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ECONOMIC EVALUATION MODEL FOR PRODUCTION EXPANSION
IN AN UNDERGROUND PERUVIAN MINE

by

Francois Mutha

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Golden, Colorado

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ABSTRACT

This report presents a procedure for evaluating the effects of expansion on the worth of an underground mine. The model used is an economic analysis approach for a production expansion which provides a set of net present value results for different related combinations of reserves, cut-off grades, average grades, operating costs, recoveries, and capital investments in accordance with Peruvian mining legislation. The production expansion alternative having the highest net present value is selected and a sensitivity analysis on this alternative is conducted. A Peruvian silver mine, Uchucchacua, is used to demonstrate the procedure.

The first of the five chapters of this report deals with mine evaluation criteria commonly used in the mining industry. Chapter 2 provides a comprehensive presentation of Peruvian mineral policy and recent tax legislation. Compania de Minas Buenaventura and the Uchucchacua Mine are described in Chapter 3. The developed program and its mechanics of operation are described in Chapter 4. Calculation of cash flow items is explained, and assumptions utilized in the program are indicated to clarify how values are determined. The case study results, sensitivity analysis, and concluding remarks are presented in Chapter 5.

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DEDICATION

In memory of my
mother for her
unforgettable
advice

CHAPTER 1
REVIEW OF MINE EVALUATION CRITERIA

1.1 Introduction

The world is tending to work mineral deposits which, on average, contain lower grades, are of greater complexity, and located in remote areas and at greater depths below the surface. The lower grades alone typically lead to narrow profit margins and, therefore, necessitate precise economic evaluations. At the same time, to keep costs as low as possible, mining must be carried out at high tonnage rates involving considerable capital expenditure. These factors, coupled with physical difficulties, increase the inherent risk. These risks can be such that the opportunity of establishing a working mine may be missed, or, if the risk is accepted, the mine may be fully equipped and fail to live up to expectations.

A mining property has a definite value because it contains a mineral endowment capable of yielding, over time, a profit to the operator, so the metal actually recovered from an ore must be sufficient to provide a profit to the operator and a payment, either as a lease royalty or redemption fund, to return the cash purchase price with interest.

Evaluating mine investment opportunities is important and difficult. It is important because economic and financial analyses of a proposed project provide a basis for equity participants and lenders to judge a project's commercial viability. It is difficult because these analyses must be based on estimates, projections, and evaluations supported by data containing some uncertainty. The final decision is warranted only after rigorous analyses. A plunge into production cannot be justified solely because the minerals have been deposited in the ground and are therefore free.

A mineral land valuation, however, is concerned mainly with determination of the purchase price agreeable to both a willing buyer and a willing seller, each possessing equal knowledge about the property and neither under any compulsion to complete the transaction.

The purpose of this chapter is to describe briefly the mine valuation models applicable to the mine investment decision, to present some characteristics of the mining industry, and to outline requirements of a mine evaluation analysis. The described techniques are not new; they are derived from capital investment theory and are generally applicable to the evaluation of investment opportunities.

1.2 Characteristics of the Mining Industry

Mining differs from other industries in that most nonmineral industries and enterprises have an indeterminate life. Mining, however, is based on the exploitation of nonrenewable natural resources; when the ore bodies are mined out, there is almost nothing left. The original capital investment must, therefore, be returned to the investor by the time the profitable life of the mine is reached.

The mining industry is also characterized by the significant risk associated with the exploration phase. The preproduction development period for a new property is relatively long. Under extremely favorable conditions, a significant mine may be developed in as little as two years, but the norm is four to six years or more.

Wide swings in mineral commodity prices are usually cited as another unique feature of the mining industry. Most minerals have a derived demand. This is because minerals are generally used as inputs in the production of other goods. The implication for the mineral industry is that their control over the demand is limited. In other words, when the demand for a particular mineral goes up, the price in a pure competition model instantly goes up. But, if we analyze the short-run term, a higher price cannot remain constantly high

because the mineral has to face the competition of the price mineral's substitutes. Both price and demand will decline if a new use for the mineral cannot be found. The international character of the mining industry makes it difficult to pass on a cost increase.

Mining is one of the most capital intensive industries, consistently ranking near the top among all industrial sectors in assets per employee and near the bottom in annual sales dollars per dollar of assets. Thus, unlike other investors, mine investors typically have large sums invested for long periods before the outcome of the venture is determined by notoriously unpredictable markets.

1.3 Requirements for Mine Evaluation Analysis

To perform a mineral deposit financial analysis, it is necessary to estimate the following factors (Bennett 1970):

- a) physical characteristic of the deposits
- b) quantity and quality of the reserves
- c) appropriate mining and processing methods
- d) a realistic production rate
- e) anticipated recoveries
- f) market prices
- g) required capital investment
- h) anticipated operating cost

It should be apparent that the estimates of many of the above variables will be highly subjective. There is a large degree of uncertainty in any mining venture which cannot be eliminated until the mineral deposit is mined out.

Hrebar (1971) considered in more detail the following salient factors in a feasibility study:

a) Information on Deposit

a.1) Geology

a.1.1) mineralization - type, grade, uniformity

a.1.2) geologic structure

a.1.3) rock types - physical properties

a.2) Geometry

a.2.1) size and shape

a.2.2) continuity

a.2.3) depth

a.3) Geography

a.3.1) location - proximity to towns, supply
depots

a.3.2) topography

a.3.3) climatic conditions

a.3.4) surface conditions - vegetation, stream
diversion

a.3.5) political boundaries

a.4) Exploration

- a.4.1) historical - district, property
- a.4.2) current program
- a.4.3) reserves - tonnages, distribution,
classification
- a.4.4) sampling - types, procedures
- a.4.5) proposed program
- b) Information on general Project Economics
 - b.1) Markets
 - b.1.1) marketable form of product - concentrates,
direct shipping ore, specifications
 - b.1.2) market location and alternatives
 - b.1.3) expected price levels and trends - supply-
demand, competitive cost levels, new
sources of product substitutions, tariffs
 - b.2) Transportation
 - b.2.1) property access
 - b.2.2) product transportation - methods, distance
costs
 - b.3) Utilities
 - b.3.1) electric power - availability, location,
ownership right of way, costs
 - b.3.2) natural gas - availability, location costs
 - b.3.3) alternatives - on site generation

b.4) Land and Mineral Rights

**b.4.1) ownership - surface, mineral acquisition
and option costs**

**b.4.2) acreage requirements - concentrator site,
waste dump and tailings pond location**

b.5) Water

**b.5.1) potable and process - sources, quantity,
quality, availability, costs**

**b.5.2) mine water - quantity, quality, depth and
source, drainage method treatment**

b.6) Labor

**b.6.1) availability and type - skilled/unskilled
in mining**

b.6.2) rates and trends

b.6.3) degree of organization

b.6.4) local district labor history

b.7) Governmental considerations

b.7.1) taxation

**b.7.2) reclamation and operating requirements and
trends**

b.7.3) zoning

b.7.4) proposed and pending mining legislation

c) Mining method selection

c.1) Physical controls

- c.1.1) strength - ore, waste, relative
- c.1.2) uniformity - mineralization, blending requirements
- c.1.3) continuity - mineralization
- c.1.4) geology - structure
- c.1.5) surface disturbance - subsidence
- c.1.6) geometry
- c.2) Selectivity
- c.3) Production requirements
 - c.3.1) relative production
 - c.3.2) development - methods, quantity, time requirements
 - c.3.3) capital requirements vs. availability
- d) Processing Methods
 - d.1) Mineralogy
 - d.2) Alternative processes
 - d.3) Product quality vs. specifications
 - d.4) Recoveries
- e) Capital and Operating cost estimates
 - e.1) Capital costs
 - e.1.1) exploration
 - e.1.2) mining
 - e.1.2.1) preproduction development
 - e.1.2.2) site preparation

- e.1.2.3) mine buildings
- e.1.2.4) mine equipment
- e.1.3) mill
 - e.1.3.1) site preparation
 - e.1.3.2) mill buildings
 - e.1.3.3) mill equipment
 - e.1.3.4) tailings pond
- e.2) Operating Costs
 - e.2.1) mining
 - e.2.1.1) labor
 - e.2.1.2) maintenance and supplies
 - e.2.1.3) development
 - e.2.2) milling
 - e.2.2.1) labor
 - e.2.2.2) maintenance and supplies
 - e.2.3) administrative and supervisory

Moreover, there are other factors which must be considered when carrying out a feasibility study:

- a) mine cut-off(s) grade(s), resulting tonnage(s) and grade(s) of ore
- b) net smelter return value(s)
- c) financial agreements
- d) annual rate of inflation for the different cost factors

e) time requirements for the various phases of the project.

1.4 Mine Valuation Methods

The impact of an investment decision on the value of the company is currently measured through the use of a valuation method. This method usually states that a firm's value reflects the future cash proceeds expected from operations, discounted for the timing of the expected receipts. In general, the basic criterion of these formulas is that the profits be greater than the costs of the resources utilized. The different economic evaluation formulas, which use the basic concepts of cash flow and time value to measure expected profitability, are described below.

1.4.1 Payback Period

The payback method is still widely used as a secondary evaluation criterion. It is defined as the time it would take to recoup the initial investment, i.e., the point in time when cumulative cash flows become zero. It can be measured either from the time the initial investment is made or from the time it begins to yield positive cash flow. Using this technique, the shorter the payback period the more attractive the investment alternative.

Originally the payback period was developed using annual profits rather than annual cash flows, but, with the growing importance of income taxes, cash flow is now accepted as the correct decision variable.

The basic weakness of the payback period technique is that only part of the operating life of an alternative is considered because cash flows beyond the payback are ignored, yet these cash flows make an important contribution to expected profitability. Another weakness is that payback period does not consider time value of money. Payback measures return of investment rather than return on investment. Projects which could not show an investment return in less than five years are generally viewed with scepticism by investors.

The payback method can cause a firm to accept high-risk, short-lived projects and reject long-lived projects that are virtually risk free. If a project payback period is calculated to be less than the company's maximum acceptable payback period, the project is accepted. Projects with lives longer than the payback period contribute profit to the firm, while those with shorter lives result in loss.

Payback period is a measure of future liquidity and is very important in analyzing investment in foreign countries that are politically or economically unstable (O'Neil 1982).

1.4.2 Discounted Payback

A variation of the payback period is the discounted payback period wherein annual cash flows are discounted at some specified rate to time zero; the discounted payback period is the point in time when the cumulative cash flow becomes zero. It is obvious that the discounted period is longer than the undiscounted payback period. Since this technique does consider the time value of money, it is superior to the regular payback period. Nonetheless, this approach does not consider the entire life of the project and the cash flow after the discounted payback period (Gentry and Hrebar 1983).

1.4.3 Net Present Value Method

By the mid 1950s the growing complexity of income tax resulted in an increasing utilization of cash flow, making clear that cash flow, not profit, is what counts in the evaluation.

With the net present value method, all cash flows are discounted to present value using the cost of capital (also defined as the minimum rate of return required on an investment). The net present value of an investment proposal is

$$NPV = \sum_{t=0}^n \frac{CF_t}{(1+r)^t}$$

where CF_t = cash flow for period t, whether it be a net cash outflow or inflow,
 r = cost of capital for the firm,
 n = last period in which a cash flow is expected.

Net present value relative to measurement for investment evaluation purposes is very useful in an accept/reject decision. The project is accepted when its net present value is greater than zero, and rejected when is less than zero.

The net present value of an existing property (without considering sunk costs) would be the maximum price the buyer should pay or the minimum price the seller should accept (Sykes 1967).

1.4.4 Profitability Index

Profitability index is defined as the ratio of the present value of future benefits, at a specified rate of discount, to the present value of investment outlays or costs at the same specified rate (cost of capital). The formula is

$$PI = \frac{\text{PV of Benefits}}{\text{PV of Costs}} .$$

The profitability index allows comparison of present value per dollar outlay. A project would be accepted when the profitability index is greater than 1 and rejected when less than 1. The higher the profitability index, the more desirable the project (Mackenzie 1970).

1.4.5 Internal Rate of Return

The internal rate of return is the discount rate that equates the present value of negative cash flow with the present value of positive cash flow; in other words, it is the discount rate that produces a zero net present value.

Then,

$$\sum_{t=0}^n \frac{CF_t}{(1+p)^t} = 0 ,$$

where CF_t = cash flow for period t ,
 p = internal rate of return,
 t = period in which cash flow is expected.

To obtain p it is necessary to solve the above equation by trial and error. It is important to recognize that there

could be more than one rate which equates the net present value to zero. When this case occurs it should be noted that these are only mathematical solving rates and have absolutely no financial significance. In the above mentioned cases, it is better to utilize net present value or wealth growth rate methods.

The acceptance criterion for the internal rate of return is to compare the calculated internal rate of return with the required rate of return stipulated by the company (cost of capital). If the internal rate of return is greater than the stipulated required rate, the project is accepted. If there are many projects that fulfill the latter premise, the investment alternative with the highest rate of return is preferred on the basis of expected profitability.

Sometimes misunderstandings in net present value and internal rate of return occur because of the different assumptions with respect to the marginal reinvestment rates on funds released from the project. The internal rate of return method implies that these funds are reinvested at the internal rate of return over the remaining life of the project. The net present value method, on the other hand, implies reinvestment at a rate equivalent to the minimum required rate of return (cost of capital) used as the discount rate.

After taking all considerations into account, most experts agree that the net present value method is superior to the internal rate of return method for evaluation of investment proposals (Sani 1977).

1.4.6 Wealth Growth Rate

Berry (1971) developed a financial measurement which determines the average rate of growth of the firm's accumulated wealth resulting from a capital project. He defines wealth growth rate as that interest rate which will equate the future value of the capital investment with the future value of the cash flows that result from exploiting the project.

The time horizon for both future values is the termination date of the project. Wealth growth rate permits the comparison of alternatives requiring both different investments and different lives; it uses cash flow rather than profits and considers time value of money.

Then, wealth growth rate is that rate at which the total investment has to grow in order to equal the future value of all subsequent reinvested cash flows at termination of the project.

