. In chapter six the general services and administration facilities to support the operation are shortly described and in chapter seven the economical analysis is presented. This report ends with the conclusions and recommendations given in chapter 8.

Geology

A mineral inventory of the Ponce Enriquez project (the Papa Grande and Mollopongo deposits) has been built on the database obtained by the Zappa and Zappa-Cambior drill campaigns consisting of 32 holes totalling 3,779 m together with the data from 4,538 metres of trenches. The mineral inventory obtained for the indicated and inferred category are 46,079,400 tonnes at 1.1 g/t of gold containing 1,622,300 ounces of gold in situ. For this estimation a cut-off grade of 0.55 g/t Au for the soft rock (saprolite) and 0.7 g/t Au for the hard rock has been used. However, this mineral inventory must be considered very preliminary.

Mining

The mining reserves and mine plan were developed using the indicated and inferred resources of the mineral inventory. The Whittle- 4D pit optimizer was used to calculate the final pit envelope, resulting in a pit of 700 x 175 m and 160 m deep for Mollopongo and 900 x 700 m and 300 m deep for Papa Grande. These pits will provide a plant feed of 5,000,000 tonnes per year for a mine life of five years. Total plant feed will amount to 24,447,950 tonnes with 1.43 g/t of gold. The overall stripping ratio waste:ore will be 0.59

Processing

Metallurgical testwork has confirmed the ore to be amenable to gravity separation and agitation leaching with cyanide solution. Based on test data and data from similar plants a conventional mill-cyanide leach plant was designed. The plant will treat 5,000,000 tonnes per year or 13,700 tonnes per day and the combined recovery of gold in the gravity separation circuit and the CIP will be 90%. The process plant will consist of primary crushing and grinding of the ore by a SAG-Ball mill circuit to 80% -150 µm. A part of the cyclone underflow will be bled to a gravity separation circuit where 60% of the gold contained is recovered. The ball mill product will be leached by a cyanide solution in agitated tanks for a period of 24 hours. The pulp will be contacted with activated carbon in carbon in pulp (CIP) agitated tanks, to adsorb the gold. Carbon stripping followed by electrowinning are used to recover the gold. The electrowon cathodes and the gravity concentrate are smelted to doré bars for shipment to a custom refiner.

Tailings and Water management

For the tailings and water management a conceptual design based on data from similar projects was developed. It consists of gravity flow of the leach tailings to a ringed dyke impoundment some seven km northwest of the plant in the plain area at the foot of the hills. The tailings impoundment provides storage for the tailings volume to be generated during mine life and a margin has been considered for rain water storage. Excess water will be treated to destroy residual cyanide and precipitate dissolved metals before water is discharged into the environment. A strict environmental control is envisaged to avoid escape of any water volume that does not comply with water quality standards.

Project economical analysis

An economical analysis of the Ponce Enriquez project was developed on the basis of information generated during the study and on data available from similar projects. Capital costs estimated total US$ 160,413,991. Operating costs are estimated at the following:

Mining costs:	US$ 1.64 per tonne moved
Processing costs:	US$ 6.37 per tonne milled (13% soft rock / 87% hard rock)
G&A costs:	US$ 1.49 per tonne milled

This gives a total cost of US$ 10.47 per tonne milled. The Ponce Enriquez project is showing a slightly negative NPV. However, a sensitivity analysis shows that an increase of high grade material and/or of total ore reserves will certainly affect greatly the economical performance of the project.

Conclusions and recommendations

The conceptual prefeasibility study completed on the Ponce Enriquez project has demonstrated the poor economic performance of the project under the actual conditions. The study demonstrates the need to improve the quality of the geological database by completing in fill 50m centers drilling to upgrade resources to proven/probable categories, and to complete additional exploration drilling throughout the property to locate some higher grade ore zones that will enhance the project economics.

However, the pre-feasibility work has enhanced the presence of a massive gold resource with a very low stripping ratio, very well located and with some regional exploration potential with the presence of the Gaby deposit (3 million ounces) located approximately 1.5 - 2.0 Km from the ore zone and the Bella Rica small scale miners zone to the south. The metallurgical work shows some 50% of the gold can be recuperated by gravity. It is recommended to pursue some engineering and metallurgical test work to optimize the Mine and Plant Design. The Ecuadorian government may establish some financial incentives to encourage the mining investment and these incentives will certainly have a positive impact on the project economics.

1. INTRODUCTION

Cambior Inc. has been mandated by Zappa Resources from Vancouver to complete a conceptual pre-feasibility study on it's Ponce Enriquez project which includes the Papa Grande and Mollopongo concessions. Zappa Resources identified the Ponce Enriquez gold district in 1991 and the Papa Grande, Mollopongo and adjacent Guadalupe concessions as bulk tonnage, low grade, open pitable mineralization with heap leach potential.

Cambior subscribed an initial CDN$ 1,500,000 private placement into the Vancouver based junior company, Zappa Resources Inc., by which, it will obtain the right to earn a 60% interest into Zappa's interest in four properties located in Ecuador, including the Papa Grande, Mollopongo, Guadalupe and Cascajo properties.

This interest may be obtained by completing a feasibility study on these concessions.

Zappa Resources Inc. is presently earning a 50% interest into the "Papa Grande" property owned by a private Ecuadorian company named Conaoro S.A. In order to earn it's 50% interest, Zappa has to pay US$ 1,850,000 to Conaoro, to spend US$ 1.0 million in exploration and to complete a conceptual pre-feasibility to be presented to Conaoro S.A.

Cambior has a right to exercise 2,307,692 warrants at CDN$ 0.78 to further finance Zappa.

Cambior is parallely purchasing from Conaoro S.A. the remaining 50% interest into the Papa Grande property. (Figure 1.1, 1.2 and Table 1.1)

ECUADOR

Scale 1 : 4 000 000

0 100 200

Kilometres

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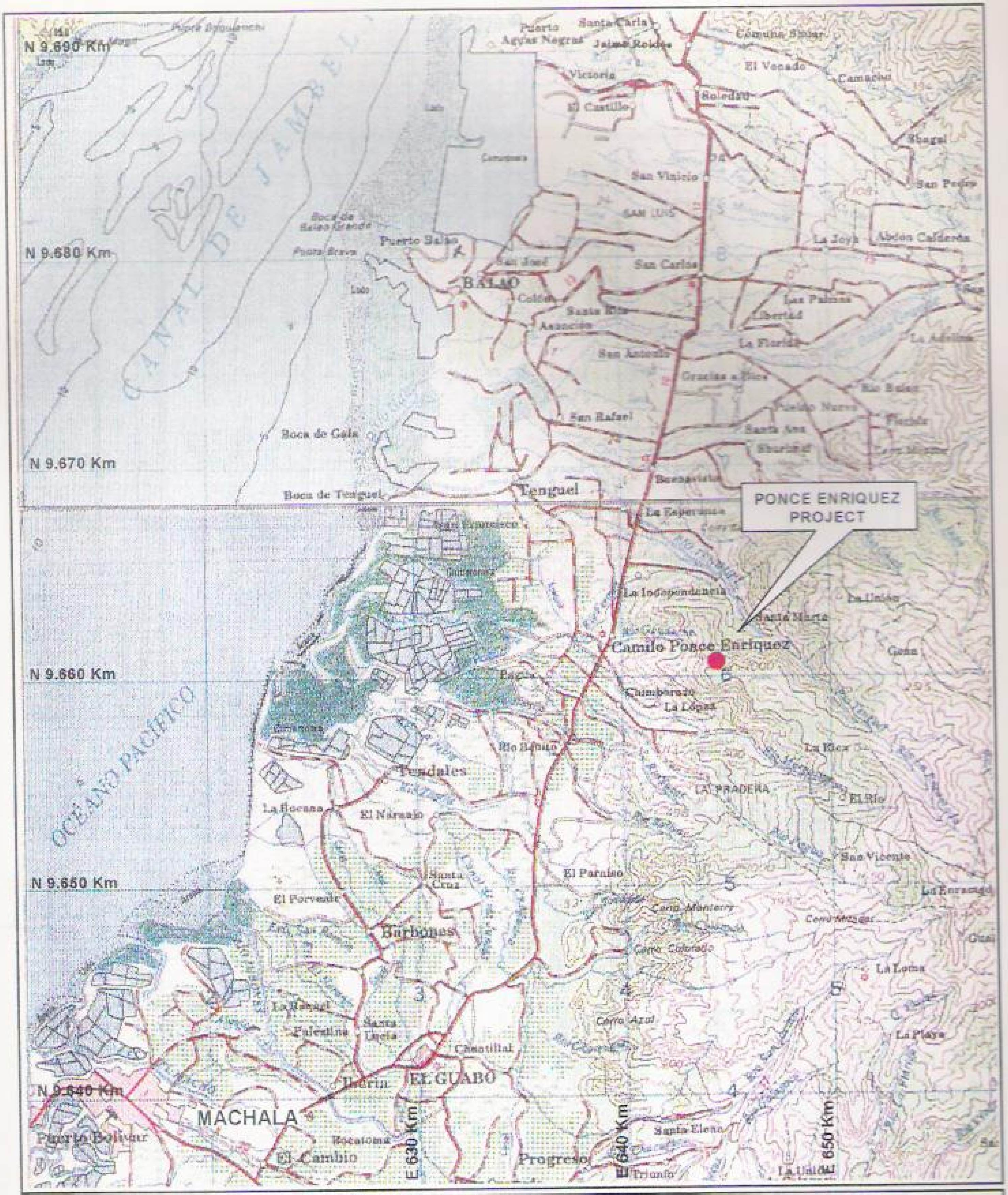
LOCATION MAP

PONCE ENRIQUEZ
PROJECT

Fig. 1.1



SCALE 1:250 000

0 5 10 15 Kilometers

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PHYSIOGRAPHY / ACCESS
PONCE ENRIQUEZ PROJECT

FIG. 1.2

Cambior - Zappa Resource
Papa Grande - Mollopongo Properties Purchase Price

Buying Company	Seller	Property	1995	1996	1997	1998	1999	Total
Zappa Res. (50%)	José Ampuero (Conaoro)	P. Grande (50%)	550	400 (Mar)	300 Mar. 600 June 900	---	---	**$ 1,850**
Zappa Res. Small scale miners	Avila Group	P. Grande	---	100 (Sept)	50 (Sept)	50 (Sept)	50 (Sept)	**$ 250**
	Piedra Group Muyuyacau	P. Grande	---	25	165 (Jan)	---	---	**$ 190**
	Torres	P. Grande	---	---	10 (Jan)	---	---	**$ 10**
	Sub-total			525	1,125	50	50	**$ 450**
Cambior Inc	J. Ampuero (Conaoro)	P. Grande 50%	---	---	250 Jan 700 June 950	3,100 July 3,100	3,150 July 3,150	**$ 7,200**
Cambior - Zappa		P. Grande	550	525	2,075	3,150	3,200	**$ 9,500**
Zappa Res.	24 Enero	Mollopongo	100	50	70	250	---	**$ 470**
Cambior - Zappa Total		P. Grande - Mollopongo	650	575	2,145	3,400	3,200	**$ 9,970**

Note: Units = US$ thousands

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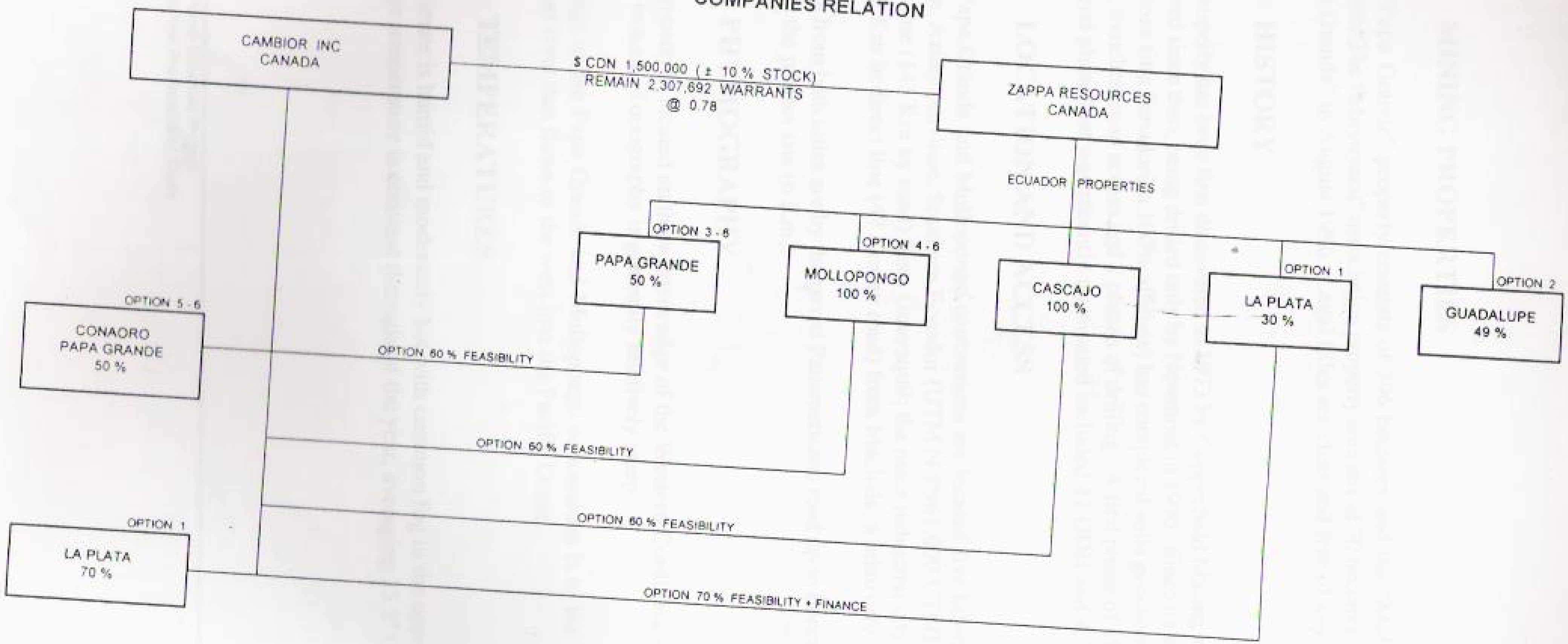
COMPANIES RELATION



OPTION 1 : Cambior may earn a 70% interest in La Plata property

OPTION 2 : Ecuadorian Mineral Corp. has an option to earn a 49% interest in the Guadalupe concession

OPTION 3 : Zappa is entitled to earn a 50% interest on the Papa Grande concession. Cambior may in turn earn a 60% interest into the Zappa's interest

OPTION 4 : Zappa has an option to buy 100% interest

OPTION 5 : Cambior has an option to buy 50% interest

OPTION 6 : Cambior and Zappa will have a respective combined 70 - 30% interest into Papa Grande concessions and 60 - 40% interest into the Mollopongo

1.1 MINING PROPERTIES

The "Papa Grande" property consists of 396 hectares and the "Mollopongo" property consists of 60 hectares. The "Muyuyacu" association property consists of 70 hectares and was detached from the original "Papa Grande" in August 1996. Legal titles are clear and free of any pursuant suits.

1.2 HISTORY

The property has been first discovered in 1973 by Copperfield Mining and has been very unsystematically explored since then, being drilled only by Newmont in 1990. Since its acquisition in 1994, Zappa, through Prominex (it's Ecuadorian 100% affiliate) has completed soils geochemistry, ground geophysics (I.P and Mag), trenches, road access and 2 phases of drilling. A first phase of 10 DDH totalling 1,401 meters and a second phase that was recently terminated included 42 DDH and 4,775 meters.

1.3 LOCATION AND ACCESS

The Papa Grande and Mollopongo concessions are located five kilometers east of the Ponce Enriquez village, Azuay province, Southern Ecuador (UTM N 9'961,000 UTME 644,500). It is about 100 Km in direct line (143 Km by road) from Guayaquil; the main industrial city and port of Ecuador to the NNW and 32 Km in direct line (47 Km by road) from Machala, a relatively well deserved city to the SW.

Access from both cities are by the paved Panamericana road up to Ponce Enriquez village and then by dirt road to the project site (6 Km).

1.4 PHYSIOGRAPHY

The property is located on the western edge of the Western Cordillera with elevation ranging from 500 - 1.100 m.a.s.l. Topography is generally relatively steep.

Drainage of the Papa Grande and Mollopongo concessions is to the Northeast by small creeks to the Tenguel river that flows to the west into the Pacific Ocean.

1.5 TEMPERATURES

The climate is humid and moderately hot with common fog in the upper parts of the property. Monthly average temperature is constant throughout the year, averaging 25.5° C +/- 1.5°.

1.6 RAIN

Rainy season starts slowly in December, but is better defined from January to April where monthly precipitations averaged 205mm at the Pagua meteorological station located in the footplain just north of Ponce Enriquez village. The rest of the year (May - December) light rain is still common, monthly precipitations averaging 42mm.

1.7 ROYALTIES

1.7.1 WEYBRIDGE

Weybridge, an Australian based Company, is entitled to 2 royalties:

a. 1% NSR
b. 5% NPI

This royalty is covering a part of Papa Grande and Guadalupe. This company obtained this royalty from the previous owner of Prominex S.A.

1.7.2 GOVERNMENT

Any production entity has to pay a 3% NSR to the Ecuadorian government (DINAMI) per law. However, Mining regulations are under revision and measures to improve foreign investment will be established. It is very probable that this royalty will be totally waved.

1.8 TAXES

1.8.1 INCOME TAX

A 25% Corporate Income Tax is applicable including mining activities.
For Legal entities, individuals (foreign or locals) and branches of a foreign corporation, holders of mining rights, who does any kind of mining activity, including contractors, are subject to a 25% income tax rate (Article 153 ML), it applies the special regulations of the ML and subsidiary the general regulations of the ITRL.

The income tax rate for legal entities was reduced starting in 1997 to 20% applicable on distributed profits while reinvested profits are subject to a 10% rate. We are expecting a reform to the regulations to the ITRL where the term "reinvested" would be explained.

1.8.2 VAT

The VAT/consumption tax as a general rule equals 10%. This rate applies to all transfers of goods and some services.

The general rule included in the Internal Tax Regime Law (ITRL) establishes two different VAT rates: 10% and 0%. Former exemptions from VAT are now considered taxable at a 0% VAT rate. The purpose of this reform, as we understand it, is to allow for the implementation of greater VAT rates, instead of the 0% VAT currently applicable upon certain transfers of goods and certain services.

The VAT on mining activity is as follows: Under Article 165 of the existing Mining Law (ML), the importation of mining implements, such as machinery, laboratories, equipment, work vehicles, parts and supplies necessary for mining activities, is exempted from VAT, unless there is a local production of similar characteristics to goods to be imported.

There is a conflict between the ML and the ITRL and other legal bodies regarding the taxability of imports for the mining industry at the 0% VAT rate. There is no exemption from VAT established in the ITRL for the importation of mining implements. Consequently, from a tax point of view, we believe that the exemption established in the ML creates a situation in which strong arguments could be made against its application. However, present experience with mining industry clients shows that they are paying VAT at the 10% rate on their imports but obtaining a refund immediately afterwards. Therefore, it is suggested that from a conservative point of view VAT at a 10% rate should be considered as an expenditure for Cambior's Ecuadorian operation.

1.8.3 MUNICIPAL TAX

Municipal Tax of 0.15% is applicable on total assets.

1.8.4 WITHHOLDING TAX

There is a local withholding rate of 1% applicable to Ecuadorian corporations or branches of foreign entities on income received on account sales. Such withholding is prepayment against year-end tax liability.

There are fixed withholding percentages for local payments depending on the nature of the payment and the type of recipient. The following is a brief description of these percentages:

- 1% on purchases of movable goods, except fuels, and on payments for construction activities.

- 2% on cargo transportation, private transportation of persons, payments to individuals for any concept not elsewhere described and payments to local companies for any other concept without an specific withholding rate.
- 5% on payments to individuals for property leases.
- 8% on fees for professional services, commissions, royalties paid to individuals with residence in Ecuador and on financial yields.

Services provided from abroad and charged to local operations are subject to a 33% withholding tax at source.

The 33% withholding is the general rule for any payment made abroad and the only exemptions are those found in Article 13 of the ITRL. Existing exemptions apply, for example, 100% to imports or 20% on fees paid abroad.

Technical assistance services are subject to a 26.40% withholding at source. The 26.40% is an effective rate, calculated as a 33% withholding rate (general rule) over 80% of the amount paid (20% exemption).

1.8.5 MINING FEES

Owners of mining concessions for exploration and exploitation shall pay annual fees to the government, in an amount related to the size of such concessions. The base of calculations changes every year depending on inflation. For 1996: (S= Sucre)

- Exploration: Fees paid for the first time = S/4.817 per hectare
  Three times for first renewal = S/ 14.451 per hectare
  Five times for the second renewal = S/24,085 per hectare
- Exploitation: S/ 14.447 per hectare

1.9 IMPORT DUTIES

The applicable laws are Organic Customs Law and it Regulations (LOA - its an acronym in Spanish) and Import Duties according to the standardization rules of the Andean Pact (NANDINA).

There are some restrictions. Not for the mining activity. For explosives, a special authorization must be requested to the Defense Ministry and the Army. The same for reagents.

The general rate of customs duties range between 0% and 45%, i.e. automobiles = 40% Customs duties are established at fixed rates of 0%, 3%, 5%, 10%, 15%, 20% and 35%. This 35% corresponds exclusively to automobiles.

On March 17,1997, the government introduced a reform to the tariffs of customs duties. It established an increase of 2, 3 and 4 additional percentile points to the tariffs mentioned in the previous paragraph. Not that the increase of custom duties will be applicable only until December 31,1997.

Under Article 164 of the ML the Committee on Import Duties will establish the lowest customs duties for the importation of mining implement, such as machinery, laboratories, equipment, work vehicles, parts and supplies necessary for mining activities in all its phases.

At the present moment the rate has been fixed at 5% for importation of mining implements which the mining activity requires.

According to literal f) of Article 23 of the LOA, imports under the jurisdiction of special laws, are considered exempt of custom duties. The ML in this case should be considered as a special law which establishes a specific treatment for the imports of the mining industry.

The Committee mentioned in Article 164 of the ML has not established a fixed rate for mining activities. Therefore, the imports mentioned in this article should be subject to the lowest possible tariff of custom duties. As 0% is the lowest tariff, this should be the rate that should be applied to all imports described in Article 164 of the ML, although for 1997 the tariff should be 2% according to recent reform.

The importation of any good, on a temporary basis, is not subject to duties, nor VAT. During the period of time such good is in the country a bank guarantee must be issued. If the same good is then nationalized or imported definitively into the country, duties must be paid on the good value less depreciation.

1.10 PROFIT SHARING PROGRAM

A 15% profit sharing bonus has to be paid to the employees without top limit. Even in the new regulations, this system shall be kept in place. The 15% profit sharing should be distributed as follows:

- The equivalent to 10% must be distributed equally among all workers. For those individuals with a period of service of less than 12 months, the amount paid is proportional to the time of service.
- The equivalent to 5% is distributed on the basis of the number of employee's dependents and time of service during the year. Dependents include spouse and children under 18 years of age.

Currently there is no limit to the amount that an individual employees may receive on account of this 15% profit sharing expenditure.

1.11 CURRENCY AND INFLATION

The currency is in Sucres (S/). The keeping of accounting books in US$ is not permitted. The exchange rate is presently US$1 = 3,891.49 S/

The inflation rate was 25.5% in '96, 22.8% in '95, 25.4% in '94 and 11.1% for the beginning of '97. General devaluation for 1997 has been an average of 2.5% per month.

1.12 DEPRECIATION

Depreciation is 20 years for buildings, 10 years for machinery and equipment and 5 years for vehicles; accelerated depreciation is possible on approval from the General Directorate of Taxes.

Amortization is 5 years at 20% per year, but under the ML (Article 155) any capital investment, costs and expenditures during the pre-production phase may be registered as assets to be written off in 4 years.

1.13 SURFACE RIGHTS

According to Ecuadorian mining law, mine operations have to purchase surface rights to be able to operate. An average price of US$ 1000 per hectare was paid by Zappa to purchase surface rights. An approximate amount of US$ 340,000 is budgeted to purchase necessary surface rights for the mine operations. Additional rights will be necessary for tailings, etc.

2. GEOLOGY

2.1 REGIONAL GEOLOGY

The Ecuadorian Andes are largely composed of volcanic rocks of Late Mesozoic to Quaternary age which rest on an older basement of metamorphic rocks and "pre-collisional" volcanic rocks (Kennerley, 1980).

Collisional accretional tectonics had an important role in the development of the Andean orogen of Ecuador and Northern Peru. Feininger (1987) has recognized at least five distinctive geologic terranes. All are distinguished from one another by dissimilar basement rocks, cover rocks, intrusive rocks, and Bouger gravity fields. Geological and geophysical evidence supports the view that all are allochthonous fragments that were emplaced against cratonic South America from Middle Jurassic to Late Eocene time.

Litherland and Aspden (1992) postulate that at least three allochthonous terranes have successively collided with the South American craton; major faults (Pujili, Raspas, and Las Arradas-Peltetec) probably are sutures where these terranes accreted to the protocontinent. The Peltetec Fault, along the western margin of the Eastern Cordillera, marks the site of the Late Jurassic-Early Cretaceous suture between the mid-Jurassic South American paleocontinental margin and the Chaucha terrane. The Pujili Fault, along the eastern margin of the Western Cordillera, marks the late Cretaceous-Early Tertiary suture between the paleocontinental margin and the Piñon-Macuchi terrane that is a colliding island arc that now largely forms the Western Cordillera. According to Litherland and Aspden, these fundamental terrane boundaries or sutures were reactivated with the advent of post-Oligocene subduction. Evidence suggests that they acted as normal faults, forming the 1,000 Km long inter-Andean depression or graben. The location of many major post-Oligocene volcanic centres along or close to the boundaries of this graben suggests that the reactivated terrane boundaries also controlled the ascent of magma, acting as regional conduits. According to Lebras et al. (1987) and Aspden et al. (1988) one of these sutures lies a short distance to the east of Ponce Enriquez gold district.

The "pre-collision" volcanic rocks include the Celica and Macuchi formations. The Celica formations consist mostly of lavas and pyroclastic rocks of andesitic composition that, according to Lebras et al. (1987), formed above a subduction zone at the border of the protocontinent. The Macuchi formation lying to the west is a distinctive island arc suite that consists of lavas and associated volcaniclastic rocks ranging in composition from basalt to dacite, and was formed above a subparallel subduction zone to the west. Continued subduction eventually welded the Macuchi Arc to the continental margin. Volcanic rocks ascribed to the Cretaceous Macuchi Formation form most of the Ponce Enriquez area.

Intrusion of a series of dioritic-granodioritic batholiths and stocks that includes the Ponce Enriquez plutons may have been controlled by the reactivated suture. The age of intrusions at Ponce Enriquez has not been determined. However, their age may be similar to that of the diorite plutons which host porphyry copper mineralization at Chaucha (Goosens and Hollister, 1973), 30 Km to the northeast, and which yielded K-Ar dates of 9.8 ± 0.3 and 12.5 ± 1.0 Ma (Muller-Kahle, 1970; Snelling, 1970).

Eocene Volcanic rocks of the Saraguro formation and Pleistocene volcanic rocks of the Tarqui formation outcrop 6 and 15 km respectively to the south east of the Papa Grande - Mollopongo Concessions area (Zúñiga and Cilio, 1979).

2.2 DEPOSIT GEOLOGY

The volcanic rocks underlying the Ponce Enriquez district are ascribed to the Macuchi Formation of Cretaceous age (Allen, 1995). They comprise mafic volcanic flows and pyroclastics of basaltic to andesitic composition that are fresh, but locally have been propylitized or actinolized. Basalts are very fine-grained, dark-greenish grey in color, massive and generally featureless, except for local pillow structures. Higher in the stratigraphic sequence lighter green tuffs outcrop locally on the Mollopongo concession. The volcanic sequence is dipping 30° to 40° east.

The oldest intrusive rock, and apparently coeval with the Cretaceous volcanic rocks is microdiorite, a fine-grained equigranular rock composed of hornblende and plagioclase. Its distribution is not well known because of lack of outcrop, but it is present at the Camp area of Papa Grande.

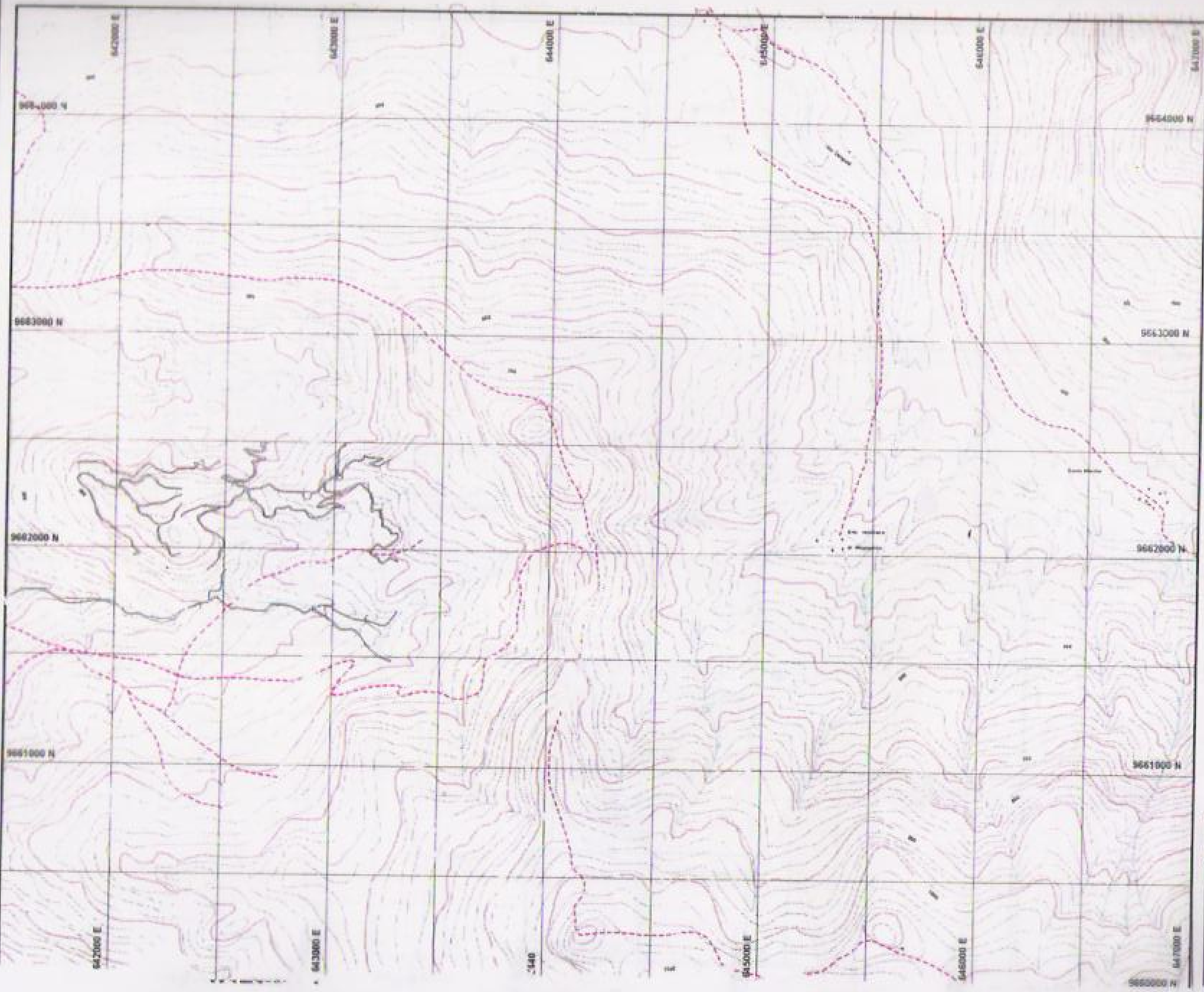
At Papa Grande (Fig. 2.1) a stock of plagioclase-hornblende dacitic porphyry (plagioclase phenocrysts more abundant than hornblende) has been intruded within the volcanic sequence causing contact metamorphism (albite-epidote-amphibolite facies), doming of its roof, and widespread crackle brecciation of the host basalts (Fig. 2.2). At least two diatreme breccia pipes were also generated by the intrusion. Minor dikes of hornblende-plagioclase dacitic porphyry (hornblende phenocrysts more abundant than plagioclase) have been recognized in drill cores, but this kind porphyry, that is the main intrusive phase in the neighbouring Gaby-Guadalupe project area, is a minor intrusive component of the Papa Grande area. Finally, a series of intrusive breccia dikes have been recognized in drill cores crosscutting both the plagioclase-hornblende porphyry and brecciated basalts; these late breccia dikes include distinctive quartz-porphyry fragments within a felsic-siliceous matrix. No intrusive rocks have been recognized at Mollopongo, at surface, drilling, and mapping of tunnels by third parties.

2.2.1 LITHOLOGY

The main rock types that are present on the Papa Grande - Mollopongo concessions are the following:

Basalts: Dark grey or dark-greenish grey colored, fine porphyritic rocks with plagioclase, amphibole and/or pyroxene phenocrysts, within a groundmass formed of a fine aggregate of plagioclase and mafic mineral microlites. The plagioclases of these rocks at Papa Grande are largely albitized, and the mafic minerals are completely replaced by acicular actinolite aggregates with some chlorite and calcite.

Tuffs: Light greenish grey tuffs occur at Mollopongo area intercalated within the basaltic sequence. These include fine grained laminated tuffs, medium- and coarse-grained lithic tuffs, and lapilli tuffs grading to fine volcanic breccias. The tuffs commonly show a strong chloritization and irregular epidotization.



LEGEND

GRAPHIC SCALE
1:25,000
0 250 500 750 1000 m

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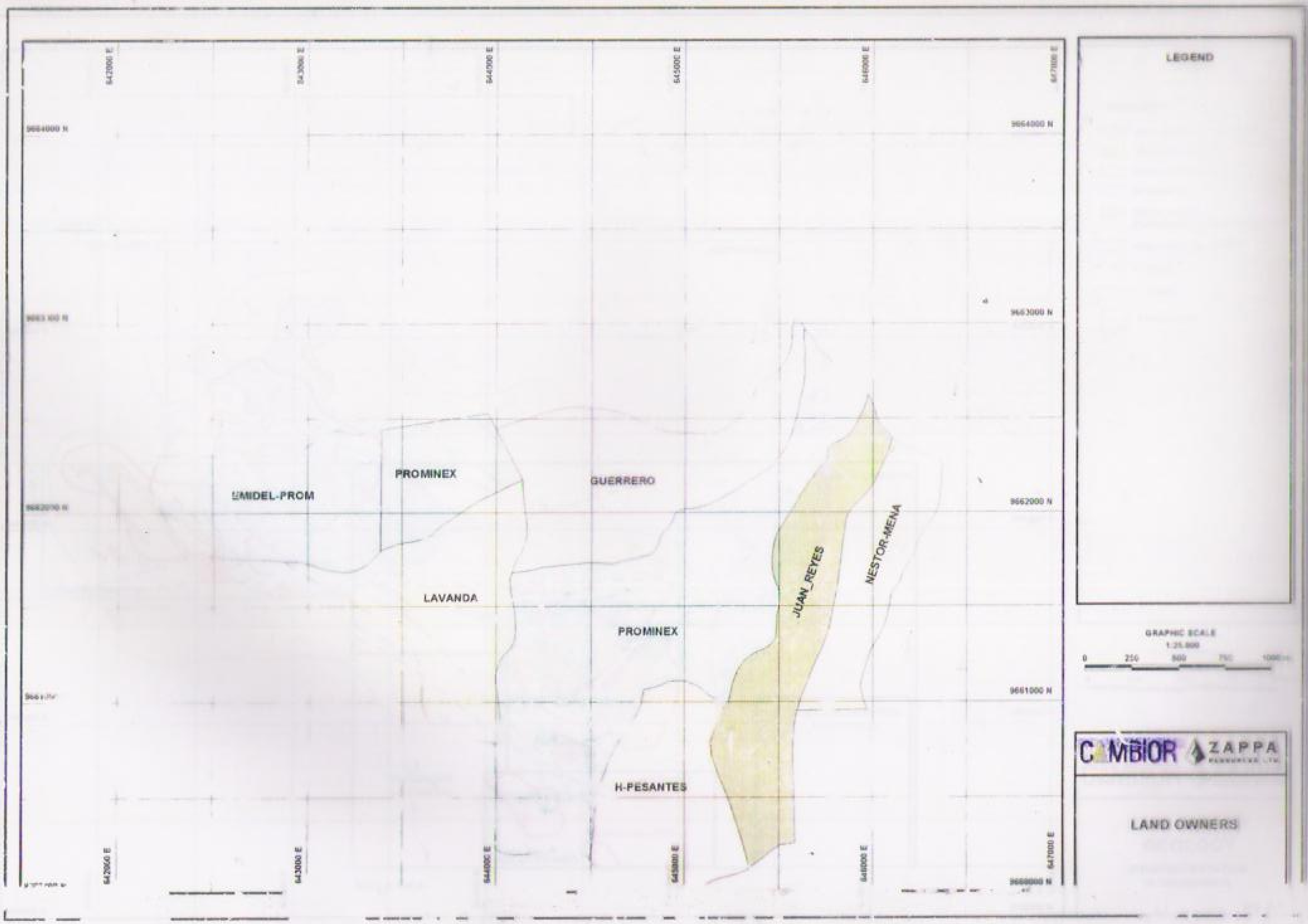
TOPOGRAPHY


LEGEND
GRAPHIC SCALE
1:25,000
0
250
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1000 m
CAMBIOR
ZAPPA
LAND OWNERS
9664000 N
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9662000 N
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642000 E
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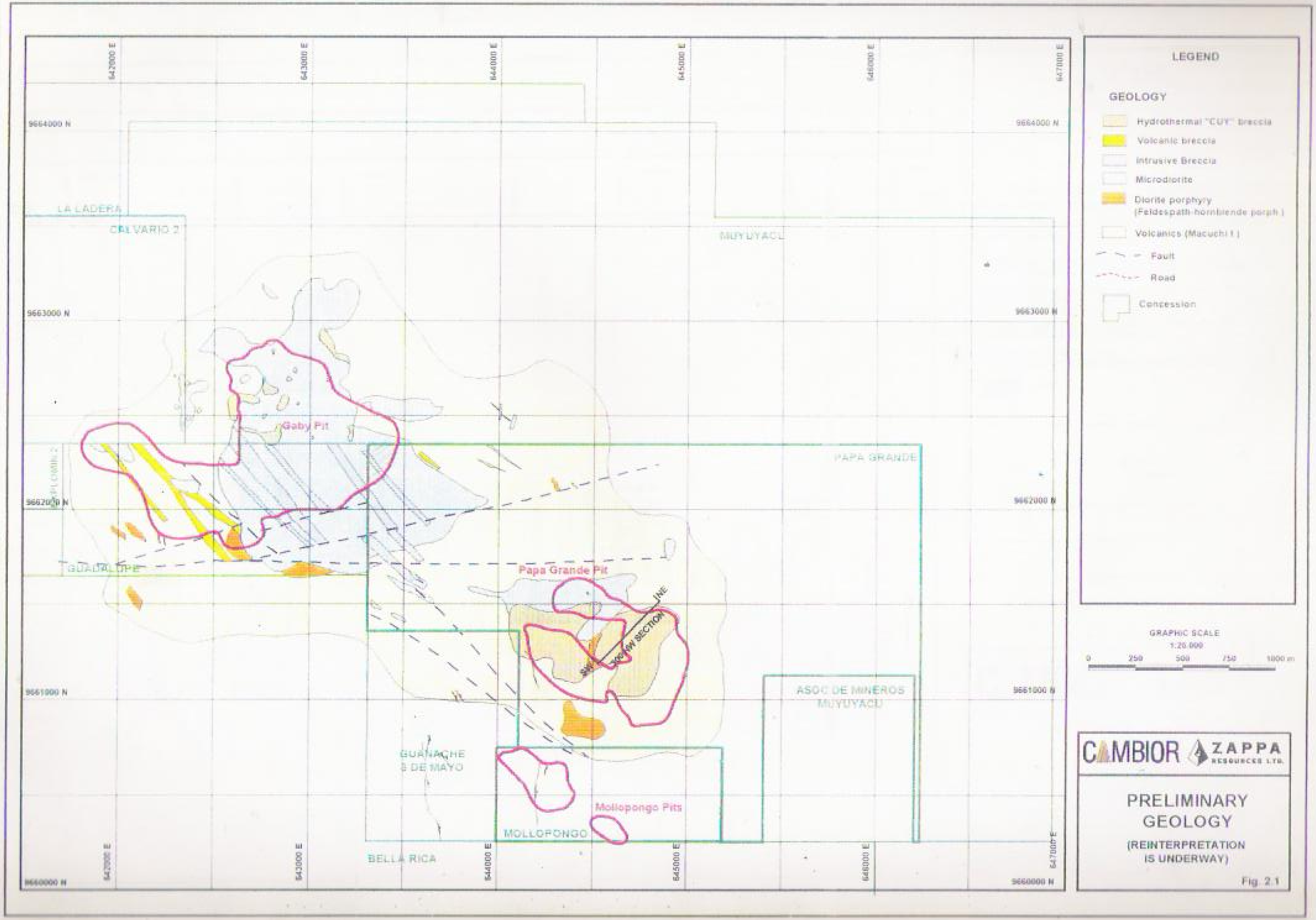
UMIDEL-PROM
PROMINEX
GUERRERO
LAVANDA
PROMINEX
JUAN_REYES
NESTOR-MENA
H-PESANTES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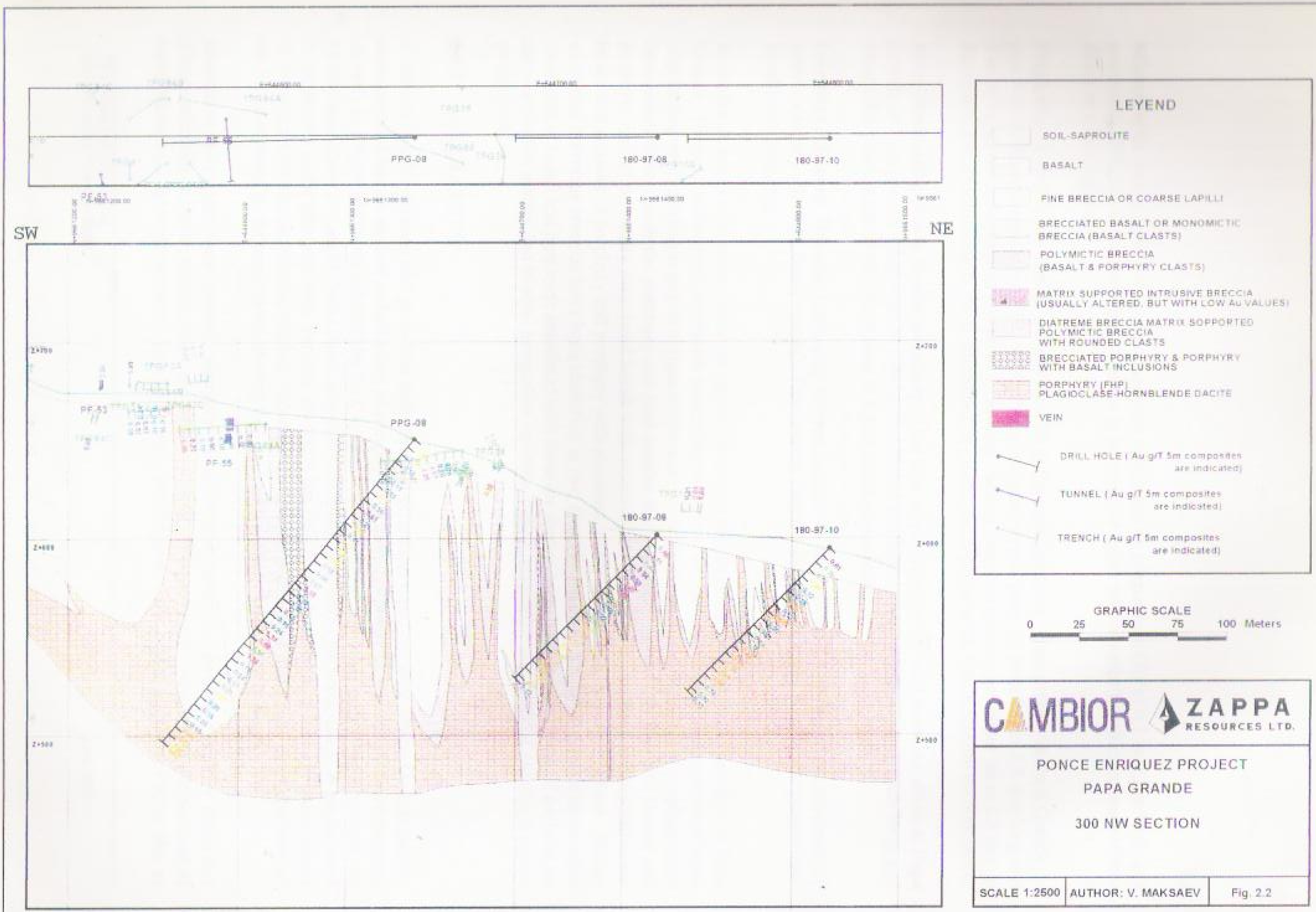
LA LADERA
CALVARIO 2
MUYUYACU
PAPA GRANDE
GUADALUPE
Gaby Pit
Papa Grande Pit
ASOC DE MINEROS
MUYUYACU
GUANACHE
5 DE MAYO
MOLLOPONGO
Mollopongo Pits
BELLA RICA
LEGEND
GEOLOGY
Hydrothermal "CUY" breccia
Volcanic breccia
Intrusive Breccia
Microdiorite
Diorite porphyry
(Feldespath-hornblende porph.)
Volcanics (Macuchi I)
Fault
Road
Concession
GRAPHIC SCALE
1:20 000
0
250
500
750
1000 m
CAMBIOR
ZAPPA
RESOURCES LTD.
PRELIMINARY
GEOLOGY
(REINTERPRETATION
IS UNDERWAY)

Fig. 2.1


SW
NE
PPG-08
180-97-08
180-97-10
PF-53
PF-55
LEYEND
SOIL-SAPROLITE
BASALT
FINE BRECCIA OR COARSE LAPILLI
BRECCIATED BASALT OR MONOMICTIC BRECCIA (BASALT CLASTS)
POLYMICTIC BRECCIA (BASALT & PORPHYRY CLASTS)
MATRIX SUPPORTED INTRUSIVE BRECCIA (USUALLY ALTERED, BUT WITH LOW Au VALUES)
DIATREME BRECCIA MATRIX SOPPORTED POLYMICTIC BRECCIA WITH ROUNDED CLASTS
BRECCIATED PORPHYRY & PORPHYRY WITH BASALT INCLUSIONS
PORPHYRY (FHP) PLAGIOCLASE-HORNBLENDE DACITE
VEIN
DRILL HOLE (Au g/T 5m composites are indicated)
TUNNEL (Au g/T 5m composites are indicated)
TRENCH (Au g/T 5m composites are indicated)
GRAPHIC SCALE
0 25 50 75 100 Meters
CAMBIOR
ZAPPA RESOURCES LTD.
PONCE ENRIQUEZ PROJECT
PAPA GRANDE
300 NW SECTION
SCALE 1:2500
AUTHOR: V. MAKSAEV
Fig. 2.2

Microdiorite: Holocrystalline, fine-grained rock composed by plagioclase (70%) 0.1 to 0.2 m long, and amphibole (20%) up to 0.4 mm long. It seems to be intrusive facies related to the basaltic sequence (either dikes or minor stocks).

Plagioclase-hornblende dacitic porphyry: This is the main intrusive phase present at Papa Grande, is generally dark grey in color with 30 - 40% plagioclase phenocrysts ranging from 0.5 to 3.5 mm long and 5 to 20 % hornblende phenocrysts up to 1 cm long. Scarce corroded quartz eyes occur up to 2.5 mm in diameter. The groundmass is felsic composed of quartz and feldspar with fine actinolite dissemination.

Hornblende-plagioclase dacitic porphyry: This type of porphyry occur only as minor dikes at Papa Grande, is light grey in color, with 20 - 30 % of euhedral hornblende phenocrysts up to 1.5 cm long, and 10 to 20% plagioclase up to 0.5 cm long in a grey felsic groundmass.

Intrusive Siliceous Breccia: Light-grey colored, angular to subrounded fragments of quartz-porphyry within a highly siliceous felsic matrix. This breccia forms dikes that crosscut basalts and plagioclase-hornblende porphyry.

Breccias: A series of breccias occur on top of the roof of the plagioclase-hornblende porphyry at Papa Grande. The most widespread is a crackle brecciation of the host basalts, with minor displacement of basalt angular fragments grading to puzzle or jigsaw-type monomictic breccias. In the vicinities of porphyry dikes brecciation affects both the porphyry and host basalts forming either polymictic breccias (basalt and porphyry clasts) or locally brecciated basalt with porphyry matrix. Drillholes have intercepted some brecciated sections of porphyry and porphyry with abundant, partly assimilated, basalt inclusions. Matrix supported **diatreme** breccias have been identified at two sites (El Inca and SW of El Cuy) with rounded fragments of basalt and porphyry; associated with these are shatter-breccias of basalt. Most of the breccias show actinolite matrix, but biotite, tourmaline, epidote, quartz, magnetite and sulfides are also frequent components.

2.2.2 ALTERATION

K-silicate, Ca-Na-silicate and propylitic hydrothermal alteration types occur at Papa Grande largely superimposed one on another and affecting all rock types. Within this prospect, textural evidence suggests an early K-silicate alteration followed by the Ca-Na-silicate alteration and a late propylitic alteration. At Mollopongo located south of Papa Grande propylitic alteration is the only type recognized. A phyllic zone is not present in the prospect area. Sericitic alteration has only been observed as minor alteration haloes of some quartz-pyrite-tourmaline veinlets, and argillic alteration is related to supergene decomposition of the rocks exposed to the tropical weathering that typically reaches about 15 m in depth.

K-silicate alteration: local potassic alteration occurs within brecciated basalts, porphyry dikes and alteration haloes of quartz, quartz-pyrite, and pyrite veinlets. Frequently the most brecciated sections of basalt show local feldspatization of clasts and matrix biotitization. Fine biotite aggregates occur also as irregular areas up to 10 cm wide within massive basalts and as complete replacement of hornblende in the porphyries. However, the K-silicate alteration is not pervasive and is largely limited to small structurally-controlled sections.

Gold-bearing veins of Papa Grande show potassic alteration haloes up to 5 m wide within the host basalts (i.e. Chaya Urco vein), bands of fine biotite aggregates are also present within these veins.

Ca-Na-silicate alteration: this kind of alteration is pervasive within the Papa Grande area affecting the basalts, porphyries, and breccias. It is characterized by the actinolite-albite±epidote±magnetite assemblage (most of the brecciated basalts of Papa Grande show actinolite±magnetite matrix), and moderate silicification; magnetite, pyrrhotite, tourmaline (schorlite), sphene, scapolite, and pyrite occur as secondary minerals associated to this type of alteration. Textural evidence indicates that the Ca-Na-silicate alteration largely post-dates the potassic alteration and pre-dates propylitic alteration in the Papa Grande area. This type of alteration has been described as hydrothermal by Singer et al. (1987), but the same mineral assemblage is typical of the albite-epidote-amphibolite facies of contact metamorphism. Within basic rocks (as the Macuchi basalts) the albite-epidote-amphibolite facies is characterized by the albite-epidote-actinolite assemblage with magnetite, tourmaline, sphene, scapolite, and pyrite. Most of the massive basalt of Papa Grande are, in fact, actinolite-albite-magnetite hornfels.

Abundant sulfides consisting of mostly pyrite, subordinate pyrrhotite, and magnetite are associated with the Ca-Na-silicate alteration. Traces of chalcopyrite and molybdenite have been also observed. The sulfides occur as irregular aggregates, veinlets and clots mostly within the matrix of breccias.

Propylitic alteration: A widespread late chloritization, epidotization, and fracture coating by calcite, chlorite and pyrite occur superimposed on K-silicate and Ca-Na-silicate alterations on Papa Grande, and is the main type of alteration at Mollopongo area.

2.2.3 MINERALIZATION

Commonly pyrite with pyrrhotite and magnetite are found in the volcanic rocks up to over 1.5 Km away from outcropping intrusives, and are particularly conspicuous within the matrix of the breccias of Papa Grande. Gold mineralization occurs within brecciated rocks in Papa Grande , but there is no particular association of gold with a specific lithology and some brecciated rocks are barren. Although higher gold grades have been observed within a diatreme breccia at El Inca sector of Papa Grande, whereas late intrusive siliceous breccia dikes are largely barren or with low grade Au. Gold is the only economic metal concentration. It occurs as native free gold particles (5 to 250 μm) commonly associated with sulfides, particularly chalcopyrite and some pyrrhotite and pyrite. Gold-bearing veins occur at Papa Grande and Mollopongo concessions associated with north-northeast and north-northwest trending and east dipping fault structures thought to be of normal sense of movement.
There is not an obvious control (lithology, structure or alteration) of disseminated gold distribution within the breccias of Papa Grande. Most of ore grade intercepts are shallow (<90 m depth) suggesting a

supergene enrichment or re-distribution of gold. However, the mineralized breccias are hard rocks with primary sulfides, and supergene effects are not apparent on the sulfides. Weathering and saprolite formation typically reaches a 15 m depth at Papa Grande (from 7 to 35 m), and oxidation usually does not extend further down, except along some faults and fracture zones. On the other hand, almost all the drillholes that have explored under the 550 m topographic level show no economic Au grades within breccias, and the plagioclase-hornblende porphyry (that is largely under that level) has shown to be barren. Most of gold mineralized breccias intersected by drillholes are within the altitude range 550 to 670 m and massive basalts occur above 700 m of altitude. This suggests that gold concentration occurred within brecciated rocks above the roof of a porphyry stock but above the 550 m level, so that this may be the bottom for primary gold mineralization.

At Mollopongo gold mineralization occurs largely within quartz-tourmaline-pyrite veins that are NNW and NNE-trending and dipping east. There are steep-dipping and low-angle veins, the last ones parallel or subparallel to the stratification of the volcanic sequence. Ore-grade gold dissemination occurs within tuff levels and basaltic pillow lavas related to strong propylitic alteration. Some chlorite bands within veins of Mollopongo area could be completely chloritized biotite bands.

Locally gold-bearing quartz-biotite (Chaya Urco at Papa Grande) and quartz-tourmaline (Mollopongo) veins are exploited by small miners, and high-grade gold-bearing vein deposits occur South of Papa Grande on the Bella Rica area in volcanic rocks with propylitic alteration. These veins are striking N15° to 20°W and dipping east and according to Paladines and Rosero (1996), these are high-temperature veins (350°-550°C) composed of quartz-pyrite, quartz-pyrrhotite-chalcopyrite-gold, quartz-arsenopyrite, and sphalerite-quartz. Gold is related to sulfides, mostly chalcopyrite, and less pyrrhotite and pyrite.

2.2.4 STRUCTURAL GEOLOGY

At Mollopongo concession the volcanic sequence of the Cretaceous Macuchi formation has a NNW to NNE strike and dip east from 30° to 40°. The same structural layout is thought to continue immediately north in Papa Grande, but no specific supportive data is available. A well-developed northwest trend of fracturing (±45°W/70°NE) has been observed on Papa Grande and Mollopongo areas. This is the main orientation of veinlets at Papa Grande consisting of a subordinate fracture set at N10°E/30°W. Main mineralized structures (veins) are NNW and NNE-trending and dipping east at Papa Grande and Mollopongo.

A NW-trend of intrusion-mineralization within the Ponce Enriquez district defined by the location Gaby-Guadalupe, Papa Grande, Mollopongo, and Bella Rica deposits is suggestive of a fundamental structural control of intrusive emplacement by deep-seated NW-trending structures. However, the occurrence of N-S mineralized structures implies that both main structural systems pre-date gold mineralization and possibly their intersection was in fact the controlling factor for intrusion emplacement and mineralization.

2.2.5 GEOLOGICAL MODEL

Gold mineralization at Ponce Enriquez District is related to the hydrothermal activity generated by the emplacement of Late Tertiary porphyry stocks within a Cretaceous basaltic sequence. At Gaby-Guadalupe and Papa Grande gold mineralization (largely dissemination) is porphyry related, whereas at Mollopongo and Bella Rica it is mostly structurally-controlled and marginal relative to the porphyry intrusions. Therefore, all these deposits are regarded as part of the same large system of gold mineralization, where different styles of mineralization are the result of the relative position (either vertical or lateral) relative to the porphyritic intrusive bodies. Within this framework these deposits are:

Gaby-Guadalupe, on the NW end of the district and at 200-400 m of altitude, is an Au-Cu-Mo porphyry system (mesothermal) related to a composite porphyry stock (the main phase is an hornblende dacitic porphyry). It was brecciated along NW-trending belts, developed a stockwork of quartz and sulfide veinlets, and has been affected by K-silicate and subsequent Ca-Na-silicate hydrothermal alteration. Gold appears to have been introduced late in the Gaby-Guadalupe system, so that gold occurs within all rock types with low concentration.

Papa Grande, immediately SE of Gaby-Guadalupe and at 550-700 m of altitude, is a breccia complex developed within basalts on the roof of a plagioclase dacitic porphyry. Superposed K-silicate, Ca-Na-silicate, and propylitic alteration affected the breccias and gold was introduced mostly within the upper section of the breccia complex. High-grade mesothermal quartz-pyrite-biotite veins occur in the vicinities of the breccia complex hosted by massive basalts.

Mollopongo, is located next to the south and 800-1000 m of altitude. Here gold occurs within a series of quartz-tourmaline-pyrite mesothermal veins, and local ore-grade dissemination within a sequence of basaltic pillow lavas and tuff intercalations. Only strong propylitic alteration of the volcanic host rocks occur, but some chlorite bands within the veins could be completely chloritized biotite bands similar to those of Papa Grande veins.

Bella Rica, farther south and 700 to 1000 m of altitude, high-grade gold has been exploited within a series of quartz-pyrite, quartz-pyrrhotite-chalcopyrite, quartz-arsenopyrite, and sphalerite-quartz veins hosted by propylitized volcanics. These are reputed to be epithermal veins, but according to Paladines and Rosero (1996) the mineral assemblage indicates that they are high-temperature veins (350°-550°C).

2.2.6 REFERENCES

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2.3 DATA COLLECTION

2.3.1 DRILLING PROGRAM

The mineral inventory estimate is based on the results of 11 core drill holes completed prior to Cambior's drilling and 21 core drill holes completed by Prominex-Cambior (Table 2.1). Not included in this estimate are the results of 22 new core drill holes for a total of 2,370 meters which were drilled in April and May 1997. A mineral inventory update with these new results will be presented as a separate report. Each drill hole is identified by its name, coordinates, azimuth, inclination, and depth, and is stored in the GEMCOM-PCXPLOR database.

Table 2.1
Database Information

	Year	No. of Holes	Meters
Prominex	1995	11	1 352
Prominex and Cambior	1996	5	767
Prominex and Cambior	1997	16	1 659
TOTAL		**32**	**3 779**

This estimate is also based on results from 4,538 meters of trenches. Included in the database are 2,660 meters of tunnel sampling. The location of some are not coherent with the topographic map. The tunnel information has been disregarded from our estimate until a complete validation of the information will have been performed. The Papa Grande sector is, in the northeast area, covered with a 50-meter by 100-meter drill grid. The Mollopongo region has been cut by only 4 diamond drill holes.

2.3.2 ASSAYING AND VALIDATION

Core drill holes were systematically cut in half and sampled from top to bottom. Most of the samples were taken at 2 m wide intervals except for a few samples that were collected according to the lithology and/or vein material. NQ core size represents the bulk of the core database.

The Prominex samples were assayed for gold (30 grams = 1 assay-ton; F.A./A.A.) and total copper. Copper values are very low (mean= 0.05%) and gold is the only economical mineral. Since 1996, all assaying has been carried out for gold (30 grams; F.A./A.A.) along with a 34 multi-element suite by I.C.P. Bondar-Clegg laboratory has performed all the assay preparation and analyses on the project.

During the Cambior due diligence program in 1996 and at the end of the second phase of drilling in 1997, a reassay check program was carried out on intervals from selected drill holes. Coarse reject and pulp samples were selected and reassayed for gold. Coarse rejects (154 samples) were reassayed using the metallic sieve -150, +150 mesh method and 157 pulp samples were reassayed using only the F.A./A.A. technique. A sizable variation in the gold content has been observed on an individual sample basis. Coarse gold particles are probably the cause of this variance. The metallic sieve -150, +150 mesh method has shown the presence of coarse gold locally. The upper part of the hole demonstrates, in general, coarse gold grains (>150 mesh or 100 microns). The weight needed to obtain a reproducible sample is a function of the particle size distribution. Therefore, if the gold particles are coarse, the weight of a representative sample submitted to assay needs to be greater especially if it is in the presence of a low grade deposit (Figure 2.3). Statistical studies carried out in the current estimate have revealed that the average difference between the analyses and the reanalyses is 15 percent. For bankable-level resource estimate the deviation between the two averages should be within a 10 percent margin if the coarse rejects are used (Figure 2.4).

For the recent drilling program, the gold assaying will be performed using 50 grams of material. The mineralized intervals will be subsequently reassayed using the coarse rejects by the metallic sieve method at the independant CIMM laboratory in Santiago.

An assay checking program of all the mineralized intervals of the previous drilling is presently underway. Coarse rejects of these intervals have been sent to CIMM in Santiago. The metallic sieve gold assaying method has been used from an individual 500 grams per sample. The results are presented in chapter 2.7.

2.3.3 DATABASE AND VALIDATION

Geological information stored in the database corresponds to rock and mineralization types. The database is stored in PC-XPLOR and QUATTRO PRO software programs. Core sample recovery for the drill holes was quite good, generally in the 90- to 95-percent range, well in-line with mining industry standards. The rock is very competent and a steep pit angle is foreseen.

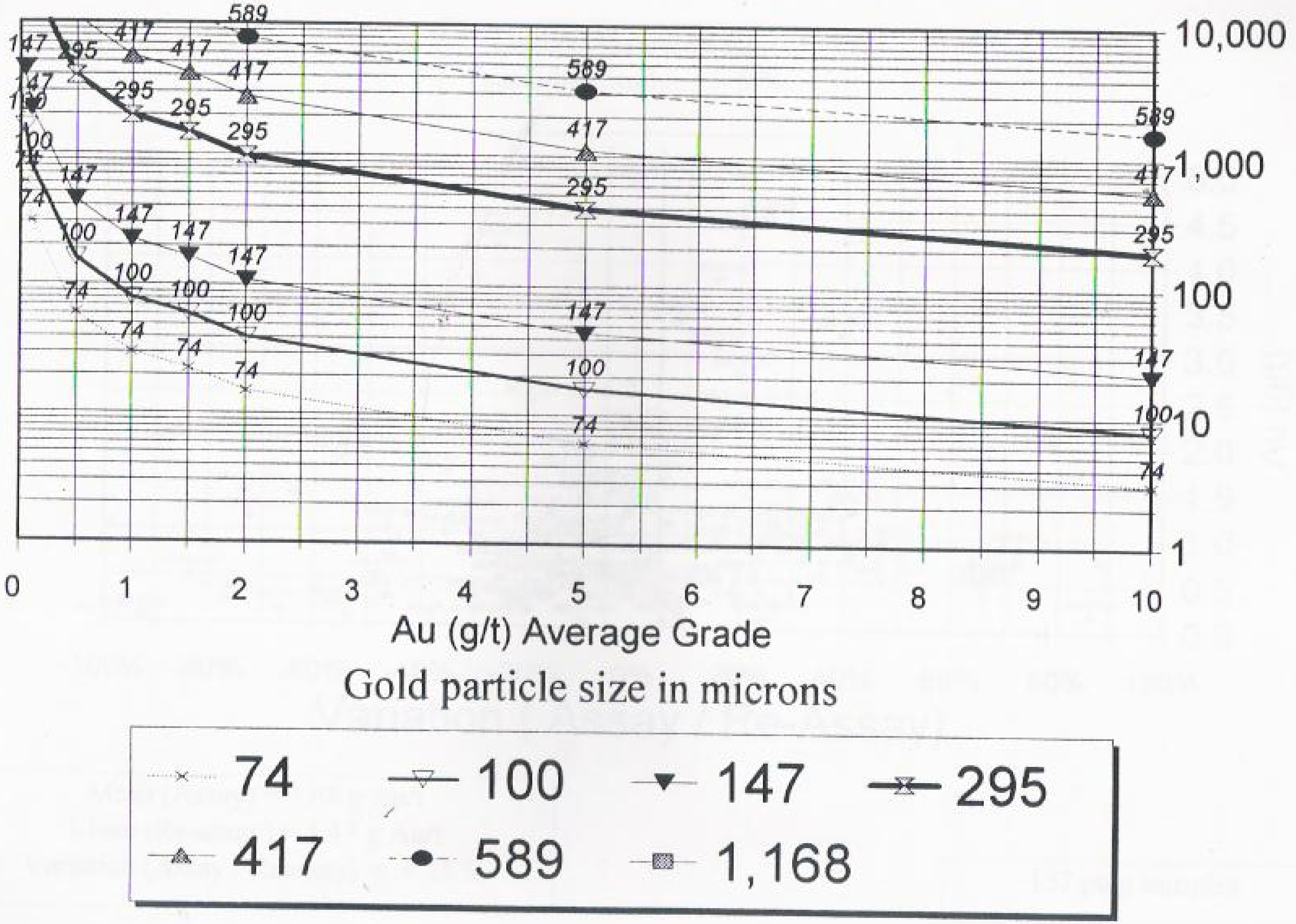
Validation of the database was established with software tools, plots on sections and plan view maps to ensure that the information stored in the database occured in the correct positions and conformed with the geological interpretation.

2.4 GEOLOGICAL INTERPRETATION

Geological interpretation was carried out using north-east cross sections spaced 50- meters apart in all areas. Drill holes, trenches and tunnels were plotted on all sections with grades, rock and mineralization types. Analysis of these sections has shown that the gold mineralization is not well associated with the rock types. The interpretation has been done by using gold isograde contours. Four types of mineralization classes have been defined, corresponding to surface sampling, low grade drill core, medium grade drill core and high grade drill core populations (Table 2.2).

Figure 2.3

Min. Weight for Representative Sample
According to Gold Grain Size



Gold particle size in microns

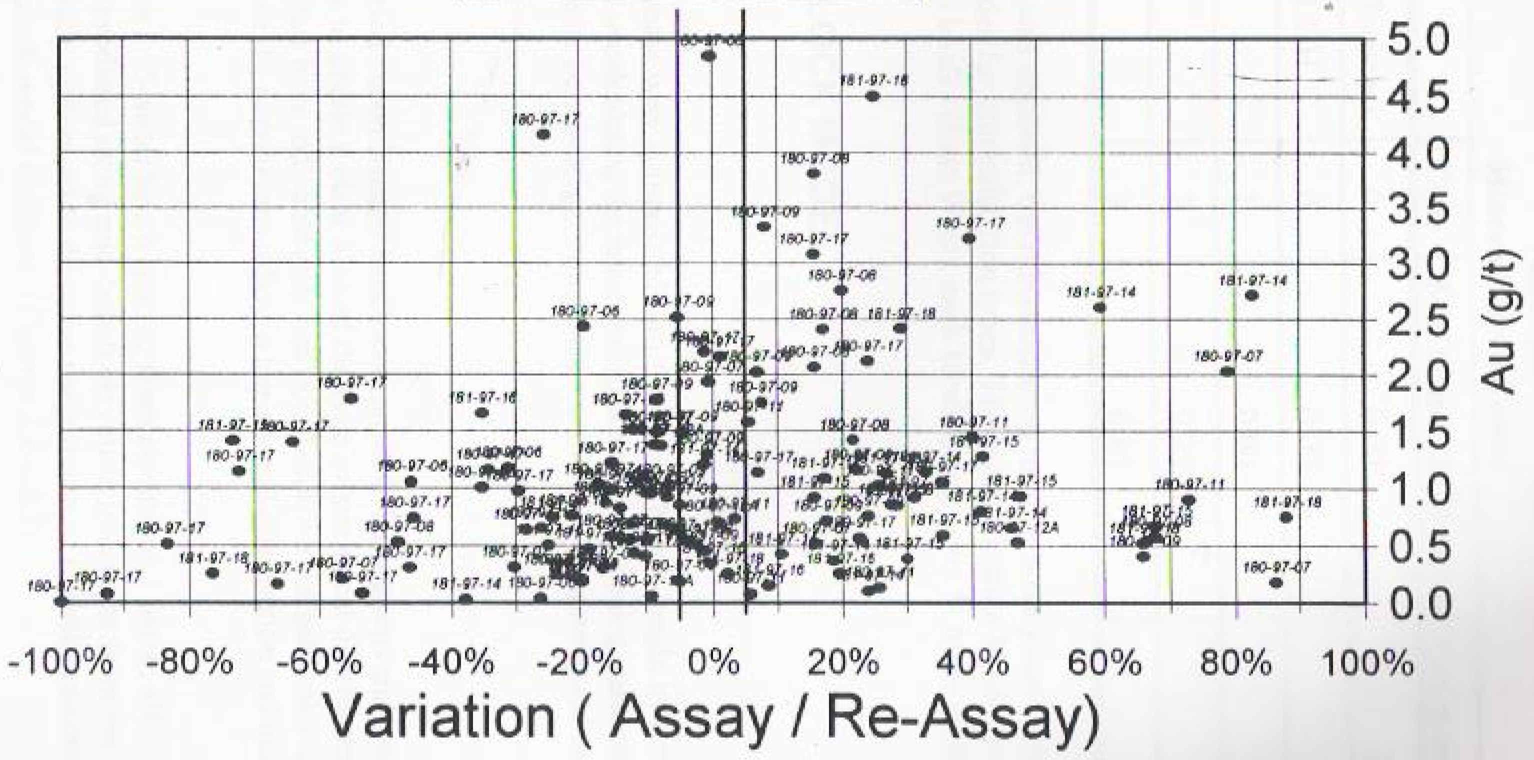
C:\DATA\ECUADOR\CRM.WB2

Figur .4

Assays vs Re-assays (Bondar Clegg)

Papa Grande and Mollopongo

Quality Assurance for
Feasibility Study +/- 5 %



Mean (Assay) = 1.68 g Au/t
Mean (Re-assay) = 1.47 g Au/t
Variation (Assay / Reassay) = + 15 %

157 pulp samples

C:\DATA\ECUADOR\LOG_ANAL.WB2

Table 2.2 Mineralization Zones			
	Code	Minimum Gold Grade	Maximum Gold Grade
Soft Rock (Saprolite) - Trenches	0	0.00	23.49
Soft Rock (Saprolite) - DDH	0	0.00	2.30
Hard Rock - DDH	1	0.00	0.25
Hard Rock - DDH	2	0.25	0.85
Hard Rock - DDH	3	0.85	5.57

Once the deposit geometry was obtained, the mineralization models were joined with the block model. Each block was assigned codes for mineralization types. The mineralization block-model consists of 400 blocks (North-South) by 440 blocks (East-West), each block being 5- by 5- by 5- meters wide, long, and high, respectively.

2.5 COMPUTER BLOCK MODEL

2.5.1 COMPOSITES

All the drill holes in the database were composited into five-meter bench-height by type of mineralization. This compositing was useful in calculating the basic statistics and in the geological modeling of the deposit. For resource estimates, 5-meter bench-height composites were used to correspond to the planned height of the mining benches.

2.5.2 STATISTICS

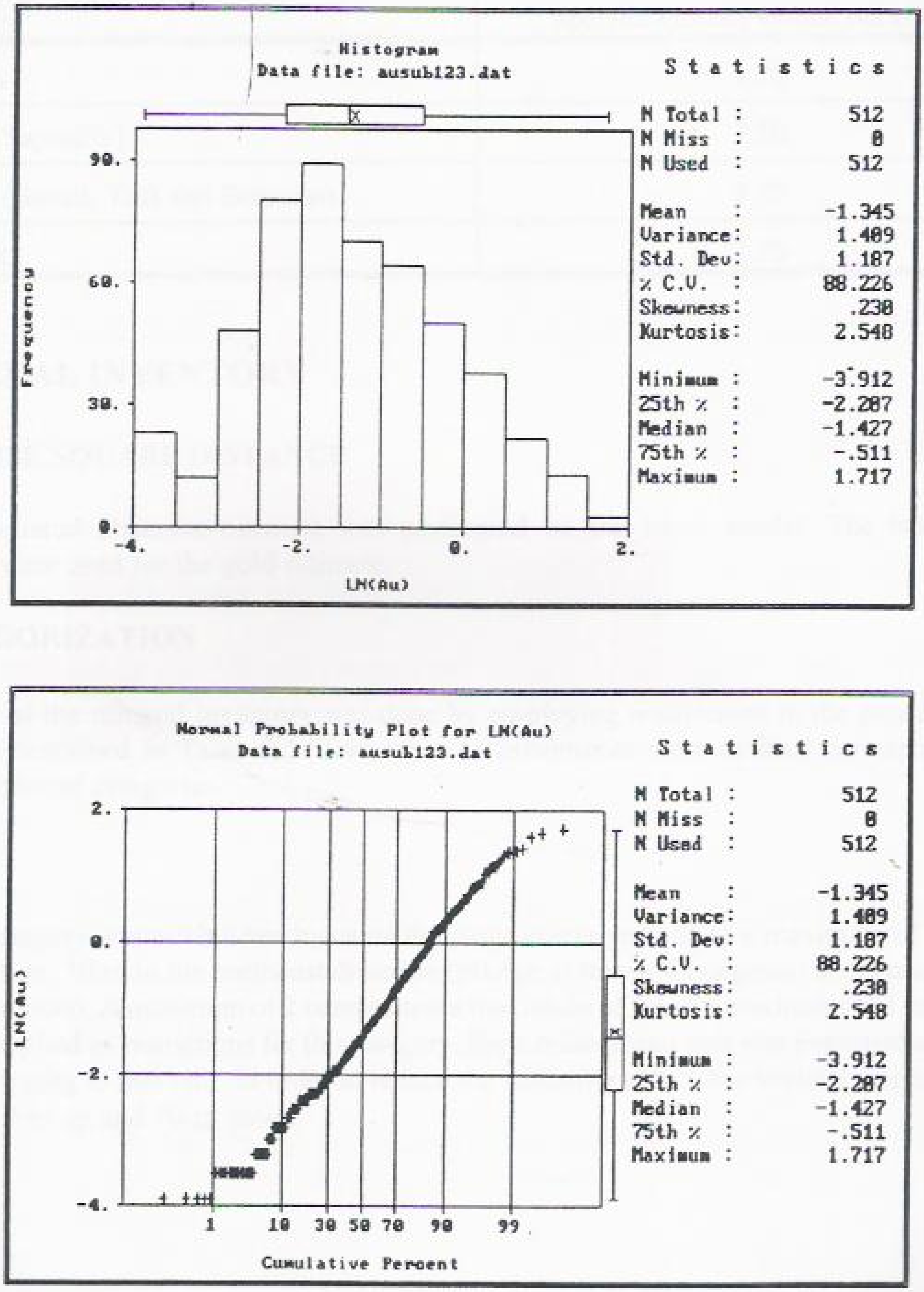
Statistical analyses were carried out on 5-meter bench-composites. Histograms and probability distribution graphs were plotted in order to obtain a clear idea of the type of statistical distribution of the population under study. Statistical analyses have indicated only one population for the gold mineralization population. These studies have shown that the populations follow a log-normal distribution and that there is an absence of outliers (Figure 2.5).