1.4.7 Growth Rate of Return

To calculate growth rate of return, it is necessary to

compound all the positive cash flow forward to some time horizon "t" years in the future. If the project is still generating cash flows after "t" years, these cash flows should be discounted back to time "t" at the same rate. The next step is to discount the investment (negative cash flow) to a present value (time 0) amount at the same rate to get an equivalent investment "I." At this point, the project promises to yield "X" dollars at time "t" if we invest the equivalent of "I" dollars now. The growth rate of return is then defined as that interest rate which "I" would have to earn in order to generate "X" dollars at time "t."

When comparing projects, growth rate of return uses a common terminal date or time horizon for all projects, and the same reinvestment rate on cash flow is made for all of them.

It can be shown that when net present value is positive, the growth rate of return is greater than the company reinvestment rate; when net present value is negative, the growth rate of return is less than the company reinvestment rate. Also, it can be seen that if one project has a higher profitability index than another, it will also have a higher growth rate of return (Gentry and Hrebar 1983).

CHAPTER 2
PERUVIAN MINERAL POLICY

2.1 Introduction

As in any cash flow analysis, a thorough understanding of mineral policy on the related taxation policy is required. Peru's mineral policy has changed significantly as a result of changes in government since World War II. Policy has alternated between a foreign investment orientation and a heavy tax legislation. The changes in the country's mineral policy can be divided roughly into three periods:

- a) 1950-1968. Characterized by a new liberal mining code favoring foreign capital investment.
- b) 1968-1980. Direct participation of the state corporation in the mining industry and counteraction of multinational mining companies by the Peruvian military government.
- c) 1981-1984. Characterized by the election of a civilian government and enactment of the new Peruvian General Mining Law, Legislative Decree No. 109. Clearly oriented toward attracting foreign and national investment.

During the first period (1950-1968), the Peruvian government sought to provide a liberal commercial and financial climate through the abolition of currency

regulations, allowance of regular profit remittances by foreign companies, and establishment of individual sectorial incentives.

The 1950 Mining Code substantially altered the taxation system, abolished export taxes on mine production, exempted mining machinery and equipment from import duties, and established a mechanism through which "marginal deposits" would be subject to lowered income tax rates throughout the amortization period, and, finally, guaranteed tax stability for 25 years. All these measures offered the potential investor a powerful set of incentives.

The second period (1969-1980) was characterized by the establishment of a military government and increased nationalism. Policy declarations of the Peruvian revolutionary government made it clear that the era of the foreign firms was over. The General Mining Law, enacted on June 9, 1971, and the explanatory regulations which followed, gave the Peruvian government a wide range of power over the industry and established the direct involvement of the state as a mining entrepreneur through Minero Peru, the state mining company.

In the third period (1981-1984), the Peruvian government tried to call the attention of foreign firms to mine investment. The new General Mining Law, Legislative

Decree No.109, adopted on June 13, 1981, by the newly elected civilian government is clearly oriented toward attracting foreign and national investment. The new law is basically directed to the following:

- a) Infusion of foreign funds into Peru's economy.
- b) Revitalization of the mining industry and recovery from the stagnation of mining output during the military government regime.
- c) Setting a strategy for future expansions and development of promising deposits.

2.2 Peruvian Mining Industry Regulations

The principle current regulation in the Peruvian mining industry is the General Mining Law, Legislative Decree No. 109. The Law covers all facets of the utilization of mineral substances of the soil and subsoil of Peruvian territory. This legal dispositive states that all mineral resources belong to the State. The State promotes and encourages their rational development. Utilization of the mineral resources is undertaken by means of the managerial activities of the State and by the granting of rights for the undertaking of activities in the mining industry to local or foreign individuals or corporations. The main articles of Legislative Decree No. 109 are shown in Appendix A.

2.3 Other Peruvian Mining Industry Regulations

There are other dispositions which cover certain aspects that the General Mining Law, Legislative Decree No. 109, does not regulate. These regulations are described below.

- a) **Export and Sales Taxes:** Until June 30, 1983, the sold concentrates were affected by Sales Export taxes (IVEX) and by the Sales Internal taxes (IVIN). These taxes have been replaced by the special taxes (Legislative Decree 190) and the additional sales tax (IMAD) created by Legislative Decree 33. The special taxes are imposed on 2% of the FOB value of concentrates.

With passage of the Republic Financing Budget (Law 23724) for 1984, the additional sales taxes (IMAD) were replaced on January 1, 1984, by a tax of 5% over FOB value of concentrates. This new tax is used for partial payment of Income Taxes.

- b) **Income Tax:** The following table shows the percentages utilized in income tax calculations. The value of an UIT refers to the taxable unit (Unidad Impositiva Tributaria) established by Legislative Decree No. 7. Conversion of the respective percentages to determine the

obligations of the holders of mining activities in one calendar year shall be made taking the amount of the taxable unit (UIT) in force on the first day of such year as a basis. The UIT will be revised annually by the government.

Peruvian Corporate Tax Rates

From	<u>UIT</u>	To	<u>Taxable Income</u> (%)
0		150	30
150		1500	40
1500		3000	50
more than		3000	55

(Peruvian Government 1976).

Listed below are the equivalent dollars per year of an UIT since January 1, 1981.

Equivalent Dollars per UIT

<u>Date</u>	<u>Rate Exchange</u> (soles/US dollars)	<u>Value of One UIT</u> (soles)	<u>Value of One UIT</u> (US dollars)
1-1-1981	342.49	350,000	1,021.90
1-1-1982	508.96	600,000	1,178.90
1-1-1983	999.29	1,100,000	1,100.80
1-1-1984	2,280.59	2,200,000	964.70

The average value of an UIT for the last four

years is \$1,066.50.

- c) **Assets Depreciation:** Calculated according the percentages shown below.

Assets Depreciation

<u>Description</u>	<u>Annual Depreciation Rate</u> (%)
Buildings, and facilities	10
Heavy Machinery, and Mining Equipment	20
Transportation Units	20
Furniture, and Office Equipment	20

(Peruvian Government 1982).

- d) **Investment Tax Credit:** The mining tax credit, based on Decree Law 22401, allows reinvestment to be credited against income taxes for the year in which they are made, with the possibility of carrying forward the unused portion of the credit for another two years. These concepts are also mentioned in articles 144, 145, and 146 of Legislative Decree No. 109.
- e) **Mining Community:** Defined as a private legal entity organized to represent all the employees of the company and to encourage them to participate in its ownership, management, and profits. The

following articles of Decree Law 23333 concerning Mining Community are self-explanatory.

Article 26.- The mining enterprise shall deduct yearly 6% of its net income to benefit the Mining Community. This amount shall be composed as follows:

- 1) 5.5% of net income as property participation through shares issued by the company.
- 2) 0.5% of net income in cash for expenses of the mining community.

Article 44.- Every year the mining enterprise shall deduct 4% of its net income as liquid participation composed as follows:

- 1) 50% shall be sent to the mining community for its distribution among the workers, according to their worked days.
- 2) The other 50% shall be sent to the Compensation Mining Community for its distribution among other mining communities.

- f) Housing: the Supreme Decree 025-82 EM/VM (Regulations of the General Mining Law, Legislative Decree No. 109) in its articles 254 and 300 states the following:

Article 254.- The holder of a mining activity must present a master plan to construct housing and additional facilities, such as schools, hospitals, mercantile, market place etc., accompanied by a cronogram according to its present and future needs.

Article 300.- The holder of a mining activity must supply to the family of their workers free initial and primary school education in the schools of the company.

2.4 Peruvian Mining Cash Flow

The cash flow elaborated in accordance with the Peruvian General Mining Law, Legislative Decree No. 109, and following the dispositions above mentioned is as follows:

- (+) Gross Income (NSR)
- (-) Sales Tax (Law 23724)(5% NSR)
- (-) Export Tax (Legislative Decree 190) (2% NSR)

- (=) Gross Sales (Article 286 Legislative Decree 109)(A)
- (-) Royalty (Article 286 Legislative Decree 109) (max 10% A)
- (-) Operating Costs

- (=) Gross Profits (Article 159 Legislative Decree 109)
- (-) Depreciation (Article 142 Legislative Decree 109)(see table page 23)
- (-)* Depletion (Article 135 Legislative Decree 109)
- (-) Exploration Amortization (Articles 135, 136, Legislative Decree 109)
- (-) Development Amortization (Article 136, Legislative Decree 109)

- (=) Taxable Income
- (-) Income Tax (B)(articles 157, and 158, Legislative Decree 109, see table page 22)
- (+) Sales Tax (Law 23724)(5% NSR)
- (+) Investment Tax Credit (ITC) (Decree Law 22401) (Articles 144, 145, 146 Legislative Decree 109)

- (=) Net Income (Article 139 Legislative Decree 109) (C)
- (-) Liquid Participation for Workers (Article 44 Decree Law 23333)(4% of C)
- (-) Property Participation by Workers (Article 26 Decree Law 23333)(6% of C)
- (-) Research & Development Fee for INGEMMET (Article 139 Legislative Decree 109)(1% of C)

- (=) Net Profit
- (+) Depletion (Article 135 Legislative Decree 109)

No

- (+) Depreciation (Article 142 Legislative Decree 109)(see table page 23)
 - (+) Exploration Amortization (Articles 135, 136 Legislative Decree 109)
 - (+) Development Amortization (Article 136 Legislative Decree 109)
 - (-) Capital Costs
 - (-) Working Capital
 - (+) Salvage CF
-

Net Cash Flow

CHAPTER 3
COMPANIA DE MINAS BUENAVENTURA
AND UCHUCCHACUA MINE

3.1 General Description of Buenaventura

Compania de Minas Buenaventura S.A. (CMBSA), the largest Peruvian private mining company, was founded in 1953. Its first operation was the silver deposit of Julcani, a former leased mine of Cerro de Pasco Copper Corporation, a subsidiary of Cerro Corporation, a New York based firm.

With the start up of Recuperada Mine eight years later, the company expanded its operations to the Huachocolpa district, a mineralized zone not far from Julcani. By that time CMBSA began negotiations with Sindicato Minero de Orcopampa to exploit its properties in Arequipa, in southern Peru. In 1968 an agreement was reached, and the silver of Orcopampa was brought into production. Meanwhile, CMBSA initiated explorations in the Uchucchacua zone, located 283 kilometers (177 miles) northeast of Lima, the Peruvian capital city.

3.1.1 Buenaventura Subsidiaries

In 1982, the Huachocolpa unit was separated from CMBSA and became a subsidiary, Compania de Minas Recuperada. Today 99% of its proprietorship belongs to Buenaventura. Orcopampa

went the same way at the beginning of 1984 and became known as Compania de Minas Orcopampa, with 99.9% ownership by Buenaventura.

Currently, CMBSA has the following subsidiaries, in addition to those already named:

- Compania Minera Colquirrumi--Exploits a mineral deposit at the Hualgayoc district, Northern Peru. CMBSA owns 52.5% of the shares.
- Compania Minera Condesa--A mining company which operates in the Huachocolpa zone. CMBSA owns 92.4%.
- Sociedad Minera El Brocal--Mines a copper deposit in Pasco, Central Peru. CMBSA manages it and owns 11.0%.
- Consorcio Energetico de Huancavelica--A corporation created with other mining companies operating in Huancavelica to develop an electrification plan in the zone. CMBSA owns 29%.
- Buenaventura Ingenieros (BISA)--A consulting mining firm.

Figure 1 shows the locations of the units and subsidiaries of Buenaventura in Peru.



Figure 1

Location of Buenaventura Subsidiaries

3.1.2 Buenaventura Mineral Production and Sales

Buenaventura production surpassed 7 million troy ounces of silver in 1983. The total feed tonnage produced in the same period amounted to 644,057 dry short tons. The company's units had the following production results in the same year:

	<u>Tonnage (d.s.t.)</u>	<u>Ounces of Silver</u>
Julcani	231,220	1,884,953
Orcopampa	172,735	2,178,668
Uchucchacua	<u>240,102</u>	<u>2,947,238</u>
CMBSA	644,057	7,010,859

During 1983 the company's total sales summed more than \$69 million. Since CMBSA was founded, silver has been the most important constituent of its concentrates. At 1983 prices, silver amounted to 86.75% of the total production value. In order of importance, gold was second with 11.92%, followed by lead with 1.23%, and copper with 0.10%.

CMBSA sells most of its concentrates through direct contracts to the following smelters: Asarco (U.S.A.), CentrominPeru (Peru), Noranda (Canada), Norddeutsche Affinerie (Germany), and Penarroja (France).

3.2 The Uchucchacua Unit

Uchucchacua, the newest unit of CMBSA is one of Peru's major silver mines. It is located in the department of Lima, as shown in Figure 2.

The ore deposits were first worked by the Spaniards, and by the early 1900s, the mines had been acquired by Peruvian interests. In the late 1960s, CMBSA began an exploration program and its first metallurgical testing was made at a pilot plant. The key to the Uchucchacua opening was overcoming metallurgical problems caused by the presence of manganese in the silver ores. After years of investigation, a suitable metallurgical process was developed in which a leaching process follows the usual flotation stage and 80% of the silver is recovered. Current annual bullion output is 2.9 million troy ounces of silver from milling 240,000 dry short tons.

The Uchucchacua ore is extracted in an extensive underground operation, mining veins, and ore bodies by selective methods. Figure 3 shows the ore grade distribution and the tonnage distribution. The main minerals are argentiferous galena, tetrahedrite, argentite, sphalerite, chalcopryrite, alabandite, calcite, quartz, and pyrite.