Plan views were generated on a 15-meter bench spacing from elevations 1,060 to 400 for the mineralization boundaries. Each plan was produced using mid-bench elevation intercepts from the respective sections. These intercepts were spatially connected to describe the volume of the mineralization. The plans were digitized and used for the block model estimate. (Figures 2.6 -.2.7)

Figure 2.5 Normal Probability Plot for Gold (DDH data only).

Papagrande and Mollopongo Projects

GOLD
LOG-NORMAL DISTRIBUTION
5m. Bench Composites (DDH only)



Specific gravity values used correspond to the estimated density for each mineralized unit and are presented in Table 2.4. At the present time, there has been no specific gravity test performed on the project samples.

Table 2.4
Specific Gravity by Mineralization Zones

	Specific Gravity (tonne per cu-m)
Overburden	1.70
Soft Rock (Saprolite)	1.50
Hard Rock (Basalt, Tuff and Breccias)	2.70
Waste Rock	2.70

2.6 MINERAL INVENTORY

2.6.1 INVERSE SQUARE DISTANCE

The Inverse Squared Distance estimate was performed on the block model. The bench maps of mineralization were used for the gold estimate.

2.6.2 CATEGORIZATION

Categorization of the mineral inventory was done by employing restrictions in the parameters. These parameters are described in Table 2.5. Two types of inventories were defined corresponding to the indicated and inferred categories.

Indicated

The indicated category was established by using the range corresponding to a maximum of 100 m in the northwest direction, 50 m in the northeast direction (plunge at minus 45 degrees) and a maximum of 10 m in the third direction. A minimum of 2 composites, a maximum of 8 and a maximum of 2 composites per hole were also applied as restrictions for this category. Each mineralized unit was evaluated using only the composites belonging to that unit. In order to reduce the smearing effect, the vertical search was limited by using only 10-m up and 10-m down.

Inferred

The inferred category was defined by using the range corresponding to a maximum of 200 m in the northwest direction, 100 m in the northeast direction (plunge at minus 45 degrees) and a maximum of 50 m in the third direction. A minimum of one composite and a maximum of 8 were applied. As described previously, the statistics have shown a unique log-nornal distribution for the gold population. In the inferred estimate, the saprolite blocks were estimated using only the saprolite composites but the low, medium and high grade drill core composites were grouped in only one population and were used in the block estimate.

Table 2.5
Search Radii Parameters - Gold Estimate

	Indicated Category					Inferred Category				
	Search Radius			Composites		Search Radius			Composites	
Mineral Unit	N315 0	N045 -45	N045 +45	Min	Max	N315 0	N045 -45	N045 +45	Min	Max
All Zones	100	50	10	2	8	200	100	50	1	8

2.6.3 MINERAL INVENTORY ESTIMATES

The resources obtained for the indicated category are:

10,649,400 tonnes at 1.4 g Au/t (479,600 ounces of gold in-situ)

and the inferred category are:

47,708,800 tonnes at 1.1 g Au/t (1,675,000 ounces of gold in-situ)

for a total of :

58,358,200 tonnes at 1.2 g Au/t (2,154,600 ounces of gold in-situ).

These figures do not take into account any mining design and are presented in Table 2.6 for different cutoff grades. Table 2.7 illustrates the estimates at the cutoff grades of 0.55 g Au/t for the soft rock and 0.7 g Au/t for the hard rock respectively.

Tabl ..6

Papa Grande + Mollopongo Projects
Ecuador
MAY 1997 ESTIMATE

Indicated
Soft Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	1,371,460	1.69	74,518
0.90	1,562,780	1.60	80,341
0.80	1,892,440	1.47	89,379
0.70	2,208,680	1.37	97,001
0.60	2,539,040	1.27	103,836
0.55	***2,787,020***	***1.21***	***108,220***
0.50	3,035,000	1.15	112,604
0.40	3,805,280	1.01	123,688
0.30	4,520,710	0.91	131,682
0.20	5,361,430	0.80	138,416
0.10	6,514,160	0.69	143,672

Inferred
Soft Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	829,900	1.85	49,339
0.90	1,007,830	1.69	54,704
0.80	1,174,510	1.57	59,317
0.70	1,389,830	1.44	64,509
0.60	1,612,640	1.33	69,154
0.55	***1,741,270***	***1.28***	***71,726***
0.50	1,973,710	1.19	75,483
0.40	2,696,700	0.99	85,982
0.30	3,627,790	0.83	96,503
0.20	4,567,750	0.71	103,880
0.10	5,992,530	0.57	110,052

Indicated and Inferred
Soft Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	2,201,360	1.75	123,857
0.90	2,570,610	1.63	135,045
0.80	3,066,950	1.51	148,696
0.70	3,598,510	1.40	161,510
0.60	4,151,680	1.30	172,989
0.55	***4,528,290***	***1.24***	***179,947***
0.50	5,008,710	1.17	188,087
0.40	6,501,980	1.00	209,670
0.30	8,148,500	0.87	228,185
0.20	9,929,180	0.76	242,296
0.10	12,506,690	0.63	253,725

Papa Grande + Mollopongo Projects
Ecuador
MAY 1997 ESTIMATE

Indicated
Hard Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	5,490,580	1.74	306,626
0.90	6,227,190	1.64	328,943
0.80	7,124,940	1.54	353,687
0.70	***7,862,370***	***1.47***	***371,335***
0.60	9,039,910	1.36	395,561
0.55	10,314,375	1.26	417,981
0.50	11,588,840	1.18	440,401
0.40	14,464,640	1.04	481,790
0.30	17,688,440	0.91	517,513
0.20	21,132,290	0.80	543,535
0.10	36,065,550	0.53	611,074

Inferred
Hard Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	21,799,930	1.37	957,721
0.90	28,068,740	1.27	1,148,593
0.80	35,451,610	1.18	1,349,183
0.70	***45,967,490***	***1.08***	***1,603,358***
0.60	55,616,180	1.01	1,805,825
0.55	62,870,270	0.96	1,933,230
0.50	70,124,360	0.91	2,060,635
0.40	86,732,840	0.82	2,300,014
0.30	109,993,880	0.72	2,557,191
0.20	146,901,660	0.60	2,849,181
0.10	207,592,110	0.47	3,133,468

Indicated and Inferred
Hard Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	27,290,510	1.44	1,264,347
0.90	34,295,930	1.34	1,477,536
0.80	42,576,550	1.24	1,702,870
0.70	***53,829,860***	***1.14***	***1,974,693***
0.60	64,656,090	1.06	2,201,386
0.55	73,184,645	1.00	2,351,211
0.50	81,713,200	0.95	2,501,036
0.40	101,197,480	0.86	2,781,804
0.30	127,682,320	0.75	3,074,704
0.20	168,033,950	0.63	3,392,715
0.10	243,657,660	0.48	3,744,542

Papa Grande + Mollopongo Projects
Ecuador
MAY 1997 ESTIMATE

Indicated
Soft + Hard Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	6,862,040	1.73	381,144
0.90	7,789,970	1.63	409,284
0.80	9,017,380	1.53	443,066
0.70	10,071,050	1.45	468,336
0.60	11,578,950	1.34	499,396
0.55	13,101,395	1.25	526,201
0.50	14,623,840	1.18	553,005
0.40	18,269,920	1.03	605,479
0.30	22,209,150	0.91	649,195
0.20	26,493,720	0.80	681,951
0.10	42,579,710	0.55	754,747

Inferred
Soft + Hard Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	22,629,830	1.38	1,007,060
0.90	29,076,570	1.29	1,203,298
0.80	36,626,120	1.20	1,408,500
0.70	47,357,320	1.10	1,667,867
0.60	57,228,820	1.02	1,874,979
0.55	64,611,540	0.97	2,004,956
0.50	72,098,070	0.92	2,136,118
0.40	89,429,540	0.83	2,385,996
0.30	113,621,670	0.73	2,653,694
0.20	151,469,410	0.61	2,953,060
0.10	213,584,640	0.47	3,243,520

Indicated and Inferred
Soft + Hard Rock

cutoff (g/t Au)	TONNAGE	g/t Au	Ounces of Gold
1.00	29,491,870	1.46	1,388,204
0.90	36,866,540	1.36	1,612,581
0.80	45,643,500	1.26	1,851,566
0.70	57,428,370	1.16	2,136,203
0.60	68,807,770	1.07	2,374,375
0.55	77,712,935	1.01	2,531,157
0.50	86,721,910	0.96	2,689,123
0.40	107,699,460	0.86	2,991,475
0.30	135,830,820	0.76	3,302,889
0.20	177,963,130	0.64	3,635,011
0.10	256,164,350	0.49	3,998,267

Tab' ?.7

Papa Grande + Mollopongo Projects
Ecuador
MAY 1997 ESTIMATE
Indicated

Soft Rock

	CUTOFF = 0.55 g Au/t			
CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
0	2,787,020	26%	1.21	108,220

Hard Rock

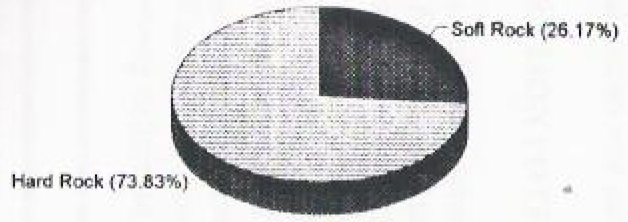
	CUTOFF = 0.7 g Au/t			
CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
1,2,3	7,862,370	74%	1.47	371,335

Total

	CUTOFF = 0.55 and 0.7 g Au/t			
CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
0,1,2,3	10,649,390	100%	1.40	479,555

Papa Grande and Mollopongo
INDICATED

CLASSIFICATION BY ROCK HARDNESS



cutoff = 0.55 g Au/t (Soft) and 0.7 g Au/t (Hard)

Total = 10,7 Mt @ 1.4 g Au/t (479,600 ounces)

Papa Grande + Mollopongo Projects
Ecuador
MAY 1997 ESTIMATE

Indicated and Inferred
Soft Rock

	CUTOFF = 0.55 g Au/t			
CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
0	4,528,290	8%	1.24	179,947

Hard Rock

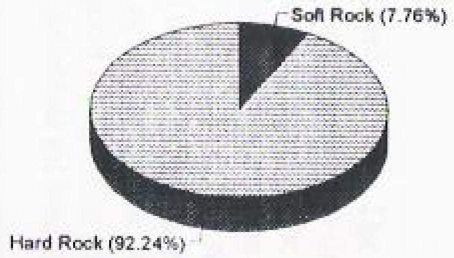
	CUTOFF = 0.7g Au/t			
CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
1,2,3	53,829,860	92%	1.14	1,974,693

Total

	CUTOFF = 0.55 and 0.7 g Au/t			
CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
0,1,2,3	58,358,150	100%	1.15	2,154,640

Papa Grande and Mollopongo
INDICATED and INFERRED

CLASSIFICATION BY ROCK HARDNESS



cutoff = 0.55 g Au/t (Soft) and 0.7 g Au/t (Hard)

Total = 58,4 Mt @ 1.2 g/t Au (2,154,600 ounces)

2.6.4 VALIDATION OF INVENTORY ESTIMATE

The validation of the resource estimate process was carried out by drawing different sections and benches and by comparing the block estimate with the information contained in the diamond drill holes (Figures 2.6 and 2.7). This validation was satisfactory.

2.6.5 EXPLORATION POTENTIAL

The property has only been scratched by a very few sparce drill holes and trenches. The presence of approximately 2,660 meters of tunnel prior to the presence of Prominex and Cambior in the sector has shown the great potential of the property. The estimates listed previously need to be taken with carefulness. The geological framework of the deposit is not well understood. The elements that control the limits and the continuities of the mineralization are to be investigated with more data. A 50mX50m grid drill spacing is recommended in order to collect more information and thereby better understand these controls. The indicated plus inferred inventories listed must be considered as very optimistic. A systematic drill program will add gold ounces rapidly to the indicated resources. A good topographic survey is also a must. The following definition drilling program is proposed inside of the actual pit limits.

Table 2.8

Grass-root Potential Meters		**7,500m**		
Pit Diamond Drill Definition				
		100m X 100m All sectors	50m X 50m 75% sector	25m X 25m 50% sector
Papa Grande	Holes	10	40	35
	Meters	1,500	6,000	5,250
Mollopongo	Holes	14	12	15
	Meters	2,100	1,800	2,250
Total	Holes	24	52	50
	Meters	3,600	7,800	7,500
Classification		Mineral Inventory	Probable & Possible Resource	Proven & Probable Resource

At Ponce Enriquez Project exploration has so far been concentrated on the definition of shallow (i.e. <90 m depth) gold mineralization within the breccia complex of Papa Grande and testing of gold dissemination at Mollopongo property. Identified mineralized bodies within both areas are still open and further exploration may well increase the identified resources.

Cambior-Zappa Properties

Inside designed pits: The resources inside the designed open pits of Papa Grande and Mollopongo have to be supported by a 100 x 100 m drilling grid (all sectors), but also 50 x 50 m drilling grid (75%), and some parts at a 25 x 25 m grid (50%) due to the discontinuity of Au grades. This would require **a first stage of 76 drillholes totalling 11,400 m** and a **second stage of 50 holes totalling 7,500 m** (Table 2.8).

Outside designed pits: Three categories of prospective areas has been delineated based on the available data (Fig. 2.n).

At Papa Grande two "Category 1" areas were defined on the NW and NE sections of the known resources. The NW area (~3.7 ha) has potential for gold-bearing stockwork within basalts on the western side of the porphyry stock, and the NE area (~3 ha) will likely extend the mineralized breccia complex. A staged drilling program would be required to test these areas: **a first stage with 12 drillholes totalling 1300 m,** and if positive it would lead to another stage of **14 holes totalling 1,500 m** to complete a 50 x 50 m drillhole grid.

At Mollopongo two "Category 1" areas were defined; the west one (~4.5 ha) has potential to significantly extend the identified gold dissemination in a N-S belt where abundant underground workings were developed by small miners along gold-bearing veins. Another "Category 1" zone was delineated on the eastern side (~4 ha) where geochemical gold anomalies and underground workings occur, and very limited drill testing has been performed. A staged drilling program with **initial 16 holes totalling 1,700 m**, and if positive it would lead to another stage of **18 holes totalling 2,000 m.**

The central area at Mollopongo designed pits has been delineated as a "Category 2" prospective area (~3 ha), because of scarce geologic data, but it may further extend the known gold dissemination. A program of 10 holes totalling 1,000 m would be required to test this area.

Staged exploration drilling outside designed pits would involve a total of **70 holes totalling 7,500 m** plus **76 holes with a total of 11,400 m** for the first stage definition inside pits. Therefore the drilling required to complete exploration within the properties would involve **146 holes totalling 18,900 m.**

Three untested magnetic high zones that have been identified within the Papa Grande and Mollopongo properties constitute three Category 3 prospective areas where basic explorations work has to be completed to evaluate their gold potential.

Papa Grande + Mollopongo Projects
Ecuador

MAY 1997 ESTIMATE

Indicated and Inferred

Soft Rock

CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
	CUTOFF = 0.55 g Au/t			
0	4,528,290	8%	1.24	179,947

Hard Rock

CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
	CUTOFF = 0.7g Au/t			
1,2,3	53,829,860	92%	1.14	1,974,693

Total

CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
	CUTOFF = 0.55 and 0.7 g Au/t			
0,1,2,3	58,358,150	100%	1.15	2,154,640

Papa Grande + Mollopongo Projects
Ecuador

JUNE 1997 UPDATE

Indicated and Inferred

Soft Rock

CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
	CUTOFF = 0.55 g Au/t			
0	4,288,340	9%	1.22	168,481

Hard Rock

CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
	CUTOFF = 0.7 g Au/t			
1,2,3	41,791,090	91%	1.08	1,453,790

Total

CODE	TONNAGE	% Tm	g Au/t	Ounces of Gold
	CUTOFF = 0.55 and 0.7 g Au/t			
0,1,2,3	46,079,430	100%	1.10	1,622,271

Papa Grande + Mollopongo Projects
Ecuador

Variation (June vs May 1997)

Indicated and Inferred

Soft Rock

CODE	TONNAGE	Tonnage variation	Ounces of Gold	Ounces variation
	CUTOFF = 0.55 g Au/t			
0	-239,950	**-5%**	-11,465	**-6%**

Hard Rock

CODE	TONNAGE	Tonnage variation	Ounces of Gold	Ounces variation
	CUTOFF = 0.7 g Au/t			
1,2,3	-12,038,770	**-22%**	-520,903	**-26%**

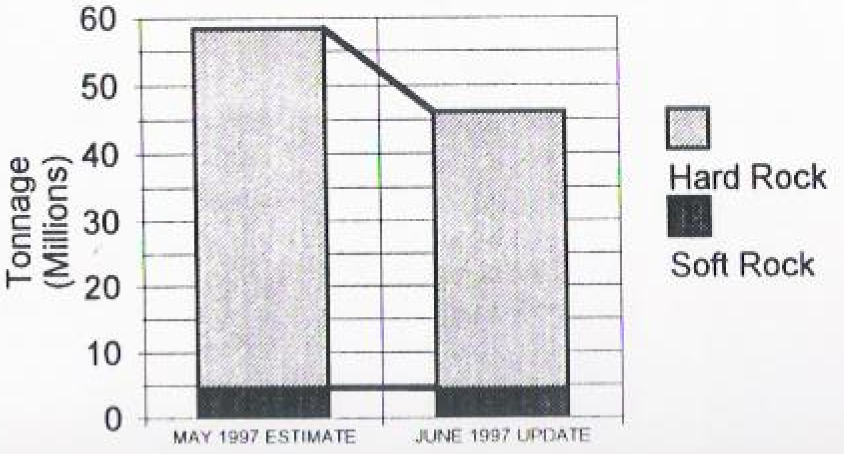
Total

CODE	TONNAGE	Tonnage variation	Ounces of Gold	Ounces variation
	CUTOFF = 0.55 and 0.7 g Au/t			
0,1,2,3	-12,278,720	**-21%**	-532,369	**-25%**

Papa Grande and Mollopongo

Variation (June vs May 1997)

INDICATED AND INFERRED



Estimated US$ 2.8 million would be required to complete further exploration work in the properties.

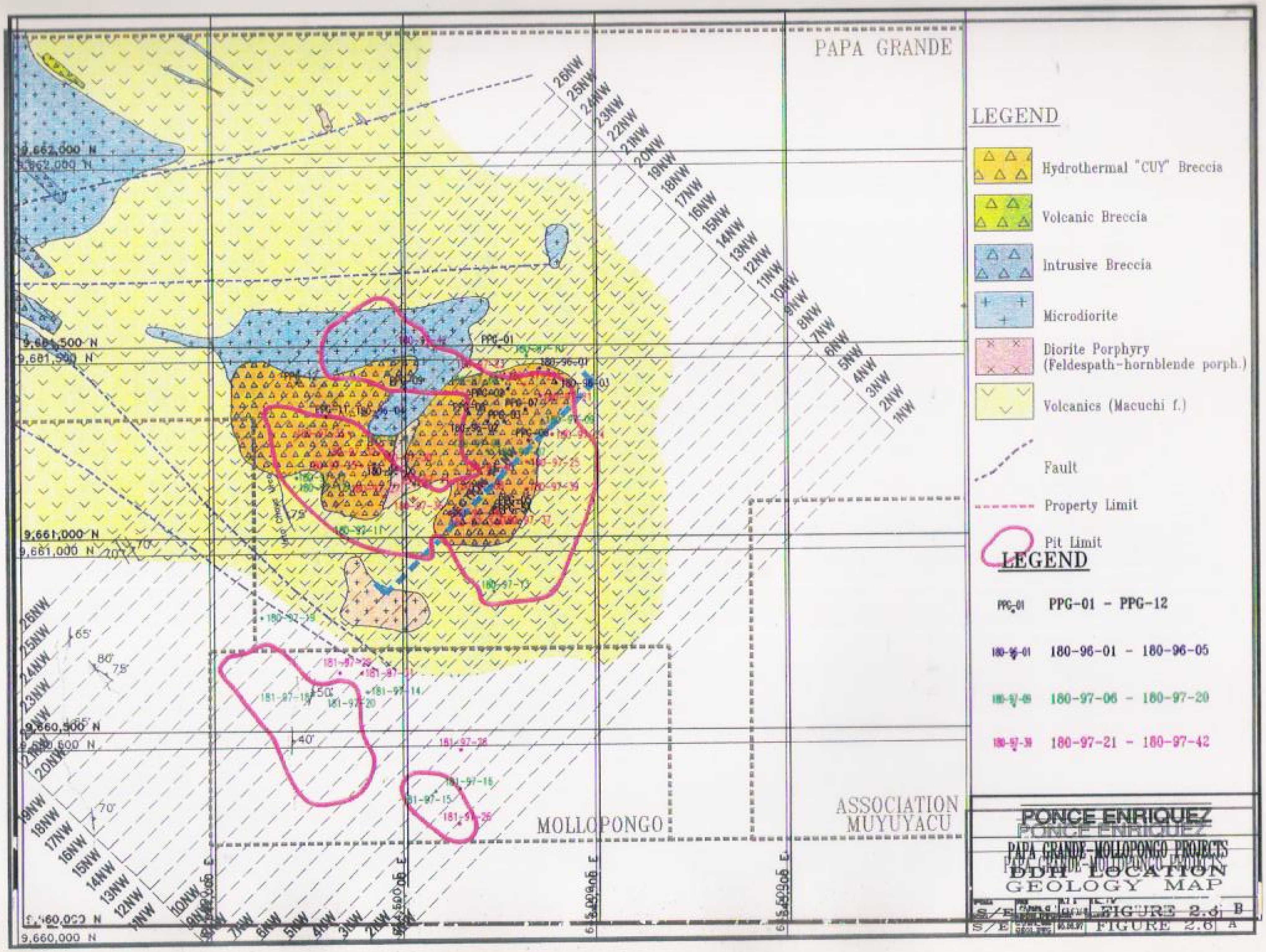
Outside Properties

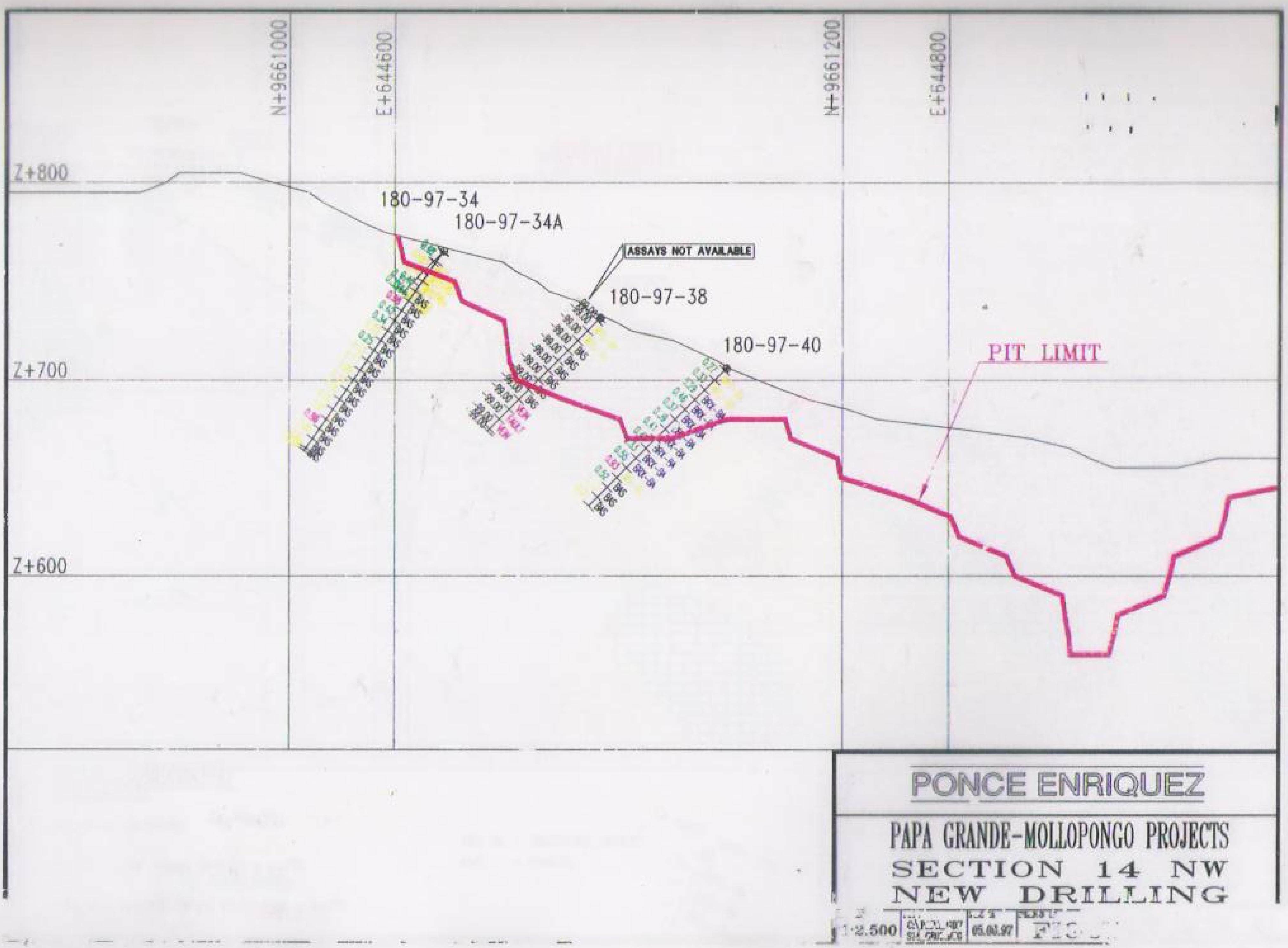
Ongoing exploitation of gold-bearing veins at Guanache and Bella Rica areas on the west and south of the properties makes these areas of prospective interest, as small miners only work high-grade ores and their potential for gold dissemination has not been tested. Therefore these areas have been included as Category 3 prospective areas, but negotiations with current owners have first to be completed before exploration work can be performed.

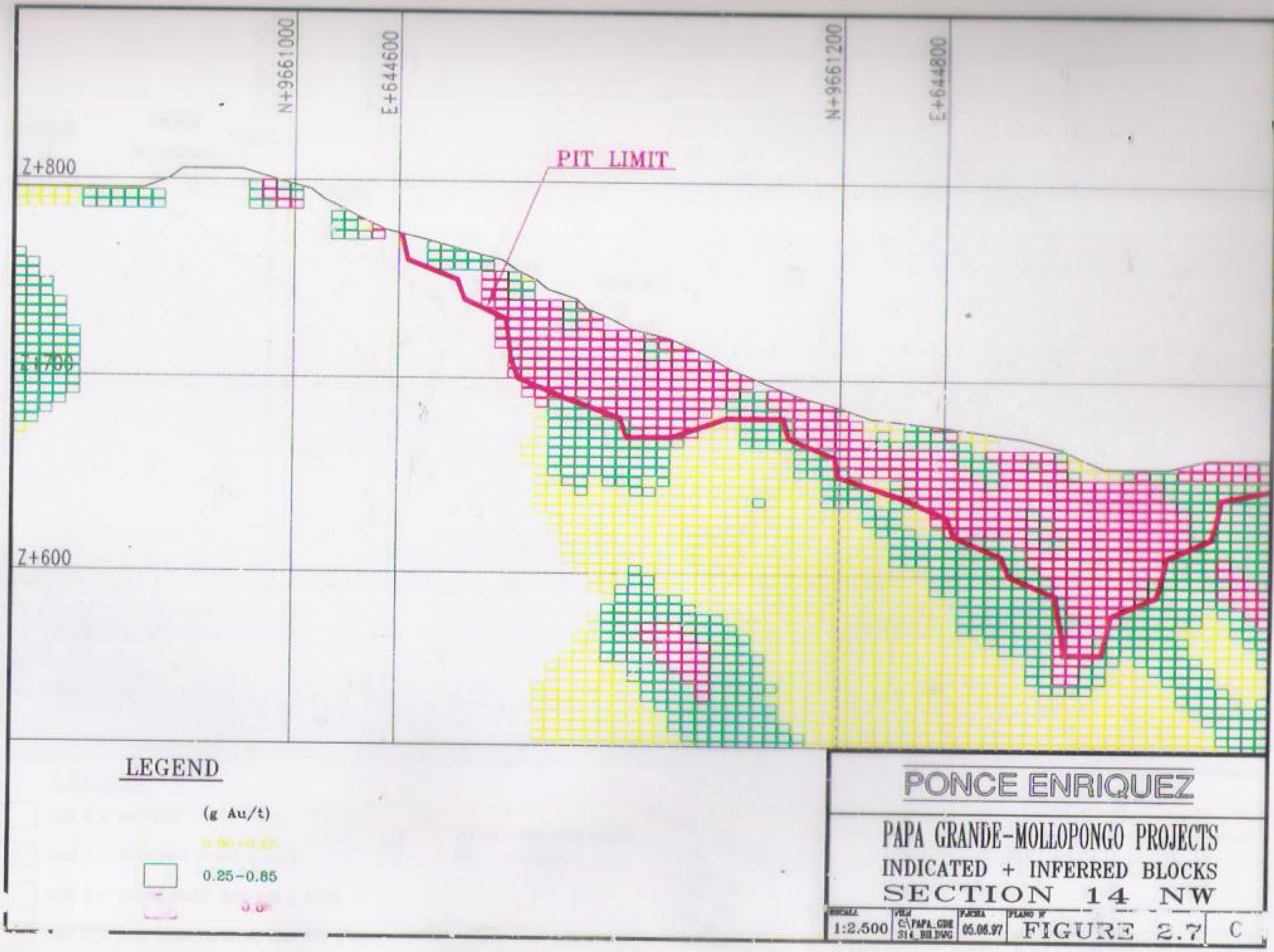
2.7 ASSAY CHECKING PROGRAM UPDATE

As explained in 2.3.2, an assay checking program of all the mineralized intervals of the Cambior-Prominex drilling was performed in May and June 1997. Coarse rejects (40 mesh) of these intervals have been sent by Bondar Clegg (Quito) to the CIMM laboratory at Santiago. The metallic sieve gold assaying method has been used from an individual 500 grams per sample. Results from a total of 441 samples have indicated that most of the results show the presence of fine gold particles (lower than 90 microns). Fine gold particles contribute to around 95 percent of the total gold assay result. These results were also confirmed by the last metallurgical testwork.

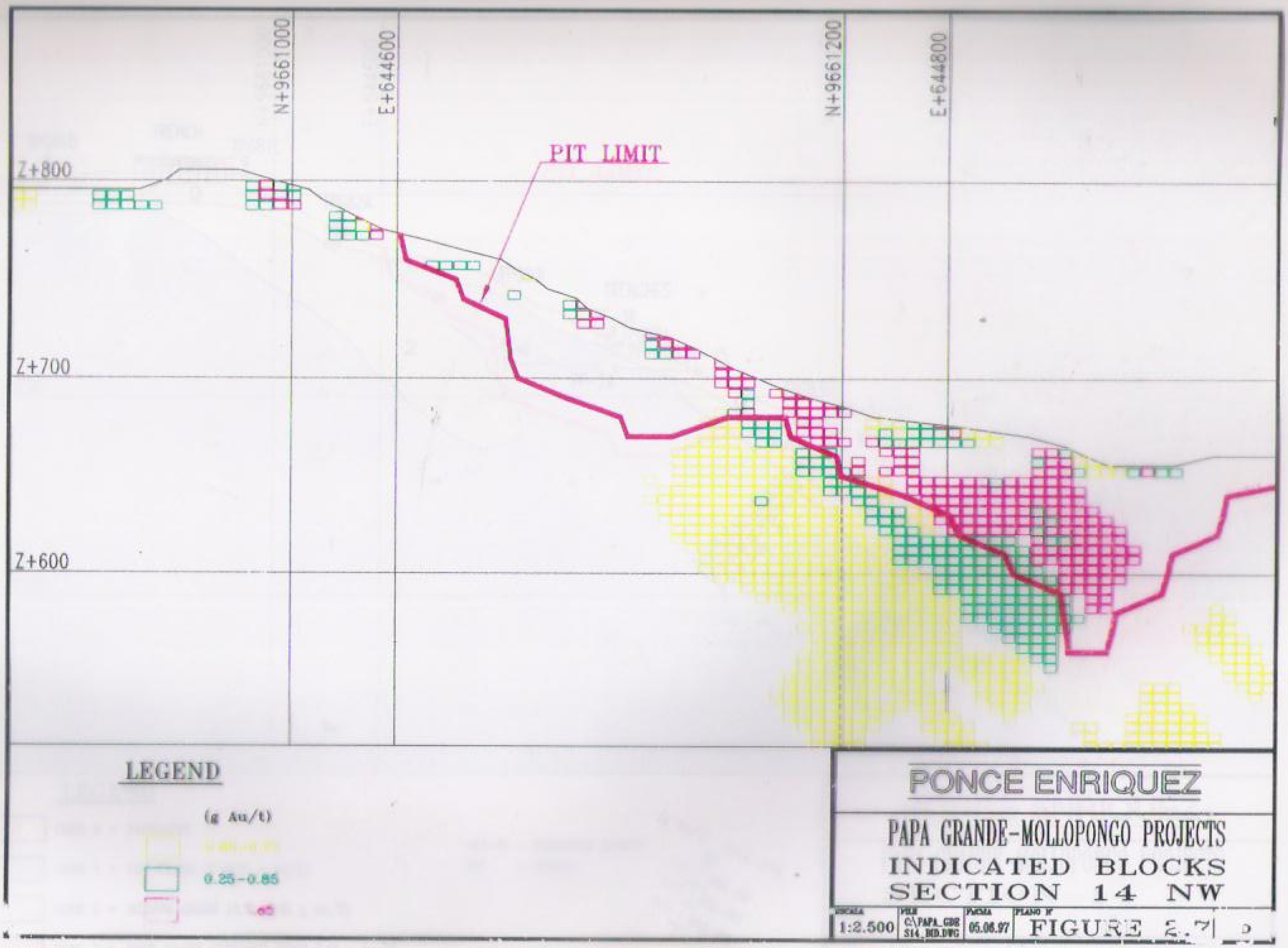
CIMM metallic sieve assay results from diamond drill holes located at less than 50 meters from the holes were coarse gold particles listed by Bondar Clegg have shown an absence of coarse gold. It is suspected that the Bondar Clegg metallic sieve assay procedure is poor or that the result is due to contamination of the sample. In conclusion, the presence of coarse gold in Papa Grande and Mollopongo projects is unrelevant. It is important to note that the assay database used for the current estimate is not affected by these check-assay programs since the original value was used.

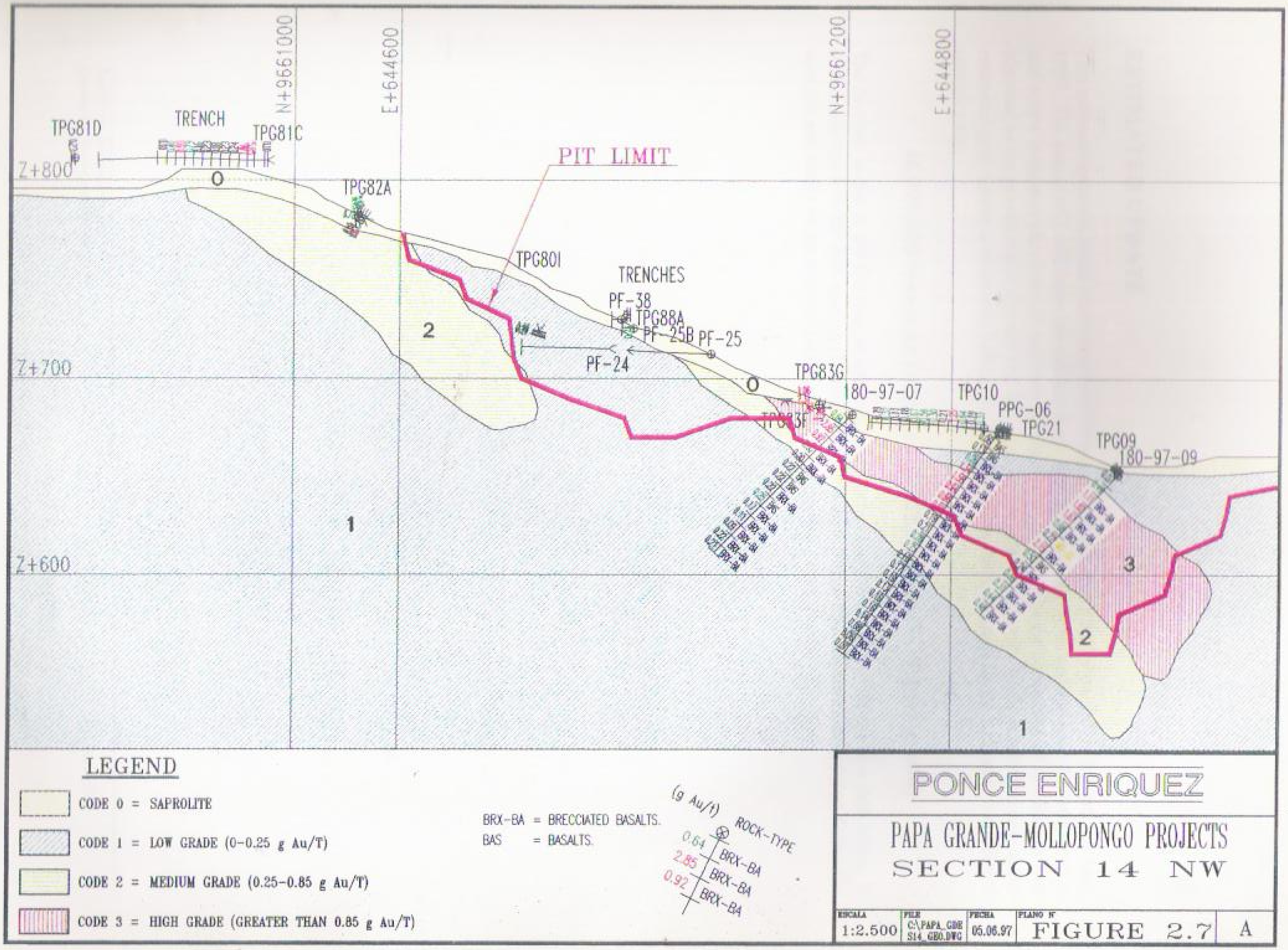

PAPA GRANDE
MOLLOPONGO
ASSOCIATION
MUYUYACU
LEGEND
Hydrothermal "CUY" Breccia
Volcanic Breccia
Intrusive Breccia
Microdiorite
Diorite Porphyry
(Feldespath-hornblende porph.)
Volcanics (Macuchi f.)
Fault
Property Limit
Pit Limit
LEGEND
PPG-01 - PPG-12
180-96-01 - 180-96-05
180-97-06 - 180-97-20
180-97-21 - 180-97-42
9,662,000 N
9,661,500 N
9,661,000 N
9,660,500 N
9,660,000 N
PONCE ENRIQUEZ
PAPA GRANDE-MOLLOPONGO PROJECTS
DDH LOCATION
GEOLOGY MAP
FIGURE 2.6


N+9661000
E+644600
N+9661200
E+644800
Z+800
Z+700
Z+600
180-97-34
180-97-34A
ASSAYS NOT AVAILABLE
180-97-38
180-97-40
PIT LIMIT
PONCE ENRIQUEZ
PAPA GRANDE-MOLLOPONGO PROJECTS
SECTION 14 NW
NEW DRILLING
1:2.500
05.03.97



N+9661000
E+644600
N+9661200
E+644800
PIT LIMIT
Z+800
Z+600
LEGEND
(g Au/t)
0.25-0.85
PONCE ENRIQUEZ
PAPA GRANDE-MOLLOPONGO PROJECTS
INDICATED + INFERRED BLOCKS
SECTION 14 NW
1:2.500
05.06.97
FIGURE 2.7
C


N+9661000
E+644600
N+9661200
E+644800
PIT LIMIT
Z+800
Z+700
Z+600
LEGEND
(g Au/t)
0.25-0.85
PONCE ENRIQUEZ
PAPA GRANDE-MOLLOPONGO PROJECTS
INDICATED BLOCKS
SECTION 14 NW
1:2.500
05.06.97
FIGURE 2.7


TPG81D
TRENCH
TPG81C
N+9661000
E+644600
N+9661200
E+644800
PIT LIMIT
Z+800
Z+700
Z+600
TPG82A
TPG80I
TRENCHES
PF-38
TPG88A
PF-25B
PF-25
PF-24
TPG83G
180-97-07
TPG10
PPG-06
TPG21
TPG09
180-97-09
LEGEND
CODE 0 = SAPROLITE
CODE 1 = LOW GRADE (0-0.25 g Au/T)
CODE 2 = MEDIUM GRADE (0.25-0.85 g Au/T)
CODE 3 = HIGH GRADE (GREATER THAN 0.85 g Au/T)
BRX-BA = BRECCIATED BASALTS.
BAS = BASALTS.
(g Au/t)
ROCK-TYPE
0.64 BRX-BA
2.85 BRX-BA
0.92 BRX-BA
PONCE ENRIQUEZ
PAPA GRANDE-MOLLOPONGO PROJECTS
SECTION 14 NW
ESCALA 1:2.500
FILE C:\PAPA_GDE S14_GEO.DWG
FECHA 05.06.97
PLANO N° FIGURE 2.7 A

ESTIMATED UPDATE

This estimate update is based on the results of 20 new core drill holes which were drilled in April and May 1997. The assays of 2 drill holes are still pending. The database has been updated with the latest results and a new indicated plus inferred estimate has been carried out. The categorization of inventories was identical to the previous calculations and the same parameters were used. A 25 percent decrease in the estimated gold ounces is observed (Table 2.8). The new inventories obtained for the indicated plus inferred category are:

46,079,400 tonnes at 1.1 g Au/t (1,622,300 ounces of gold in-situ)

The decrease is due to the fact that, in general, lower gold values are obtained for the new drill holes. It also shows that a closer drill spacing (50m x 50m and locally 25m x 25m) is a must in order to define the controls and limits of the mineralization.

3. MINE

The Mining Reserves and Mine Plan were developed using the indicated and inferred resources of the Mineral Inventory presented in the chapter before. The Whittle 4D pit optimizer was used to calculate the final pit envelope at the following conditions:

	Soft Rock	Hard Rock
Gold price (US$/oz)	400	400
Royalty (NSR)	3.75%	3.75%
Mining cost (US$/t moved)	1.32	1.55
Milling cost (US$/t milled)	5.15	6.63
G&A cost (US$/t milled)	1.03	1.03
Mill recovery	90%	90%
Interramp slope angle	48 degrees	48 degrees

The pit optimizer identified two distinctive pit envelopes covering respectively the Mollopongo and Papa Grande sectors. The pit have the following general characteristics:

	Mollopongo	Papa Grande
Length (m)	700 m	900 m
Width (m)	175 m	700 m
Depth (m)	160 m	300 m
High wall (m)	180 m	300 m

In order to establish the mining reserves the internal cut-off grades were calculated as follows:

	Soft Rock	Hard Rock
Milling (US$/t)	5.15	6.63
G&A (US$/t)	1.03	1.03
Total cost (US$/t)	6.18	7.66
Equivalent gold grade at US$ 400 / oz	0.48 g/t	0.60 g/t
Mill recovery	90%	90%
Royalty recovery	96.25%	96.25%
Internal cut-off grade	0.55 g/t	0.70 g/t

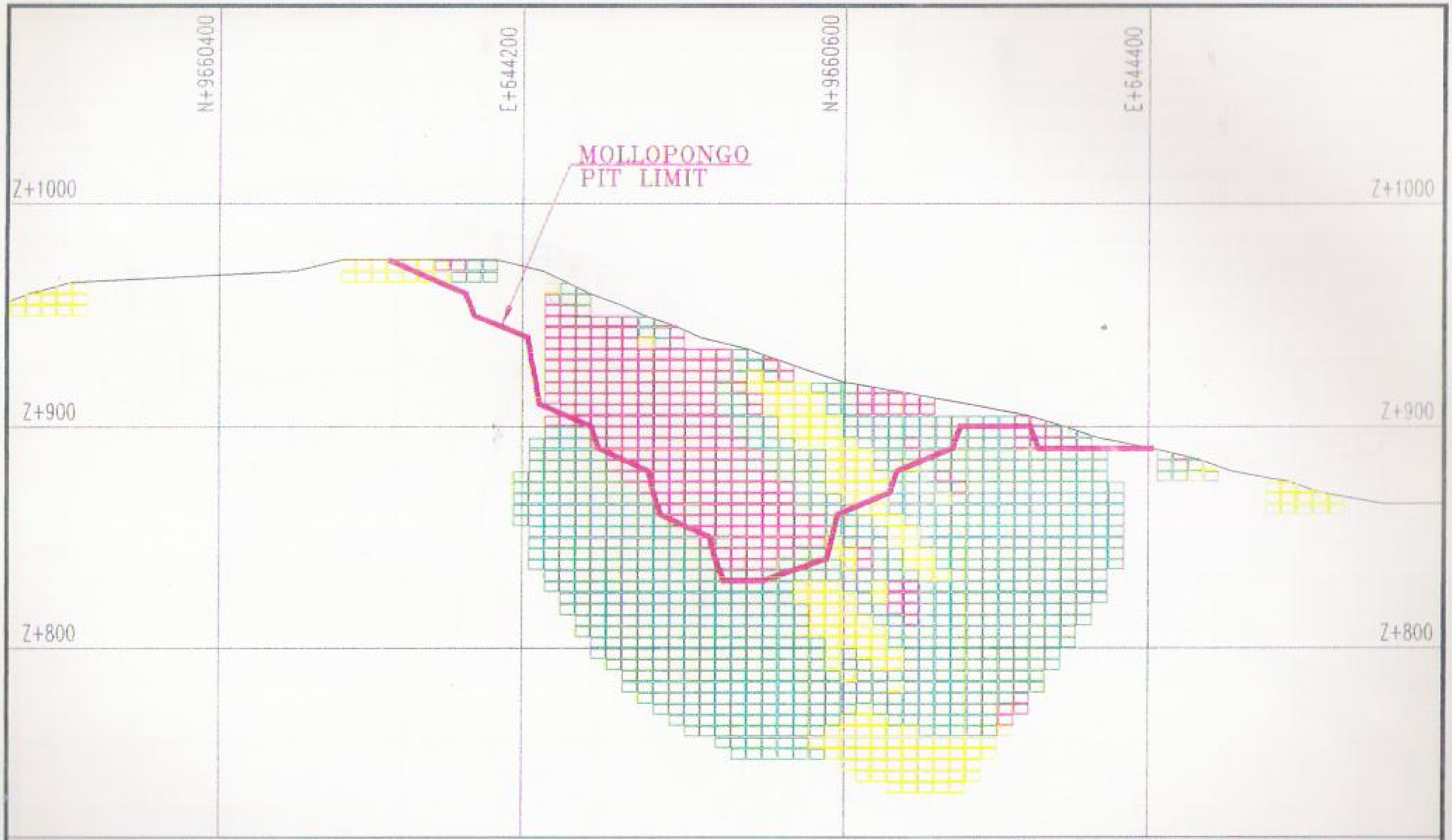
The mining reserves, based, on the criteria presented above were calculated as follows:

	Soft Rock	Hard Rock	Total
Mollopongo	1,482,040 t @ 1.67 g/t	5,742,340 t @ 1.60 g/t	7,224,380 t @ 1.62 g/t
Papa Grande	1,629,370 t @ 1.20 g/t	15,594,200 t @ 1.37 g/t	17,223,570 t @ 1.34 g/t
Total	3,111,410 t @ 1.42 g/t	21,336,540 t @ 1.43 g/t	24,447,950 t @ 1.43 g/t

In order to optimize the mine plan, two internal pit envelopes were developed within the final pit, representing phases at gold price of US$ 50 and US$ 100 / oz. The final mine plan is presented on Table 3.1.

Figures 3.1 and 3.2 present the typical sections of the two pits and Figure 3.3 presents a general arrangement of the Ponce Enriquez complex. Figure 3.3 also presents the location of the waste dumps that will be located at north east and north west of Papa Grande property.

The operating conditions for the Papa Grande and Mollopongo pits are characterized by the difficult topography, based on the Omai experience, mining in such conditions is possible when roads can be established to access the first benches and after the mining can progress downward in conditions relatively easy. Based on the field visit such roads seem possible to establish and also hard rock quarry are available to produce the hard rock necessary to cover the road to permit the operation during the rainy seasons. The Mollopongo and Ponce Enriquez pits have the advantages of having mineralized zones right on surface and the topographic conditions facilitate the drainage of the pits.



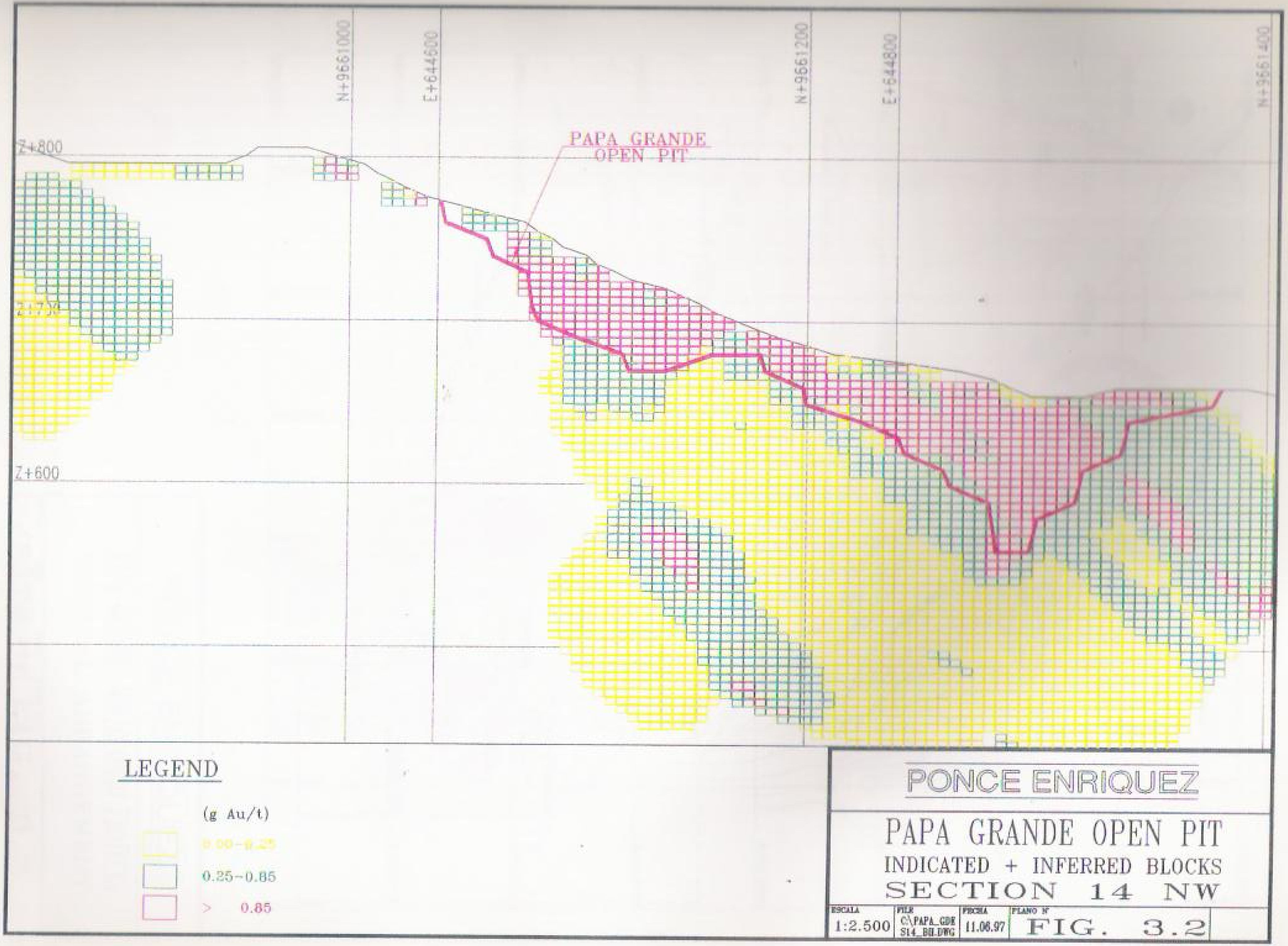
PONCE ENRIQUEZ

MOLLOPONGO OPEN PIT

INDICATED + INFERRED BLOCKS

SECTION 12 NW

ESCALA	FILE	FECHA	PLANO N°
1:2.500	C:\PAPA_GDE 512_BLK.DWG	07.06.97	FIG. 3.1



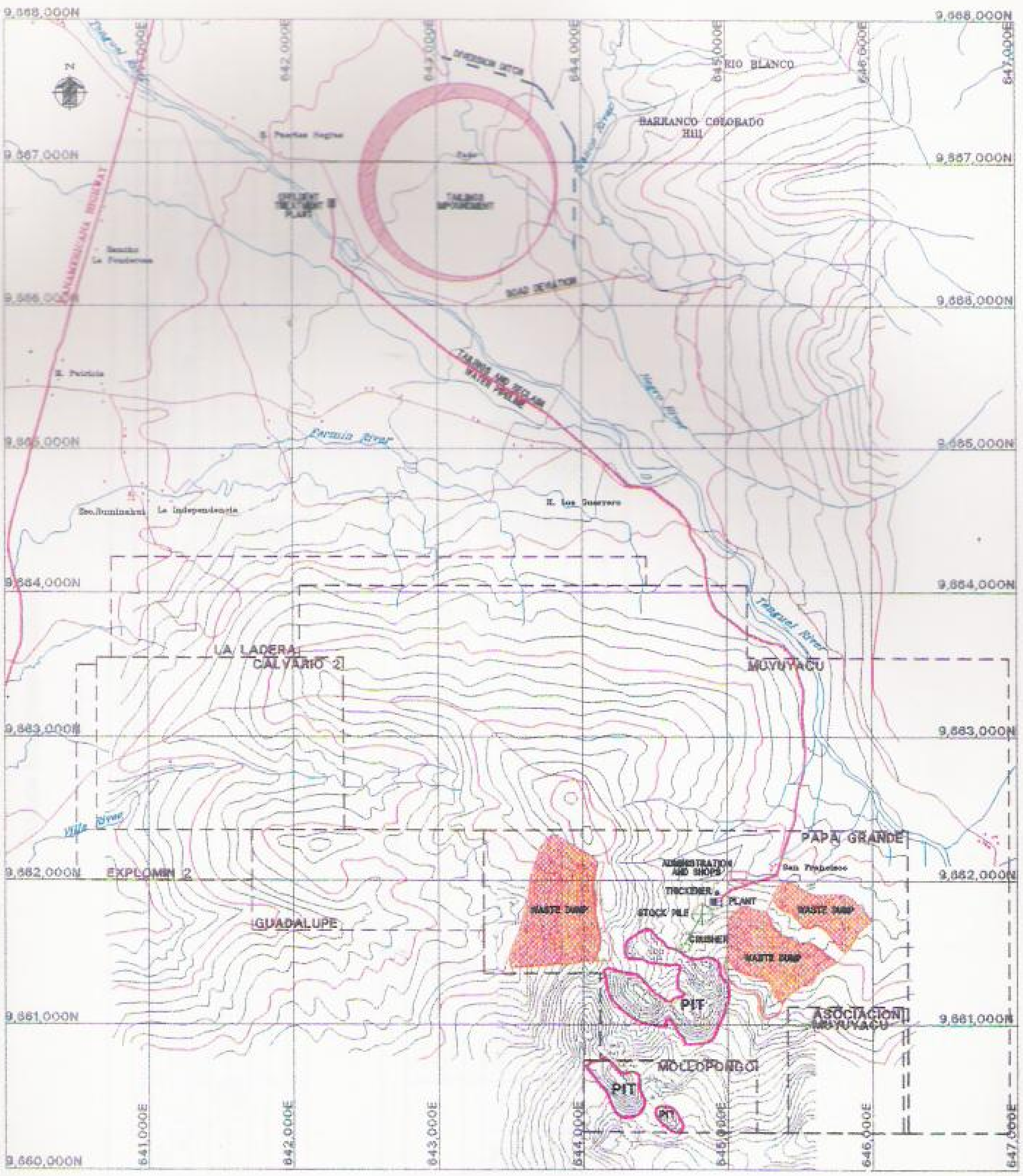
PONCE ENRIQUEZ

PAPA GRANDE OPEN PIT

INDICATED + INFERRED BLOCKS

SECTION 14 NW

ESCALA	FILE	FECHA	PLANO N°
1:2.500	C:\PAPA_GDE S14_BH.DWG	11.06.97	FIG. 3.2



PONCE ENRIQUEZ

PAPA GRANDE-MOLLOPONGO PROJECTS
GENERAL ARRANGEMENT

ESCALA	FILE	FECHA	PLANO N°
S/E	C:\PAPA_GDE FIG 3-3.DWG	10.06.97	FIG. 3.3

Ponce Enriquez Project

Table 3.1

Mineable Reserves Summary	Phase I				Phase II				Phase III			
	Saprolite		Hard Rock		Saprolite		Hard Rock		Saprolite		Hard Rock	
	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au
PP												
Year 1	1,000,000	1.954	4,000,000	2.007								
Year 2	326,700	1.580	85,560	2.290	673,300	1.212	3,914,440	1.434				
Year 3					513,180	1.142	4,000,000	1.288	486,820	0.919		
Year 4							2,311,020	1.490	156,410	0.985	2,532,570	1.195
Year 5											4,491,950	1.139

Mineable Reserves Total	Total						
	Saprolite		Hard Rock		Total Ore		Waste
	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes	g/t Au	Tonnes
PP							
Year 1	1,000,000	1.954	4,000,000	2.007	5,000,000	1.997	2,963,000
Year 2	1,000,000	1.332	4,000,000	1.452	5,000,000	1.428	2,743,000
Year 3	1,000,000	1.033	4,000,000	1.288	5,000,000	1.237	4,182,000
Year 4	156,410	0.985	4,843,590	1.336	5,000,000	1.325	2,068,000
Year 5			4,491,950	1.139	4,491,950	1.139	2,394,000
Total					24,491,950	1.431	14,350,000

Strip Ratio: 0.59

Equipment selected to mine the Ponce Enriquez Complex are similar to the one used at the Omai operations and are summarized as follows:

	PP	1	2	3	4	5
Drill 150 mm	2	2	2	2	2	2
Backhoe 15 m3	1	1	1	1	1	1
Loader 11 m3	1	1	1	1	1	1
Truck 77 t	7	7	7	8	6	6
Wheeldozer 450 hp	1	1	1	1	1	1
Bulldozer 405 hp	3	3	3	3	3	3
Grader 275 hp	2	2	2	2	2	2
Water truck	1	1	1	1	1	1

For grade control reasons, benches in this study are assumed to be of 5 meters.

Pit operations are assumed to be on a continuous basis. Working schedule are assumed to be 14 days in, 7 days out and 12 hours working shift.

The Mine Department will consist in the mine operations, maintenance, engineering and geology.

Capital and operating costs are presented in Chapter 7.

4. PROCESSING

4.1 ORE CHARACTERIZATION

Ore mineralization of the Papa Grande project comprises weathered soft rock and underlying hard rock. In the ore reserves, soft rock represents 13 %, however, the plant design is based only on the characteristics of the hard rock, due to the inexistance of any test results on the soft rock part of the deposit.

The main part of the deposit is formed by a central Breccia complex body, consisting of brecciated basalt in different gradations. Apart from this body there is a smaller distinctive diatreme breccia body west of the main zone. Mineralization, appears to be essentially the same. Mollopongo is a vein system along with gold dissemination associated to more porous tuffaceous beds, located higher up the mountain, although geologically quite different, no significant mineralogical or metallurgical differences appear to exist between Mollopongo and the two zones of Papa Grande.

Gold is typically finely disseminated throughout the ore, but is amenable to gravity separation. It occurs associated and included in pyrite and in lesser amounts in gangue, some traces of other sulphides are found (pyrothite, chalcopyrite and galena).

Mine plans show process plant feed of 5,000,000 ton per year at an average grade of 1.4 g/t gold. Peak head grades will be about 2.0 g/t gold and this value is used to design dimensions of equipment.

4.2 Metallurgical testwork

For this study a metallurgical test program was undertaken. The objective was to obtain in a short time frame a good idea of metallurgical behaviour, without getting into details. The program consisted of the following:

1) Ore characterization
   a. Head assay
   b. Mineralogy
   c. Assay by size fraction
2) Bond rod & ball mill work indices
3) Gravity separation tests
4) Cyanidation tests
5) Column leach tests

For this metallurgical program six composites were made to represent the deposit as it was known by mid April '97. The main breccia complex zone was divided in two for this purpose, in a northern and a southern zone. From each of these two zones two composites were made out of quarter core from the Cambior and Prominex drill campaigns. One composite at a higher grade (1.5 - 2 g/t Au) and one at a lower grade (0.7 - 1 g/t Au), to see the influence of the grade on metallurgical behaviour. Also a composite was made from a diatreme breccia zone slightly west of the main intrusive zone, this appears to be a different ore type due to the different host rock (breccia vs. brecciated basalt in the main breccia complex zone). Finally a sixth composite was taken from the Mollopongo zone. Below the six composites are defined as will be of use during the rest of this chapter.

Composite 1	Main breccia complex zone, northern part	1.5 - 2 g/t Au
Composite 2	Main breccia complex zone, southern part	1.5 - 2 g/t Au
Composite 3	Diatreme breccia zone	± 2 g/t Au
Composite 4	Mollopongo zone	± 2 g/t Au
Composite 5	Main breccia complex zone, northern part	0.7 - 1 g/t Au
Composite 6	Main breccia complex zone, southern part	0.7 - 1 g/t Au

4.2.1 SAMPLE CHARACTERIZATION

Head assays

The composites were assayed for the following elements: Au, Ag, Fe, Cu_{seq}, Zn, Pb, S & C. Table 4.1 presents the results.

Table 4.1
Head Assay Results

	Comp. 1	Comp. 2	Comp. 3	Comp. 4	Comp. 5	Comp. 6
Au g/t	2.55	2.16	2.12	2.32	0.96	0.80
Ag g/t	2.0	1.5	2.0	2.0	1.5	1.0
Fe %	11.0	9.22	12.1	10.4	10.5	10.2
Cu_{tot} %	0.045	0.033	0.036	0.033	0.068	0.039
Cu_{CN} %	0.001	0.001	0.001	0.001	0.001	0.001
Cu_{H2SO4} %	0.002	0.002	0.003	0.005	0.001	0.002
Cu_{res} %	0.001	0.001	0.001	0.001	0.001	0.001
Zn %	0.013	0.005	0.004	0.006	0.01	0.005
Pb %	0.001	0.001	0.001	0.002	0.001	0.001
S %	2.73	4.13	5.16	2.59	2.88	4.19
C %	0.20	0.20	0.09	0.10	0.21	0.23

Mineralogy

The six composites were prepared to 100 % -35 Tyler mesh (420 µm) and subsequently separated in a heavy and a light fraction by Heavy Medium Separation with a liquid specific density of 2.89. The heavy fractions were then studied by reflective light microscopy. The weight percentages in the heavy fractions varied from 7.3 to 11.5 % w/w. In general all composites were very similar in terms of mineral components, being principally pyrite with less pyrothite and small amounts of fine chalcopyrite, predominantly associated and included in pyrite. Other copper minerals as well as sphalerite and galena were sometimes observed in traces. Also magnetite and limonite were noticed in small amounts.

The gold observed was also quite similar in all samples, the majority is included as fine grains (3 - 30 µm) in pyrite or sometimes pyrothite (17 - 55 %). Another important part as fine grains (3 - 10 µm) is included in gangue (17 - 30 %). Free gold is observed from 17 to 33 % as a bit coarser grains 20 - 40 µm. The balance being gold grains associated with pyrite or gangue, in one sample upto 50 %. The pyrite and gangue particles that contained gold were generally pretty coarse from 70 to 450 µm. In no sample gold particles observed were bigger than 50 µm.

Assay by size fraction

The composites -10# Tyler were classified in to sieve fractions; + 297 µm, 149 - 297 µm, 74 - 149 µm, 44 - 74 µm, 30 - 44 µm, 11 - 30 µm and -11 µm. Due to the coarse sample preparation most of the weight was encountered in the + 297 µm fraction. Although this fraction yielded gold grades similar to the overall head grades it can not be concluded that there is coarse gold, since the gold in this fracton might be fine gold included in coarse pyrite particles. In all samples the fraction + 30 - 44 µm returned significant higher gold grades (8 - 15 g/t). Also in several samples the fractions + 11 - 30 µm and + 44 - 74 µm returned gold values slightly higher than average (4 - 5 g/t). All other fractions had gold grades similar or lower than the aveage head grade. It can be concluded that most of the gold is in the 30 - 44 µm range.

4.2.2 BOND ROD & BALL MILL WORK INDICES

To obtain grindability data standard Bond Work Indices were determined on all composite samples. Rod mill feed was crushed to -2" and ground to 16#. The feed for the ball mill was crushed to -6# and ground to 100#. Table 4.2 presents the resulting Bond work indices all in metric units (kWh/t).

Table 4.2 Bond Work Indices

	Bond Rod Mill Work Index	Bond Ball Mill Work Index
Composite 1	22.8	18.0
Composite 2	23.1	20.6

Table 4.2 Bond Work Indices		
Composite 3	21.3	17.5
Composite 4	20.6	19.4
Composite 5	22.6	18.4
Composite 6	26.7	20.5

4.2.3 GRAVITY SEPARATION TEST RESULTS

For this test the composites were ground to 100% -48# Tyler (297 µm) and subsequently passed over a Wilfley table. The concentrate obtained was passed over a superpanner obtaining 10 - 20 g of final concentrate. One half was assayed for Au and the other half was send for mineralogical analysis to study the occurrence, liberation and particle sizes of the gold present in the gravity concentrate. Table 4.3 presents the results of the gravity separation tests.

These results indicate that there is good potential for recovering part of the gold in a gravity circuit.

Table 4.3 Gravity Separation Test Results

	Conc. super panner	Tails super panner	Tails Wilfey table
Composite 1	60.2%	8.9%	30.9%
Composite 2	64.4%	10.2%	25.4%
Composite 3	61.5%	13.1%	25.5%
Composite 4	66.0%	15.0%	19.0%
Composite 5	60.0%	23.0%	17.0%
Composite 6	39.2%	31.5%	29.3%

4.2.4 CYANIDATION TESTS

Standard bottle roll leach tests were executed to investigate gold recovery by cyanide leaching. Four tests were done with each composite, varying two main parameters. The grind was done at 60% and 80% passing 200 Tyler mesh and the sodium cyanide concentration in the leach solution was 0.5 and 1.0 g/l. Gold recovery was just a little affected by varying the parameters and was quite comparable for all samples varying fom 86 % to 94 % with most values in the 88% to 92 % range. The most significant difference in the results were the lime and NaCN consumptions. Table 4.4 presents the average results for the four test series and the averages for each of the composites.

Table 4.4 Summary of Cyanidation Results

	Recovery %Au	NaCN consumption kg/ton	Lime consumption kg/ton
Series 1; 60% -200#, 0.5 g/l NaCN	89.3	0.76	1.52
Series 2; 60% -200#, 1.0 g/l NaCN	90.5	1.07	1.40
Series 3; 80% -200#, 0.5 g/l NaCN	91.3	0.75	1.37
Series 4; 80% -200#, 1.0 g/l NaCN	90.2	1.47	1.15
Composite 1	90.7	0.83	0.88
Composite 2	92.1	0.73	1.26
Composite 3	92.4	1.15	1.56
Composite 4	90.8	1.67	2.11
Composite 5	87.8	0.97	1.10
Composite 6	88.0	0.72	1.26

Although, mineralogy showed that most of the gold appears to be fine and included in pyrite and gangue, cyanidation results still are good. Probably grinding breaks the particles along the gold borders, exposing most of the gold particles to the leaching solution. However, the effect of finer grinding is small as is the effect of a higher concentration of NaCN. It can be seen that the composites with the lower grades do show somewhat lower recoveries (2 - 3 %). The parameters of test series 1 are selected as process parameters due to lower consumptions of reagents and the just slightly lower recoveries.

4.2.5 COLUMN LEACH TESTS

Also column leach tests are done to study the possiblility of heap leaching. To date just some results are received, reason for this study to focus on conventional grinding & agitation leaching.

4.3 DESIGN CRITERIA & FLOWSHEET DEVELOPMENT

4.3.1 DESIGN CRITERIA

Process flowsheets and design criteria are developed on the basis of information generated during the test program. Due to the limited quantity of tests performed, experience with similar operations is used to develop design criteria were test data is not available. (Table 4.5)

Conventional milling followed by CIP, was selected as the process route. The CIP is followed by carbon stripping and electrowinning of the strip solution.

The processing facilities are designed according to the following criteria:

Ore production (t/y)	5,000,000
Operating days per year	365
Capacity (t/d)	13,700
Availability of plant	92 %
Ore head grade (g/t Au)	1.1 average
	2.0 maximum (design)
Ore specific gravity (t/m^3)	2.9 hard rock (basalt)
	1.5 soft rock (saprolite)
Gold recovery (%)	90 %
Gold production (Oz/yr)	160,000

The design criteria is presented in Table 4.5.

The process facilities consist of; primary crushing, conveying and stockpiling, grinding in a two stage semi-autogenous (SAG) and ball mill circuit, gravity separation, leaching with sodium cyanide solution in agitated tanks, adsorption on activated carbon in agitated tanks, stripping with hot caustic cyanide solution and electrowinning to produce the gold. The gravity concentrate and the deposited gold on the steel cathode are smelted to produce doré bars.

The leach tailings is thickened and flows by gravity through a HDPE pipeline to the tailings impoundment some seven kilometers and ± 500 m lower. Overflow from the tailings thickener is collected in the process water pond and recycled to the processing facilities. The remaining make-up water required is obtained from the water in the tailings pond that is pumped to the process water pond. Fresh water is extracted from the Tenguel river and stored in the fresh water pond.