In 1975 the mine began production at a level of 180 dry short tons of ore per day. By the mid-1980s a \$15

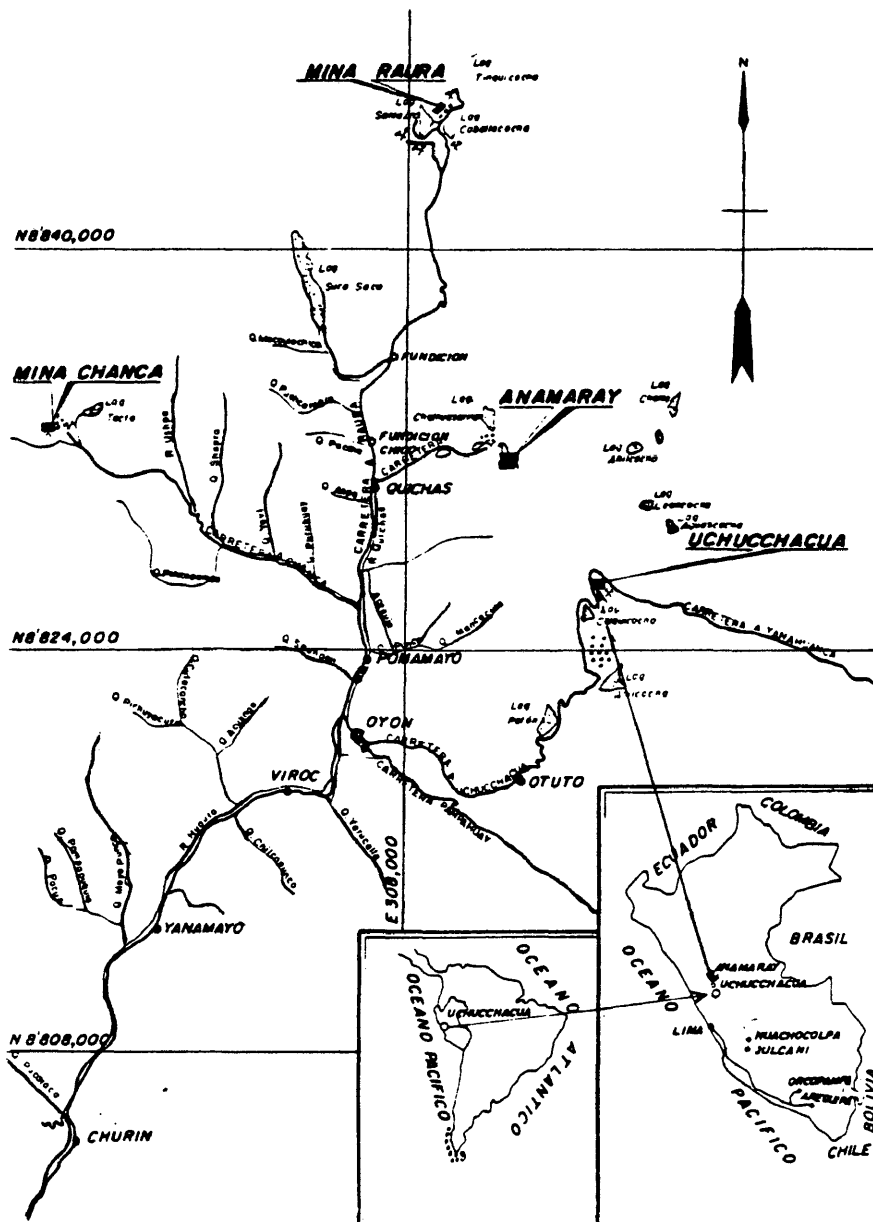


Figure 2

Location of Uchucchacua Mine

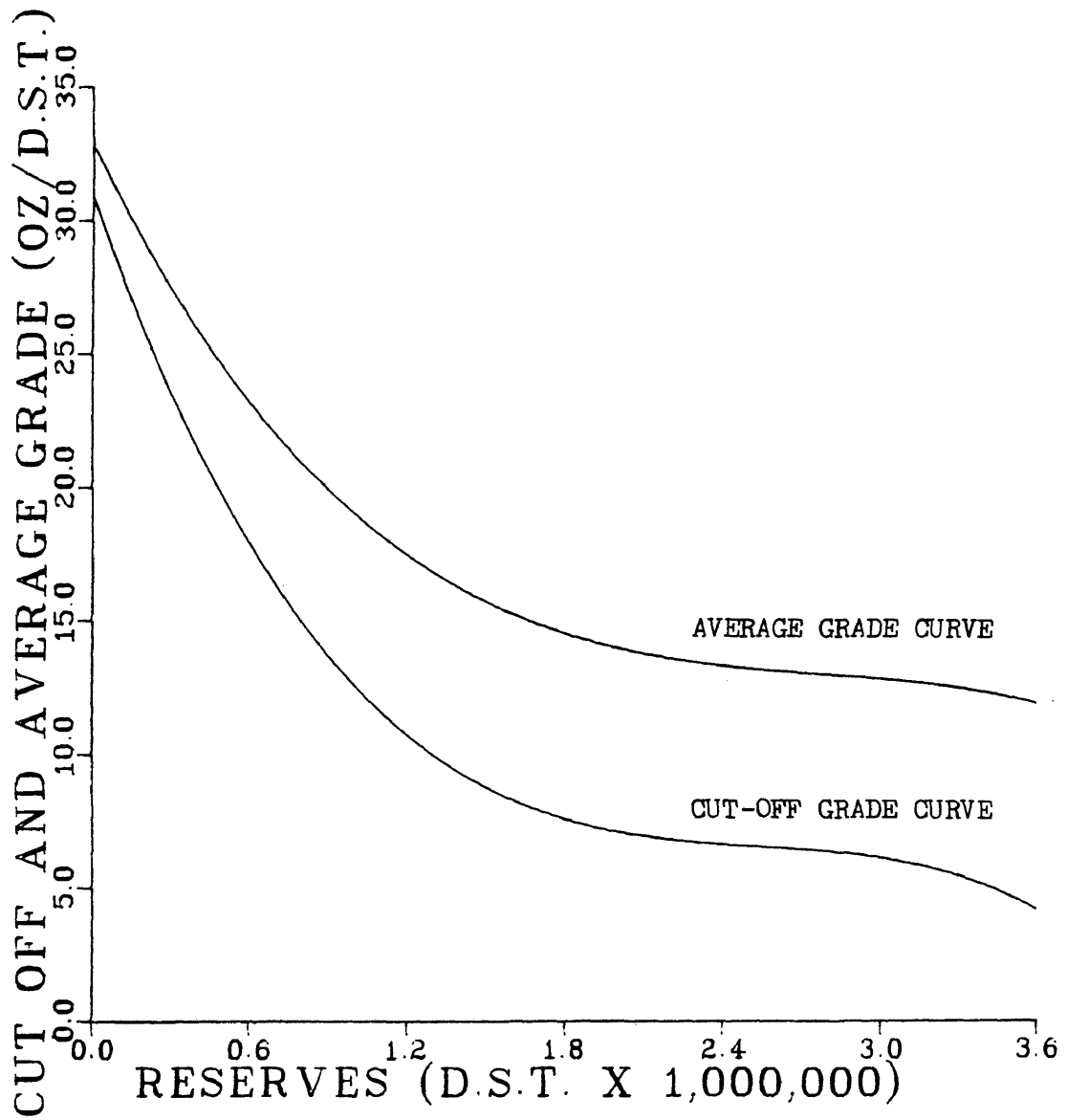


Figure 3

Ore Grade and Tonnage Distribution

million expansion program was completed. This plan was designed to increase production up to 500 dry short tons per day. Silver production was increased from 900,000 to 1.9 million ounces per year. The expanded facilities included the leaching plant, concentration plant, and construction of the 1300 kilowatt hydroelectric plant. The mine used costly thermoelectric energy and the generators operated at only 70% capacity because of the altitude. As the mine site is located in a isolated zone, the expansion program considered the construction of a 200-worker housing and recreation facility. To complete the program, the mine was also subject to an intensive exploration and development plan.

In 1982, due to the low silver prices, substantial austerity measures were instituted to cut costs and boost production: an expansion from 500 to 700 dry short tons per day was made, and a record level of 2.9 million ounces of silver was produced by putting efforts on good mineral zones and by improving processing and efficiency.

The nucleus of the new expansion plan, objective of this study, will be a shaft sinking, enlargement of the mill capacity, expansion of the current hydroelectric plant, construction of worker housing, and new facilities necessary to the operation.

3.2.1 Location and Geology

The Uchucchacua unit is located 283 kilometers (177 miles) northeast of Lima, and 28 kilometers (17.5 miles) from the town of Oyon, in the province of Cajatambo, department of Lima. Its altitude is 4,500 meters (14,763 feet) above sea level. The unit is surrounded by the rugged hills of the Occidental Andean mountains. Roads connect the mine site with the cities of Lima, Huanuco, and Cerro de Pasco.

Most of the exposed rocks of the zone are sediments of the Superior Cretaceous, mainly of the Jumasha formation, with intrusions of small Tertiary stocks, and covered, in the northern part, by volcanic rocks constituted by pyroclastic, breachs, and lavas.

All the sedimentary rocks have been intensively folded, and these movements have given origin to the Cachipampa anticline. These structures have been horizontally displaced by the Cachipampa and Socorro fault. After an erosion and volcanic period characterized by vertical movements, the Uchucchacua fault was produced.

The Uchucchacua fault has a north-south strike, and has a strike slip over 500 meters (1640 feet). Its dip is 78 degrees west. The Cachipampa fault ends at the Uchucchacua fault and has a surface displacement of 400 meters (1310

feet). Its strike is north 60 degrees east and has a dip of 78 degrees south-west. The Socorro fault begins at the Uchucchacua fault and has a vertical displacement of 250 meters (820 feet) and a strike slip of 420 meters (1377 feet), (see Figure 4).

Mineralization in Uchucchacua is emplaced mainly with calcite of hydrothermal origin in Jumasha limestones and in dacitic intrusives. There are two types of mineral deposits: veins and replacement ore bodies. The veins are located in Jumasha limestone or in Jumasha marbled limestone. The veins in limestones have their outcrops well defined with an average width of 1.5 meters (5 feet). The veins in marbled limestones have a width between 0.30 meters (1 foot) and 4.00 meters (13 feet).

All the known replacement ore bodies are located in Jumasha limestones, and their outcrops are constituted by many calcite veinlets. The ore bodies have a length of between 30 meters (100 feet) and 70 meters (230 feet), and a width of between 2 meters (6.5 feet) and 12 meters (39 feet). Mineralization in ore bodies has been deposited mainly by replacement of carbonates, and in part by hypothermal to mesothermal filling of fractures (Bermudez 1984).

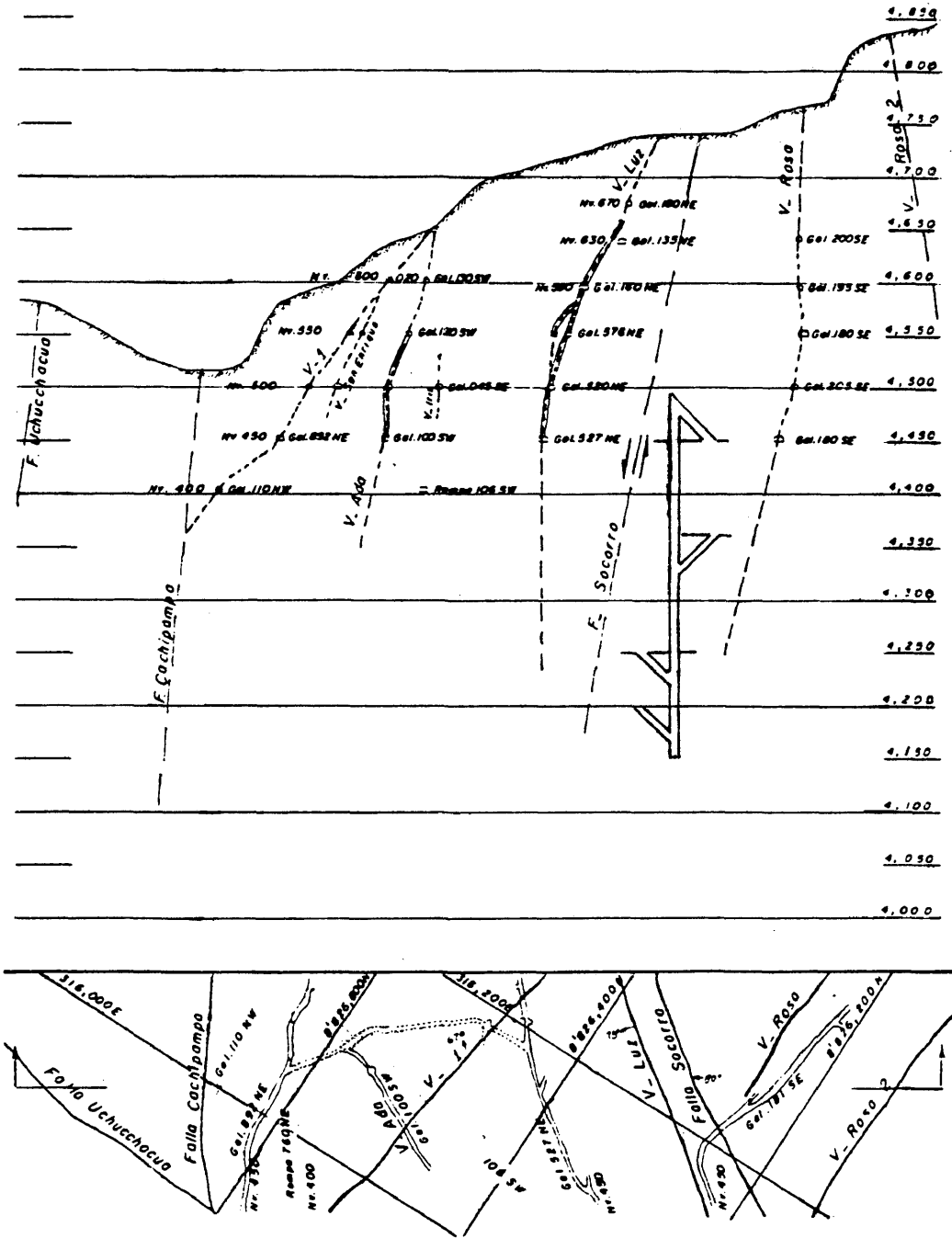


Figure 4
Cross Section of the Uchucchacua Mine

3.2.2 Mining

Current daily production of the Uchucchacua Mine is 700 dry short tons of ore using conventional shrinkage and cut and fill stoping methods.

3.2.2.1 Access and Haulage

The levels of the mine are 450, 500, 550, 590, 630, and 730; where 730 is the highest level. For instance, 730 level means that the height above sea level is 4,730 meters (15,508 feet). The vertical interval of two consecutive levels may range between 40 meters (131 feet) and 50 meters (164 feet). These intervals were shown in Figure 4.

Ore passes gather all the ore above 450 level. They were constructed using a Dresser 500 raise boring machine with a 12-inch pilot hole and a 6-foot reamer. Their length varies between 180 meters (590 feet) and 240 meters (786 feet). A vertical waste pass connects and distributes fill from 730 to 500 levels. Four ventilation raises connect the lower levels of the mine with the surface, injecting fresh air or extracting contaminated air with 90 horsepower axial electric fans of 70,000 cubic feet per minute capacity.

The haulage and most important level is 450, equipped with two 8-ton trolley locomotives and capable of hauling ten gramby lateral dump cars with a capacity of 80 cubic feet (4 tons). The distance between the orepasses and the

ore bins is 1.6 kilometers (1 mile). The haulage level size is 9 x 10 feet, with a gradient of 3/1000. The rail weight is 50 pounds per yard.

The other levels are equipped with battery locomotives of 3.5 tons, capable of hauling eight lateral dump cars of 35 cubic feet (1.5 tons) capacity. The average travel distance for battery locomotives is 400 meters (1,311 feet) between stopes and ore passes. The secondary's level size is 7 x 8 feet, and the rails employed are 30 pounds per yard.

3.2.2.2 Exploitation

As previously pointed out, the Uchucchacua mine basically has two types of deposits: veins and replacement ore bodies.

3.2.2.2.1 Shrinkage

Veins are worked with the shrinkage method which takes advantage of dips in the veins, ranging from 75 to 85 degrees, and the competence of hanging and foot walls.

The length of the ore block exploited by shrinkage is 90 meters (295 feet), with an average width of 1.5 meters (5 feet). At each extreme of the ore block, manways are driven according to the advance of the stope. In the central part of the block a ventilation raise is driven.

The drilling operation is carried out utilizing

pneumatic stopers with each operated by one worker using 22 millimeters (7/8 inches) by 2.4 meters (8 feet) drill steel. Dynamite is used in the blasting process with a powder factor of 0.94 pounds per ton. Loading pockets, every 6 meters (20 feet), are constructed with timber on the haulage level where the locomotives draw approximately 30% of the broken ore, leaving the remaining 70% in the stope as a work platform and artificial support, (see Figure 5).

3.2.2.2.2 Cut-and-Fill

Cut-and-fill is employed to exploit replacement ore bodies. In general these ore bodies contain higher grades than veins, one of the reasons that a selective method is used for their exploitation. These ore bodies are almost vertical and have very irregular shapes that make it practically impossible to apply other mining methods. Ore bodies have a length of between 30 meters (100 feet) and 70 meters (230 feet), and a width of between 2 meters (6.5 feet) and 12 meters (39 feet). As in the shrinkage stopes, manways are driven and chutes are constructed at the extremes of the ore body. In the central part of the stope, a raise is constructed to be used as a ventilation duct or as a fill pass (see Figure 6). Drilling is done using pneumatic jacklegs and utilizing 22 millimeters (7/8 inches) by 2.4 meters (8 feet) steel with each operated by one

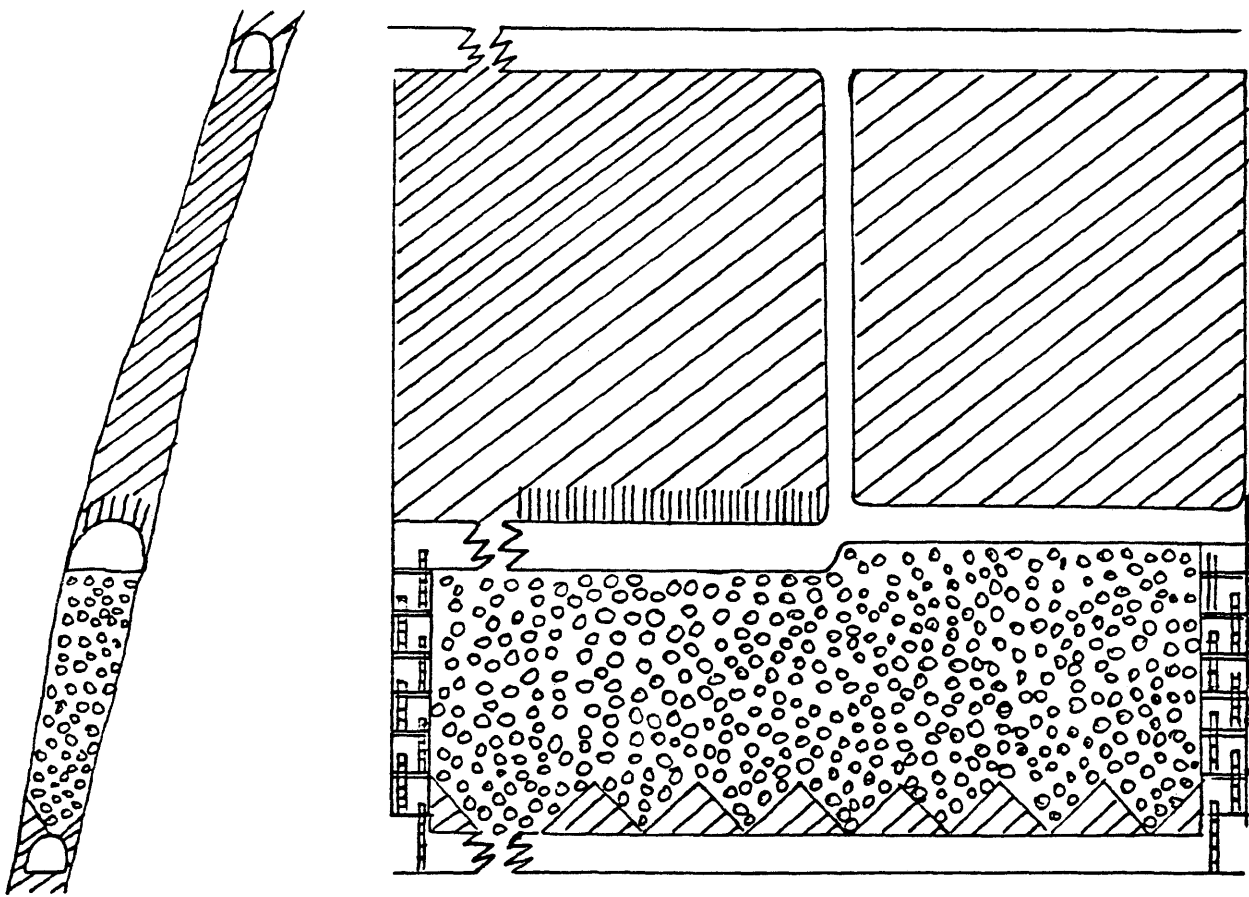


Figure 5
Tranverse and Longitudinal Section of
a Shrinkage Stope

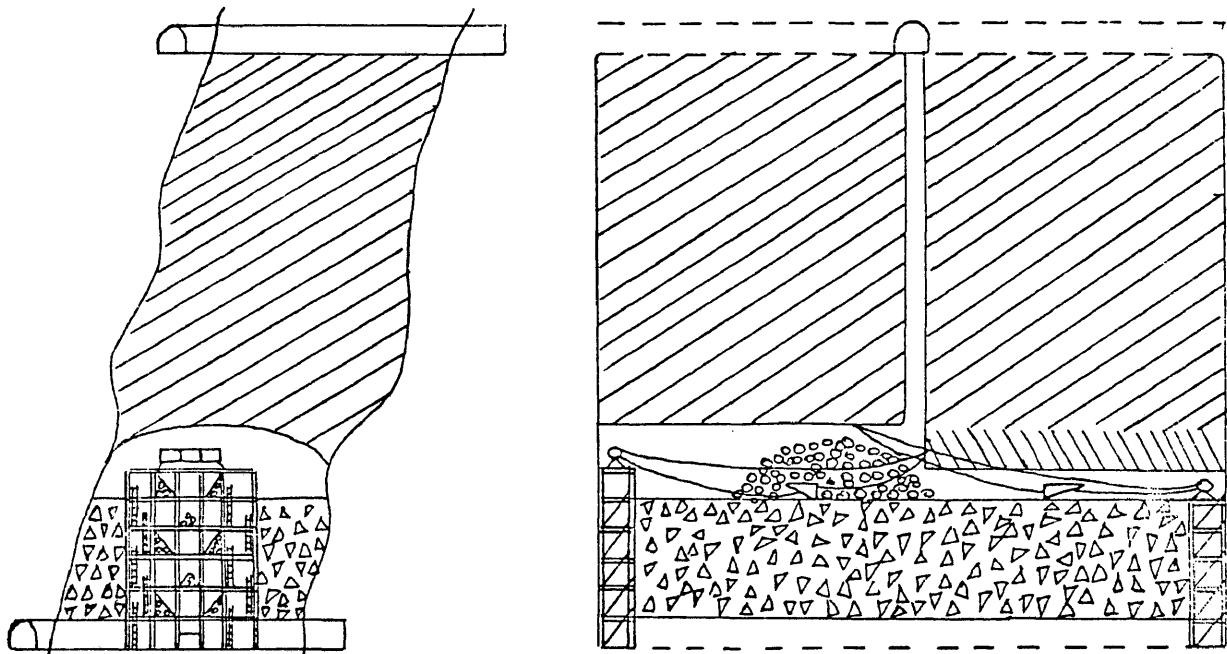


Figure 6
Transverse and Longitudinal Section of
a Cut-and-Fill Slope

worker drilling 45 degree inclined holes. Dynamite is also employed in the cut-and-fill stopes with a 0.82 pounds per ton powder factor. Broken ore is dragged to ore chutes using 3-drum slushers with 30 horsepower electric motors and 36-inch scrapers. Filling waste is also distributed in the stope by the slushers.

Percentage of production by methods and productivity achieved in shrinkage and cut-and-fill stopes are presented below:

	<u>Shrinkage</u>		<u>Cut-and-Fill</u>
	<u>Breakage</u>	<u>End</u>	
Productivity (d.s.t./man-shift)	5.5	7.4	8.5
Total Production Tonnage (%)		51.4	48.6
Overall Silver Ounces Output (%)		36.4	63.6

Because the ore and wall rock are extremely competent, artificial support in stopes, drifts and cross cuts is not used. Table 1 shows the exploration results during the period 1979-1983.

3.2.3 Energy

As with most of the Peruvian mines because of their remote locations, Uchucchacua electric energy is provided by

Table 1
Historical Uchucchacua Exploration Results

<u>Year</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Exploration (mts)	5,012	6,698	5,294	3,368	4,286
Discovered Ore (d.s.t.)	N/A	210,585	336,590	505,818	275,662
Discovered Ore/ Extracted Ore Ratio	N/A	1.97	2.04	2.60	1.15
Discovered Ore/ Meters Developed Ratio	N/A	31.44	63.58	150.18	64.80

N/A: Information not available.

Source: CMBSA, "Memoria Anual," various editions (1980, 1981, 1982, 1983), Lima.

diesel generators and by a hydroelectric plant. The electric energy is transformed into pneumatic energy to be used in the drilling process. Both sources of energy are described in the following paragraphs because of their importance in the planned expansion.

3.2.3.1 Electric Energy

Currently Uchucchacua mines have the following sources of electric energy:

Effective Electric Energy Power			
	<u>Nominal</u>	<u>Power (kw)</u>	<u>Effective</u>
a. Diesel (Groups)			
2 Caterpillar	800	ea.	550 ea.
1 Sulzer	1100		900
b. Hydroelectric Plant (turbines)			
1 Siemens	500		500
1 Westinghouse	<u>800</u>		<u>800</u>
Total Electric Energy	4000		3300

The new 1300 kilowatt "Paton" hydroelectric plant produces a line voltage of 22,000 volts. At the mine, a primary transformer reduces the voltage to 10,000 volts and a secondary one to 440 volts, 60 hertz, the industrial current that the operation utilizes.

Currently the demand distribution of electric energy

follows the next pattern:

Consumption Distribution of Electric Energy

<u>Location</u>	<u>Consumption (kw)</u>	<u>% of Total Consumption</u>
Mine	1,100	39.2
Concentrator & Leaching Plant	1,000	35.6
Housing & Public Lighting System	500	17.8
Worshops	90	3.2
Distribution Losses	50	1.8
Transmission Losses	30	1.1
Other	<u>35</u>	<u>1.3</u>
Total	2,805	100.0

Thus, Uchucchacua mine has a nominal 4,000 kilowatt installed, an effective 3,300 kilowatt installed, and 2,805 kilowatt demand.

3.2.3.2 Pneumatic Energy

Currently Uchucchacua unit has the following air compressors:

Effective Capacity of Pneumatic Energy

<u>Compressor Type</u>	<u>Installed Capacity (cfm)</u>	<u>Efficiency (%)</u>	<u>Effective Capacity (cfm)</u>
1 Helicoidal Sullair	3,100	90	2,790
2 Cylindrical IR	2,500	85	2,125
1 Cylindrical IR	<u>1,000</u>	85	<u>850</u>
Total	9,100		7,890

Considering a 5% leakage due to friction, elbows, and

couplings on effective capacity, 7,495 cubic feet per minute is available.

The demand for compressed air for a current production of 700 dry short tons per day is as follows:

45 drilling machines @ 125 cfm each	5,625	cfm
7 overshot loader @ 325 cfm each	2,275	cfm
4 Pneumatic chutes, @ 125 cfm each	<u>500</u>	cfm
Total Demand	8,400	cfm

Considering a simultaneity factor of 75% (Ingersoll Rand 1982) the average demand at any time is 6,300 cubic feet per minute. Given that the effective capacity is 7,495 cubic feet per minute, and the average demand is 6,300 cubic feet per minute, the mine's compressed air has a surplus of 1,195 cubic feet per minute. Since the daily mine output is 700 dry short tons, and the average demand of compressed air is 6,300 cubic feet per minute, the requirement to produce a dry short ton is 9 cubic feet per minute.