TABLE 4.5 DESIGN CRITERIA

		Units	Comments
GENERAL			
Throughput - nominal	5,000,000	t/y	
	13,700	t/d	
- availability	92.0	%	
- instantaneous	620	t/h	
Gold production	14,816	g/d	
	173,866	Oz/yr	
Overall gold recovery	90.1%		
Material Characteristics			
Average moisture content	5	%	
Heavy ore component specific gravity	2.9	t/m^3	
Light ore component specific gravity	1.5	t/m^3	
Average ore specific gravity	2.72	t/m^3	
Ore bulk density	1.63	t/m^3	
Abrasion Index : - low range (soft ore)	0.09		assumed, no test results available
- high range (hard ore)	0.55		assumed, no test results available
Reserves fraction as soft ore	12.9	%	
Feed grade- Au (avg.)	1.2	g/t	
- Au (max. = design)	2.0	g/t	
- Ag	1.1	g/t	
- Cu	0.03	%	
CRUSHING			
Utilization rate	75	%	
-standardized throughput for ore density	1446	st/ op.h	@100lb/ft3 bulk density for lighter ore type
Primary Crusher Type	gyratory		
Dump hopper capacity	240	t	
Crusher feeder	none		
Crusher Size	42 x 70 XHD		
Open side setting	191	mm	
Run-of-mine size : 80% passing	762	mm	
Product size : 80% passing	102	mm	
Impact Work Index - hard rock	15	kWh/t	assumed, no test results available
Impact Work Index - soft rock	5	kWh/t	assumed, no test results available
Installed power	260	kW	
Indicated power usage	227	kW	
Estimated liner consumption - hard rock	16.8	g/t	
Estimated liner consumption - soft rock	8.9	g/t	
Coarse Ore Storage			
Required capacity (live)	9,900	t	
Storage type	conical pile		
Coarse ore feeders type	apron		
Number of feeders	2		

TABLE 4.5 DESIGN CRITERIA			
		Units	**Comments**
GRINDING			
Portion of total grinding power to SAG	0.57		
Indicated split size between circuits	459	um	
First Stage			
Type	SAG	mill	
Measured rod mill Work Index	23.00	kWh/t	
Correlated autogenous Work Index	20.00	kWh/t	
SAG design Work Index	22.00	kWh/t	
SAG Work Index - soft rock	13.58	kWh/t	relation of ball mill Wi's to the sag Wi
Circuit product size: 80% passing	459	um	
Number of mills	1		
Motor size indicated	7,457	kW	
	10,000	HP	
Motor type	synchronous		
Mill diameter	30	ft	
	9.14	m	
Mill length	18	ft	
	5.49	m	
Effective grinding length	16	ft	
	4.88	m	
Indicated circulating load	59	%	
Fraction of critical speed	72	%	
Grinding media size	127	mm balls	
Overall charge level	22	%	
Steel loading level	10	%	
Mill charge bulk density	3.00	t/m^3	
Steel charge weight	144	t	
Estimated media consumption - hard rock	0.61	kg/t	
Estimated liner consumption - hard rock	0.05	kg/t	for chrome-molybdenum alloy
Estimated media consumption - soft rock	0.32	kg/t	
Estimated liner consumption - soft rock	0.03	kg/t	for chrome-molybdenum alloy
Pumping power requirement	252	kW	assuming 12 m head on pump
	338	HP	
SAG circuit screen	o/head eccentr.		
Opening size	2	mm	
Proportion of material finer than opening	63	%	
Pulp flow through screen	944	tph	
- pulp	551	m^3/h	
- water	323	m^3/h	
	66	% solids	
Required screening area	26.17	m^2	
Number of units	2		
Screen water requirement	41	m^3/h	spray bars c/w duckbills @ 15 gpm ea.
Mill pulp density	74	% solids	
- high range	1.94	t/m^3	
- low range	1.33	t/m^3	
Water cons. around primary circuit	290	m^3/h	

TABLE 4.5 DESIGN CRITERIA		Units	Comments
GRINDING (continued)			
Second Stage			
Type	Ball	mill	
Design ball mill Work Index	20.50	kWh/t	@ 100 mesh
Desired circuit product size: 80% passing	149	um	
Bond ball mill Work Index - soft rock	10.70	kWh/t	assumed as at Gross Rosebel
Number of mills required	1		
Motor size indicated	5,593	kW	
	7,500	HP	
Mill diameter	20	ft	
	6.10	m	
Mill length	27	ft	
	8.23	m	
Effective grinding length	26.5	ft	
	8.08	m	
Fraction of critical speed	73	%	
Grinding media size	39	mm balls	
Overall charge level	37	%	
Ball loading level	35	%	
Mill charge bulk density	4.48	t/m^3	
Ball charge weight	424	t	
Estimated media consumption - hard rock	1.00	kg/t	
Estimated liner consumption - hard rock	0.08	kg/t	rubber lining recommended
Estimated media consumption - soft rock	0.52	kg/t	
Estimated liner consumption - soft rock	0.04	kg/t	rubber lining recommended
Cycloning Stage			
Indicated circulating load	400	%	
Pulp flow from SAG circuit	944	tph	
	551	m^3/h	
	66	% solids	
Pulp density to ball mill	72	%solids	
Indicated cyclone underflow : - solids	2,482	tph	
- pulp	3,447	tph	
	1,878	m^3/h	
Pulp flow to cyclone feed	3,258	m^3/h	
Indicated cyclone feed : - solids	3,102	tph	
- pulp	5,220	tph	
	59	% solids	
	35	% sol. vol.	
Cyclone feed pump power requirements	385	kW	one pump operating, one stand-by
	517	HP	
Water addition around ball mill circuit	829	m^3/h	
Indicated operating pressure	70	kPa	can be changed from 55 to 103 for # cycl.
Preferred cyclone size	20	inches	
Number of units required	16		include 2 spares

TABLE 4.5 DESIGN CRITERIA

		Units	Comments
GOLD CIRCUIT			
Gold Gravity Circuit			
Portion of cyclone u/f bled to device	10	%	
Type of gravity pre-concentrator	Reichert cones		
Pre-concentrator capacity	60	t/h/unit	
Nº of pre-concentrators required	4		
Cone diameter	2,000	mm	
Type of gravity concentrator	centrifugal		nominally Knelson 30CD, automated
Unit size	762	mm	
Unit capacity	35	tph	depends on test results
Number of units required	2		
Gold recovery by gravity	60	%	
Daily production	3,946	g	
Gold Leaching			
Pulp flow to leaching circuit	1,773	tph	
	1,380	m^3/h	
	35	% solids	cycl. # very sensitive to value;range:35-40
Pulp density	1.28	t/m^3	
Indicated required solids retention time	24	hours	
leaching circuit volume requirement	15,338	m^3	allowance for space occupied by agitator
diameter of tanks	13.00	m	
height of tanks	16.60	m	aspect ratio H/D = 1.2, 1m free-board
number of units	8		minimum of 4 to prevent short circuiting
Aeration rate	0.2	$m^3/h/m^3$	assumed as at Gross Rosebel
Total aeration	1,699	m^3/h	
Cyanide consumption	0.75	kg/t	
Lime consumption	1.40	kg/t	
Indicated gold recovery by cyanidation	87	%	
Daily gold production	10,870	g	
Carbon Circuit			
Design carbon contacting time	4.5	hours	assumed as at Gross Rosebel
CIP circuit volume requirement	2,932	m^3	allowance for agitator, carbon screens
diameter of tanks	9.00	m	
height of tanks	11.80	m	aspect ratio H/D = 1.2, 1m free-board
number of units	5		minimum of 4 to prevent short circuiting
number of screens per tank	2		
Feed solution Au	0.71	mg/l	
Barren solution Au	0.01	mg/l	
Carbon adsorbtion efficiency	98	%	
Gold adsorbed - design (=max)	17,755	g/d	

TABLE 4.5 DESIGN CRITERIA			
		Units	**Comments**
GOLD RECOVERY			
Carbon stripping			
Gold loading of carbon	5,000	g/t	
Carbon stripping requirement - design	3,551	kg/d	
Stripping circuit capacity	9	t	for 3 shifts of stripping per week
Carbon stripping method	hot, alkaline		
Stripping circuit volume requirement	18.8	m^3	
diameter of vessels	1.45	m	
height of vessels	5.80	m	aspect ratio H/D = 4
number of units	2		
available stripping circuit volume	19.16	m^3	
Solution flow	38.31	m^3/h	
Acid wash bed volumes	4		
nitric acid consumption	53	kg/t carbon	assumed as at Gross Rosebel
Neutralization bed volumes	4		
NaOH consumption	21	kg/t carbon	assumed as at Gross Rosebel
Eluate bed volumes	9		assumption based on literature
stripping cycle	9	h	
total eluate solution	172	m^3	
NaOH consumption	153	kg/t carbon	assumed as at Gross Rosebel
Volume of loaded/barren solution tanks	190	m^3	10 % margin
tank height	7	m	
tank diameter	6	m	aspect ratio H/D = 1.2
Stripped carbon loading	100	g/t	assumed as at Gross Rosebel
Gold concentration eluate	235	g/t	
Strip temperature	145.0	°C	assumed as at Gross Rosebel
Strip pressure	450.0	kPa	assumed as at Gross Rosebel
Carbon stripping efficiency	98.0	%	
Carbon reactivation process	rotary kiln		
Reactivation temperature	700	°C	assumed as Gross Rosebell
Reactivation time	60	min	assumed as Gross Rosebell
Capacity	3,551	t/d	
Feed rate	257	kg/h	assumed as Gross Rosebell
Fuel source	Diesel oil		
Operating hours	97	h/week	
Total operating heat load	1,055	kW	assumed as Gross Rosebell
Reactivation kiln diameter	1,200	mm	assumed as Gross Rosebell
Reactivation kiln length	11,000	mm	assumed as Gross Rosebell

TABLE 4.5 DESIGN CRITERIA

		Units	Comments
GOLD RECOVERY (continued)			
Electrowinning			
Electrowinning residence time	15	min/pass	assumption based on literature
Electrowinning operating time	12	h/d	
Electrowinning flow rate	3.6	m^3/pass	
cell volume required	4	m^3	
N° of cells	2		
cell length	1.1	m	
cell width	1.1	m	
cell heigth	1.1	m	
cell volume available	4.0	m^3	
Electrowinning cell area	4	m^2	
current	600	A	
current density	496	A/m^2	
current efficiency	10	%	assumption based on literature
voltage	5	V	
Gold Refinery			
Furnace type	Electric, tilting		
electrical consumption	125	kW	as at Omai
flux mixture	tba		
TAILINGS THICKENING			
Tailings flowrate	1,939	t/h	
	1,547	m^3/h	
	32	% solids	
Thickener (1 x high rate) diameter	28	m	
Flocculant addition	10	g/t (solids)	
Underflow density	50	% solids	
Underflow (slurry)	849	m^3/h	
Overflow (water)	698	m^3/h	

4.3.2 WATER BALANCE

The water balance for the CIP plant in the diagram presented in Figure 4.1, demonstrates that no fresh water is needed as make-up water. The required process water quantity will be provided by the thickener overflow and the balance will be the reclaim water. This also lowers the excess water quantity from the tailings pond that has to be treated before being discharged into the Tenguel river.

FIGURE 4.1

WATER BALANCE CIP PLANT

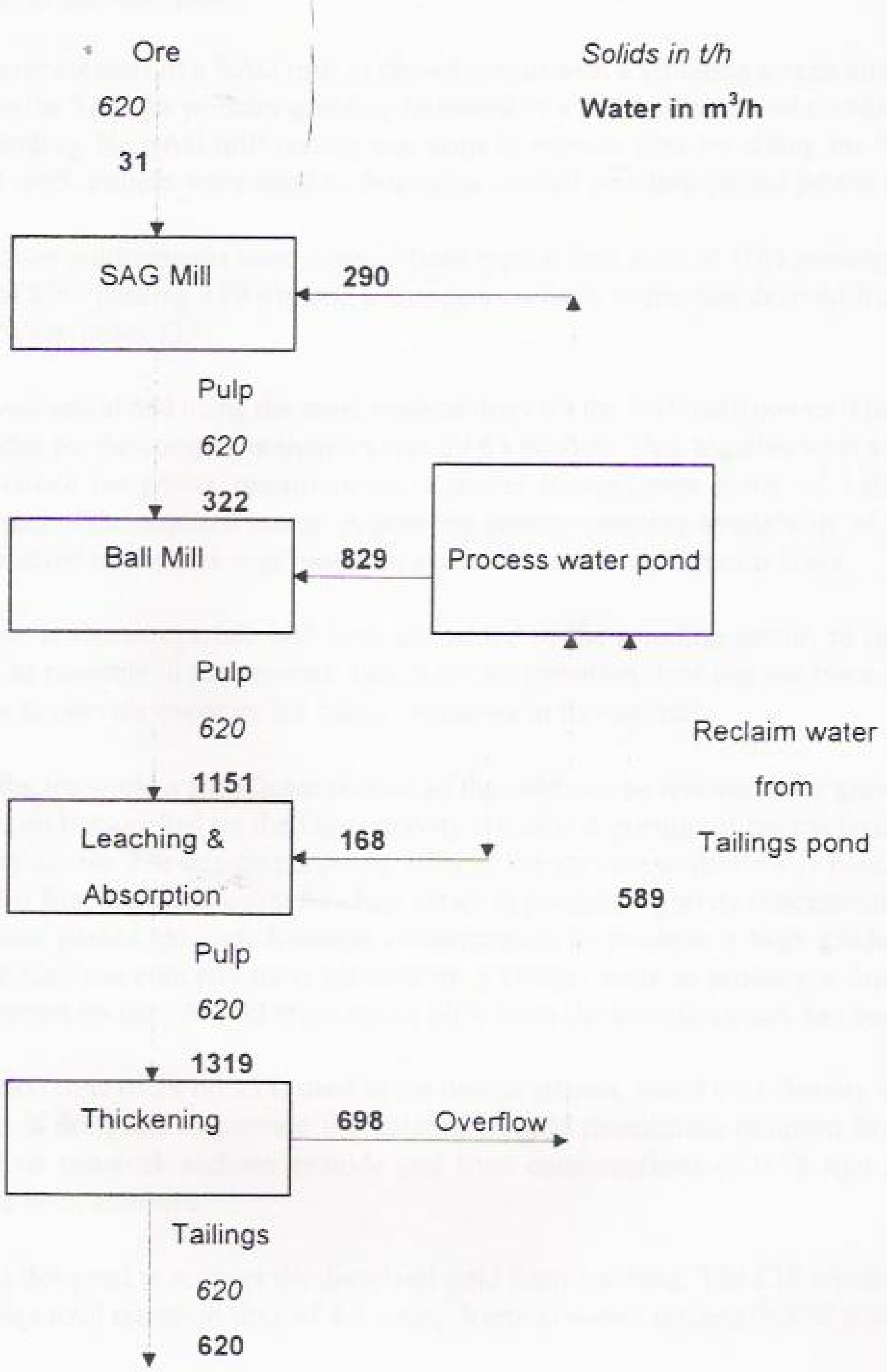


Figure 4.1

4.3.3 FLOWSHEET DEVELOPMENT

Ore is delivered by trucks to the primary crusher. The crusher has been designed based on throughput data only, due to the inavailability of test data. The crushed rock discharges on a belt conveyor that transports the ore to the stockpile.

The grinding circuit consists of a SAG mill in closed circuit with a vibrating screen and returning the screen oversize to the SAG for primary grinding followed by a ball mill in closed circuit with cyclones for secondary grinding. No SAG mill testing was done to provide data for sizing the SAG mill. The Bond rod & ball work indices were used to determine overall grinding circuit power requirements.

The SAG mill power requirements were derived from typical feed sizes of 80% passing 102 mm with a SAG product of 80% passing 459 μm and a autogenous work index was derived from the highest Bond Rod Mill Work Index (23).

Ball mill power was calculated using the same methodology for the SAG mill power. The highest Bond ball mill work index for the composite samples was 20.6 kWh/ton. This, together with a p_{80} of 150 μm, was used to calculate the power requirements. a power transmission factor of 1.05 was used in determining the size of the required motor. A grinding circuit operating availability of 92% has been assumed. The selected motor size was based on available commercial motor sizes.

As is the practice at Omai, cyanide and lime are added to the grinding circuit to initiate cyanide leaching as soon as possible in the process. Leach circuit retention time has not been reduced in the flowsheet design to provide capacity for future increases in throughput.

As indicated by the testwork, a significant portion of the gold can be recovered by gravity separation methods. The circuit is modelled on the Omai gravity circuits. A portion of the cyclone underflow is bled to the gravity circuit. For design purposes, 10% of the cyclone underflow is bled to the gravity circuit. This feed is first upgraded using Reichert cones to produce a gravity concentrate. The rougher concentrate is then passed through Knelson concentrators to produce a high grade intermediate concentrate. The Knelson concentrate is cleaned on a Deister table to produce a final concentrate which can be smelted on site. A gold recovery of 60% from the gravity circuit has been assumed.

A leaching retention time of 24 hours is used in the design criteria, based on a density of 35% solids. The leach circuit is designed to provide the balance of gold dissolution required for a 87% leach recovery. Based on testwork sodium cyanide and lime consumptions of 0.75 kg/t and 1.40 kg/t respectively have been assumed.

The CIP circuit is designed to recover the dissolved gold from leaching. The CIP circuit is comprised of five stages with a total retention time of 4.5 hours. Vertical wiped screens (NKM type) are used for

4.3.3 FLOWSHEET DEVELOPMENT

Ore is delivered by trucks to the primary crusher. The crusher has been designed based on throughput data only, due to the inavailability of test data. The crushed rock discharges on a belt conveyor that transports the ore to the stockpile.

The grinding circuit consists of a SAG mill in closed circuit with a vibrating screen and returning the screen oversize to the SAG for primary grinding followed by a ball mill in closed circuit with cyclones for secondary grinding. No SAG mill testing was done to provide data for sizing the SAG mill. The Bond rod & ball work indices were used to determine overall grinding circuit power requirements.

The SAG mill power requirements were derived from typical feed sizes of 80% passing 102 mm with a SAG product of 80% passing 459 µm and a autogenous work index was derived from the highest Bond Rod Mill Work Index (23).

Ball mill power was calculated using the same methodology for the SAG mill power. The highest Bond ball mill work index for the composite samples was 20.6 kWh/ton. This, together with a p_{80} of 150 µm, was used to calculate the power requirements, a power transmission factor of 1.05 was used in determining the size of the required motor. A grinding circuit operating availability of 92% has been assumed. The selected motor size was based on available commercial motor sizes.

As is the practice at Omai, cyanide and lime are added to the grinding circuit to initiate cyanide leaching as soon as possible in the process. Leach circuit retention time has not been reduced in the flowsheet design to provide capacity for future increases in throughput.

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The CIP circuit is designed to recover the dissolved gold from leaching. The CIP circuit is comprised of five stages with a total retention time of 4.5 hours. Vertical wiped screens (NKM type) are used for carbon retention. The carbon gold loading is assumed at 5.0 kg/t which is a conservative figure based on literature.

Carbon stripping is based on conventional pressure stripping with acid washing of the carbon prior to stripping. The stripped carbon is reactivated in a rotary kiln and returned to the CIP facilities. Gold recovery is by electrowinning with knitted stainless steel mesh cathodes. Washed gold from the cathodes and gravity concentrate are then smelted with fluxes to produce gold doré bullion bars.

4.4 PLANT DESIGN

The Ponce Enriquez process plant is designed to process 13,700 t/d of gold ore in a conventional circuit consisting of primary crushing, SAG/ball mill grinding, gravity recovery of gold, leaching, CIP adsorption, carbon stripping and reactivation, electrowinning, and smelting. The process plant operates 24 hours per day, 365 days per year with an operating availability of 92%, and recovers 90% of the gold in the plant feed.

4.4.1 PRIMARY CRUSHING PLANT

Ore is hauled from the mining areas and is fed to a 42 inch by 70 inch gyratory crusher fitted with a 260 kW motor. Ore can be fed to the crusher from two sides. A hydraulic rock breaker is located next to the crusher to break any oversize rocks. The crusher is operated with an open side setting of 191 mm and discharges into a discharge pocket. Crushed ore is removed from the discharge pocket with a 1829 mm wide by 9144 mm long apron feeder. The apron feeder discharges onto a 1218 mm wide and 500 m long conveyor which feeds the stockpile feed radial stacking conveyor.

A dual lift overhead travelling monorail crane is provided for crusher maintenance. Hoist beams are provided for servicing the apron feeder and the crusher drive. A rotary screw compressor and an air receiver are provided for the gyratory crusher area. Dust collection is by wet scrubbing.

4.4.2 ORE RECLAIM

Crushed ore is distributed by the stockpile radial stacker to a 9,900 t live capacity stockpile. Coarse ore is removed from the stockpile by two 1820 mm wide by 6000 mm long apron feeders which discharge onto a 1218 mm wide SAG mill feed conveyor.

4.4.3 GRINDING CIRCUIT

Coarse ore is conveyed to a 30 feet diameter by 18 feet long SAG mill for primary grinding. The SAG mill is driven by a 10,000 HP fixed speed motor. SAG mill discharge flows onto one of two 2.55 m by 5.13 m horizontal vibrating screen for classification. Screen oversize is conveyed by a 1067 mm wide belt conveyors to a retractable transfer conveyor which returns the oversize material on the SAG mill feed conveyor.

Undersize from the vibrating screens is distributed to a cyclone feed pump box feeding one cyclone cluster for classification. The cyclone feed pump box is fitted with a 385 kW variable speed cyclone feed pump. The cluster contains sixteen, 20 inch diameter cyclones. Underflow from the cyclone cluster gravitates to a 20 feet diameter by 27 feet long ball mill for further grinding while the cyclone overflow flows to trash screens. The ball mill is driven by a 7,500 HP fixed speed motor. A portion of the cyclone cluster underflow is bled to the gravity separation circuit. Ball mill discharge combines with SAG mill discharge screen undersize for classification by the cyclone cluster. An onstream particle size analyzer is provided for process control. An uninstalled cyclone feed pump is provided as a spare.

Sodium cyanide solution and lime slurry are added to the grinding circuit to initiate gold dissolution at the earliest point in the process.

Two, 120 t bins are provided for the storage of 127 mm and 39 mm diameter grinding balls. Grinding balls are discharged from the bins through air operated arc gates into ball buckets. The ball buckets are hoisted with the grinding area overhead crane and discharge the grinding balls to the grinding mills through their respective feed chutes.

A dual lift (50t/10t) overhead travelling monorail crane is provided for grinding maintenance and handling of grinding balls.

4.4.4 GRAVITY SEPARATION CIRCUIT

A bleed stream from each cyclone cluster underflow is screened over two sizing screens. Screen undersize is pumped to a feed distributor. The distributor splits the slurry flow to four, 2000 mm diameter Reichert cones. Reichert cones' concentrate is pumped to magnetic drum separator. The separator removes tramp iron from the Reichert cones' concentrate. The concentrate slurry is then split between two, 762 mm diameter Knelson concentrators. The concentrators are designed for continuous concentrate discharge which gravitates to the refinery.

Tailings from the Reichert cones and the Knelson concentrators and the sizing screens oversize gravitate to a pump box where they are pumped to the ball mill.

4.4.5 CYANIDATION

Cyclone overflow at 35% solids flows is pumped to a leach circuit consisting of eight, mechanically agitated 13.0 m diameter by 16.6 m tanks for leaching providing 24 hours of retention time. Each tank is fitted with a dual turbine agitator. Cones located under the bottom turbine are used to sparge air into each tank. Sodium cyanide solution is added to the first leach tank as required to dissolve the remaining gold.

4.4.6 GOLD RECOVERY

Slurry from the leach circuit is contacted with carbon in five, 9.0 m diameter by 11.80 m high mechanically agitated tanks to recover the residual soluble gold and silver. The circuit has a total retention time of 4.5 hours. Carbon is advanced counter-current to the slurry flow by vertical recessed impeller pumps.

Each tank is provided with two, 10 m^2 vertical, wiped static screens in order to retain carbon in the respective tank and to allow slurry to flow to the next tank.

Slurry discharging from the last tank flows over a 25 m^2 linear screen for the recovery of fugitive carbon from the CIP circuit. After dewatering, oversize from the screen is pumped back to the CIP circuit and undersize flows by gravity to the tailings thickener.

Loaded carbon from the first CIP tank is screened and washed on a vibrating screen. Screen undersize gravitates to the CIP circuit and oversize (washed carbon) flows to a loaded carbon bin.

Loaded carbon is pumped to two 1.45 m diameter by 5.80 m overall height acid wash vessels where it is treated with a nitric acid solution in order to removed compounds deleterious to the stripping process. Acid is delivered to the plant in stainless steel carboys at a strength of 67%. The acid is pumped to a mix tank where it is diluted to 7.5% for use in the strip circuit.

After being treated with the acid solution, the carbon is neutralized with a sodium hydroxide solution, washed with water and pumped to one of two available 1.45 m diameter by 5.80 m high strip vessels. The acid wash vessels and strip vessels each hold 9 t of carbon.

Barren strip solution containing sodium cyanide and sodium hydroxide is pumped from a storage tank through heat exchangers to one of two available strip vessels. The hot strip solution elutes the gold and silver from the carbon and the resultant pregnant solution exits the strip vessel and passes through the heat exchangers where its temperature is reduced below the boiling point and preheats the incoming barren strip solution. Pregnant strip solution exiting the heat exchangers flows to a pregnant solution tank.

Heat for the strip solution is provided by a 1500 kW direct fired boiler working in conjunction with the heat exchangers. The boiler is fuelled by diesel fuel. A water softening system is provided to generate clean water for the strip circuit make up requirements to minimize scaling and fouling of heat exchanger surfaces.

4.4.7 CARBON REACTIVATION

After stripping the carbon is pumped to a carbon storage bin which in turn feeds a diesel fired 1.2 m diameter by 11.0 m long horizontal carbon reactivation kiln in order to remove organic material from the carbon. Reactivated carbon is pumped back to the CIP circuit after being screened in order to remove carbon fines. Carbon fines are bagged for periodic sale to a smelter for recovery of the residual gold and silver.

Fresh carbon is attritioned in a carbon conditioning tank and then screened with the reactivated carbon to remove carbon fines. Carbon is delivered in 500 kg tote bags to the plant.

4.4.8 REFINERY

Solution from the pregnant solution tank is pumped through one of three electrowinning cells where the eluted gold is recovered unto stainless steel mesh cathodes. Solution from the discharge of the cells is pumped to the barren solution tank in the strip circuit.

Electrowon gold is washed from the cathodes then filter pressed and dried prior to smelting. Sludge from the electrowinning cells is drained and then filter pressed and dried with the electrowon gold.

Knelson concentrate is received into a surge hopper and then passed through a 250 mm diameter by 400 mm magnetic drum separator to remove any remaining tramp iron. After magnetic separation, the concentrate is passed over a N° 14 Deister concentrating table for final upgrading. Table tailings are pumped to the gravity circuit tailings pump box while table concentrate is dried.

Dried sludge and table concentrate are mixed with fluxes and charged into a induction furnace. The induction furnace smelts the fluxed material into gold doré bullion and slag. The doré bullion is cast into bars, stored in a vault and then shipped to a refinery for final processing.
The slag is crushed and processed through the grinding circuit.

4.4.9 TAILINGS THICKENING & HANDLING

The residuel slurry from the leach circuit is thickened in a 28 m diameter high-capacity thickener. Thickener overflow is collected in the process water tank where it is combined with reclaim water to provide water for the plant

The thickener underflow at 50 % solids flows by gravity through a 15 inch HDPE pipe to the tailings impoundment, almost seven kilometers north-west of the plant in the plains at the foot of the hills. The drop in elevation is 480 m. The tailings impoundment is described in the next chapter.

4.4.10 REAGENTS MIX AND DISTRIBUTION

Lime

Quicklime (CaO) is added to the grinding circuit for pH control. It is delivered to site in 1 t bags and dumped into a hopper. Lime is removed from the hopper by a screw conveyor and discharges into a ball mill slaking system which produces a milk of lime slurry. Lime slurry is stored in an agitated storage tank and then distributed through a ring main system.

Sodium Cyanide

Sodium cyanide (NaCN) is delivered to the process plant in 1 t bags. It is mixed with water in a mechanically agitated tank to a solution strength of 25%. The cyanide solution is pumped to a storage tank and then through a ring main to the grinding and leach circuits.

Flocculant

Flocculant is delivered to the process plant in bags and mixed with water in a packaged flocculant mix system to a solution strength of 0.5%. Flocculant is pumped from a storage tank by a metering pump to the thickener. Flocculant is diluted to a solution strength of 0.05% prior to being added to the thickeners by adding dilution water to an in-line mixer.

Sodium Hydroxide

Sodium hydroxide (NaOH) is delivered to the process plant in bags and mixed with water in a mechanically agitated tank to a solution strength of 20% and pumped to the carbon stripping circuit.

Compressed Air

The following compressed air systems have been provided:

- three, 644 m^3/h 810 kPa rotary screw compressors, air receivers and air dryers for plant air and instrument air at the process plant site.
- three, 1800 m^3/h 350 kPa rotary screw compressors to provide air to the leach tanks.

Diesel Fuel

A 38 m^3 capacity diesel fuel storage tank and dispensing pump is provided at the process plant site to supply the strip solution heater and the carbon reactivation kiln.

4.4.11 WATER SUPPLY

4.5.11.1 FRESH WATER

Fresh Water will be taken from the Tenguel River, a distance of 1.5 kilometres north-east of the plant site. A small dam will be constructed to enable storage of water to provide a continuous supply to the site throughout the year. No fresh water is required as make-up water for the plant, since the process water requirements are met by the thickener overflow and reclaim water from the tailings pond. Therefore fresh water will only be used to satisfy the potable water needs and for fire protection.

A wetwell will be constructed and two vertical turbine water pumps installed, one operating and one stand-by. These pumps will supply water through a 100 mm diameter high density polyethylene pipeline to the fresh water pond. From there it is pumped to the Maintenance, Warehouse and Administration area Fresh/Fire water storage tank. Water from this tank will be mainly used for the washing of vehicles.

4.5.11.2 PROCESS WATER

Process water will be pumped by two pumps, one operating and one standby. The pumps will be located within a water pump station at the Process Water Pond. The water will be distributed to all end users through a buried 150 mm diameter high density polyethylene pipeline.

4.5.11.3 RECLAIM WATER

The quantity required to balance the process water needs will be pumped from the tailings pond. Due to heavy rainfall in the area and the water contained in the tailings slurry there is a need to discharge excess water from the tailings pond. In order to minimize this quantity that has to be treated to ensure water quality in the Tenguel river, reclaim water quantity is maximized.

The reclaim system will include a barge with two vertical pumps (one operating and one on standby). Each pump is capable of pumping 600 m^3/hr of reclaim water to the booster pump station. The booster pumps (one operating and one on standby), pump the water back to the plant through a 350 mm diameter carbon steel pipeline of 6710 m length at a difference in elevation of 480 m. Each pump will be 1050 kW for a nominal 18 hrs operating per day. The pipeline will be laid on grade within the tailings pipeline trench.

4.4.12 AUTOMATION

The plant will be controlled by a modern, distributed type control system using a combination of a DCS interfaced with PLC's.

Process variables to be controlled, monitored and alarmed are shown on the instrumented flowsheets.

4.5 PLANT ANCILLARY FACILITIES

Ancillary buildings will be generally fabricated light steel construction, with prefinished sheet metal cladded exterior walls. Wall insulation will be added where air-conditioning is required. They will generally be single storey construction with treated concrete floors or tiled, according to use. Internal walls will be sheeted metal stud partitions. Air conditioned buildings will have double glazed windows and buildings with natural ventilation will have louvres with mosquito net screens. Acoustic tile ceilings will be provided in air conditioned buildings. Open ceilings in naturally ventilated buildings will be used. All roofs will be pitched and clad with prefinished metal roofing. Lockers for change areas will be single compartment type half lockers. Vanity units will be plastic laminate faced plywood on wood framing. The buildings will be mosquito proofed and complete with all essential services, plumbing, drainage and lighting.

The mine/mill operational area has been divided among two sites. The mine service and administration site has been separated from the main mill area and is located as a separate site. The following ancillary facilities are located in this area:

Administration building,
Truck shop and warehouse complex (including mine offices),
Mine dry and miners transfer building,
Security and first aid offices,
Fuel dispensing and fuel storage area,
Mine truck wash bay,
Potable water treatment and distribution plant,
Septic tank and leaching field.

The following ancillary facilities are located in the main mill area:

Mill offices and laboratory,
Mill work shops,
Reagent storage
Potable water treatment and distribution plant,
Septic tank and leaching field.

4.5.1 MILL LABORATORY

Single storey, air conditioned building approximately 20 meters wide by 40 meters long. Floor plan provides for separate assay and metallurgical laboratories, offices and rooms for surveyors and explorers. Central male and female washrooms accessible by corridor from both laboratories.

4.5.2 REAGENT STORAGE BUILDING

A light structural steel shed, approximately 12 metres wide by 120 metres long, has been allocated for reagent storage. The shed is open on one side for handling of the reagents by fork lift. A similar shed 12 metres wide by 36 metres long, abutting the reagent storage will be used as a storage for mill rubber items and for capital spares. Attached to the reagent storage shed there will be a fenced enclosed area used as outdoor storage.

4.5.3 MILL WORK SHOPS

A building approximately 18 metres wide by 36 metres long, has been allocated for various indoor and outdoor shops and work areas. This building, as well as the reagent storage building and the mill laboratory building , will be located adjacent to the mill building.

5. TAILINGS AND WATER MANAGEMENT

5.1 INTRODUCTION

The tailings, consisting of the leach residues from the CIP facilities, are transported down-hill to the tailings impoundment by gravity, flowing through a 15" HDPE pipeline.

During the metallurgical test program, no specific tests were done to define the characteristics of the tailings. Therefore, design criteria are derived based on general assumptions and known characteristics of tailings at similar operations.

The tailings facilities consist of the tailings impoundment, a quarry to extract the material for dam building, reclaim water facilities and an effluent treatment plant.

5.2 SITE CHARACTERIZATION

Due to the quite steep topography of the Papa Grande concession, no suitable area exists to store the tailings in a safe way. The total amount of tailings over mine life will be 24.5 million tonnes. Therefore a terrain in the plain area at the foot of the hills was selected. Distance from the plant is 6.7 kilometres and the drop in elevation 480 m.

This area is now used for banana plantations. The rainfall in this area is high as at Papa grande and although also evaporation takes place, a net inflow of water has to be taken into account. The terrain is gently sloping towards the north-west (2.6 %). It is assumed that as at Papa Grande, the soil consists of saprolitic rock that can be compacted to provide an impervious bottom of the tailings impoundment, meaning minimum site preparation.

For dam construction a quarry is considered, both hard rock and saprolite will be extracted to build the dam, using the saprolite for an impervious core.

5.3 DESIGN CRITERIA

The tailings impoundment has been designed to contain 30 million tonnes of tailings. A ringed dyke type tailings impoundment is considered the most apropriate. (Table 5.1)

TABLE 5.1 DESIGN CRITERIA

		Units	Comments
TAILINGS HANDLING			
Tailings flowrate	1,939	t/h	
	1,547	m^3/h	
	32	% solids	
Tailings pipeline (gravity flow)	HDPE		assumed same as Pachon
flow velocity	2.3	m/s	assumed same as Pachon
pipe diameter	361	mm	
	14	inch	
length	6,000	m	
Tailings dam			
Tailings deposited dry density	1.3	t/m^3	assumed same as Pachon
Water content of tailings	30.0	%	assumed same as Pachon
Total volume tailings end of minelife	23,076,923	m^3	
Natural slope	2.6	%	
Ringed dyke tailings impoundment			
inside diameter	1,250	m	
outside diameter	1,378	m	
height of dam upstream	2	m	
height of dam downstream	38	m	
height of starterdam downstream	17.5	m	
Tailings pond area	1,227,185	m^2	
Total impoundment volume	24,773,790	m^3	
Margin for rainwater storage	1,696,867	m^3	
Total dam volume	2,625,222	m^3	inside 1H:1V outside 2H:1V
Starter dam volume	645,007	m^3	
waste rock	387,004	m^3	assumed 60 %
saprolite	258,003	m^3	assumed 40 %
Starter impoundment volume	5,041,628	m^3	
Diversion ditch length	1,850	m	

TABLE 5.1 DESIGN CRITERIA			
		Units	Comments
WATER MANAGEMENT			
Effluent treatment			
Stage 1; Cyanide destruction	H_2O_2		
Treatment capacity	158	l/s	
	569	m^3/h	
Nº of tanks	3		
tank height	6.2	m	
tank diameter	6.2	m	aspect ratio H/D = 1
Retention time	60	min	assumed as Gross Rosebell
Stage 2; Metal precipitation	$Fe_2(SO_4)_3$		
Nº of tanks	1		
tank height	6.2	m	
tank diameter	6.2	m	aspect ratio H/D = 1
Retention time	20	min	assumed as Gross Rosebell
Clarifier type	Reactor clarifier		assumed as Gross Rosebell
Rise rate	1.25	$m^3/h/m^2$	assumed as Gross Rosebell
Flocculant addition rate	0.5	g/m^3	assumed as Gross Rosebell
Reclaim water			
Plant reclaim water requirements	589	m^3/h	
Pumping distance	6,710	m	
Difference in elevation	480	m	
Steel pipeline diameter	350	mm	
flow velocity	1.7	m/s	
friction losses in pipeline	2,431	W	
Pumping power required (24 h operation)	773	kW	
Pumping power required (18 h operation)	1,033	kW	
Process water			
Process water flow to plant	1,287	m^3/h	
storage pond volume (1 day)	30,899	m^3	

5.4 WATER BALANCE

For the water balance over the tailings pond, precipitation data from a meteorologic station in Pagua located 7 km south-west of Ponce Enriquez (15 km south-west of the tailings impoundment) is considered the most representative. The maximum monthly precipitation data over a ten year period (1985 - 1994) were used. Evaporation data came from the meteorologic station Tenguel. some ten km west of the tailings area.

The water in & outflow from the tailings pond considered is the daily design base. that means without considering the availability of 92 %. This was done because the tailings pond has a big water storage capacity. The resulting water balance is significant. (Table 5.2)

TABLE 5.2 PAPA GRANDE TAILINGS POND WATER BALANCE

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 Tailings inflow													
Solids	t/d	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700
	t/month	424,700	383,600	424,700	411,000	424,700	411,000	424,700	424,700	411,000	424,700	411,000	424,700
Water	m^3/d	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700
	m^3/month	424,700	383,600	424,700	411,000	424,700	411,000	424,700	424,700	411,000	424,700	411,000	424,700
2 Reclaim water outflow													
Solution	m^3/d	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015
	m^3/month	403,465	364,420	403,465	390,450	403,465	390,450	403,465	403,465	390,450	403,465	390,450	403,465
3 Natural Inflow and outflow													
Inflow volume													
Max. monthly precipitation Pagua	mm	465.40	626.70	382.90	496.70	263.70	46.10	49.30	66.40	59.90	76.20	63.60	159.90
Tailings impoundment area	m^2	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185	1,227,185
Natural inflow	m^3	571,132	769,077	469,889	609,543	323,609	56,573	60,500	81,485	73,508	93,511	78,049	196,227
	m^3/d	18,424	27,467	15,158	20,318	10,439	1,886	1,952	2,629	2,450	3,016	2,602	6,330
Outflow volume													
Site pan evaporation (avg) Tenguel	mm	80	81	83	85	81	77	75	75	73	71	72	77
Tailings impoundment evaporation max	m^3	98,175	99,402	101,856	104,311	99,402	94,493	92,039	92,039	89,584	87,130	88,357	94,493
Natural outflow	m^3/d	3,167	3,550	3,286	3,477	3,207	3,150	2,969	2,969	2,986	2,811	2,945	3,048
4 System balance													
Water inflow from tailings	m^3/d	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700	13,700
Reclaim water outflow	m^3/d	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015	13,015
Natural inflow	m^3/d	18,424	27,467	15,158	20,318	10,439	1,886	1,952	2,629	2,450	3,016	2,602	6,330
Natural outflow	m^3/d	3,167	3,550	3,286	3,477	3,207	3,150	2,969	2,969	2,986	2,811	2,945	3,048
SYSTEM BALANCE inflow - outflow	m^3/d	15,942	24,602	12,557	17,526	7,917	-579	-332	345	149	891	341	3,967
5 Water disposal requirements													
Bleed required to balance solution	m^3/d	15,942	24,602	12,557	17,526	7,917	-579	-332	345	149	891	341	3,967
Maximum bleed rate	l/s	184.5	284.7	145.3	202.8	91.6	-6.7	-3.8	4.0	1.7	10.3	4.0	45.9
6 Hypothetical options for water treatment													
Total water volume in impoundment	m^3	494,192	1,183,047	1,572,314	2,098,096	2,343,538	2,326,168	2,315,864	2,326,545	2,331,019	2,358,636	2,369,219	2,488,221
Vol. in impoundment with treatment & bleed 100 l/s	m^3	360,272	928,167	1,183,514	1,579,696	1,691,218	1,544,248	1,400,024	1,276,785	1,151,659	1,045,356	925,997	915,046
Vol. in impoundment with treatment & bleed 180 l/s	m^3	282,556	780,255	957,887	1,278,859	1,312,665	1,090,486	868,546	667,591	467,255	283,236	88,668	0

* Assume 12 hrs operating per day

5.5 TAILINGS MANAGEMENT

Tailings flow from the plant by gravity through a HDPE pipeline to the tailings impoundment. The pipeline reaches the impoundment area at the effluent treatment plant where also the offices for the tailings impoundment and the pumping station for reclaim water are located.