3.2.4 Operating Costs

Operating costs of Uchucchacua are shown in Table 2 for the first eight months of 1984. The average operating costs for this period amounts to \$32.15 per dry short ton. Their most important components are labor, supplies, and depreciation, which amount to \$9.63, \$8.83, and \$7.74 per dry short ton respectively. Various other costs amount to

Table 2
 Current Uchucchacua General Cost Summary
 January-August 1984
 700 d.s.t./day
 (in US dollars)

<u>Month</u>	<u>Labor</u>	<u>Supplies</u>	<u>Various</u>	<u>Depreciation</u>	<u>Total Expense</u>	<u>Cost/ton</u>
Jan.	208,866	173,373	98,275	251,096	731,610	37.4
Feb.	165,215	160,889	101,747	234,291	662,142	41.0
March	211,370	185,122	122,565	142,513	661,570	31.4
April	190,395	110,680	115,390	144,440	560,905	27.3
May	199,307	232,975	83,947	132,963	648,922	31.1
June	174,309	184,145	114,399	121,484	594,337	30.2
July	178,066	181,083	102,855	108,200	570,204	27.8
Aug.	201,381	171,575	203,593	93,413	669,962	33.0
Expenses						
Total (x1000)	1,528.9	1,399.8	942.8	1,228.4	5,099.7	--
Aver.	191,113	174,980	117,846	153,550	637,456	--
Cost/ton						
% Total	29.95	27.47	18.51	24.07	100.00	--
Average	9.63	8.83	5.95	7.74	32.15	--

Source: Paz, Favio, 1984, Planeamiento Operacional Unidad Uchucchacua, Lima, CMBSA.

\$5.95/dry short ton.

Appendix B contains tables describing detail cost items. For example, Table B.1 shows in detail the components of labor costs. The larger amount corresponds to fringe benefits of \$6.16 per dry short ton, which represents 63.9% of total labor costs. Similarly, Table B.2 shows that the most important supplies are fuel, \$3.02 per dry short ton, representing 34.2% of total supplies, followed by laboratory and plant with \$2.63 per dry short ton, representing 29.8% of total supplies. Table B.3 shows that payments to contractors represents 53.3% of various costs, with an average of \$62,796 per month. Table B.4 shows depreciation costs in the unit.

3.2.5 Personnel

The Uchucchacua mines currently have a labor force of 516 people, including staff, employees, teachers, and workers, as shown in Table 3. The average daily salary per worker, including overtime, Sundays and holidays, is as follows (from Table B.1):

$$[37,375 + 2,430 + 4,850]/[426 - (426)/12] = \$114.20/\text{month}$$

$$\$114.20/30 = \$3.80/\text{day}$$

Fringe benefits per worker/day are almost the same as for employee/day and are as follows (from Table B.1):

$$122,235 / (426 + 33) = \$266.00/\text{month}$$

Table 3
Current Uchucchacua Personnel Distribution
by Departments
700 d.s.t./day
(January 1984)

<u>Department</u>	<u>Staff</u>	<u>Employees</u>	<u>Workers</u>	<u>Total</u>
Superintendence	2	1	0	3
Safety	1	1	13	15
Mine	6	6	198	210
Concentrator & Leaching Plant	7	3	49	59
Geology	2	1	11	14
Housing, Maintenance & Surveying	2	3	32	37
Planning	1	0	0	1
Mechanical Workshop	2	2	50	54
Electrical Workshop	1	1	17	19
Laboratory	1	0	14	15
Hospital	6	1	8	15
Social Work	2	2	0	4
Industrial Relations	2	1	0	3
Hotel-Cafeteria	0	1	16	17
Accounting	1	4	0	5
Personnel Office	0	3	2	5
Warehouse	1	2	10	13
Mercantile	0	1	6	7
Internal Auditor	1	0	0	1
School	<u>1</u>	<u>18</u>	<u>0</u>	<u>19</u>
Total	39	51	426	516

Source: Paz, Favio, 1984, Planeamiento Operacional Unidad Uchucchacua, Lima, CMBSA.

$$\$266.00 / 30 = \$8.90/\text{day}$$

This means that the total cost per day/worker is

$$\$3.80 + \$8.90 = \$12.70/\text{day}.$$

The fringe benefits represent 235% of the basic salary.

3.2.6 Metallurgy

Conventional flotation and leaching processes are used to produce the silver concentrate. A metallurgical problem of the Uchucchacua's ore is caused by the presence of manganese in the silver ore. Since conventional flotation did not separate alabandite, a manganese sulphide, from the silver, a leaching process is needed.

A Peruvian metallurgical consulting firm, C. H. Plenge, designed a leaching plant, where after flotation, a silver-manganese concentrate is treated with sulphuric acid to dissolve the manganese and leave the silver as a solid. Hydrogen sulfide gas, produced in the process, is burned off before release into the atmosphere. The pre-leaching concentrate at Uchucchacua contained nearly 20% manganese, compared to a relatively low 4% with leaching. More than 80% of the silver is recovered.

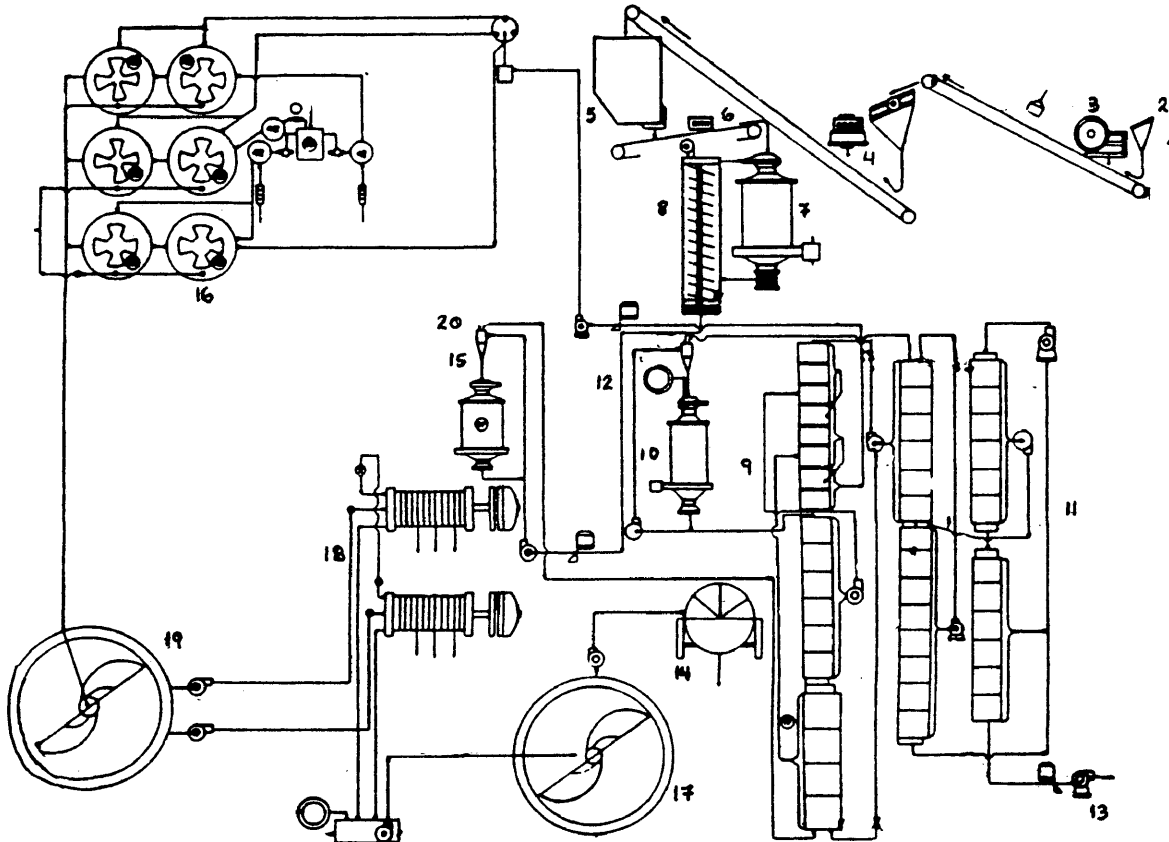
Historical Uchucchacua metallurgical results are shown in Table 4, and the flowsheet is shown in Figure 7.

Table 4
Historical Uchucchacua Metallurgical Results

<u>Year</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>
Feed Mill (d.s.t.)	63,482	106,876	164,860	207,453	240,102
Feed Grade Ag (oz/d.s.t.)	N/A	11.20	11.02	16.00	15.30
Concentrates Pb-Ag(d.s.t.)	1,970	3,017	4,251	7,865	---
Ag Grade (oz/d.s.t.)	N/A	108.90	96.40	126.96	---
Pb Grade (% /d.s.t.)	N/A	10.64	8.70	8.21	---
Contents Ag (oz)	229,684	328,684	409,817	998,540	---
Pb (d.s.t.)	165	321	372	646	---
Leached Conc. (d.s.t.)	2,283	3,244	6,783	9,512	17,296
Ag Grade (oz/d.s.t.)	N/A	193.20	148.20	176.50	170.40
Pb Grade (% /d.s.t.)	N/A	15.48	12.90	11.50	12.10
Contents Ag (oz)	462,424	626,717	1,005,254	1,678,899	2,947,238
Pb (d.s.t.)	325	502	874	1,097	1,960
Ratio of Concentration	---	---	---	---	13.9
Ag Ounces Recovered	692,108	955,401	1,415,071	2,677,449	2,947,238
Recovery (%)	N/A	79.8	77.9	80.7	80.2

N/A : Information not available.

Source: CMBSA, "Memoria Anual," various editions (1980, 1981, 1982, 1983), Lima.



Legend

- | | |
|------------------------------|---------------------------|
| 1. 60 Tn Balance | 11. No.48 Agitair Cells |
| 2. 400 Tn Coarse Ore Bin | 12. Conditioner |
| 3. 15" x 30" Primary Crusher | 13. 5" x 4" Tailing Pumps |
| 4. 4' Secondary Crusher | 14. 6' x 6' Disc Filter |
| 5. Open Steel Ore Bins (2) | 15. 6' x 6' Ball Mill |
| 6. Weightometer | 16. 8' x 11' Reactors |
| 7. 8' x 10' Ball Mill | 17. 25' x 8' Thickener |
| 8. 60' x 32" Classifier | 18. 3' x 3' Filter |
| 9. 100 cu-ft Cells | 19. 25' x 8' Thickener |
| 10. 5' x 10' Ball Mill | 20. Cyclons Battery |

Figure 7

Uchucchacua Metallurgical Flowsheet

CHAPTER 4

PRODUCTION EXPANSION EVALUATION MODELS

4.1 Statement of the Problem

During 1984 silver prices have declined from \$10 to \$6 per ounce, and at the same time operating costs have increased. As a result, a number of silver mining companies are going out of business. Other silver companies remain competitive because of low operating costs. As the difference between price and cost becomes less, company management must study alternatives to prevent a matching of costs and price. If a mine has adequate ore reserves, management can consider an expansion program to reduce costs and to preserve a reasonable profit margin.

This is exactly the problem facing the Uchucchacua Mine management, currently producing 700 dry short tons per day.

4.2 Expansion Alternatives

Three expansion programs are considered: a) an increase of 150 dry short tons/day to boost production to 850 dry short tons/day, b) an increase of 300 dry short tons/day to boost production to 1000 dry short tons/day, and c) an increase of 500 dry short tons/day to bring production to 1200 dry short tons/day. Analyzing these four production levels--the current level plus the three alternatives--from

the financial standpoint is the purpose of this study. With this objective a program was developed.

There are some details in cash flow calculations which are not common for the four production levels, and the intention of this section is to explain how to handle them. Current operating costs are provided in Chapter 3 and Appendix B; the following paragraphs will contain information about operating costs for 850, 1000, and 1200 dry short tons/day, as well as personnel, exploration expenses, development expenses, and capital investment calculations for each alternative.

4.2.1 Personnel and Operating Costs

Based on Table 3, Uchucchacua personnel distribution for the three alternatives has been projected as shown in Tables 5, 6, and 7, taking into account productivity by departments, especially mine; concentrator and leaching plant; technical services, such as mechanical and electrical workshops; and community services, such as schools.

For the purpose of this study it has been assumed that the mine will continue utilizing the same processes and equipment as before.

Tables 8, 9, and 10 are projected Uchucchacua cost summary for 850, 1000, and 1200 dry short tons/day respectively, which are based on tables contained in

Table 5
 Projected Uchucchacua Personnel Distribution
 850 d.s.t./day

<u>Department</u>	<u>Staff</u>	<u>Employees</u>	<u>Workers</u>	<u>Total</u>
Superintendence	2	1	0	3
Safety	1	1	15	17
Mine	7	6	240	253
Concentrator & Leaching	7	3	55	65
Geology	3	1	11	15
Housing, Maintenance & Surveying	2	3	35	40
Planning	1	0	0	1
Mechanical Workshop	2	2	53	57
Electrical Workshop	1	1	18	20
Laboratory	1	0	15	16
Hospital	7	1	8	16
Social Work	2	2	0	4
Industrial Relations	2	1	0	3
Hotel Cafeteria	0	1	16	17
Accounting	1	4	0	5
Personnel Office	0	3	3	6
Warehouse	1	2	10	13
Mercantile	0	1	7	8
Internal Auditor	1	0	0	1
School	<u>1</u>	<u>24</u>	<u>0</u>	<u>25</u>
Total	42	57	486	579

Table 6
 Projected Uchucchacua Personnel Distribution
 1000 d.s.t./day

<u>Department</u>	<u>Staff</u>	<u>Employees</u>	<u>Workers</u>	<u>Total</u>
Superintendence	2	1	0	3
Safety	1	1	17	19
Mine	7	7	280	294
Concentrator & Leaching	7	4	60	71
Geology	3	1	13	17
Housing, Maintenance & Surveying	2	3	35	40
Planning	1	0	0	1
Mechanical Workshop	2	2	55	59
Electrical Workshop	1	1	20	22
Laboratory	1	0	15	16
Hospital	7	1	9	17
Social Work	3	2	0	5
Industrial Relations	2	1	0	3
Hotel Cafeteria	0	1	16	17
Accounting	1	4	0	5
Personnel Office	0	3	3	6
Warehouse	1	2	10	13
Mercantile	0	1	8	9
Internal Auditor	1	0	0	1
School	<u>1</u>	<u>29</u>	<u>0</u>	<u>30</u>
Total	43	64	541	648

Table 7
 Projected Uchucchacua Personnel Distribution
 1200 d.s.t./day

<u>Department</u>	<u>Staff</u>	<u>Employees</u>	<u>Workers</u>	<u>Total</u>
Superintendence	2	1	0	3
Safety	2	1	19	22
Mine	8	8	340	356
Concentrator & Leaching	8	4	65	77
Geology	3	2	15	20
Housing, Maintenance & Surveying	2	3	37	42
Planning	1	0	0	1
Mechanical Workshop	2	2	60	64
Electrical Workshop	1	1	20	22
Laboratory	1	0	15	16
Hospital	8	1	10	19
Social Work	4	2	0	6
Industrial Relations	2	1	0	3
Hotel Cafeteria	0	1	18	19
Accounting	1	5	0	6
Personnel Office	0	4	4	8
Warehouse	1	2	12	15
Mercantile	0	1	10	11
Internal Auditor	1	0	0	1
School	<u>1</u>	<u>35</u>	<u>0</u>	<u>36</u>
Total	48	74	625	747