The tailings are led to three impoundment feed points at the center, left and right side of the foot of the tailings impoundment. The deposited dry density of the tailings is assumed to be 1.3 t/m^3.

The starter dam will provide enough storage volume for the first year of operation. During the following years the dam will be raised to increase the volume of the impoundment in order to provide enough volume for the tailings with a margin for excess water build-up during the rainy season.

5.6 WATER MANAGEMENT

As demonstrated in the water balance, rainfall greatly exceeds evaporation. Although reclaim water quantity has been maximized, still a considerable amount of excess water will exist. This has to be discharged to the Tenguel river.

To ensure water quality in the Tenguel river, the excess water will be treated in an effluent treatment plant before discharge. This plant has been designed assuming operating 12 hours per day and the balance was based on a full year cycle. That means that rainwater will build-up during the rainy season but after a complete year all excess water will be treated and discharged. The 12 hours operating time provides a margin in case of storm events and wetter years than considered in the water balance.

The effluent treatment plant consists of two treatment phases, with in total four tanks 6.25 m diameter by 6.25 m high reaction tanks with 22 kW agitators. In the first treatment stage, hydrogen peroxide is added to oxidize and destroy cyanide complexes. In the second treatment stage, ferric sulphate is added to precipitate any heavy metals in solution.

After treatment, an anionic flocculant is added to the treated water to promote settling in the subsequent reactor clarifier. Clarifier overflow is discharged into the Tenguel river. Clarifier solids are periodically pumped from the clarifier and discharged into the tailings impoundment.

Any treated water which does not meet discharge specifications will be pumped to tailings pond.

Hydrogen peroxide (H_2O_2) is delivered to the effluent treatment plant in ISO containers at a solution strength of 70% and is transferred to a dosing tank. Hydrogen peroxide is pumped from the dosing tank to the cyanide destruction tanks.

Flocculant is delivered to the effluent treatment plant in bags and mixed with water in a packaged flocculant mix system to a solution strength of 0.5%. Flocculant is pumped from a storage tank by a metering pump to the reactor-clarifier.

Ferric sulphate ($Fe_2(SO_4)_3 \cdot 12H_2O$) is delivered to the effluent treatment as moist crystals in bags and mixed with water in a mechanically agitated tank to a solution strength of 14%. The ferric sulphate solution is pumped from a storage tank to the metal precipitation tanks.

6. GENERAL SERVICES AND ADMINISTRATION

The General Services and Administration department (G&A) will provide the essential services required to support the Ponce Enriquez mine and processing operations. The services offered will include the general management, accounting, procurement, human resources management and infrastructure maintenance. In this chapter the G&A department will be briefly described and in the next chapter the G&A capital and operating costs will be covered.

6.1 MANPOWER AND WORKING SCHEDULE

Workforce requirements and salaries are presented in table 6.1. The salaries are based on our research of salaries at Ecuadorian operations. The table presents total costs for the mine, i.e. including all overhead costs such as profit sharing and fringe benefits.

The working schedule will be based on three shifts, that means working 14 days for 12 hours a day and seven days off. The staff will work on a normal 5 - 2 basis. Several expatriate staff members will work on an alternative schedule according to their specific task.

Workforce is assumed to come from the nearby city of Machala and/or nearby villages. Expatriate and national staff will be housed in Machala. Bus firms will take care of the daily transportation of the employees from the city of Machala and surrounding villages to the mine site.

6.2 SUPPLIES AND SERVICES OPERATING COSTS

Supplies and services are described in more detail as follows:

Access road maintenance:
Maintenance of the access road will be done by a contractor. The total cost is estimated at US$ 500,000 per year.

Travel allowance for Senior Staff:
A provision of US$ 504,600 is placed to cover the cost of expatriate traveling to their respective countries on a regular schedule.

Building maintenance:
An amount of US$ 150,000 is budgeted to cover the cost of materials used to maintain the infrastructure buildings on site.

Charitable donations:
Donations and government relations are estimated at US$ 50,000 per year.

Communications:
Annual communications costs are estimated at US$ 350,000.

Computer software licenses:
Annual software licensing fees are estimated at US$ 30,000.

Consulting fees:
A provisional amount of US$ 100,000 per year is budgeted to cover the cost of consulting services which may be required for special circumstances that cannot presently be defined.

Legal fees:
A provisional amount of US$ 200,000 per year is budgeted to cover the cost of legal services.

Electrical power:
Electrical costs for all services not included in the mine and mill estimates are estimated at US$ 400,000.

Environmental monitoring:
An annual amount of US$ 150,000 is provided for environmental monitoring.

Food and accomodations:
No costs for food and accomodations were considered, since it is assumed that all personnel will live in the nearby town of Machala or in nearby villages, hence they will bring their lunch with them. Lunch rooms were considered in the mill and the administration building.

Ground transport:
Ground transport from the cities to the mine site will be done by a contractor, the costs are estimated at US$ 400,000 per year.

Courier, postage:
Annual courier and postage charges are estimated at US$ 74,000 for both.

Travel expenses:
A provision of US$ 100,000 per year is included to cover travel expenses incurred to attend technical and management meetings, seminars and conventions.

Housing allowances for expatriates:
A provision of US$ 720,000 is placed to rent and maintain the houses, to pay school fees, etc. for expatriates living in Machala.

Insurance:
Estimated annual insurance costs amount US$ 950,000.

Office equipment:
A provision of US$ 30,000 per year is allowed for the maintenace and replacement of small office equipment, such as facsimile machines, binding equipment, etc.

Office supplies:
A provisional amount of US$ 25,000 per year is allowed to cover the cost of office supplies required to support department operations.

Printing:
A provision of US$ 30,000 per year is included for the maintenance of reproduction equipment.

Publications and Periodicals:
A provision of US$ 10,000 per year is allowed for newspapers, technical publications and subcsriptons for specialized magazines.

Radio repairs:
A provision of US$ 89,617 per year is allowed for radio maintenance.

Recruitment and relocation:
A provision for turnover of 10 people per year, estimated at US$ 10,000 per person, is included under this category.

Training:
Provisional amounts are included in the G&A costs for safety and operational training, consisting of training manuals, videos and instruction courses given by outside consultants and specialists. The costs are estimated at US$ 500,000 during the first two years and US$ 200,000 for the resting three years of operation.

Ponce Enriquez Project

Table 6.1

Mine Department Employees						
		Year				
Payroll Personnel	Cost Unit	1 No.	2 No.	3 No.	4 No.	5 No.
Mine Supervision						
Mine Superintendent *	143,208	1	1	1	1	1
Operation Foreman *	50,000	3	3	3	3	3
Drill & Blast Foreman *	50,000	1	1	1	1	1
Dispatcher	20,000	3	3	3	3	3
Training Foreman *	50,000	1	1	1	1	1
Mine Clerk	10,000	1	1	1	1	1
Maintenance Supervision						
Maintenance Superintendent *	143,208	1	1	1	1	1
Field Foreman *	50,000	3	3	3	3	3
Shop Foreman	30,000	3	3	3	3	3
Planner *	50,000	1	1	1	1	1
Training Foreman *	50,000	1	1	1	1	1
Clerk	10,000	1	1	1	1	1
Engineering						
Chief Engineer *	108,202	1	1	1	1	1
Mine Engineer *	60,000	2	2	2	2	2
Technician	20,000	2	2	2	2	2
Surveyor	20,000	2	2	2	2	2
Assistant Surveyor	10,000	4	4	4	4	4
Clerk	10,000	1	1	1	1	1
Geology						
Chief Geologist *	108,202	1	1	1	1	1
Geologist *	60,000	2	2	2	2	2
Geologist	3,000	2	2	2	2	2
Technician	20,000	2	2	2	2	2
Sampler	10,000	6	6	6	6	6
Sub-Total		**45**	**45**	**45**	**45**	**45**
Hourly Labor						
Drilling						
Driller	9,480	6	6	6	6	6
Driller Second.	4,800	3	3	3	3	3
Blasting						
Blaster	9,480	1	1	1	1	1
Blaster Helper	4,800	2	2	2	2	2
Truck Driver	4,800	1	1	1	1	1
Loading						
Shovel & Loader Operator	10,800	5	5	5	5	5
Wheeldozer Operator	9,480	3	3	3	3	3
Hauling						
Truck Operator	9,480	18	18	20	15	15
Dozer Operator	9,480	8	8	8	8	8
General Services						
Grader Operator	9,480	6	6	6	6	6
Water Truck Operator		0	0	0	0	0
Backhoe Operator	9,480	6	6	6	6	6
Pumping Operator	7,200	6	6	6	6	6
Labourer	3,600	6	6	6	6	6
Janitor	3,600	3	3	3	3	3
Maintenance						
Field General Mechanic	9,480	9	9	9	9	9
Field General Welder	9,480	3	3	3	3	3
Field Electrician	10,800	3	3	3	3	3
Lube Truck Operator	7,200	3	3	3	3	3
Labourer	3,600	6	6	6	6	6
Shop Mechanic	9,480	9	9	9	9	9
Welder Machinist	9,480	3	3	3	3	3
Electrician	10,800	3	3	3	3	3
Labourer	3,600	6	6	6	6	6
Janitor	3,600	3	3	3	3	3
Tool Crib Attendant	3,600	3	3	3	3	3
Sub-Total		**125**	**125**	**127**	**122**	**122**
Total		**170**	**170**	**172**	**167**	**167**

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Table 6.1 (cont'd)

Mill Department Employees						
		Year				
Payroll Personnel	Cost	1	2	3	4	5
	Unit	No.	No.	No.	No.	No.
Management & administration						
Clerk	10,000	1	1	1	1	1
Subtotal		1	1	1	1	1
Operations						
Mill Operation Supt. *	143,208	1	1	1	1	1
Shift Foreman	50,000	3	3	3	3	3
Training Foreman *	50,000	1	1	1	1	1
Operator Foreman	30,000	3	3	3	3	3
Operator (crushing)	10,800	3	3	3	3	3
Operator (grind / leach)	10,800	6	6	6	6	6
Operators (stripping)	9,480	2	2	2	2	2
Operator (refinery)	9,480	3	3	3	3	3
Operator (services)	9,480	3	3	3	3	3
Mobile Equip.Driver	4,800	3	3	3	3	3
Ops. Helper/Labourer	3,600	12	12	12	12	12
Sub total		40	40	40	40	40
Maintenance						
Mill maintenance Supt. *	70,000	1	1	1	1	1
Mechanical Eng. *	60,000	1	1	1	1	1
Maintenance Planner	50,000	1	1	1	1	1
Draughstman	20,000	1	1	1	1	1
maintenance Foreman	50,000	3	3	3	3	3
Senior Tradesman	30,000	1	1	1	1	1
Senior Tradesman *	30,000	1	1	1	1	1
Instr. Tecnician	10,800	3	3	3	3	3
Tradesman	9,480	6	6	6	6	6
Maint. Helper/Labourer	3,600	12	12	12	12	12
Subtotal		30	30	30	30	30
Services & Metallurgy						
Chief Metallurgist *	70,000	1	1	1	1	1
Environmental Eng. *	60,000	1	1	1	1	1
Metallurgist *	50,000	1	1	1	1	1
Metallurgist	50,000	1	1	1	1	1
Metallurgy Technician	20,000	2	2	2	2	2
Janitor	3,600	1	1	1	1	1
Subtotal		7	7	7	7	7
Assay lab						
Chief Chemist *	60,000	1	1	1	1	1
Assay Lab. Technician	10,800	3	3	3	3	3
Assayer	9,480	6	6	6	6	6
Sample Preparation	4,800	6	6	6	6	6
Subtotal		16	16	16	16	16
Subtotal Mill Department		94	94	94	94	94

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Table 6.1 (cont'd)

G&A Deapartment Employees

Payroll Personnel	Cost unit	Year 1 No.	2 No.	3 No.	4 No.	5 No.
Staff	$/y					
General Manager *	150,000	1	1	1	1	1
Executive Secretary	12,000	1	1	1	1	1
General Receptionist	8,000	1	1	1	1	1
Accountant	15,000	2	2	2	2	2
Payroll Clerk	8,000	2	2	2	2	2
Human Resources Manager	30,000	1	1	1	1	1
Human Resources Officer	15,000	2	2	2	2	2
Human Resources Clerk	8,000	2	2	2	2	2
Health and Safety Trainer *	50,000	1	1	1	1	1
Health & Safety Officer	15,000	2	2	2	2	2
Nurse	15,000	2	2	2	2	2
Supply Manager	30,000	1	1	1	1	1
Supply Secretary	8,000	1	1	1	1	1
Warehouse Supervisor	15,000	3	3	3	3	3
Warehouse Clerk	10,000	9	9	9	9	9
Transportation Coordinator	15,000	2	2	2	2	2
Services Manager	30,000	1	1	1	1	1
Communication Engineer *	50,000	2	2	2	2	2
Communication Technician	25,000	2	2	2	2	2
Network Supervisor	25,000	2	2	2	2	2
Computer Technician	15,000	2	2	2	2	2
Security Manager *	50,000	1	1	1	1	1
Security Guard	15,000	15	15	15	15	15
Sub-Total		58	58	58	58	58
Hourly Labour						
Equipment Operator	8,000	15	15	15	15	15
Carpenter	6,000	4	4	4	4	4
Electrician	8,000	6	6	6	6	6
Plumber	6,000	4	4	4	4	4
Janitor	4,000	2	2	2	2	2
Sub-Total		31	31	31	31	31
Total G&a Department		89	89	89	89	89

Total Expatriate Employees	32	32	32	32	32
Total National Employees	321	321	323	318	318
Total Employees	353	353	355	350	350

*: Expatriate

7. ECONOMICAL ANALYSIS

An economical analysis of the project was prepared for the Ponce Enriquez project, on the base of the different information presented in the chapters before.

7.1 CAPITAL COSTS

Capital costs are summarized in Table 7.1. Detailed capital costs for the mine, mill, tailings dam and general services and administration are respectively presented in Tables 7.2, 7.3, 7.4 and 7.5. Capital costs for the electrical and communications, infrastructures and indirect costs were estimated on the base of similar installations for the Gross Rosebel Project, which is located in Surinam, in similar conditions as the Ponce Enriquez project.

The on-going capital costs are presented in Table 7.6 and have been limited, in reason of the short life, to the on-going construction of the tailings dam and the purchase of some mining equipment.

Capital cost estimation was executed on the assumption that all specialized equipment imported will not be subject to any import duties, since similar equipment is not fabricated in Ecuador. Freight costs to deliver all equipment and material were accounted separately and were accounted as an indirect cost.

7.2 OPERATING COSTS

Operating costs were evaluated in detail and are presented in Table 7.7 for the mine operation, Table 7.8 for the processing operations and Table 7.9 for the general services and administration. They can be summarized as follows:

Mining costs:	US$ 1.64 per tonne moved
Milling costs:	US$ 6.37 per tonne milled (13% saprolite / 87% hard rock)
G&A:	US$ 1.49 per tonne milled

The main economical indicators used in the operating costs estimation are as follows:

Fuel:	US$ 0.29 / l
Power generated on site:	US$ 0.07 / kW-h
Cyanide:	US$1,600 / tonne
Qualified national mine or mill operator:	US$10,800 / year (Company cost)

Value added tax was not included in the operating costs, considering the fact that the final product, gold, will be exported and the value added tax will be subject to reimbursement. The import duties for the operating costs were not considered for the same reason stated in the capital costs estimation.

7.3 ECONOMICAL MODEL

A detailed economical model was constructed to reflect the economical performance of the project and is presented in Table 7.10.

The time frame presented in the economical model consist in three years of pre-production and five years of operation. The year PP-3 will be used to execute exploration and definition drilling and the years PP- 2 and PP will be used to construct the project.

During the year PP-3 the following expenses were considered:

Property purchase commitments.	US$ 7,870,000
Exploration and definition drilling:	US$ 5,000,000
Feasibility study:	US$ 5,000,000

For the construction of the economical model the split of the initial capital costs was estimated at 40% and 60% respectively in years PP-2 and PP. Value added tax was considered for the initial capital costs and was calculated by applying a value added tax factor of 10% on 60% of the initial capital costs. The value added tax was reimbursed during the first year of production.

Working capital was estimated at US$ 15,000,000 and was considered fully recoverable at the end of the project.

NSR royalties of respectively 1% and 3% payable to Baybridge and the Ecuadorian government were reflected in the economical model.

Income taxes at a rate of 20% were considered in the economical model. Depreciation was calculated as stipulated in the Ecuadorian Law at 25% per year.

The economical parameters of the project can be summarized as follows:

Mining Reserves:	3,156,410 tonnes @ 1.42 g/t Au (Saprolite) 21,335,540 tonnes @ 1.37 g/t Au (Hard Rock) 24,491,950 tonnes @ 1.38 g/t Au total
Total gold produced:	977,459 ounces

7.4 SENSITIVITY ANALYSIS

The following sensitivities were studied

Sensitivity before tax (Cash flow US$ 000)						
	Favourable		Base case		Unfavourable	
Discount rate	0%	8%	0%	8%	0%	8%
Gold +/- US$ 50/oz	(20,536)	(48,093)	(67,454)	(79,647)	(114,372)	(111,201)
Gold +/- US$ 100/oz	26,389	(16,539)	(67,454)	(79,647)	(161,290)	(142,756)
Operating costs +/- 10%	(41,810)	(62,736)	(67,454)	(79,647)	(93,098)	(96,559)
Operating costs +/- 20%	(16,166)	(45,825)	(67,454)	(79,647)	(118,742)	(113,470)
Capital costs +/- 10%	(51,412)	(65,892)	(67,454)	(79,647)	(83,495)	(93,403)
Capital costs +/-20%	(35,371)	(52,136)	(67,454)	(79,647)	(99,537)	(107,158)
Gold Grade +/- 10%	(29,919)	(54,404)	(67,454)	(79,647)	(104,988)	(104,891)
3% Royalty Eliminated	(55,724)	(71,759)	(67,454)	(79,647)	N/A	N/A
Reserves 1.5 X the size of actual	(6,344)	(49,726)	(67,454)	(79,647)	N/A	N/A
Reserves 2 X the size of the actual	54,766	(24,850)	(67,454)	(79,647)	(79,647)	N/A

Sensitivity after tax (Cash flow US$ 000)						
	Favourable		Base case		Unfavourable	
Discount rate	0%	8%	0%	8%	0%	8%
Gold +/- US$ 50/oz	(26.695)	(52.798)	(70.840)	(82.234)	(114.985)	(111.670)
Gold +/- US$ 100/oz	17,450	(23.362)	(70.840)	(82.234)	(161.290)	(142.756)
Operating costs +/- 10%	(46.223)	(66.108)	(70.840)	(82.234)	(95.456)	(98.360)
Operating costs +/- 20%	(21.607)	(49.981)	(70.840)	(82.234)	(120.073)	(114.487)
Capital costs +/- 10%	(55.601)	(69.091)	(70.840)	(82.234)	(86.079)	(95.377)
Capital costs +/-20%	(40.361)	(55.948)	(70.840)	(82.234)	(101.319)	(108.520)
Gold Grade +/- 10%	(35.524)	(58.685)	(70.840)	(82.234)	(106.156)	(105.783)
3% Royalty Eliminated	(59.804)	(74.875)	(70.840)	(82.234)	N/A	N/A
Reserves 1.5 X the size of actual	(9.730)	(52.312)	(70.840)	(82.234)	N/A	N/A
Reserves 2 X the size of the actual	42.238	(31.060)	(70.840)	(82.234)	N/A	N/A

Ponce Enriquez Project

Table 7.1

Summary of Capital Cost Estimates	Total (US $)
100 General Administration & Services	
101 Software	250,000
Mobile Equipment	370,000
Sub-Total	**620,000**
300 Mining	
311 Equipment	19,691,000
330 Software and survey instruments	667,000
340 Open Pit Water Manangement	400,000
360 Mine roads preparation	500,000
370 Explosives Handling Facilities	400,000
Sub-Total	**21,658,000**
400 Electrical and Communications	
420 Generating plant	17,982,000
430 Site distribution	651,537
460 Communications	500,000
Sub-Total	**19,133,537**
500 Infrastructure	
505 Access road to site	500,000
515 On-Site roads	500,000
540 Sewage Disposal System	150,000
545 Waste Disposal System	35,000
550 Administration Complex	454,000
555 Warehouse Complex & Truck shop	3,406,000
560 Security and first aid building	228,000
565 Fuel Handling	1,376,000
Sub-Total	**6,649,000**
600 Ore Handling and Processing	
605 General Equipment	1,644,469
610 Crushers and Ore Handling	3,587,870
620 Grinding	17,317,828
630 Gravity recovery	934,850
640 Leaching, CIP, refining	7,213,850
650 Thickening & Tailings handling	3,621,250
660 Reagents Handling & Storage	353,850
670 Mill Services	456,500
680 Mill Facilities	107,575
680 Laboratory	1,340,450
688 Mill shops	453,950
690 Electrical & Communications	2,499,750
Sub-Total	**39,532,192**

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Table 7.1 (Cont'd)

Summary of Capital Cost Estimates (Cont'd)		Total (US$)
800 Tailings and Water Management		
801 Tailings Land Purchase		400,000
810 Tailings Disposal Pipeline		1,324,600
820 Tailings Dam		2,415,523
830 Tailings Distribution		86,250
840 Water Reclaim		1,870,875
850 Fresh Water		438,500
855 Potable Water		348,500
858 Fire Protection		350,975
860 Process Water		836,600
870 Drainage Pond		100,925
880 Effluent Water Treatment		2,694,950
Sub-Total		**10,867,698**
900 Indirects		
910 Construction Building Facilities		880,000
920 Aggregate Plant		701,000
930 Concrete Plant		53,000
940 Equipment and Tools		6,607,000
945 Service Personel / Equipt. / Maint.		870,000
950 Freight		7,125,000
955 Engineering		3,713,000
960 PCM		6,161,000
970 Personal R&B and Transportation		6,570,000
975 Temporary Power Generation		500,000
980 First Fill		1,000,000
990 Land purchase		3,000,000
992 Permits		500,000
997 Owner's costs		3,000,000
998 Vendor Representatives		350,000
Sub-Total		**41,030,000**
Sub-Total		**139,490,427**
Contingenc	15.00%	20,923,564
Total		**160,413,991**

Table 7.2

Capital Costs Mine Department

	Cost (000$)	PP No	PP ($ 000)	Year 1 No	Year 1 ($ 000)	Year 2 No	Year 2 ($ 000)	Year 3 No	Year 3 ($ 000)	Year 4 No	Year 4 ($ 000)	Year 5 No	Year 5 ($ 000)	Total ($ 000)
Major Equipment														
Acquisition														
Drill 150 mm	789	2	1,578		0		0		0		0		0	1,578
Secondary drill airtrack	526	1	526		0		0		0		0		0	526
Shovel 15 m3	2,200	1	2,200		0		0		0		0		0	2,200
Spare bucket	135	1	135		0		0		0		0		0	135
Loader 11 m3	1,130	1	1,130		0		0		0		0		0	1,130
Wheeldozer 450 hp	567	1	567		0		0		0		0		0	567
Truck 77 t	984	7	6,887		0	1	984		0		0		0	7,870
Bulldozer D9	579	3	1,736		0		0		0		0		0	1,736
Grader 275 hp	470	2	941		0		0		0		0		0	941
Water truck 76 kl	988	1	988		0		0		0		0		0	988
Sub-Total			16,688		0		984		0		0		0	17,672
Total			16,688		0		984		0		0		0	17,672
Transportation	0.00%		0		0		0		0		0		0	0
Total Major Equipment			**16,688**		**0**		**984**		**0**		**0**		**0**	**17,672**
Service Equipment														
Acquisition														
Backhoe 2 m3	227	2	453		0		0		0		0		0	453
Front-end-loader 4m3	367	0	0		0		0		0		0		0	0
Crane 60 t	424	1	424		0		0		0		0		0	424
Forklift 5 t	94	1	94		0		0		0		0		0	94
Explosive Truck	135	2	270		0		0		0		0		0	270
Utility truck	31	0	0		0		0		0		0		0	0
Fuel truck	120	1	120		0		0		0		0		0	120
Lube truck	167	2	333		0		0		0		0		0	333
Maintenance truck	143	0	0		0		0		0		0		0	0
Tire manipulator	361	1	361		0		0		0		0		0	361
Low bed 50 t	181	1	181		0		0		0		0		0	181
Low bed 200 t	802	0	0		0		0		0		0		0	0
Pit bus	78	2	156		0		0		0		0		0	156
Pick-up truck	21	15	314		0		0	5	105	5	105	5	105	627
Lighting tower	21	6	124		0		0		0		0		0	124
Mobile welding machine	12	2	24		0		0		0		0		0	24
Mobile compressor	52	2	104		0		0		0		0		0	104
Diesel portable pump	15	3	45		0		0		0		0		0	45
Sub-Total			3,003		0		0		105		105		105	3,317

Ponce Enriquez Project

Table 7.2 (cont'd)

Capital Costs Mine Department														
		Year												
		PP		1		2		3		4		5		Total
				No	($ 000)	No	($ 000)	No	($ 000)	No	($ 000)	No	($ 000)	($ 000)
Software's and Survey Instruments	Cost (000$)													
Mine engineering software's	250	1	250		0		0		0		0		0	250
Survey GPS system	117	1	117		0		0		0		0		0	117
Preventive maintenance	300	1	300											300
Total Software's and Survey Instruments	**667**		**667**		**0**		**0**		**0**		**0**		**0**	**667**
Water Management														
Channels and Dams			400		0		0		0		0		0	400
Sub-Total			400		0		0		0		0		0	400
Total Water Management			**400**		**0**		**0**		**0**		**0**		**0**	400
Mine Roads Preparation														
Mine roads preparation			500		0		0		0		0		0	500
Total Mine Roads Preparation			**500**		**0**		**0**		**0**		**0**		**0**	**500**
Powder Magazines Preparation														
Powder Magazines Preparation			400		0		0		0		0		0	400
Total Powder Magazines Preparation			**400**		**0**		**0**		**0**		**0**		**0**	**400**
Pre-Stripping														
Pre-stripping			0		0		0		0		0		0	0
Total Pre-Stripping			**0**		**0**		**0**		**0**		**0**		**0**	**0**

Ponce Enriquez Project

Table 7.2 (cont'd)

Capital Costs Mine Department

		Year										
	PP	1		2		3		4		5		Total
		No	($ 000)	No	($ 000)	No	($ 000)	No	($ 000)	No	($ 000)	($ 000)
Capital Costs Summary												
Major Equipment	16,688		0		984		0		0		0	17,672
Small Equipment	3,003		0		0		105		105		105	3,317
Software's and Survey Instruments	667		0		0		0		0		0	667
Water Management	400		0		0		0		0		0	400
Mine Roads Preparation	500		0		0		0		0		0	500
Powder Magazines Preparation	400		0		0		0		0		0	400
Pre-Stripping	0		0		0		0		0		0	0
Total	21,658		0		984		105		105		105	22,956

PONCE ENRIQUEZ PROJECT

Table 7.3

TOTAL excludes freight, insurance & duties

CAPITAL COST ESTIMATE PROCESS PLANT

code	Description	Equipment Cost	Materials	Manhours	$/mh	mh cost	TOTAL
	GENERAL						
601							
3100	Excavation,Backfill & Drainage	$0	$15,000	45,000	$4.50	$202,500	$217,500
3700	Mechanical Equipment						
	Skid Loader	$35,000	$0	0	$4.50	$0	$35,000
	Bull Dozer D-10 - 525 HP	$760,269	$0	0	$4.50	$0	$760,269
	Forklift (5t)	$26,000	$0	0	$4.50	$0	$26,000
	Loader 960 F	$221,000	$0	0	$4.50	$0	$221,000
	Boom Truck	$135,000	$0	0	$4.50	$0	$135,000
	Elevated Platform lift	$35,000	$0	0	$4.50	$0	$35,000
	Pickup Defender 3/4 ton (4x)	$152,000	$0	0	$4.50	$0	$152,000
	Pickup Toyota Hi-Lux (3x)	$62,700	$0	0	$4.50	$0	$62,700
	Total General	$1,426,969	$15,000			$202,500	$1,644,469
	CRUSHING & ORE HANDLING						
610							
3100	Excavation,Backfill & Drainage	$0	$540,000	5,000	$4.50	$22,500	$562,500
3200	Concrete	$0	$920,000	102,000	$4.50	$459,000	$1,379,000
3300	Structure	$0	$756,000	15,000	$4.50	$67,500	$823,500
3400	Electrical & Instrumentation	$0	$266,500	24,000	$4.50	$108,000	$374,500
3500	Heating, Ventilation & Air Conditioning	$500	$0	100	$4.50	$450	$950
3600	Piping	$0	$53,300	0	$4.50	$0	$53,300
3700	Mechanical Equipment						
	Primary Gyratory Crusher 42"x70"	$755,000	$0	22,400	$4.50	$100,800	$855,800
	Rock Breaker	$240,000	$0	320	$4.50	$1,440	$241,440
	Electromagnet - Belt Feeder Discharge	$25,000	$0	100	$4.50	$450	$25,450
	Ore Pocket Discharge Belt Feeder	$360,000	$0	2,400	$4.50	$10,800	$370,800
	Instrument Air Dryer	$26,500	$0	80	$4.50	$360	$26,860
	Gyratory Crusher Area Wet Scrubber	$25,000	$0	600	$4.50	$2,700	$27,700
	Crusher Area Dust Slurry Pump	$8,000	$0	90	$4.50	$405	$8,405
	7.5 t Monorail Hoist Crusher Motor	$22,000	$0	90	$4.50	$405	$22,405
	Belt Scale Crusher Discharge Conveyor	$11,500	$0	60	$4.50	$270	$11,770
	Transfer Conveyor 1200 mm x 700 m	$1,000,000	$0	25,000	$4.50	$112,500	$1,112,500
	Calibration Chain Hoist	$22,000	$0	90	$4.50	$405	$22,405
	Air Compressor & Receiver	$35,000	$0	540	$4.50	$2,430	$37,430
	Sump Pump	$10,000	$0	80	$4.50	$360	$10,360
	Discharge Feeder Feed Chute Liner	$75,000	$0	800	$4.50	$3,600	$78,600
	Discharge Feeder Discharge Chute	$30,000	$0	200	$4.50	$900	$30,900
	Electromagnet Trash Chute	$15,000	$0	200	$4.50	$900	$15,900
	Trash Bin	$5,000	$0	10	$4.50	$45	$5,045
3800	Architecture	$0	$26,650	0	$4.50	$0	$26,650
	Total Crushing & Ore Handling	$2,665,000	$26,650			$896,220	$3,587,870

Table 7.3 (cont'd)

TOTAL excludes freight, insurance & duties

CAPITAL COST ESTIMATE PROCESS PLANT

code	Description	Equipment Cost	Materials	Manhours	$/mh	mh cost	TOTAL
	GRINDING						
620							
3100	Excavation,Backfill & Drainage	$0	$17,700	0	$4.50	$0	$17,700
3200	Concrete	$0	$800,000	108,000	$4.50	$486,000	$1,286,000
3300	Structure	$0	$900,000	35,000	$4.50	$157,500	$1,057,500
3400	Electrical & Instrumentation	$0	$1,220,330	30,000	$4.50	$135,000	$1,355,330
3500	Heating, Ventilation & Air Conditioning	$2,000	$0	250	$4.50	$1,125	$3,125
3600	Piping	$0	$732,198	40,000	$4.50	$180,000	$912,198
3700	Mechanical Equipment						
	Stockpile Discharge Collar	$30,500	$0	800	$4.50	$3,600	$34,100
	Reclaim Apron Feeder 1.8 m x 6 m (2x)	$308,000	$0	1,500	$4.50	$6,750	$314,750
	Reclaim Tunnel Area Wet Dust Collector	$50,000	$0	1,200	$4.50	$5,400	$55,400
	Reclaim Tunnel Sump Pump	$7,500	$0	160	$4.50	$720	$8,220
	Reclaim Feeder Hoist	$35,000	$0	120	$4.50	$540	$35,540
	SAG Mill Feed Conveyor 1000 mm	$450,000	$0	6,300	$4.50	$28,350	$478,350
	SAG Mill Stationary Feed Chute	$40,000	$0	500	$4.50	$2,250	$42,250
	SAG Mill 30' x 18' 10.000 HP	$5,147,000	$0	25,000	$4.50	$112,500	$5,259,500
	SAG Mill Liner Jib Crane	$24,000	$0	70	$4.50	$315	$24,315
	SAG Mill Crane	$365,000	$0	700	$4.50	$3,150	$368,150
	SAG Mill Liner Handler	$250,000	$0	400	$4.50	$1,800	$251,800
	SAG Mill Screen Feed Chute	$28,750	$0	200	$4.50	$900	$29,650
	SAG Mill Discharge Screen	$136,000	$0	1,200	$4.50	$5,400	$141,400
	SAG Mill Discharge Pump Box	$35,000	$0	100	$4.50	$450	$35,450
	Ball Feed Bin - SAG Mill	$34,500	$0	400	$4.50	$1,800	$36,300
	Ball Mill 20' x 27' 7500 HP	$4,237,000	$0	25,000	$4.50	$112,500	$4,349,500
	Ball Mill Liner Jib Crane	$24,000	$0	90	$4.50	$405	$24,405
	Ball Mill Crane	$240,000	$0	600	$4.50	$2,700	$242,700
	Ball Mill Cyclone Cluster	$205,000	$0	500	$4.50	$2,250	$207,250
	Cyclone Cluster Feed Pump	$150,000	$0	250	$4.50	$1,125	$151,125
	Cyclone Feed Pump Box	$25,000	$0	100	$4.50	$450	$25,450
	Ball Feed Bin - Ball Mill	$34,500	$0	400	$4.50	$1,800	$36,300
	Belt Scale Conveyor	$16,000	$0	140	$4.50	$630	$16,630
	Hydraulic Inching Drive	$173,000	$0	200	$4.50	$900	$173,900
	Grinding Sump Pump (2x)	$28,000	$0	160	$4.50	$720	$28,720
	Discharge Chute Conveyor (3x)	$27,500	$0	300	$4.50	$1,350	$28,850
	Grinding Ball Bucket (3x)	$86,250	$0	600	$4.50	$2,700	$88,950
	Tote Bin (3x)	$13,800	$0	160	$4.50	$720	$14,520
3800	Architecture	$0	$115,000	15,000	$4.50	$67,500	$182,500
	Total Grinding	$12,203,300	$3,785,228			$1,329,300	$17,317,828
	GRAVITY RECOVERY						
630							
3100	Excavation,Backfill & Drainage	$0	$10,000	600	$4.50	$2,700	$12,700
3400	Electrical & Instrumentation	$0	$78,000	5,500	$4.50	$24,750	$102,750
3600	Piping	$0	$2,500	200	$4.50	$900	$3,400
3700	Mechanical Equipment	$780,000	$0	8,000	$4.50	$36,000	$816,000
	Total Gravity Recovery	$780,000	$90,500			$64,350	$934,850
	LEACHING, CIP & REFINING						
640							
3100	Excavation,Backfill & Drainage	$0	$0	500	$4.50	$2,250	$2,250
3200	Concrete	$0	$125,000	17,000	$4.50	$76,500	$201,500
3300	Structure	$0	$465,000	35,000	$4.50	$157,500	$622,500
3400	Electrical & Instrumentation	$0	$387,500	28,000	$4.50	$126,000	$513,500
3500	Heating, Ventilation & Air Conditioning	$0	$2,000	800	$4.50	$3,600	$5,600
3600	Piping	$0	$850,000	50,000	$4.50	$225,000	$1,075,000
3700	Mechanical Equipment	$3,875,000	$0	155,000	$4.50	$697,500	$4,572,500
3800	Architecture	$0	$140,000	18,000	$4.50	$81,000	$221,000
	Total Leaching, CIP & Refining	$3,875,000	$1,969,500			$1,369,350	$7,213,850

Table 7.3 (cont'd)