Table 8
 Projected Uchucchacua General Cost Summary
 850 d.s.t./day
 (in US dollars)

	<u>Labor</u>	<u>Supplies</u>	<u>Various</u>	<u>Depreciation</u>	<u>Total Expenses</u>
Expenses					
Total/ year	2,590,940	2,493,145	1,507,481	1,844,875	8,436,441
Average/ Month	215,911	207,762	125,623	153,739	703,036
Cost/d.s.t.					
% Total	30.71	29.55	17.87	21.87	100.00
Average	8.95	8.61	5.20	6.37	29.13

Table 9

Projected Uchucchacua General Cost Summary

1000 d.s.t./day

(in US dollars)

	<u>Labor</u>	<u>Supplies</u>	<u>Various</u>	<u>Depreciation</u>	<u>Total Expenses</u>
Expenses					
Total/ year	2,884,276	2,037,532	1,698,659	1,844,875	8,465,342
Average/ Month	240,356	169,791	141,554	153,739	705,445
Cost/d.s.t.					
% Total	34.07	24.07	20.07	21.79	100.00
Average	8.47	5.98	4.98	5.41	24.84

Table 10
 Projected Uchucchacua General Cost Summary
 1200 d.s.t./day
 (in US dollars)

	<u>Labor</u>	<u>Supplies</u>	<u>Various</u>	<u>Depreciation</u>	<u>Total Expenses</u>
Expenses					
Total/ year	3,391,067	2,389,056	1,953,562	1,844,875	9,578,560
Average/ Month	282,588	199,088	162,796	153,739	798,213
Cost/d.s.t.					
% Total	35.40	24.94	20.40	19.26	100.00
Average	8.28	5.84	4.78	4.51	23.41

Appendices C, D, and E, respectively. Table 11 is a summary of operating costs per alternative.

4.2.2 Exploration Expenses

Utilizing the average ratio of 67.62 dry short tons of ore discovered per meter developed from 1980 to 1983 (Table 1), and using a cost of \$230.00/meter, exploration expenses for all production levels were calculated and are shown below.

<u>Production</u>		<u>Annual Required</u>	<u>Annual Spending</u>
<u>Daily</u>	<u>Annual</u>	<u>Exploration</u>	<u>(in US dollars)</u>
(d.s.t.)	(d.s.t.)	(mts)	
700	238,000	3,527	811,210
850	289,432	4,280	984,462
1000	340,508	5,035	1,158,050
1200	408,610	6,042	1,389,830

In the developed program, exploration expenses are escalated at a rate of 5% per year for the project life; ore discovered per year has not been considered in the calculations because of the uncertainty of its tonnage and grade.

4.2.3 Development Expenses

Sinking a shaft to a depth of 280 meters (918 feet) will ensure the normal feed of ore to the concentrator plant, given that a high percentage of ore reserves are located below the 450 level. The projected shaft, to be

Table 11
 Summary of Operating Costs
 (US dollars/d.s.t.)

	<u>Alternatives</u> (d.s.t./day)			
	<u>700</u>	<u>850</u>	<u>1000</u>	<u>1200</u>
Labor	9.63	8.95	8.47	8.28
Supplies	8.83	8.61	5.98	5.84
Others	5.95	5.20	4.98	4.78
Depreciation	<u>7.74</u>	<u>6.37</u>	<u>5.41</u>	<u>4.51</u>
Total	32.15	29.13	24.84	23.41

built inside the mine, will have a rectangular shape and three divisions being each 5 x 5 feet. It is scheduled for completion in two years.

The main station and the machine room will be located at the 450 level. To operate the shaft, it will be necessary to construct five level stations at the 400, 360, 310, 250, and 200 levels. Within the design, construction of three ore pockets in intermediate levels are also being considered, as well a sump at the bottom of the shaft. A summary of shaft costs are presented below:

<u>Quantity</u>	<u>Description</u>	<u>Unit Cost</u> ($\$$)	<u>Total Cost</u> ($\$$)
1	Sinking: rectangular shaft Level: 450 to 170 Dimensions: 280 mts Unit Cost: $\$1800/\text{mt}$		504,000
1	Main station & machine room Level: 450 Dimensions: 30 x 10 x 4 mts Unit Cost: $\$130/\text{m}^3$		156,000
5	Level station Level: 400, 360, 310, 250, 200 Dimensions: 10 x 10 x 4 mts Unit Cost: $\$150/\text{m}^3$	60,000	300,000
3	Ore pockets Level: 360, 250, 200 Dimensions: 25 x 4 x 4 mts Unit Cost: $\$150/\text{m}^3$	60,000	180,000
1	Sump Level: 170 Dimensions: 10 x 4 x 4 mts Unit Cost: $\$180/\text{m}^3$		28,800

Total construction costs	1,168,800
Installation costs	35,000
Contingency 15%	<u>108,570</u>
Total shaft costs	1,384,370

Costs of double drums and pumps are included in the shaft machinery investment. A total of \$1,384,370 will be spent in two years, corresponding \$692,185 for the first and \$726,794 for the second year including a cost escalation of 5% for the last one.

4.2.4 Capital Investment

Since the evaluation study deals with production expansion, capital investment differs for each production level. In line with company policy, plans are to replace mine machinery, plant machinery, and transportation units every five years. Based on input data the investment has been escalated at 5% per year.

The following paragraphs will describe the required investment items in each of the four cases considering that it will be spent in the first two years of project's life.

4.2.4.1 Capital Investment for 700 d.s.t./day

a) Schools. CMBSA is operating a primary and a secondary school. Currently this facility is too small for the student population and cannot be enlarged. Thus, a new school must be built.

b) Housing. To continue operations in Uchucchacua, the company must build at least nine buildings of six apartments each to meet the current housing demand.

c) Shaft Machinery. A double drum hoist for 300 meters depth is being considered at a cost of \$271,000. Two pumps are necessary for the sump at a cost of \$14,750 each.

Appendix F details all these calculations and shows replacement mine machinery, plant machinery, and transportation units calculations.

4.2.4.2 Capital Investment for 850 d.s.t./day

a) School. It is assumed that the same investment as for 700 dry short tons/day will suffice.

b) Housing. The expansion will increase the number of workers from 426 to 486 (see Tables 3 and 5). In addition to the nine new buildings currently required, nine additional buildings will be needed. Nine buildings will be built in the first year and nine in the second year, with an escalation cost of 5%.

c) Hospital. Since the beginning of operations CMBSA has been using a small building as a hospital. The additional labor force will make it necessary to build a new hospital.

d) Mercantile. Because the old mercantile has remained inside the operations area, it will be necessary to build up

a new mercantile within the camp area.

e) Shaft Machinery. The same investment as for the current level of production will apply.

f) Mine Machinery. As was indicated in Chapter 3, the need for compressed air is about 9 cubic feet per minute per ton produced. Since production is going to be 850 dry short tons/day, compressed air needs will be 7650 cubic feet per minute. It was pointed out earlier that the availability of compressed air is 7495 cubic feet per minute, a deficit of 155 units. It will be necessary to purchase a new 1000 cubic feet per minute Ingersoll Rand compressor.

g) Plant Machinery. The concentrator plant has sufficient capacity in crushing and grinding operations to treat 850 dry short tons/day. Appendix G details all these calculations and shows replacement mine machinery, plant machinery, and transportation units calculations.

4.2.4.3 Capital Investment for 1000 d.s.t./day

a) School. No additional increase in capital expenditure over that required for 850 dry short tons/day is necessary.

b) Housing. Given the increased number of workers it will be necessary to build 27 new buildings of 6 apartments each.

c) Hospital. The amount of investment is the same as

for 850 dry short tons/day.

d) Mercantile. No additional increase in capital investment over that required for 850 dry short tons/day is necessary.

e) Hydroelectric Plant. As stated in Chapter 3, CMBSA in Uchucchacua uses diesel groups which have an excessive cost per kilowatt-hour. The other source of energy is the Paton hydroelectric plant, which currently is producing 1300 kilowatt. It is possible to expand its total generation power up to 3400 kilowatt by installing an additional turbine of 2100 kilowatt.

f) Shaft Machinery. Appendix H shows the calculations.

g) Mine Machinery. The most expensive acquisition is going to be a 2500 cubic feet per minute Ingersoll Rand compressor to ensure the normal flow of compressed air to the mine.

h) Plant Machinery. The major acquisitions in plant machinery for 1000 dry short tons/day are going to be a jaw crusher and a rod grinder. See Appendix H for replacement needs and costs of mine machinery, plant machinery, and transportation units.

4.2.4.4 Capital Investment for 1200 d.s.t./day

a) School. Given an increase in the number of students it will be necessary to build a 6500 square meter school

facility.

b) Housing. The need for new housing will require 45 buildings of six apartments each.

c) Hospital. A 3500 square meter hospital will be required.

d) Mercantile. A 1500 square meter mercantile will be needed to satisfy camp population requirements.

e) Shaft Machinery. A most powerful double drum hoist must be acquired to fulfill the increased demand for ore tonnage by the concentrator plant.

f) Disposal Dam and Other Needs. Requirements for this level of production include construction of a new disposal dam and enlargement of the concentration and leaching plant buildings to lodge the new equipment.

g) Mine Machinery. The most significant acquisitions will be two Ingersoll Rand 2500 cubic feet per minute compressors.

h) Plant Machinery. The most expensive purchases, among other items, will be a 5 feet cone crusher, a 9 1/2 feet x 12 feet rod grinder, and a filter.

See Appendix I for replacement needs and costs of mine machinery, plant machinery, and transportation units. A summary showing the capital investment for the different alternatives is presented in Table 12.

Table 12
Summary of Capital Investment
(in US dollars)

		<u>Alternatives</u>			
		(d.s.t./day)			
		<u>700</u>	<u>850</u>	<u>1000</u>	<u>1200</u>
	<u>Year</u>				
School	1	---	---	---	---
	2	608,580	608,580	608,580	1,177,312
Housing	1	745,200	745,200	1,117,800	1,863,000
	2	---	782,460	1,173,690	1,956,150
Hospital	1	---	459,200	459,200	824,750
	2	---	---	---	---
Mercantile	1	---	---	---	---
	2	---	181,125	181,125	271,687
Hydroelec- tric Plant	1	---	---	1,443,425	1,443,425
	2	---	---	---	---
Shaft Machinery	1	346,500	346,500	346,500	427,250
	2	---	---	---	---
Mine Machinery	1	---	234,050	503,800	868,650
	2	---	---	---	---
Plant Machinery	1	---	205,150	835,700	1,439,750
	2	---	---	---	---
Waste Dam	1	---	---	---	1,466,250
	2	---	---	---	---
Total		1,700,280	3,562,265	6,669,820	11,738,224

4.3 Financial Analysis

This section will describe the development of the financial analysis program and its assumptions. The objective of the model is to evaluate the net present value obtained from different combinations of reserves tonnage, cut-off grade, average grade, capital investments, operating costs, and recoveries. The production level which offers the highest net present value will be selected as the optimal.

Lotus 1-2-3 (electronic worksheet), a personal computer program, was used to perform the runs. A model was developed for each of the four production levels.

4.3.1 Parameters of the Models

The models begin with a "Data Table" (see Table 13) that contains parameters for which values can be changed for different runs. The investment schedule is used as input and the program will calculate and set escalated replacement values for mine machinery, plant machinery, and transportation units for five year periods.

4.3.2 Steps in the Model Program

The general procedure followed in the model is as follows:

- a) Enter input values for each parameter in the "Data Table."

Table 13
Input Data Table

D A T A T A B L E

Tons/day
 Ag Average Grade (oz/st)
 Pb Average Grade (%)
 Cut-Off (oz/st)
 Reserves (st)
 Ag Recovery (%)
 Pb Recovery (%)
 Concentration Ratio
 Leaching Ratio
 Ag Price (\$/oz)
 Pb Price (\$/lb)
 Plant Availability (%)
 Annual Production (st)
 Ag Price Escalation (%)
 Pb Price Escalation (%)
 Treatment Cost Escalation (%)
 F,S.& W Escalation (%)
 Penalties Escalation (%)
 Mine Life (years)
 Sales Taxes (%)
 Export Taxes (%)
 Royalties (%)
 Production Costs (\$/st)
 Administrative Costs (\$/st)
 Financing Costs (\$/st)
 Total Operating Costs (\$/st)
 Depreciation Costs (\$/st)
 Operating Cost Escalation (%)
 Mineral Rights (\$)
 Ore Founded Ratio (st/mt)
 Exploration Cost (\$/mt)
 Average UIT Value (\$)
 Selectivity Index
 Liquid Participation (%)
 Property Participation (%)
 Inge~~met~~ (%)
 Inflation Rate (%)
 Constant Discount Rate (%)
 Escalated Discount Rate (%)

- b) Input investment schedule.
- c) The program calculates
 - c.1) a metallurgical report;
 - c.2) a production schedule table where the amount of annual reserve and production is obtained, as well as escalated metal prices;
 - c.3) net smelter return. The net value of one ton of leaching concentrate is obtained using the found concentrate composition;
 - c.4) depreciation amounts. Using the investment schedule data, the program obtains the depreciation values from each investment made in each year and sums them by year;
 - c.5) cash flows;
 - c.6) net present value. Using 1-2-3 formula NPV and the escalated discount rate, the program finds the net present value for the production level case.
- d) The program prints-out all the input and output values and tables.