TOTAL excludes freight, insurance & duties

CAPITAL COST ESTIMATE PROCESS PLANT

code	Description	Equipment Cost	Materials	Manhours	$/mh	mh cost	TOTAL
	THICKENING & TAILINGS HANDLING						
650							
3100	Excavation,Backfill & Drainage	$0	$5,000	1,500	$4.50	$6,750	$11,750
3200	Concrete	$0	$110,000	17,500	$4.50	$78,750	$188,750
3300	Structure	$0	$150,000	15,000	$4.50	$67,500	$217,500
3400	Electrical & Instrumentation	$0	$500,000	20,000	$4.50	$90,000	$590,000
3600	Piping	$0	$30,000	500	$4.50	$2,250	$32,250
3700	Mechanical Equipment	$2,500,000	$0	18,000	$4.50	$81,000	$2,581,000
	Total Thickening & Tailings Handling	$2,500,000	$795,000			$326,250	$3,621,250
	REAGENTS HANDLING & STORAGE						
660							
3400	Electrical & Instrumentation	$0	$65,000	4,000	$4.50	$18,000	$83,000
3600	Piping	$0	$5,000	1,000	$4.50	$4,500	$9,500
3700	Mechanical Equipment	$250,000	$0	2,000	$4.50	$9,000	$259,000
3800	Architecture	$0	$1,000	300	$4.50	$1,350	$2,350
	Total Reagents Handling & Storage	$250,000	$71,000			$32,850	$353,850
	MILL SERVICES						
670							
3400	Electrical & Instrumentation	$0	$75,000	3,500	$4.50	$15,750	$90,750
3600	Piping	$0	$10,000	2,500	$4.50	$11,250	$21,250
3700	Mechanical Equipment	$330,000	$0	2,500	$4.50 -	$11,250	$341,250
3800	Architecture	$0	$1,000	500	$4.50	$2,250	$3,250
	Total Mill Services	$330,000	$86,000			$40,500	$456,500
	MILL FACILITIES						
680							
3500	Heating, Ventilation & Air Conditioning	$0	$2,500	1,000	$4.50	$4,500	$7,000
3700	Mechanical Equipment	$50,000	$0	2,000	$4.50	$9,000	$59,000
3800	Architecture	$0	$40,000	350	$4.50	$1,575	$41,575
	Total Mill Facilities	$50,000	$42,500			$15,075	$107,575
	MILL LABORATORY						
685							
3200	Concrete	$0	$75,000	7,000	$4.50	$31,500	$106,500
3300	Structure	$0	$75,000	4,000	$4.50	$18,000	$93,000
3400	Electrical & Instrumentation	$0	$80,000	2,000	$4.50	$9,000	$89,000
3500	Heating, Ventilation & Air Conditioning	$0	$35,000	3,500	$4.50	$15,750	$50,750
3600	Piping	$0	$15,000	2,000	$4.50	$9,000	$24,000
3700	Mechanical Equipment	$800,000	$0	5,200	$4.50	$23,400	$823,400
3800	Architecture	$0	$125,000	6,400	$4.50	$28,800	$153,800
	Total Mill Laboratory	$800,000	$405,000			$135,450	$1,340,450
	MILL SHOPS						
688							
3200	Concrete	$0	$65,000	6,500	$4.50	$29,250	$94,250
3300	Structure	$0	$120,000	6,500	$4.50	$29,250	$149,250
3400	Electrical & Instrumentation	$0	$50,000	2,500	$4.50	$11,250	$61,250
3500	Heating, Ventilation & Air Conditioning	$0	$7,500	1,000	$4.50	$4,500	$12,000
3700	Mechanical Equipment	$35,000	$0	5,200	$4.50	$23,400	$58,400
3800	Architecture	$0	$50,000	6,400	$4.50	$28,800	$78,800
	Total Mill Laboratory	$35,000	$292,500			$126,450	$453,950
	ELECTRICAL / CONTROL ROOM						
690							
3400	Electrical & Instrumentation	$2,000,000	$200,000	30,000	$4.50	$135,000	$2,335,000
3500	Heating, Ventilation & Air Conditioning	$0	$100,000	3,500	$4.50	$15,750	$115,750
3600	Piping	$0	$40,000	2,000	$4.50	$9,000	$49,000
	Total Electrical / Control Room	$2,000,000	$340,000			$159,750	$2,499,750
	TOTAL PROCESS PLANT	**$26,915,269**	**$7,918,878**			**$4,698,045**	**$39,532,192**

PONCE ENRIQUEZ PROJECT

Table 7.4 (cont'd)

TOTAL excludes freight, insurance & duties

code	Description	Equipment Cost	Materials	Manhours	$/mh	mh cost	TOTAL
CAPITAL COST ESTIMATE TAILINGS & WATER MANAGEMENT							
858	*FIRE PROTECTION*						
3200	Concrete	$0	$2,000	250	$4.50	$1,125	$3,125
3300	Structure	$0	$1,500	100	$4.50	$450	$1,950
3400	Electrical & Instrumentation	$0	$12,500	300	$4.50	$1,350	$13,850
3600	Piping	$0	$185,000	6,000	$4.50	$27,000	$212,000
3700	Mechanical Equipment	$105,000	$0	1,000	$4.50	$4,500	$109,500
3800	Architecture	$0	$2,000	1,900	$4.50	$8,550	$10,550
	Total fire protection	$105,000	$203,000			$42,975	$350,975
860	*PROCESS WATER*						
3100	Excavation,Backfill & Drainage	$0	$10,000	18,000	$4.50	$81,000	$91,000
3200	Concrete	$0	$5,000	2,500	$4.50	$11,250	$16,250
3300	Structure	$0	$35,000	500	$4.50	$2,250	$37,250
3400	Electrical & Instrumentation	$0	$190,000	3,000	$4.50	$13,500	$203,500
3600	Piping	$0	$160,000	5,800	$4.50	$26,100	$186,100
3700	Mechanical Equipment	$260,000	$0	8,500	$4.50	$38,250	$298,250
3800	Architecture	$0	$2,000	500	$4.50	$2,250	$4,250
	Total Process Water	$260,000	$402,000			$174,600	$836,600
870	*DRAINAGE POND*						
3100	Excavation,Backfill & Drainage	$0	$10,000	8,000	$4.50	$36,000	$46,000
3400	Electrical & Instrumentation	$0	$25,000	1,000	$4.50	$4,500	$29,500
3600	Piping	$0	$2,500	300	$4.50	$1,350	$3,850
3700	Mechanical Equipment	$20,000	$0	350	$4.50	$1,575	$21,575
	Total Drainage Pond	$20,000	$37,500			$43,425	$100,925
880	*EFFLUENT WATER TREATMENT*						
3100	Excavation,Backfill & Drainage	$0	$5,000	2,000	$4.50	$9,000	$14,000
3200	Concrete	$0	$125,000	17,000	$4.50	$76,500	$201,500
3300	Structure	$0	$105,000	10,000	$4.50	$45,000	$150,000
3400	Electrical & Instrumentation	$0	$175,000	8,600	$4.50	$38,700	$213,700
3600	Piping	$0	$1,000,000	32,000	$4.50	$144,000	$1,144,000
3700	Mechanical Equipment	$800,000	$0	32,000	$4.50	$144,000	$944,000
3800	Architecture	$0	$12,000	3,500	$4.50	$15,750	$27,750
	Total Effluent Water Treatment	$800,000	$1,422,000			$472,950	$2,694,950
	TOTAL TAILINGS & WATER TREATMENT	***$2,645,000***	***$4,083,100***			***$3,739,598***	***$10,867,698***

Ponce Enriquez Project

Table 7.5

General Services and Administration (G&A) Capital & On-Going Capital Costs

		Year												
		PP		1		2		3		4		5		Total
	Cost (000$)	No.	($ 000)	No.	($ 000)	No.	($ 000)	No.	($ 000)	No.	($ 000)	No.	($ 000)	($ 000)
Mobile Equipment														
60 t Crane on Truck	706	1	N/C Constr.				0		0		0		0	0
30 t Forklift	385	1	N/C Constr.				0		0		0		0	0
Front-end-Loader 4 m³	365	1	N/C Constr.				0		0		0		0	0
Pick-Up Trucks	21	10	209				0		0		0		0	209
Bus	78	2	156				0		0		0		0	156
Boom Truck	143	1	N/C Constr.				0		0		0		0	0
10 t Garbage Trucks	74	1	N/C Constr.				0		0		0		0	0
4WD Ambulances	62	1	N/C Constr.				0		0		0		0	0
Aluminum Motor Boat	3	2	5				0		0		0		0	5
Sub-Total - Before Shipment		**20**	**370**			**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**370**
Freight	0%		0		0		0		0		0		0	0
														0
Total - Mobile Equipment			**370**		**0**		**0**		**0**		**0**		**0**	**370**
Computer Software														
Warehousing and Accounting Software	250	1	250	0	0	0	0	0	0	0	0	0	0	250
Total - Computer Software			**250**		**0**		**0**		**0**		**0**		**0**	**250**
Total - G&A Capital and On-Going Capital Costs			**620**		**0**		**0**		**0**		**0**		**0**	**620**

PONCE ENRIQUEZ PROJECT

Table 7.6

ONGOING CAPITAL COST

	Units	year 2	year 3	year 4	year 5
MINING EQUIPMENT		**$994,000**	**$105,000**	**$105,000**	**$105,000**
TAILINGS DAM & IMPOUNDMENT					
Dam height begin of year	m	17.5	24	30	34
Dam volume begin of year	m^3	645,007	1,116,473	1,667,608	2,097,447
Dam height end of year	m	24	30	34	38
Dam volume end of year	m^3	1,116,473	1,667,608	2,097,447	2,577,614
Unit costs dam building	US$/$m^3$	$ 3.50	$ 3.50	$ 3.50	$ 3.50
Total Tailings Dam & Impoundment		**$1,650,131**	**$1,928,973**	**$1,504,436**	**$1,680,586**
TOTAL		**$2,644,131**	**$2,033,973**	**$1,609,436**	**$1,785,586**

Ponce Enriquez Project

Table 7.7

Operating Costs Mine Department

			Year										
				1		**2**		**3**		**4**		**5**	**Total**
Tonnes saprolite ore mined (000)				1,000		1,000		1,000		156		0	3,156
Tonnes hard rock ore mined (000)				4,000		4,000		4,000		4,844		4,492	21,336
Tonnes saprolite waste mined (000)				1,434		553		2,082		0		0	4,069
Tonnes hard rock waste mined (000)				1,529		2,190		2,100		2,068		2,394	10,281
Total material moved (000)				7,963		7,743		9,182		7,068		6,886	38,842
Tonnes blasted (000)				5,529		6,190		6,100		6,911		6,886	31,616
Drilling													
Determination of the drills & gross hours													
Drills 150 mm													
Performance drill (000 tonnes/year)				2,759		2,759		2,759		2,759		2,759	
Drills required (Calculations)				2.00		2.24		2.21		2.51		2.50	
Drills on site				2		2		2		2		2	
Gross operating hours / unit				5,355		5,355		5,355		5,355		5,355	
Total gross operating hours required				10,731		12,015		11,839		13,415		13,365	61,365
Secondary drills airtrack													
Drills on site				1		1		1		1		1	
Gross operating hours / unit	GOH/year	4.000		4,000		4,000		4,000		4,000		4,000	20,000
Operating Personnel													
Driller (US$)	Salary/year	9.480	6	56,880	6	56,880	6	56,880	6	56,880	6	56,880	284,400
Driller second (US$)	Salary/year	4.800	3	14,400	3	14,400	3	14,400	3	14,400	3	14,400	72,000
Operating Costs													
Drills 311 mm													
Supply cost (US$)	Op. cost/GOH	32.48		348,573		390,259		384,550		435,734		434,136	1,993,252
Secondary drills 150 mm													
Supply cost (US$)	Op. cost/GOH	10.00		40,000		40,000		40,000		40,000		40,000	200,000
Maintenance Personnel													
Pro-rata from maintenance personnel (US$)				37,872		37,872		37,872		37,872		37,872	189,360
Maintenance Costs													
Drills 150 mm													
Fuel (US$)	Op. cost/GOH	19.58		210,126		235,256		231,814		262,669		261,705	1,201,570
Spare parts (US$)	Op. cost/GOH	25.93		278,212		311,484		306,927		347,779		346,504	1,590,905
Secondary drills													
Fuel (US$)	Op. cost/GOH	8.00		32,000		32,000		32,000		32,000		32,000	160,000
Spare parts (US$)	Op. cost/GOH	10.00		40,000		40,000		40,000		40,000		40,000	200,000
Total Drilling (US$)				**1,058,062**		**1,158,151**		**1,144,443**		**1,267,333**		**1,263,498**	5,891,487
US$/tonne blasted				**0.191**		**0.187**		**0.188**		**0.183**		**0.183**	0.933
US$/tonne moved				**0.133**		**0.150**		**0.125**		**0.179**		**0.183**	0.770

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department													
			Year										
				1		2		3		4		5	Total
Tonnes saprolite ore mined (000)				1,000		1,000		1,000		156		0	3,156
Tonnes hard rock ore mined (000)				4,000		4,000		4,000		4,844		4,492	21,336
Tonnes saprolite waste mined (000)				1,434		553		2,082		0		0	4,069
Tonnes hard rock waste mined (000)				1,529		2,190		2,100		2,068		2,394	10,281
Total material moved (000)				7,963		7,743		9,182		7,068		6,886	38,842
Tonnes blasted (000)				5,529		6,190		6,100		6,911		6,886	31,616
Blasting													
Operating Costs													
Operating Personnel													
Blaster (US$)	Salary/year	9,480	1	9,480	1	9,480	1	9,480	1	9,480	1	9,480	47,400
Blaster helper (US$)	Salary/year	4,800	2	9,600	2	9,600	2	9,600	2	9,600	2	9,600	48,000
Truck drivers (US$)	Salary/year	4,800	1	4,800	1	4,800	1	4,800	1	4,800	1	4,800	24,000
Blasting product (US$)	Bl c / tonne	0.266		1,470,698		1,646,583		1,622,494		1,838,448		1,831,708	8,409,930
Maintenance Personnel													
Pro-rata from maintenance personnel (US$)				18,936		18,936		18,936		18,936		18,936	94,680
Total Blasting (US$)				**1,513,514**		**1,689,399**		**1,665,310**		**1,881,264**		**1,874,524**	**8,624,010**
US$/tonne blasted				**0.274**		**0.273**		**0.273**		**0.272**		**0.272**	**0.273**
US$/tonne moved				**0.190**		**0.218**		**0.181**		**0.266**		**0.272**	**0.222**

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department			Year					
			1	2	3	4	5	Total
Tonnes saprolite ore mined (000)			1,000	1,000	1,000	156	0	3,156
Tonnes hard rock ore mined (000)			4,000	4,000	4,000	4,844	4,492	21,336
Tonnes saprolite waste mined (000)			1,434	553	2,082	0	0	4,069
Tonnes hard rock waste mined (000)			1,529	2,190	2,100	2,068	2,394	10,281
Total material moved (000)			7,963	7,743	9,182	7,068	6,886	38,842
Tonnes blasted (000)			5,529	6,190	6,100	6,911	6,886	31,616
Loading (Rehandling included)								
Determination of the quantity of shovels required								
Shovel 15 m3								
Performance shovel (000 tonnes/year)			4,000	4,000	4,000	4,000	4,000	
Shovels required (number of units)			1.99	1.94	2.30	1.77	1.72	
Shovels) on site (number of units)			1	1	1	1	1	
Gross hours required	GOH/year	6,000	6,000	6,000	6,000	6,000	6,000	30,000
Loaders 11 m3								
Tonnage left for loaders (000)			3,963	3,743	5,182	3,068	2,886	18,842
Performance loaders (000 tonnes/year)			3,500	3,500	3,500	3,500	3,500	
Loaders required (number of units)			1.13	1.07	1.48	0.88	0.82	
Loaders on site (number of units)			1	1	1	1	1	
Gross hours required	GOH/year	6,000	6,794	6,417	8,883	5,259	4,948	32,300
Rehandling for bad weather (hours)			0	0	0	0	0	0
Total loader hours			6,794	6,417	8,883	5,259	4,948	32,300
Wheel dozer 450 hp			1	1	1	1	1	
Gross hours required	GOH/year	5,000	5,000	5,000	5,000	5,000	5,000	25,000
Operating Personnel								
Shovel & loader operators (US$)	Salary/year	10,800	5 54,000	5 54,000	5 54,000	5 54,000	5 54,000	270,000
Wheel dozer (US$)	Salary/year	9,480	3 28,440	3 28,440	3 28,440	3 28,440	3 28,440	142,200
Operating Costs								
Loader 11 m3								
Tires (US$)	Op. cost/GOH	23.96	162,817	153,770	212,875	126,036	118,569	774,067
Wheel dozer 450 hp								
Tires (US$)	Op. cost/GOH	12.22	61,110	61,110	61,110	61,110	61,110	305,552
Maintenance Personnel								
Pro-rata from maintenance personnel			94,680	94,680	94,680	94,680	94,680	473,400
Maintenance Costs								
Shovel 15 m3								
Fuel (US$)	Op. cost/GOH	31.71	190,269	190,269	190,269	190,269	190,269	
Spare parts (US$)	Op. cost/GOH	93.93	563,563	563,563	563,563	563,563	563,563	2,817,814
Loader 11 m3								
Fuel (US$)	Op. cost/GOH	23.49	159,591	150,724	208,658	123,539	116,220	758,731
Spare parts (US$)	Op. cost/GOH	95.23	646,992	611,044	845,912	500,835	471,164	3,075,947
Wheel dozer 450 hp								
Fuel (US$)	Op. cost/GOH	16.24	81,200	81,200	81,200	81,200	81,200	406,000
Spare parts (US$)	Op. cost/GOH	23.43	117,150	117,150	117,150	117,150	117,150	585,750
Total Loading (US$)			**2,159,811**	**2,105,950**	**2,457,857**	**1,940,821**	**1,896,365**	**9,609,460**
US$/tonne moved			**0.271**	**0.272**	**0.268**	**0.275**	**0.275**	**0.247**

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department

			Year										
				1		**2**		**3**		**4**		**5**	**Total**
Tonnes saprolite ore mined (000)				*1,000*		*1,000*		*1,000*		*156*		*0*	*3,156*
Tonnes hard rock ore mined (000)				*4,000*		*4,000*		*4,000*		*4,844*		*4,492*	*21,336*
Tonnes saprolite waste mined (000)				*1,434*		*553*		*2,082*		*0*		*0*	*4,069*
Tonnes hard rock waste mined (000)				*1,529*		*2,190*		*2,100*		*2,068*		*2,394*	*10,281*
Total material moved (000)				*7,963*		*7,743*		*9,182*		*7,068*		*6,886*	*38,842*
Tonnes blasted (000)				*5,529*		*6,190*		*6,100*		*6,911*		*6,886*	*31,616*
Hauling (Rehandling included)													
Truck 77 t													
NOH required (from truck simulator)				*42,000*		*42,000*		*48,000*		*36,000*		*36,000*	*204,000*
Trucks required (units)	GOH/year	6,000		*6.64*		*6.45*		*7.65*		*5.89*		*5.74*	
Trucks on site (units)				*7*		*7*		*8*		*6*		*6*	
Truck-hours rehandling (Bad weather)				*0*		*0*		*0*		*0*		*0*	*0*
Total hours				*42,000*		*42,000*		*48,000*		*36,000*		*36,000*	*204,000*
Bulldozers D9				*3*		*3*		*3*		*3*		*3*	
Gross hours required	GOH/year	5,000		*15,000*		*15,000*		*15,000*		*15,000*		*15,000*	*75,000*
Operating Personnel													
Truck operators (US$)	Salary/year	9,480	*18*	169,218	*18*	169,218	*20*	193,392	*15*	145,044	*15*	145,044	*821,916*
Dozer operators (US$)	Salary/year	9,480	*8*	72,522	*8*	72,522	*8*	72,522	*8*	72,522	*8*	72,522	*362,610*
Operating Costs													
Truck 77 t													
Tires (US$)	Op. cost/GOH	17.70		743,354		743,354		849,548		637,161		637,161	*3,610,578*
Maintenance Personnel													
Pro-rata from maintenance personnel				227,232		227,232		227,232		227,232		227,232	*1,136,160*
Maintenance Costs													
Truck 77 t													
Fuel (US$)	Op. cost/GOH	21.46		901,320		901,320		1,030,080		772,560		772,560	*4,377,840*
Spare parts (US$)	Op. cost/GOH	18.53		778,168		778,168		889,335		667,001		667,001	*3,779,673*
Bulldozer D9													
Fuel (US$)	Op. cost/GOH	12.73		190,913		190,913		190,913		190,913		190,913	*954,564*
Spare parts (US$)	Op. cost/GOH	22.01		330,158		330,158		330,158		330,158		330,158	*1,650,792*
Total Hauling (US$)				**3,412,885**		**3,412,885**		**3,783,180**		**3,042,591**		**3,042,591**	**16,694,133**
US$/tonne moved				**0.429**		**0.441**		**0.412**		**0.430**		**0.442**	**0.430**

Table 7.7 (cont'd)

Operating Costs Mine Department

	Basis	Rate	No.	Year 1	No.	Year 2	No.	Year 3	No.	Year 4	No.	Year 5	Total
Tonnes saprolite ore mined (000)				1,000		1,000		1,000		156		0	3,156
Tonnes hard rock ore mined (000)				4,000		4,000		4,000		4,844		4,492	21,336
Tonnes saprolite waste mined (000)				1,434		553		2,082		0		0	4,069
Tonnes hard rock waste mined (000)				1,529		2,190		2,100		2,068		2,394	10,281
Total material moved (000)				7,963		7,743		9,182		7,068		6,886	38,842
Tonnes blasted (000)				5,529		6,190		6,100		6,911		6,886	31,616
General Services													
Grader 275 hp				2		2		2		2		2	
Total effective hours	GOH/year	6,000		12,000		12,000		12,000		12,000		12,000	60,000
Water truck 76 kl				1		1		1		1		1	
Total effective hours	GOH/year	4,000		4,000		4,000		4,000		4,000		4,000	20,000
Operating Personnel													
Grader operators (US$)	Salary/year	9,480	6	56,880	6	56,880	6	56,880	6	56,880	6	56,880	284,400
Water truck operators (US$)	Salary/year	7,200	0	0	0	0	0	0	0	0	0	0	0
Backhoe operator (US$)	Salary/year	9,480	6	56,880	6	56,880	6	56,880	6	56,880	6	56,880	284,400
Pumping operator (US$)	Salary/year	7,200	6	43,200	6	43,200	6	43,200	6	43,200	6	43,200	216,000
Laborer (US$)	Salary/year	3,600	6	21,600	6	21,600	6	21,600	6	21,600	6	21,600	108,000
Janitor (US$)	Salary/year	3,600	3	10,800	3	10,800	3	10,800	3	10,800	3	10,800	54,000
Operating Costs													
Grader 275 hp													
Tires (US$)	Op. cost/GOH	2.29		27,480		27,480		27,480		27,480		27,480	137,400
Water truck 76 kl													
Tires (US$)	Op. cost/GOH	5.00		20,000		20,000		20,000		20,000		20,000	100,000
Road maintenance													
Provision for culvert, crushed rock, etc. (US$)				50,000		50,000		50,000		50,000		50,000	250,000
Pumping													
Electrical cost pumping				144,000		144,000		144,000		144,000		144,000	720,000
Provision for pumping equipment, spare parts (US$)				200,000		200,000		200,000		200,000		200,000	1,000,000
Maintenance Personnel													
Field general mechanic (US$)	Salary/year	9,480	9	85,320	9	85,320	9	85,320	9	85,320	9	85,320	426,600
Field general welder (US$)	Salary/year	9,480	3	28,440	3	28,440	3	28,440	3	28,440	3	28,440	142,200
Field electrician (US$)	Salary/year	10,800	3	32,400	3	32,400	3	32,400	3	32,400	3	32,400	162,000
Lube truck operator (US$)	Salary/year	7,200	3	21,600	3	21,600	3	21,600	3	21,600	3	21,600	108,000
Laborer (US$)	Salary/year	3,600	6	21,600	6	21,600	6	21,600	6	21,600	6	21,600	108,000
Shop mechanic (US$)	Salary/year	9,480	9	85,320	9	85,320	9	85,320	9	85,320	9	85,320	426,600
Welder-machinist (US$)	Salary/year	9,480	3	28,440	3	28,440	3	28,440	3	28,440	3	28,440	142,200
Electrician (US$)	Salary/year	10,800	3	32,400	3	32,400	3	32,400	3	32,400	3	32,400	162,000
Laborer (US$)	Salary/year	3,600	6	21,600	6	21,600	6	21,600	6	21,600	6	21,600	108,000
Janitor (US$)	Salary/year	3,600	3	10,800	3	10,800	3	10,800	3	10,800	3	10,800	54,000
Tool crib attendant (US$)	Salary/year	3,600	3	10,800	3	10,800	3	10,800	3	10,800	3	10,800	54,000
Mechanical labour drilling (US$)	Credit	10.00%		(37,872)		(37,872)		(37,872)		(37,872)		(37,872)	(189,360)
Mechanical labour blasting (US$)	Credit	5.00%		(18,936)		(18,936)		(18,936)		(18,936)		(18,936)	(94,680)
Mechanical labour loading (US$)	Credit	25.00%		(94,680)		(94,680)		(94,680)		(94,680)		(94,680)	(473,400)
Mechanical labour hauling (US$)	Credit	60.00%		(227,232)		(227,232)		(227,232)		(227,232)		(227,232)	(1,136,160)
Maintenance Costs													
Grader 275 hp													
Fuel (US$)	Op. cost/GOH	8.41		100,920		100,920		100,920		100,920		100,920	504,600
Spare parts (US$)	Op. cost/GOH	24.98		299,820		299,820		299,820		299,820		299,820	1,499,098
Water truck													
Fuel (US$)	Op. cost/GOH	17.32		69,264		69,264		69,264		69,264		69,264	346,320
Spare parts (US$)	Op. cost/GOH	13.50		54,000		54,000		54,000		54,000		54,000	270,000
Service equipment													
Backhoe 2 m3			2		2		2		2		2		
Fuel (US$)	Op. cost/year	56,250		112,500		112,500		112,500		112,500		112,500	562,500
Spare parts (US$)	Op. cost/year	130,000		260,000		260,000		260,000		260,000		260,000	1,300,000
Front-end-loader 4 m3			0		0		0		0		0		
Fuel (US$)	Op. cost/year	55,000		0		0		0		0		0	0
Spare parts (US$)	Op. cost/year	119,640		0		0		0		0		0	0
Crane 60 ton			1		1		1		1		1		
Fuel (US$)	Op. cost/year	22,500		22,500		22,500		22,500		22,500		22,500	112,500
Spare parts (US$)	Op. cost/year	40,000		40,000		40,000		40,000		40,000		40,000	200,000
5 t Forklift			1		1		1		1		1		
Fuel (US$)	Op. cost/year	14,400		14,400		14,400		14,400		14,400		14,400	72,000
Spare parts (US$)	Op. cost/year	15,000		15,000		15,000		15,000		15,000		15,000	75,000
Explosive truck			2		2		2		2		2		
Fuel (US$)	Op. cost/year	14,400		28,800		28,800		28,800		28,800		28,800	144,000

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department

		Year 1		Year 2		Year 3		Year 4		Year 5		Total
Tonnes saprolite ore mined (000)			*1,000*		*1,000*		*1,000*		*156*		*0*	*3,156*
Tonnes hard rock ore mined (000)			*4,000*		*4,000*		*4,000*		*4,844*		*4,492*	*21,336*
Tonnes saprolite waste mined (000)			*1,434*		*553*		*2,082*		*0*		*0*	*4,069*
Tonnes hard rock waste mined (000)			*1,529*		*2,190*		*2,100*		*2,068*		*2,394*	*10,281*
Total material moved (000)			*7,963*		*7,743*		*9,182*		*7,068*		*6,886*	*38,842*
Tonnes blasted (000)			*5,529*		*6,190*		*6,100*		*6,911*		*6,886*	*31,616*
Spare parts (US$)	Op cost/year 25,380		50,760		50,760		50,760		50,760		50,760	253,800
Utility truck		*0*		*0*		*0*		*0*		*0*		
Fuel (US$)	Op cost/year 14,400		0		0		0		0		0	0
Spare parts (US$)	Op cost/year 25,380		0		0		0		0		0	0
Fuel truck		*1*		*1*		*1*		*1*		*1*		
Fuel (US$)	Op cost/year 14,400		14,400		14,400		14,400		14,400		14,400	72,000
Spare parts (US$)	Op cost/year 50,760		50,760		50,760		50,760		50,760		50,760	253,800
Lube truck		*2*		*2*		*2*		*2*		*2*		
Fuel (US$)	Op cost/year 14,400		28,800		28,800		28,800		28,800		28,800	144,000
Spare parts (US$)	Op cost/year 50,760		101,520		101,520		101,520		101,520		101,520	507,600
Maintenance truck		*0*		*0*		*0*		*0*		*0*		
Fuel (US$)	Op cost/year 14,400		0		0		0		0		0	0
Spare parts (US$)	Op cost/year 25,380		0		0		0		0		0	0
Boom truck		*1*		*1*		*1*		*1*		*1*		
Fuel (US$)	Op cost/year 14,400		14,400		14,400		14,400		14,400		14,400	72,000
Spare parts (US$)	Op cost/year 25,380		25,380		25,380		25,380		25,380		25,380	126,900
Tire truck		*1*		*1*		*1*		*1*		*1*		
Fuel (US$)	Op cost/year 23,400		23,400		23,400		23,400		23,400		23,400	117,000
Spare parts (US$)	Op cost/year 59,820		59,820		59,820		59,820		59,820		59,820	299,100
Low bed 200 t c/w truck		*0*		*0*		*0*		*0*		*0*		
Fuel (US$)	Op cost/year 34,632		0		0		0		0		0	0
Spare parts (US$)	Op cost/year 0		0		0		0		0		0	0
Low bed 50 t c/w truck		*1*		*1*		*1*		*1*		*1*		
Fuel (US$)	Op cost/year 14,400		14,400		14,400		14,400		14,400		14,400	72,000
Spare parts (US$)	Op cost/year 25,380		25,380		25,380		25,380		25,380		25,380	126,900
Pit bus		*2*		*2*		*2*		*2*		*2*		
Fuel (US$)	Op cost/year 14,400		28,800		28,800		28,800		28,800		28,800	144,000
Spare parts (US$)	Op cost/year 25,380		50,760		50,760		50,760		50,760		50,760	253,800
Pick-up truck		*15*		*15*		*15*		*15*		*15*		
Fuel (US$)	Op cost/year 5,000		75,000		75,000		75,000		75,000		75,000	375,000
Spare parts (US$)	Op cost/year 6,000		90,000		90,000		90,000		90,000		90,000	450,000
Lighting towers		*6*		*6*		*6*		*6*		*6*		
Fuel (US$)	Op cost/year 5,000		30,000		30,000		30,000		30,000		30,000	150,000
Spare parts (US$)	Op cost/year 6,000		36,000		36,000		36,000		36,000		36,000	180,000
Mobile welding machine		*2*		*2*		*2*		*2*		*2*		
Fuel (US$)	Op cost/year 1,500		3,000		3,000		3,000		3,000		3,000	15,000
Spare parts (US$)	Op cost/year 6,000		12,000		12,000		12,000		12,000		12,000	60,000
Mobile compressors		*2*		*2*		*2*		*2*		*2*		
Fuel (US$)	Op cost/year 1,500		3,000		3,000		3,000		3,000		3,000	15,000
Spare parts (US$)	Op cost/year 6,000		12,000		12,000		12,000		12,000		12,000	60,000
Diesel portable pumps		*3*		*3*		*3*		*3*		*3*		
Fuel (US$)	Op cost/year 1,500		4,500		4,500		4,500		4,500		4,500	22,500
Spare parts (US$)	Op cost/year 6,000		18,000		18,000		18,000		18,000		18,000	90,000
Total General Services (US$)			**2,420,124**		**2,420,124**		**2,420,124**		**2,420,124**		**2,420,124**	**12,100,618**
US$/tonne moved			**0.304**		**0.313**		**0.264**		**0.342**		**0.351**	**0.312**

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department

			Year										Total
				1		2		3		4		5	Total
Tonnes saprolite ore mined (000)				1,000		1,000		1,000		156		0	3,156
Tonnes hard rock ore mined (000)				4,000		4,000		4,000		4,844		4,492	21,336
Tonnes saprolite waste mined (000)				1,434		553		2,082		0		0	4,069
Tonnes hard rock waste mined (000)				1,529		2,190		2,100		2,068		2,394	10,281
Total material moved (000)				7,963		7,743		9,182		7,068		6,886	38,842
Tonnes blasted (000)				5,529		6,190		6,100		6,911		6,886	31,616
Administration													
Mine Supervision													
Mine superintendent (US$)*	Salary/year	143,208	1	143,208	1	143,208	1	143,208	1	143,208	1	143,208	716,040
Operation foreman (US$)*	Salary/year	50,000	3	150,000	3	150,000	3	150,000	3	150,000	3	150,000	750,000
Drill & blast foreman (US$)*	Salary/year	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
Dispatcher (US$)	Salary/year	20,000	3	60,000	3	60,000	3	60,000	3	60,000	3	60,000	300,000
Training foreman (US$)*	Salary/year	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
Mine clerk (US$)	Salary/year	10,000	1	10,000	1	10,000	1	10,000	1	10,000	1	10,000	50,000
Maintenance Supervision													
Maintenance superintendent (US$)*	Salary/year	143,208	1	143,208	1	143,208	1	143,208	1	143,208	1	143,208	716,040
Field foreman (US$)*	Salary/year	50,000	3	150,000	3	150,000	3	150,000	3	150,000	3	150,000	750,000
Shop foreman (US$)	Salary/year	30,000	3	90,000	3	90,000	3	90,000	3	90,000	3	90,000	450,000
Maintenance planner (US$)*	Salary/year	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
Training foreman (US$)*	Salary/year	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
Clerk (US$)	Salary/year	10,000	1	10,000	1	10,000	1	10,000	1	10,000	1	10,000	50,000
Engineering													
Chief engineer (US$)*	Salary/year	108,202	1	108,202	1	108,202	1	108,202	1	108,202	1	108,202	541,010
Mine engineer (US$)*	Salary/year	60,000	2	120,000	2	120,000	2	120,000	2	120,000	2	120,000	600,000
Technician (US$)	Salary/year	20,000	2	40,000	2	40,000	2	40,000	2	40,000	2	40,000	200,000
Surveyor (US$)	Salary/year	20,000	2	40,000	2	40,000	2	40,000	2	40,000	2	40,000	200,000
Assistant surveyor (US$)	Salary/year	10,000	4	40,000	4	40,000	4	40,000	4	40,000	4	40,000	200,000
Clerk (US$)	Salary/year	10,000	1	10,000	1	10,000	1	10,000	1	10,000	1	10,000	50,000
Geology													
Chief geologist (US$)*	Salary/year	108,202	1	108,202	1	108,202	1	108,202	1	108,202	1	108,202	541,010
Geologist (US$)*	Salary/year	60,000	2	120,000	2	120,000	2	120,000	2	120,000	2	120,000	600,000
Geologist (US$)	Salary/year	30,000	2	60,000	2	60,000	2	60,000	2	60,000	2	60,000	
Technician (US$)	Salary/year	20,000	2	40,000	2	40,000	2	40,000	2	40,000	2	40,000	200,000
Sampler (US$)	Salary/year	10,000	6	60,000	6	60,000	6	60,000	6	60,000	6	60,000	300,000
Mine Expenses													
Supplies (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Travel expenses (US$)				10,000		10,000		10,000		10,000		10,000	50,000
Safety equipment (US$)				40,000		40,000		40,000		40,000		40,000	200,000
Computer equipment (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Maintenance Expenses													
Supplies (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Travel expenses (US$)				10,000		10,000		10,000		10,000		10,000	50,000
Safety equipment (US$)				40,000		40,000		40,000		40,000		40,000	200,000
Computer equipment (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Engineering													
Supplies (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Travel expenses (US$)				10,000		10,000		10,000		10,000		10,000	50,000
Safety equipment (US$)				10,000		10,000		10,000		10,000		10,000	50,000
Computer equipment (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Geology													
Supplies (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Travel expenses (US$)				10,000		10,000		10,000		10,000		10,000	50,000
Safety equipment (US$)				10,000		10,000		10,000		10,000		10,000	50,000
Computer equipment (US$)				20,000		20,000		20,000		20,000		20,000	100,000
Total Administration (US$)				**2,002,820**		**2,002,820**		**2,002,820**		**2,002,820**		**2,002,820**	**9,714,100**
US$/tonne moved				**0.252**		**0.259**		**0.218**		**0.283**		**0.291**	**0.250**