4.3.3 Tonnage, Cut-Off Grade, and Average Grade

The tonnage, cut-off grade, and average grade are based on Table 14. For the purpose of the financial analysis, cut-off grade will remain constant throughout the case

Table 14
 Tonnage, Cut-Off Grade and Average Grade
 Distribution

<u>Case</u>	<u>Tonnage</u> (d.s.t.)	<u>Cut Off Grade</u> (Ag oz/d.s.t.)	<u>Average Grade</u> (Ag oz/d.s.t.)	<u>Fine Content</u> (Ag oz)
1	3,600,000	4.0	11.75	42,300,000
2	3,100,000	5.0	12.25	37,975,000
3	2,600,000	6.0	12.90	33,540,000
4	2,150,000	7.0	13.75	29,562,500
5	1,750,000	8.0	15.00	26,250,000
6	1,500,000	9.0	15.75	23,625,000
7	1,350,000	10.0	16.25	21,937,500

Source: Bermudez, Carlos, 1984, "Cubicacion de Mineral Unidad Uchucchacua", Lima, CMBSA.

evaluation's life, and the ore grade exploited will be the average grade.

4.3.4 Metallurgical Considerations

Since the concentrator plant never runs at full capacity during its annual operation because of failures, strikes, and the maintenance schedule, a plant availability factor has to be found using existing Uchucchacua data.

Routine Maintenance: 15 hours/month	180 hours
General Maintenance: 1 day/year	24 hours
Strikes: 10 days/year	240 hours
Mechanical failure: 6 hours/month	72 hours
Electrical failure: 6 hours/month	<u>72 hours</u>
Total hours/year (Paz 1984):	588 hours

Thus, the total number of days that the concentrator plant does not work during a year is 24.5.

The plant availability factor is then

$$(365 \text{ days/year} - 24.5 \text{ days/year}) / 365 \text{ days/year} = 0.9329.$$

The metallurgical report indicates the composition of the concentrate, for each daily production tonnage entered, current and expanded, whichever is the case.

For simplification, the concentration ratio and leaching ratio will remain constant at 11.5 and 1.3, respectively. The silver recovery will be varied from 79.5% in case 1 to 80.1% in case 7, since the higher the average grade, the higher the recovery. The lead recovery will

remain constant at 82% because its importance is negligible in the net smelter return context.

At this point the evaluation program is able to escalate both silver and lead prices separately at given rates. During the evaluation analysis an escalation factor is considered of 5% yearly in both variables. Net smelter return calculations are based on the selling contract between CMBSA and Asarco. Details are shown in Appendix J. The model considers independent escalation rates for treatment costs, penalties costs, insurance, freight, shipment, and warehousing.

4.4 General Considerations in Cash Flow Calculations

The following paragraphs explain the steps in the cash flow calculation.

4.4.1 Gross Income, Sales and Export Tax, and Gross Sales

Gross Income is calculated by multiplying the net value of a ton of leaching concentrate per year by the number of tons of leaching concentrate produced during the same year. Sales taxes are obtained by taking 5% of Gross Income. This amount can be used later as a credit against Income Taxes. Export taxes equal 2% of Gross Income. Gross Sales is the result of subtracting Sales Tax and Export Tax from Gross Income.

4.4.2 Royalties, Operating Costs, and Gross Profits

Peruvian regulations state that royalties to be paid by the assignee to the assigner will not exceed 10% of Gross Sales. Given that Uchucchacua's concessions belong to CMBSA, any royalties are paid, so they have been omitted.

Likewise the evaluation program considers an escalation of 5% per year of operating costs. This number could be changed according to input data. Another feature of the program is that as soon as expanded production starts at the beginning of third year, it takes into account the expanded production operating costs, because in previous years it has been taking operating costs of 700 dry short tons/day.

Gross Profits is obtained by subtracting Royalties and Operating Costs from Gross Sales.

4.4.3. Depreciation and Depletion

Depreciation calculations are based on percentage depreciation assets shown on page 23.

Currently CMBSA owns the Uchucchacua Mine because it made a mining claim. No acquisition was involved and therefore, acquisition costs have been neglected and depletion is nil for the financial analysis. Another reason for not considering depletion allowance is that CMBSA has been working in Uchucchacua for approximately 10 years and

the fees due to the mining claim have already been depleted. However, the evaluation program can consider a depletion allowance only with a change in the input data.

4.4.4 Taxable Income, Income Tax, and Investment Tax Credit

Taxable income is obtained by subtracting Depreciation, Depletion, Exploration Amortization, and Development Amortization from Gross Profits.

Income tax is regulated by a scale ranging from 30% to 55% of the taxable income. It can be obtained from a table included in the program. As shown earlier, the average value of a UIT since 1981 is \$1,066.50 and it is assumed that this equivalence will be constant in upcoming years.

When taxable income is equal to or less than zero, income tax also will be zero because there is no other corporate income against which to credit income tax. Peruvian promotion regulations require payment of only 2/3 of ordinary income tax for expansion projects which increase their fine content production over 20%.

The mining tax credit allows reinvestment to be credited against income taxes for the year in which they were made, with the possibility of carrying forward the unused portion of the credit for another two years.

The cash flow does not include Investment Tax Credit Recapture since the General Mining Law, Legislative Decree

109, allows it only when the asset is transferred before its 90% depreciation is completed. The available Investment Tax Credit is calculated as follows:

$$\begin{aligned} & (\text{Income Tax/Taxable Income}) \times (\text{Taxable Income} - \text{Income Tax}) \\ & \quad \times \text{Selectivity Index} = \text{Available ITC} \end{aligned}$$

The selectivity index is an index prescribed by the government which in the case of mining is 1.

4.4.5 Net Income, Worker Participation, and INGEMMET Fee

Net Income is obtained by subtracting Income Tax from Taxable Income and adding Sales Tax plus Investment Tax Credit. The mining enterprise deducts yearly 4% and 6% of its Net Income as liquid and property participation, respectively, for its workers.

Also, any holder of a mining activity deducts 1% from his Net Income after applying the Income Tax for the maintenance of INGEMMET, the national geological, mining, and metallurgical research institute.

4.4.6 Net Profit, Capital Costs, and Working Capital

The difference between Net Income and the sum of Liquid Participation, Property Participation, Research and Development is Net Profit. In this study, it is assumed that the full amount of capital cost is 100% equity, and that for

cash flow calculations, capital cost represents the sum of investment and replacement investment. The expansions are considered to begin in the third year, given that during the first two years the preproduction expansion investment will be made.

The evaluation program considers working capital as the amount equivalent to 60 days of operating cost in the first year. The same amount will be returned at the end of the project life. For the purpose of this study, salvage cash flow has been neglected.

4.4.7 Net Cash Flow and Discount Rates

To calculate Net Cash Flow, it is necessary to add Depreciation, Depletion, Exploration Amortization, Development Amortization, and Salvage Cash Flow to Net Profit and subtract from that figure the sum of Capital Costs and Working Capital.

Since the evaluation study is based on escalated dollars, it is necessary to utilize an escalated discount rate. Using the formula $(1+i)=(1+f)(1+i')$ where i is escalated discount rate, i' is constant discount rate, and f is inflation rate. In the financial analysis, 4% is utilized as the inflation rate, and 8% as the constant discount rate.

CHAPTER 5

RESULTS, SENSITIVITY ANALYSIS, AND CONCLUSIONS

5.1 Introduction

A mining company investigating an expansion production program must determine which alternative will be most valuable for its mining operation. Finding the investment amount which will produce a positive present value when it is applied to the deposit is not enough. To take maximum advantage, the company must find the investment outlay that will result in the greatest difference between the present value of the income and the present value of the investment; in other words, the highest net present value. In the same way, the optimum cut-off grade is that cut-off which gives the property the highest net present value. This means that optimum size and cut-off grade are not independent and have to be solved simultaneously (Douglas 1971).

5.2 Net Present Value Results

Table 15 contains results from runs of the computer program for 700, 850, 1000, and 1200 dry short tons per day, where silver average grade, cut-off grade, reserves, silver recovery, operating cost, capital investment, and tax changes. The values in Table 15 are graphically represented in Figures 8, 9, 10, and 11.

Table 15
 Net Present Value
 (in 1,000 US dollars)

<u>Cut-Off</u> (Ag oz/ d.s.t.)	<u>Alternatives</u> (d.s.t./day)			
	<u>700</u>	<u>850</u>	<u>1000</u>	<u>1200</u>
4	25,272	29,820	34,240	33,448
5	26,611	31,170	34,735	33,856
6	28,109	32,471	35,028	34,932
7	28,397	33,995	36,793	36,140
8	29,012	35,553	38,353	36,957
9	28,234	34,886	36,722	35,256
10	27,483	33,772	35,421	33,264