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department						
	Year					
	1	2	3	4	5	Total
Tonnes saprolite ore mined (000)	*1,000*	*1,000*	*1,000*	*156*	*0*	*3,156*
Tonnes hard rock ore mined (000)	*4,000*	*4,000*	*4,000*	*4,844*	*4,492*	*21,336*
Tonnes saprolite waste mined (000)	*1,434*	*553*	*2,082*	*0*	*0*	*4,069*
Tonnes hard rock waste mined (000)	*1,529*	*2,190*	*2,100*	*2,068*	*2,394*	*10,281*
Total material moved (000)	*7,963*	*7,743*	*9,182*	*7,068*	*6,886*	*38,842*
Tonnes blasted (000)	*5,529*	*6,190*	*6,100*	*6,911*	*6,886*	*31,616*
Summary						
Drilling	1,058,062	1,158,151	1,144,443	1,267,333	1,263,498	*5,891,487*
Blasting	1,513,514	1,689,399	1,665,310	1,881,264	1,874,524	*8,624,010*
Loading	2,159,811	2,105,950	2,457,857	1,940,821	1,896,365	*10,560,805*
Hauling	3,412,885	3,412,885	3,783,180	3,042,591	3,042,591	*16,694,133*
General Services	2,420,124	2,420,124	2,420,124	2,420,124	2,420,124	*12,100,618*
Administration	2,002,820	2,002,820	2,002,820	2,002,820	2,002,820	*10,014,100*
Total	**12,567,217**	**12,789,328**	**13,473,733**	**12,554,953**	**12,499,921**	**63,885,152**
Tonnes moved	7,963,160	7,742,960	9,181,650	7,067,870	6,886,120	*38,841,760*
Drilling	0.133	0.150	0.125	0.179	0.183	0.152
Blasting	0.190	0.218	0.181	0.266	0.272	0.222
Loading	0.271	0.272	0.268	0.275	0.275	0.272
Hauling	0.429	0.441	0.412	0.430	0.442	0.430
General Services	0.304	0.313	0.264	0.342	0.351	0.312
Administration	0.252	0.259	0.218	0.283	0.291	0.258
Total	**1.578**	**1.652**	**1.467**	**1.776**	**1.815**	**1.645**
Detailed mining Costs per items						
Salaries						
Mine						
Staff	463,208	463,208	463,208	463,208	463,208	
Labour	608,700	608,700	632,874	584,526	584,526	
Sub-total						
Maintenance						
Staff	493,208	493,208	493,208	493,208	493,208	
Labour	378,720	378,720	378,720	378,720	378,720	
Sub-total						
Engineering	358,202	358,202	358,202	358,202	358,202	
Geology	388,202	388,202	388,202	388,202	388,202	
Total Salaries	2,690,240	2,690,240	2,714,414	2,666,066	2,666,066	
Supplies						
Electrical energy	144,000	144,000	144,000	144,000	144,000	
Fuel	2,353,503	2,369,765	2,553,017	2,241,233	2,232,951	
Explosives	1,470,698	1,646,583	1,622,494	1,838,448	1,831,708	
Drilling accessories	388,573	430,259	424,550	475,734	474,136	
Spare parts	3,955,442	3,952,766	4,294,245	3,767,685	3,736,739	
Tires	1,014,761	1,005,715	1,171,013	871,787	864,320	
Road supplies	50,000	50,000	50,000	50,000	50,000	
Pumping supplies	200,000	200,000	200,000	200,000	200,000	
Administrative supplies	300,000	300,000	300,000	300,000	300,000	
Total Supplies	9,876,977	10,099,088	10,759,319	9,888,887	9,833,855	
Total	**12,567,217**	**12,789,328**	**13,473,733**	**12,554,953**	**12,499,921**	

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department	Year					
	1	2	3	4	5	Total
Tonnes saprolite ore mined (000)	*1,000*	*1,000*	*1,000*	*156*	*0*	*3,156*
Tonnes hard rock ore mined (000)	*4,000*	*4,000*	*4,000*	*4,844*	*4,492*	*21,336*
Tonnes saprolite waste mined (000)	*1,434*	*553*	*2,082*	*0*	*0*	*4,069*
Tonnes hard rock waste mined (000)	*1,529*	*2,190*	*2,100*	*2,068*	*2,394*	*10,281*
Total material moved (000)	*7,963*	*7,743*	*9,182*	*7,068*	*6,886*	*38,842*
Tonnes blasted (000)	*5,529*	*6,190*	*6,100*	*6,911*	*6,886*	*31,616*
Mine Department Employees: On Site						
Salaried Staff						
Mine Supervision						
Mine Superintendent *	1	1	1	1	1	
Operation Foreman *	3	3	3	3	3	
Drill & Blast Foreman *	1	1	1	1	1	
Dispatcher	3	3	3	3	3	
Training Foreman *	1	1	1	1	1	
Mine Clerk	1	1	1	1	1	
Maintenance Supervision						
Maintenance Superintendent	1	1	1	1	1	
Field Foreman *	3	3	3	3	3	
Shop Foreman	3	3	3	3	3	
Planner *	1	1	1	1	1	
Training Foreman *	1	1	1	1	1	
Clerk	1	1	1	1	1	
Engineering						
Chief Engineer *	1	1	1	1	1	
Mine Engineer *	2	2	2	2	2	
Technician	2	2	2	2	2	
Surveyor	2	2	2	2	2	
Assistant Surveyor	4	4	4	4	4	
Clerk	1	1	1	1	1	
Geology						
Chief Geologist *	1	1	1	1	1	
Geologist *	2	2	2	2	2	
Geologist	2	2	2	2	2	
Technician	2	2	2	2	2	
Sampler	6	6	6	6	6	
Sub-Total	**45**	**45**	**45**	**45**	**45**	
Hourly Labor						
Drilling						
Driller	6	6	6	6	6	
Driller Second	3	3	3	3	3	
Blasting						
Blaster	1	1	1	1	1	
Blaster Helper	2	2	2	2	2	
Truck Driver	1	1	1	1	1	
Loading						
Shovel & Loader Operator	5	5	5	5	5	
Wheeldozer Operator	3	3	3	3	3	
Hauling						
Truck Operator	18	18	20	15	15	
Dozer Operator	8	8	8	8	8	
General Services						
Grader Operator	6	6	6	6	6	
Water Truck Operator	0	0	0	0	0	
Backhoe Operator	6	6	6	6	6	
Pumping Operator	6	6	6	6	6	
Labourer	6	6	6	6	6	
Janitor	3	3	3	3	3	

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department						
	Year					
	1	**2**	**3**	**4**	**5**	**Total**
Tonnes saprolite ore mined (000)	*1,000*	*1,000*	*1,000*	*156*	*0*	*3,156*
Tonnes hard rock ore mined (000)	*4,000*	*4,000*	*4,000*	*4,844*	*4,492*	*21,336*
Tonnes saprolite waste mined (000)	*1,434*	*553*	*2,082*	*0*	*0*	*4,069*
Tonnes hard rock waste mined (000)	*1,529*	*2,190*	*2,100*	*2,068*	*2,394*	*10,281*
Total material moved (000)	*7,963*	*7,743*	*9,182*	*7,068*	*6,886*	*38,842*
Tonnes blasted (000)	*5,529*	*6,190*	*6,100*	*6,911*	*6,886*	*31,616*
Maintenance						
Field General Mechanic	9	9	9	9	9	
Field General Welder	3	3	3	3	3	
Field Electrician	3	3	3	3	3	
Lube Truck Operator	3	3	3	3	3	
Labourer	6	6	6	6	6	
Shop Mechanic	9	9	9	9	9	
Welder Machinist	3	3	3	3	3	
Electrician	3	3	3	3	3	
Labourer	6	6	6	6	6	
Janitor	3	3	3	3	3	
Tool Crib Attendant	3	3	3	3	3	
Sub-Total	**125**	**125**	**127**	**122**	**122**	
Total	**170**	**170**	**172**	**167**	**167**	

Ponce Enriquez Project

Table 7.7 (cont'd)

Operating Costs Mine Department						
	Year					
	1	2	3	4	5	Total
Tonnes saprolite ore mined (000)	1,000	1,000	1,000	156	0	3,156
Tonnes hard rock ore mined (000)	4,000	4,000	4,000	4,844	4,492	21,336
Tonnes saprolite waste mined (000)	1,434	553	2,082	0	0	4,069
Tonnes hard rock waste mined (000)	1,529	2,190	2,100	2,068	2,394	10,281
Total material moved (000)	7,963	7,743	9,182	7,068	6,886	38,842
Tonnes blasted (000)	5,529	6,190	6,100	6,911	6,886	31,616
Mine Equipment						
Heavy Equipment						
Drills 150 mm	2	2	2	2	2	
Secondary Drill Airtracks	1	1	1	1	1	
Shovels 15 m3	1	1	1	1	1	
Loader 11 m3	1	1	1	1	1	
Wheeldozer 450 hp	1	1	1	1	1	
Truck 77 t	7	7	8	6	6	
Bulldozers D9	3	3	3	3	3	
Grader 275 hp	2	2	2	2	2	
Water truck 76 kl	1	1	1	1	1	
Sub-Total	**19**	**19**	**20**	**18**	**18**	
Service Equipment						
Backhoe 2 m3	2	2	2	2	2	
Front-end-loader 4 m3	0	0	0	0	0	
Crane 60 ton	1	1	1	1	1	
5 t Forklift	1	1	1	1	1	
Explosive truck	2	2	2	2	2	
Utility truck	0	0	0	0	0	
Fuel truck	1	1	1	1	1	
Lube truck	2	2	2	2	2	
Maintenance truck	0	0	0	0	0	
Boom truck	1	1	1	1	1	
Tire truck	1	1	1	1	1	
Low bed 200 t c./w. truck	0	0	0	0	0	
Low bed 50 t c./w. truck	1	1	1	1	1	
Pit bus	2	2	2	2	2	
Pick-up truck	15	15	15	15	15	
Lighting towers	6	6	6	6	6	
Mobile welding machine	2	2	2	2	2	
Mobile compressors	2	2	2	2	2	
Diesel portable pumps	3	3	3	3	3	
Sub-Total	**42**	**42**	**42**	**42**	**42**	
Total	**61**	**61**	**62**	**60**	**60**	

PONCE ENRIQUEZ PROJECT

Table 7.8

OPERATING COSTS - CIP PLANT - Soft rock

WEAR STEEL

ITEM	US$/T PURCHASE	CONSUM. KG/T	US$/T COST
PRIMARY CRUSHER LINERS	2019	0.012	0.023
CONE CRUSHER LINERS	2019	0.000	0.000
SAG LINERS	1800	0.033	0.060
BALL MILL LINERS	1800	0.054	0.098
SAG GRINDING BALLS	653	0.317	0.207
BALL MILL BALLS	658	0.517	0.340
		TOTAL :	0.728

Note : 1. - Grinding media pricing as per La Granja for foreign supply, with 30$/t less for transportation
2. - Steel liner cost based on mill suppliers bids, with 270$/t for trspt FOB mine
3. - Rubber lining cost based on mill supplier bids, with 340 $/t for trspt
4. - Liner wear assume 30% of weight losses on liner replacement

REAGENT COSTS

ITEM	US$/T PRICE	CONS. G/T	US$/T COST
LIME (1)	160	1400	0.2240
CYANIDE (2)	1600	750	1.2000
CYANIDE IN STRIP CIRCUIT (2)	1600	7	0.0112
ACTIVATED CARBON (3)	1940	50	0.0970
STRIP HEATING FUEL (3)	230	50	0.0115
CAUSTIC SODA (3)	600	75	0.0450
NITRIC ACID (3)	2800	40	0.1120
GOLD SMELTING FLUXES (3)	4000	10	0.0400
TAILINGS AND WATER TREATMENT			
FLOCCULANT (2)	3100	10.25	0.0318
HYDROGEN PEROXIDE (4)	0.50		0.0000
		TOTAL :	1.7725

Notes :
1) Cost from TVX study
2) Pricing from La Granja, adjusted for transportation
3) Pricing from Gross Rosebel feasibility study
4) $ per m^3 of effluent treated (includes other reagents), data from Omai

PONCE ENRIQUEZ PROJECT

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Soft rock

ELECTRICITY COSTS

ITEM	kW INST.	LOAD FACTOR	US$/T
1. CRUSHING	290	0.29	0.0104
2. CONVEYING	1,500	0.40	0.0733
3. STOCKPILE & RECLAIM	300	0.37	0.0135
4. GRINDING	13,807	0.49	0.8296
5. LIME PREPARATION	100	0.35	0.0043
6. GRAVITY CIRCUIT	250	0.58	0.0178
7. LEACHING AND CARBON CIRCUIT	900	0.58	0.0641
8. CARBON STRIPPING, REGENERATION	250	0.58	0.0178
9. GOLD REFINING	200	0.14	0.0034
10. TAILINGS DISPOSAL	750	0.53	0.0490
11. THICKENING	55	0.24	0.0016
12. REAGENT PREP.	150	0.29	0.0053
13. MISC. SHOPS / OFFICES	500	0.52	0.0319
14. LABORATORIES	75	0.44	0.0040
15. RECLAIM, DILUTION, FRESH WATER	1,500	0.77	0.1425
	20,627		
		TOTAL :	1.2686

Notes : - Electricity cost at 0.07 US$/kWh based on diesel generators

MOBILE EQUIPMENT

ITEM	N° VEHCL.	COST PER OP. HOURS	US$/T
LOADERS, DOZER,HEAVY EQUIP.	2	60.00	0.022
PICKUPS, LIGHT VEHICLES	10	6.00	0.007
		TOTAL :	0.029

Note : - Diesel fuel @ 29 c/l

PONCE ENRIQUEZ PROJECT

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Soft rock

ELECTRICITY COSTS

ITEM	kW INST.	LOAD FACTOR	US$/T
1. CRUSHING	290	0.29	0.0104
2. CONVEYING	1,500	0.40	0.0733
3. STOCKPILE & RECLAIM	300	0.37	0.0135
4. GRINDING	13,807	0.49	0.8296
5. LIME PREPARATION	100	0.35	0.0043
6. GRAVITY CIRCUIT	250	0.58	0.0178
7. LEACHING AND CARBON CIRCUIT	900	0.58	0.0641
8. CARBON STRIPPING, REGENERATION	250	0.58	0.0178
9. GOLD REFINING	200	0.14	0.0034
10. TAILINGS DISPOSAL	750	0.53	0.0490
11. THICKENING	55	0.24	0.0016
12. REAGENT PREP.	150	0.29	0.0053
13. MISC. SHOPS / OFFICES	500	0.52	0.0319
14. LABORATORIES	75	0.44	0.0040
15. RECLAIM, DILUTION, FRESH WATER	1,500	0.77	0.1425
	20,627		
		TOTAL :	1.2686

Notes : - Electricity cost at 0.07 US$/kWh based on diesel generators

MOBILE EQUIPMENT

ITEM	Nº VEHCL.	COST PER OP. HOURS	US$/T
LOADERS, DOZER,HEAVY EQUIP.	2	60.00	0.022
PICKUPS, LIGHT VEHICLES	10	6.00	0.007
		TOTAL :	0.029

Note : - Diesel fuel @ 29 c/l

PONCE ENRIQUEZ PROJECT

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Soft rock

MILL MANPOWER COST (3 shifts basis)

MILL TITLE	CODES	N° PERS.	SALARY US$/yr unit	SALARY US$/yr
Management & administration				
CLERK	S	1	$10,000	$10,000
Operations		1		
MILL OPERATIONS SUPT.	E, S	1	$143,208	$143,208
SHIFT FOREMAN		3	$50,000	$150,000
TRAINING FOREMAN	E, S	1	$50,000	$50,000
OPERATORS FOREMEN		3	$30,000	$90,000
OPERATOR (crushing)	H	3	$10,800	$32,400
OPERATOR (grind / leach)	H	6	$10,800	$64,800
OPERATOR (stripping)	H	2	$9,480	$18,960
OPERATOR (refinery)	H	3	$9,480	$28,440
OPERATOR (services)	H	3	$9,480	$28,440
MOBILE EQUIP. DRIVER	H	3	$4,800	$14,400
OPS HELPER/LABOURER	H	12	$3,600	$43,200
Maintenance		40		
MILL MAINTENANCE SUPT.	E, S	1	$70,000	$70,000
MECHANICAL ENG.	E, S	1	$60,000	$60,000
MAINTENANCE PLANNER	S	1	$50,000	$50,000
DRAUGHSTMAN	S	1	$20,000	$20,000
MAINT. FOREMAN		3	$50,000	$150,000
SENIOR TRADESMAN		1	$30,000	$30,000
SENIOR TRADESMAN	E	1	$30,000	$30,000
INSTR. TECHNICIAN		3	$10,800	$32,400
TRADESMAN	H	6	$9,480	$56,880
MAINT HELPER/LABOURER	H	12	$3,600	$43,200
Services & metallurgy		30		
CHIEF METALLURGIST	E, S	1	$70,000	$70,000
ENVIRONMENTAL ENG.	E, S	1	$60,000	$60,000
METALLURGIST	E	1	$50,000	$50,000
METALLURGIST		1	$50,000	$50,000
METALLURGY TECHNICIAN		2	$20,000	$40,000
JANITOR	H	1	$3,600	$3,600
Assay lab		7		
CHIEF CHEMIST	E, S	1	$60,000	$60,000
ASSAY LAB. TECHNICIAN		3	$10,800	$32,400
ASSAYER	H	6	$9,480	$56,880
SAMPLE PREPARATION	H	6	$4,800	$28,800
		16		
		94	TOTAL :	$ 1,668,008
			US$/t	$ 0.33

Codes
E = expatriate
S = staff working on 5-2 basis (others 14-7)
H = hourly employees
- Salaries include overheads considered are as follow :

Hourly	Expat.	Nat. Staff
50.0%	59.0%	40.0%

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Soft rock

OVERALL PROCESSING COSTS - soft rock

ITEM	US$/T MILLED
ELECTRICAL POWER	1.2686
WEAR STEEL (CRUSHING/GRIND.)	0.7284
REAGENTS	1.7725
MOBILE EQUIP. OPS. & MAINT.	0.0288
SPARES *	0.2715
MANPOWER **	0.3336
ADMIN COSTS (TRAINING,ETC) ***	0.0667
CONTINGENCY (15%on consumables)	0.6105
TOTAL (US$/t)	5.08

Notes :

* = Estimated at 5% of equipment purchase cost per year

** = Total manpower costs ; not distributed in items

*** = Estimated at 5% of manpower costs (overtime) plus 0.05$/t

PONCE ENRIQUEZ PROJECT

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Hard rock

WEAR STEEL

ITEM	US$/T PURCHASE	CONSUM. KG/T	US$/T COST
PRIMARY CRUSHER LINERS	2019	0.022	0.044
CONE CRUSHER LINERS	2019	0.000	0.000
SAG LINERS	1800	0.060	0.108
BALL MILL LINERS	1800	0.098	0.177
SAG GRINDING BALLS	653	0.610	0.398
BALL MILL BALLS	658	0.996	0.655
		TOTAL :	1.382

Note : 1. - Grinding media pricing as per La Granja for foreign supply, with 30$/t less for transportation
2. - Steel liner cost based on mill suppliers bids, with 270$/t for trspt FOB mine
3. - Rubber lining cost based on mill supplier bids, with 340 $/t for trspt
4. - Liner wear assume 30% of weight losses on liner replacement

REAGENT COSTS

ITEM	US$/T PRICE	CONS. G/T	US$/T COST
LIME (1)	160	1400	0.2240
CYANIDE (2)	1600	750	1.2000
CYANIDE IN STRIP CIRCUIT (2)	1600	7	0.0112
ACTIVATED CARBON (3)	1940	50	0.0970
STRIP HEATING FUEL (3)	230	50	0.0115
CAUSTIC SODA (3)	600	75	0.0450
NITRIC ACID (3)	2800	40	0.1120
GOLD SMELTING FLUXES (3)	4000	10	0.0400
TAILINGS AND WATER TREATMENT			
FLOCCULANT (2)	3100	10.25	0.0318
HYDROGEN PEROXIDE (4)	0.50		0.0000
		TOTAL :	1.7725

Notes :
1) Cost from TVX study
2) Pricing from La Granja, adjusted for transportation
3) Pricing from Gross Rosebel feasibility study
4) $ per m^3 of effluent treated (includes other reagents), data from Omai

PONCE ENRIQUEZ PROJECT

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Hard rock

ELECTRICITY COSTS

ITEM	kW INST.	LOAD FACTOR	US$/T
1. CRUSHING	290	0.87	0.0311
2. CONVEYING	1,500	0.40	0.0733
3. STOCKPILE & RECLAIM	300	0.37	0.0135
4. GRINDING	13,807	0.85	1.4392
5. LIME PREPARATION	100	0.35	0.0043
6. GRAVITY CIRCUIT	250	0.58	0.0178
7. LEACHING AND CARBON CIRCUIT	900	0.58	0.0641
8. CARBON STRIPPING, REGENERATION	250	0.58	0.0178
9. GOLD REFINING	200	0.14	0.0034
10. TAILINGS DISPOSAL	750	0.53	0.0490
11. THICKENING	55	0.24	0.0016
12. REAGENT PREP.	150	0.29	0.0053
13. MISC. SHOPS / OFFICES	500	0.52	0.0319
14. LABORATORIES	75	0.44	0.0040
15. RECLAIM, DILUTION, FRESH WATER	1,500	0.77	0.1425
	20,627		
		TOTAL :	1.8989

Notes : - Electricity cost at 0.07 US$/kWh based on diesel generators

MOBILE EQUIPMENT

ITEM	N° VEHCL.	COST PER OP. HOURS	US$/T
LOADERS, DOZER,HEAVY EQUIP.	2	60.00	0.022
PICKUPS, LIGHT VEHICLES	10	6.00	0.007
		TOTAL :	0.029

Note : - Diesel fuel @ 29 c/l

PONCE ENRIQUEZ PROJECT

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Hard rock

MILL MANPOWER COST (3 shifts basis)

MILL			SALARY	
TITLE	CODES	Nº PERS.	US$/yr unit	US$/yr
Management & administration				
CLERK	S	1	$10,000	$10,000
Operations		1		
MILL OPERATIONS SUPT.	E, S	1	$143,208	$143,208
SHIFT FOREMAN		3	$50,000	$150,000
TRAINING FOREMAN	E, S	1	$50,000	$50,000
OPERATORS FOREMEN		3	$30,000	$90,000
OPERATOR (crushing)	H	3	$10,800	$32,400
OPERATOR (grind / leach)	H	6	$10,800	$64,800
OPERATOR (stripping)	H	2	$9,480	$18,960
OPERATOR (refinery)	H	3	$9,480	$28,440
OPERATOR (services)	H	3	$9,480	$28,440
MOBILE EQUIP. DRIVER	H	3	$4,800	$14,400
OPS HELPER/LABOURER	H	12	$3,600	$43,200
Maintenance		40		
MILL MAINTENANCE SUPT.	E, S	1	$70,000	$70,000
MECHANICAL ENG.	E, S	1	$60,000	$60,000
MAINTENANCE PLANNER	S	1	$50,000	$50,000
DRAUGHSTMAN	S	1	$20,000	$20,000
MAINT. FOREMAN		3	$50,000	$150,000
SENIOR TRADESMAN		1	$30,000	$30,000
SENIOR TRADESMAN	E	1	$30,000	$30,000
INSTR. TECHNICIAN		3	$10,800	$32,400
TRADESMAN	H	6	$9,480	$56,880
MAINT HELPER/LABOURER	H	12	$3,600	$43,200
Services & metallurgy		30		
CHIEF METALLURGIST	E, S	1	$70,000	$70,000
ENVIRONMENTAL ENG.	E, S	1	$60,000	$60,000
METALLURGIST	E	1	$50,000	$50,000
METALLURGIST		1	$50,000	$50,000
METALLURGY TECHNICIAN		2	$20,000	$40,000
JANITOR	H	1	$3,600	$3,600
Assay lab		7		
CHIEF CHEMIST	E, S	1	$60,000	$60,000
ASSAY LAB. TECHNICIAN		3	$10,800	$32,400
ASSAYER	H	6	$9,480	$56,880
SAMPLE PREPARATION	H	6	$4,800	$28,800
		16		
		94	TOTAL :	$ 1,668,008
			US$/t	$ 0.33

Codes
E = expatriate
S = staff working on 5-2 basis (others 7-7)
H = hourly employees
- Salaries include overheads considered are as follow :

Hourly	Expat.	Nat. Staff
50.0%	59.0%	40.0%

Table 7.8 (cont'd)

OPERATING COSTS - CIP PLANT - Hard rock

OVERALL PROCESSING COSTS - hard rock

ITEM	US$/T MILLED
ELECTRICAL POWER	1.8989
WEAR STEEL (CRUSHING/GRIND.)	1.3822
REAGENTS	1.7725
MOBILE EQUIP. OPS. & MAINT.	0.0288
SPARES *	0.2715
MANPOWER **	0.3336
ADMIN COSTS (TRAINING,ETC) ***	0.0667
CONTINGENCY (15%on consumables)	0.8031
TOTAL (US$/t)	6.56

Notes :

* = Estimated at 5% of equipment purchase cost per year

** = Total manpower costs ; not distributed in items

*** = Estimated at 5% of manpower costs (overtime) plus 0.05$/t

Ponce Enriquez Project

Table 7.9

G&A Operating Costs

	Cost	Year 1		Year 2		Year 3		Year 4		Year 5		Total
Payroll Personnel (** Senior staff)	unit	No.	Cost ($)	No.	Cost ($)	No.	Cost ($)	No.	Cost ($)	No.	Cost ($)	Cost ($)
Staff	$/y											
General Manager *	150,000	1	150,000	1	150,000	1	150,000	1	150,000	1	150,000	750,000
Executive Secretary	12,000	1	12,000	1	12,000	1	12,000	1	12,000	1	12,000	60,000
General Receptionist	8,000	1	8,000	1	8,000	1	8,000	1	8,000	1	8,000	40,000
Accountant	15,000	2	30,000	2	30,000	2	30,000	2	30,000	2	30,000	150,000
Payroll Clerk	8,000	2	16,000	2	16,000	2	16,000	2	16,000	2	16,000	80,000
Human Resources Manager	30,000	1	30,000	1	30,000	1	30,000	1	30,000	1	30,000	150,000
Human Resources Officer	15,000	2	30,000	2	30,000	2	30,000	2	30,000	2	30,000	150,000
Human Resources Clerk	8,000	2	16,000	2	16,000	2	16,000	2	16,000	2	16,000	80,000
Health and Safety Trainer *	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
Health & Safety Officer	15,000	2	30,000	2	30,000	2	30,000	2	30,000	2	30,000	150,000
Nurse	15,000	2	30,000	2	30,000	2	30,000	2	30,000	2	30,000	150,000
Supply Manager	30,000	1	30,000	1	30,000	1	30,000	1	30,000	1	30,000	150,000
Supply Secretary	8,000	1	8,000	1	8,000	1	8,000	1	8,000	1	8,000	40,000
Warehouse Supervisor	15,000	3	45,000	3	45,000	3	45,000	3	45,000	3	45,000	225,000
Warehouse Clerk	10,000	9	90,000	9	90,000	9	90,000	9	90,000	9	90,000	450,000
Transportation Coordinator	15,000	2	30,000	2	30,000	2	30,000	2	30,000	2	30,000	150,000
Services Manager	30,000	1	30,000	1	30,000	1	30,000	1	30,000	1	30,000	150,000
Communication Engineer *	50,000	2	100,000	2	100,000	2	100,000	2	100,000	2	100,000	500,000
Communication Technician	25,000	2	50,000	2	50,000	2	50,000	2	50,000	2	50,000	250,000
Network Supervisor	25,000	2	50,000	2	50,000	2	50,000	2	50,000	2	50,000	250,000
Computer Technician	15,000	2	30,000	2	30,000	2	30,000	2	30,000	2	30,000	150,000
Security Manager *	50,000	1	50,000	1	50,000	1	50,000	1	50,000	1	50,000	250,000
Security Guard	15,000	15	225,000	15	225,000	15	225,000	15	225,000	15	225,000	1,125,000
Sub-Total		58	1,140,000	58	1,140,000	58	1,140,000	58	1,140,000	58	1,140,000	5,700,000
Hourly Labour												
Equipment Operator	8,000	15	120,000	15	120,000	15	120,000	15	120,000	15	120,000	600,000
Carpenter	6,000	4	24,000	4	24,000	4	24,000	4	24,000	4	24,000	120,000
Electrician	8,000	6	48,000	6	48,000	6	48,000	6	48,000	6	48,000	240,000
Plumber	6,000	4	24,000	4	24,000	4	24,000	4	24,000	4	24,000	120,000
Janitor	4,000	2	8,000	2	8,000	2	8,000	2	8,000	2	8,000	40,000
Sub-Total		31	224,000	31	224,000	31	224,000	31	224,000	31	224,000	1,120,000
Total - Payroll Personnel		89	1,364,000	89	1,364,000	89	1,364,000	89	1,364,000	89	1,364,000	6,820,000

* Expatriate

Ponce Enriquez Project

Table 7.9 (cont'd)

G&A Operating Costs

	Cost	Year 1		Year 2		Year 3		Year 4		Year 5		Total
	unit	No.	Cost ($)	No.	Cost ($)	No.	Cost ($)	No.	Cost ($)	No.	Cost ($)	Cost ($)
Mobile Equipment												
	$/unit											
60 t Crane on Truck		1		1		1		1		1		
Fuel	22,500		22,500		22,500		22,500		22,500		22,500	112,500
Spares and Consumables	134,500		134,500		134,500		134,500		134,500		134,500	672,500
30 t Forklift		1		1		1		1		1		
Fuel	21,600		21,600		21,600		21,600		21,600		21,600	108,000
Spares and Consumables	32,040		32,040		32,040		32,040		32,040		32,040	160,200
Front-end-Loader 4 m³		1		1		1		1		1		
Fuel	55,000		55,000		55,000		55,000		55,000		55,000	275,000
Spares and Consumables	119,640		119,640		119,640		119,640		119,640		119,640	598,200
Pick-Up Trucks		10		10		10		10		10		
Fuel	5,000		50,000		50,000		50,000		50,000		50,000	250,000
Spares and Consumables	6,000		60,000		60,000		60,000		60,000		60,000	300,000
Buses		2		2		2		2		2		
Fuel	14,400		28,800		28,800		28,800		28,800		28,800	144,000
Spares and Consumables	25,380		50,760		50,760		50,760		50,760		50,760	253,800
Boom Truck		1		1		1		1		1		
Fuel	14,400		14,400		14,400		14,400		14,400		14,400	72,000
Spares and Consumables	25,380		25,380		25,380		25,380		25,380		25,380	126,900
10 t Garbage Trucks		1		1		1		1		1		
Fuel	14,400		14,400		14,400		14,400		14,400		14,400	72,000
Spares and Consumables	25,380		25,380		25,380		25,380		25,380		25,380	126,900
4WD Ambulances		1		1		1		1		1		
Fuel	1,440		1,440		1,440		1,440		1,440		1,440	7,200
Spares and Consumables	6,000		6,000		6,000		6,000		6,000		6,000	30,000
Aluminum Motor Boat		2		2		2		2		2		
Fuel	475		950		950		950		950		950	4,750
Spares and Consumables	1,000		2,000		2,000		2,000		2,000		2,000	10,000
Total - Mobile Equipment			664,790		664,790		664,790		664,790		664,790	3,323,950

Total G&A Operating Costs			7,492,009		7,492,009		7,192,009		7,192,009		7,192,009	36,560,046

Ponce Enriquez Project

Table 7.10

Economical Model - Base Case

Gold price: 400 US$/oz

		PP-2	PP-1	PP	1	2	3	4	5	Total
Ore saprolite (tonnes)					1,000,000	1,000,000	1,000,000	156,410		3,156,410
g/t					1.95	1.33	1.03	0.99		1.42
Ore hard rock (tonnes)					4,000,000	4,000,000	4,000,000	4,843,590	4,491,950	21,335,540
g/t					2.01	1.14	1.29	1.34	1.14	1.37
Total mill feed (tonnes)					5,000,000	5,000,000	5,000,000	5,000,000	4,491,950	24,491,950
g/t					2.00	1.17	1.24	1.33	1.14	1.38
Recovery					90.00%	90.00%	90.00%	90.00%	90.00%	
Ounces					**288,836**	**169,910**	**178,967**	**191,702**	**148,044**	**977,459**
Revenues (US$)					115,534,265	67,964,055	71,586,799	76,680,632	59,217,746	390,983,497
Royalty	1.00%				1,155,343	679,641	715,868	766,806	592,177	3,909,835
Royalty	3.00%				3,466,028	2,038,922	2,147,604	2,300,419	1,776,532	11,729,505
Net revenues (US$)					**110,912,894**	**65,245,493**	**68,723,327**	**73,613,407**	**56,849,037**	**375,344,157**
Waste (tonnes)				0	2,963,000	2,743,000	4,182,000	2,068,000	2,394,000	14,350,000
Total material moved (tonnes)					7,963,000	7,743,000	9,182,000	7,068,000	6,885,950	38,841,950
Operating costs										
Mining (US$)					12,567,217	12,789,328	13,473,733	12,554,953	12,499,921	63,885,152
Milling Soft Rock (US$)	5.08 $/t				5,080,000	5,080,000	5,080,000	794,563	0	16,034,563
Milling Hard Rock (US$)	6.56 $/t				26,240,000	26,240,000	26,240,000	31,773,950	29,467,192	139,961,142
G&A (US$)					7,492,009	7,492,009	7,192,009	7,192,009	7,192,009	36,560,045
Total (US$)					**51,379,226**	**51,601,337**	**51,985,742**	**52,316,475**	**49,169,122**	**256,440,902**
Production Costs Summary										
Mining US$/tonne moved					1.58	1.65	1.47	1.78	1.82	1.64
Milling (US$/tonne milled)					6.26	6.26	6.26	6.51	6.56	6.37
G&A (US$/tonne milled)					1.50	1.50	1.44	1.44	1.60	1.49
Operating cost (US$/tonne milled)					10.28	10.32	10.40	10.46	10.94	10.47
Operating cost (US$/oz produced before royalty)					177.88	303.70	290.48	272.90	332.06	262.35
Operating Revenues					**59,533,668**	**13,644,156**	**16,737,585**	**21,297,931**	**7,689,915**	**118,903,255**

Ponce Enriquez Project

Table 7.10

Economical Model - Base Case

Gold price: 400 US$/oz

		PP-2	PP-1	PP	1	2	3	4	5	Total
Operating Revenues					**59,533,668**	**13,644,156**	**16,737,585**	**21,297,931**	**7,689,916**	**118,903,255**
Capital costs										
Comitments for Property Purchase (US$)		7,870,000								7,870,000
Exploration and Definition Work (US$)		5,000,000								5,000,000
Feasibility Study Preparation (US$)		5,000,000								5,000,000
Initial Capital Costs (US$)			64,165,596	96,248,395						160,413,991
On-going Capital Costs (US$)						2,644,131	2,033,973	1,609,436	1,785,586	8,073,126
Value Added Tax (US$)			4,491,592	6,737,388	(11,228,979)					0
Working Capital (US$)					15,000,000				(15,000,000)	0
Total Capital Costs (US$)		**17,870,000**	**68,657,188**	**102,985,782**	**3,771,021**	**2,644,131**	**2,033,973**	**1,609,436**	**(13,214,414)**	**186,357,117**
Cash Flow Before Tax (US$)		**(17,870,000)**	**(68,657,188)**	**(102,985,782)**	**55,762,647**	**11,000,025**	**14,703,612**	**19,688,495**	**20,904,329**	**(67,453,862)**
Discounted Cash Flow Before Taxes (US$)										
Discount rates:	8.00%	(17,195,416)	(61,171,676)	(84,960,661)	42,595,159	7,780,129	9,629,270	11,938,730	11,737,026	(79,647,440)
	10.00%	(17,038,376)	(59,510,964)	(81,151,115)	39,945,603	7,161,522	8,704,910	10,596,442	10,228,009	(81,062,169)
	12.00%	(16,885,563)	(57,924,058)	(77,576,863)	37,504,234	6,605,605	7,883,606	9,425,304	8,915,134	(82,032,601)
	Period:	0.50	1.50	2.50	3.50	4.50	5.50	6.50	7.50	
After Tax Calculations										
Operating Revenues (US$)		0	0	0	59,533,668	13,644,156	16,737,585	21,297,931	7,689,915	118,903,255
Capital costs eligible for depreciation (US$)		10,000,000	64,165,596	96,248,395	0	2,644,131	2,033,973	1,609,436	1,785,586	178,487,117
Depreciation (US$)					42,603,498	43,264,531	43,773,024	44,175,383	2,018,282	175,834,716
Loss carried forward (US$)					0	0	29,620,374	56,655,813	79,533,264	
Taxable revenues calculations (US$)					16,930,170	(29,620,374)	(56,655,813)	(79,533,264)	(73,861,631)	
Effective taxable revenues (US$)					16,930,170	0	0	0	0	16,930,170
Income Taxes (US$)	20.00%				3,386,034	0	0	0	0	3,386,034
Cash flow before taxes (US$)		(17,870,000)	(68,657,188)	(102,985,782)	55,762,647	11,000,025	14,703,612	19,688,495	20,904,329	(67,453,862)
Income Taxes (US$)		0	0	0	3,386,034	0	0	0	0	3,386,034
Cash Flow After Taxes (US$)		**(17,870,000)**	**(68,657,188)**	**(102,985,782)**	**52,376,613**	**11,000,025**	**14,703,612**	**19,688,495**	**20,904,329**	**(70,839,896)**
Discounted Cash Flow After Taxes (US$)										
Discount rates:	8.00%	(17,195,416)	(61,171,676)	(84,960,661)	40,008,684	7,780,129	9,629,270	11,938,730	11,737,026	(82,233,914)
	10.00%	(17,038,376)	(59,510,964)	(81,151,115)	37,520,016	7,161,522	8,704,910	10,596,442	10,228,009	(81,487,756)
	12.00%	(16,885,563)	(57,924,058)	(77,576,863)	35,226,803	6,605,605	7,883,606	9,425,304	8,915,134	(84,109,943)
	Period	0.50	1.50	2.50	3.50	4.50	5.50	6.50	7.50	