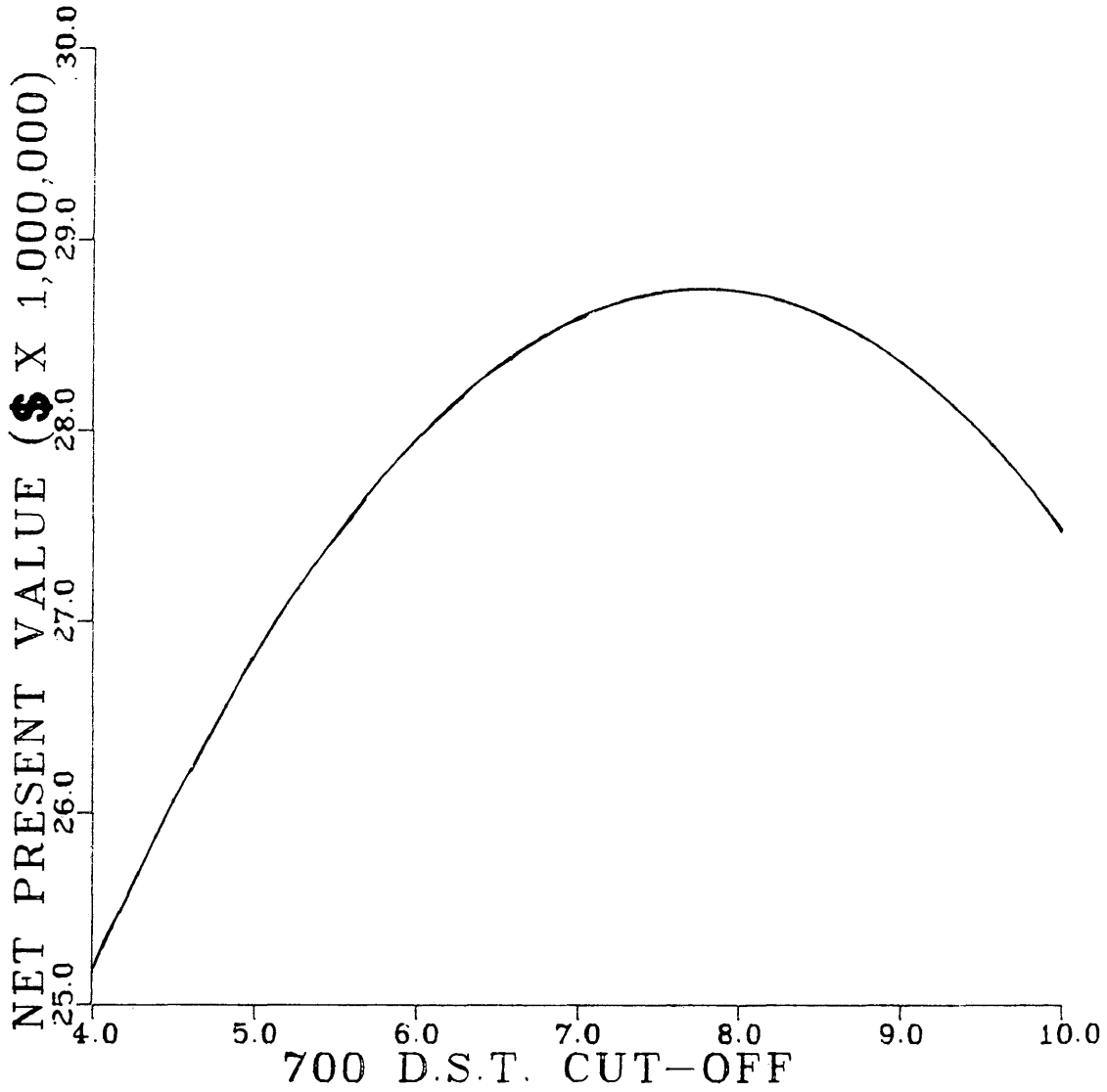


Figure 8
Net Present Value Variations
700 d.s.t./day Cases

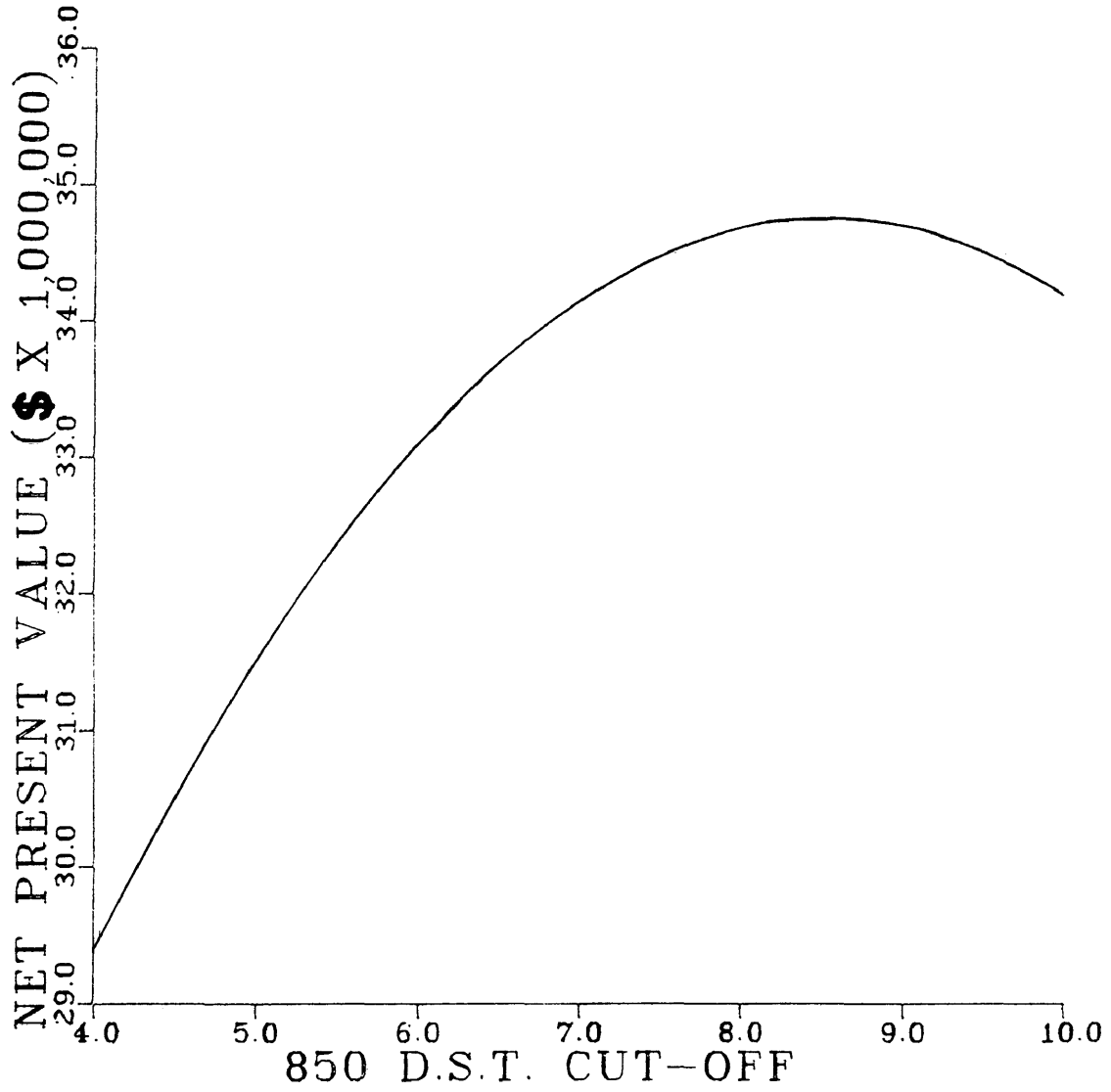


Figure 9
Net Present Value Variations
850 d.s.t./day Cases

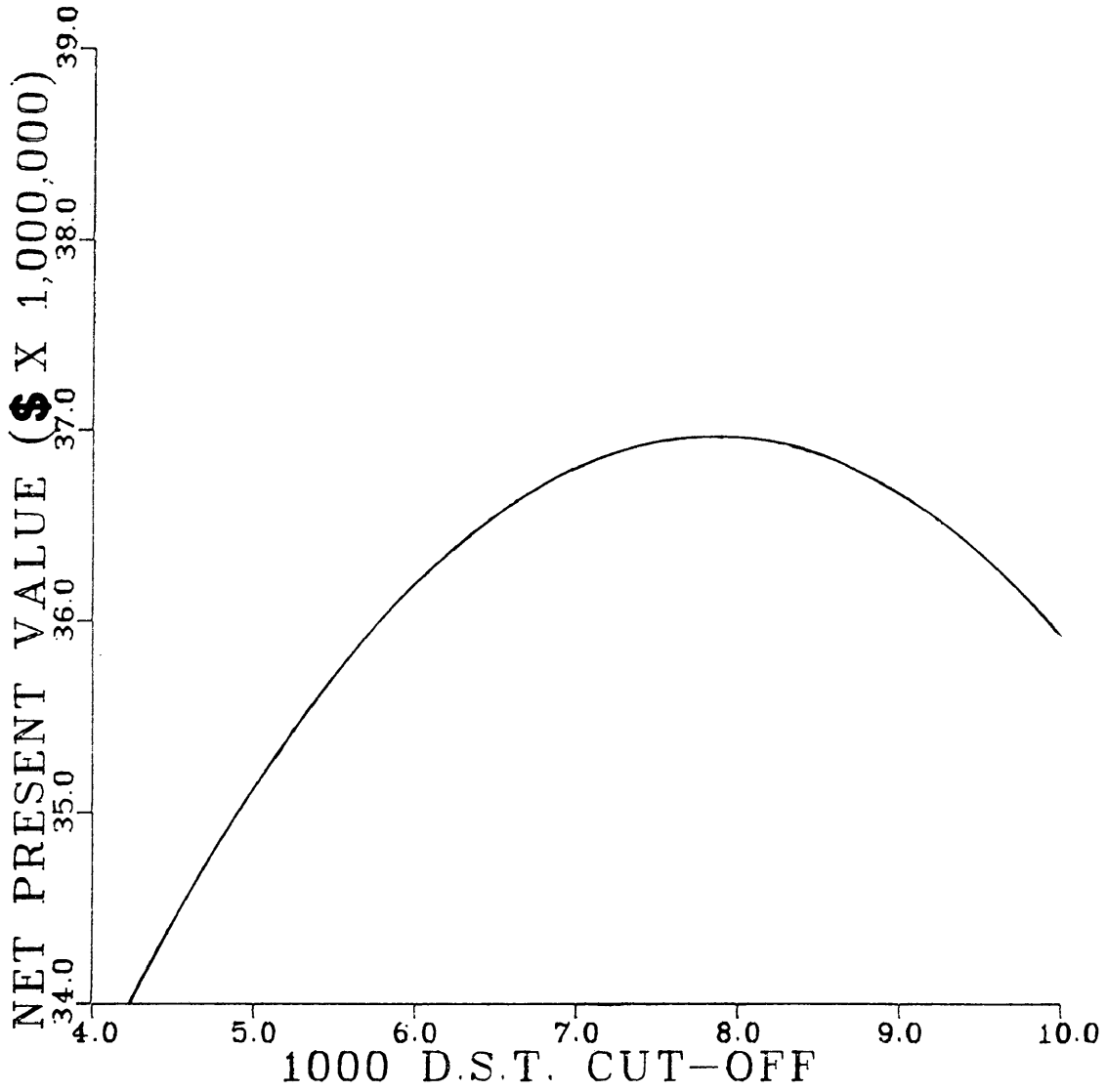


Figure 10
Net Present Value Variations
1000 d.s.t./day Cases

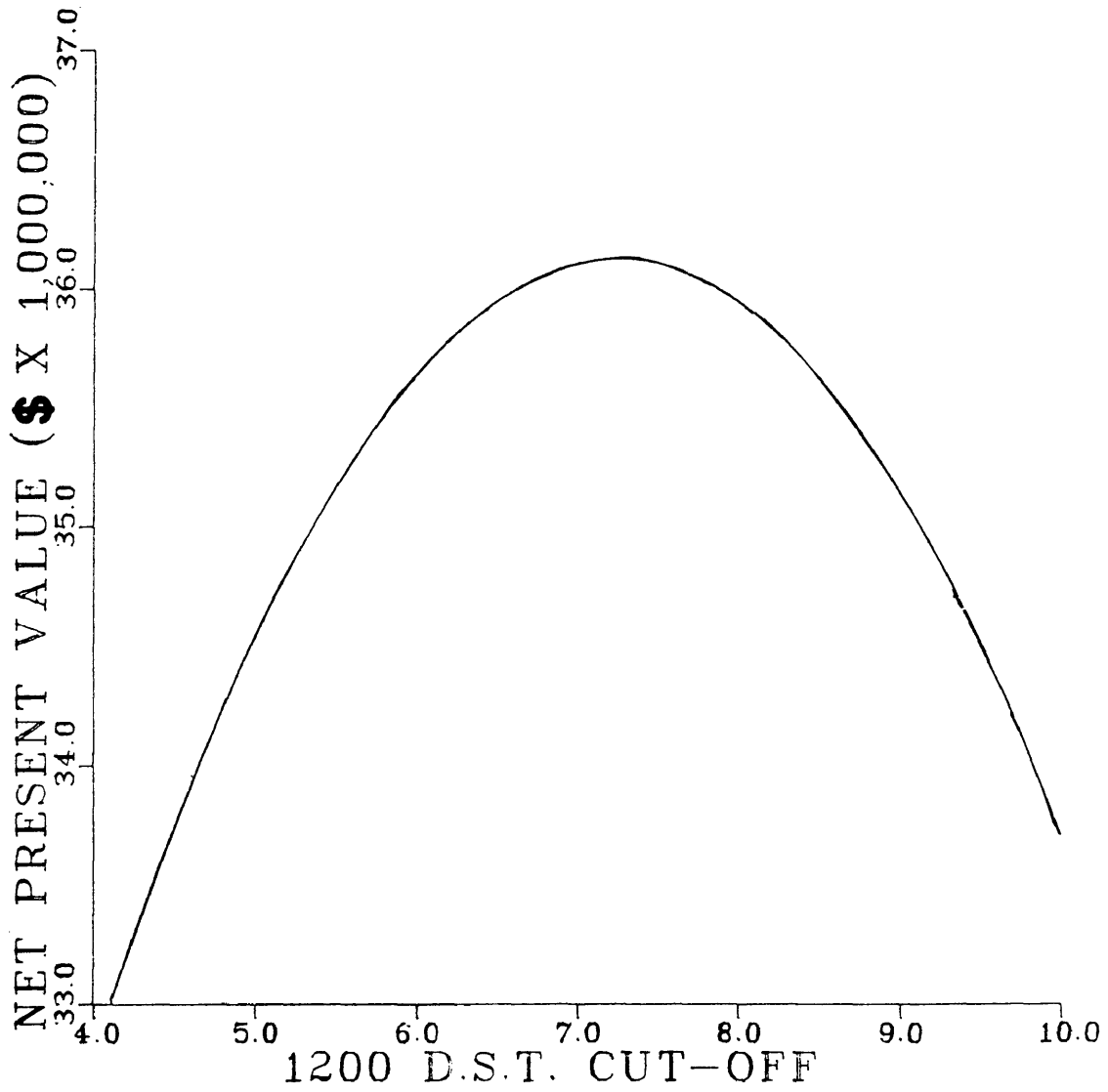


Figure 11
Net Present Value Variations
1200 d.s.t./day Cases

The highest net present value for the four evaluated production levels are as follows:

<u>Daily Production</u> (d.s.t.)	<u>Highest NPV</u> (1000 x \$)	<u>Cut-Off Grade</u> (Ag oz/ton)
700	29,012	8.0
850	35,553	8.0
1000	38,353	8.0
1200	36,957	8.0

Figure 12 shows that the highest net present value, \$38.353 million at a production level of 1000 dry short tons per day, corresponds to a cut-off grade of 8 ounces, a reserve of 1,750,000 dry short tons, a silver average grade of 15 ounces, and a project life of 5.74 years. Appendix K contains the computer runs of highest net present value for each alternative.

5.3 Sensitivity Analysis

Sensitivity analysis is a means of evaluating the effects of uncertainty on investment by determining how an investment alternative's profitability changes as a particular parameter varies. This type of analysis calls to the attention of the decision maker only those variables that could strongly affect the final outcome. Sensitivity analysis is frequently used to determine how much change in a variable would be necessary to reverse the decision based on average value estimates.

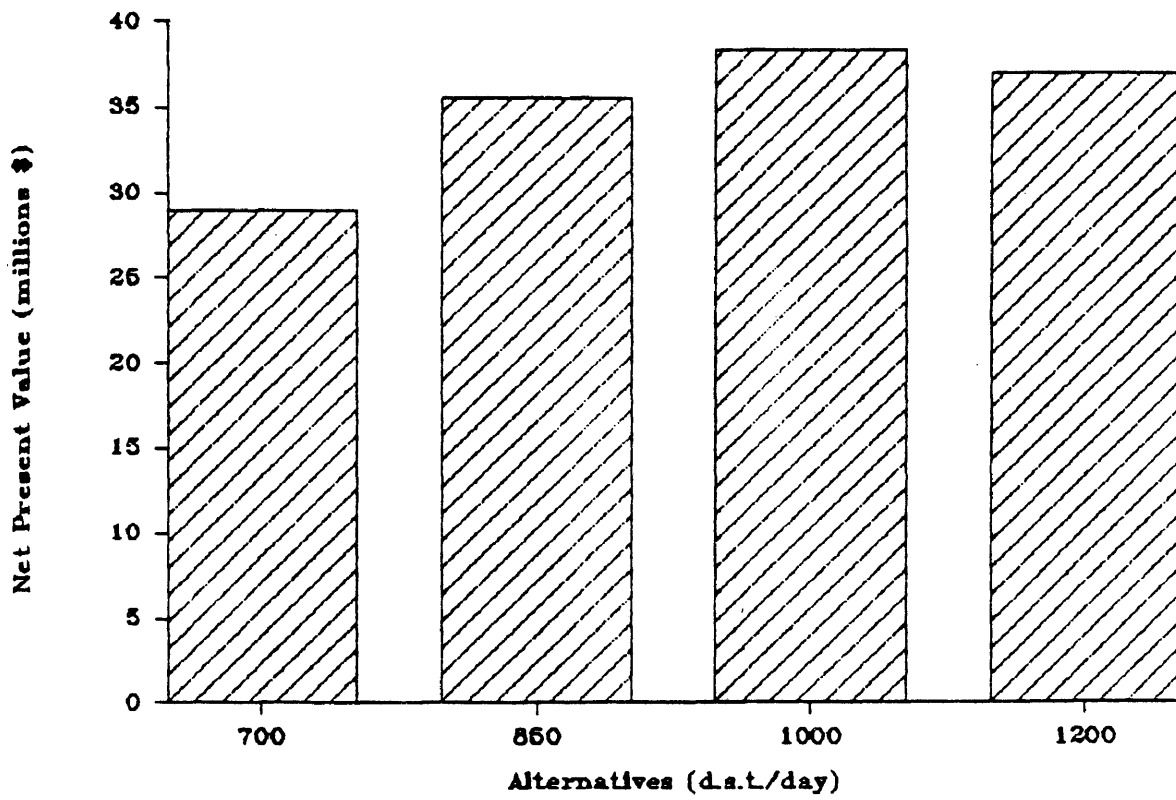


Figure 12

Highest Net Present Value

A variable is changed over successive calculations of the total outcome, and all other variables remain constant. The rate of change in the total outcome relative to the rate of change in the variable being considered will indicate the significance of this variable in the overall evaluation.

The intent is to rank these parameters by the magnitude of their effect on venture profitability and to identify those areas where refinement of technical and financial planning would be most beneficial to deposit exploitation (Stermole 1982). Figures 13 through 23 show variations in net present value caused by changes in parameters within realistic limits based on the author's work experience.

5.3.1 Silver Price

Silver price is one of the most sensitive parameters in the evaluation study. The greater the silver price, the higher the net present value, since silver price applies directly to gross income. Figure 13 shows the relationship between net present value and silver price. It is demonstrated in Appendix L that for an increment of 50% in price, net present value increases to 90%.

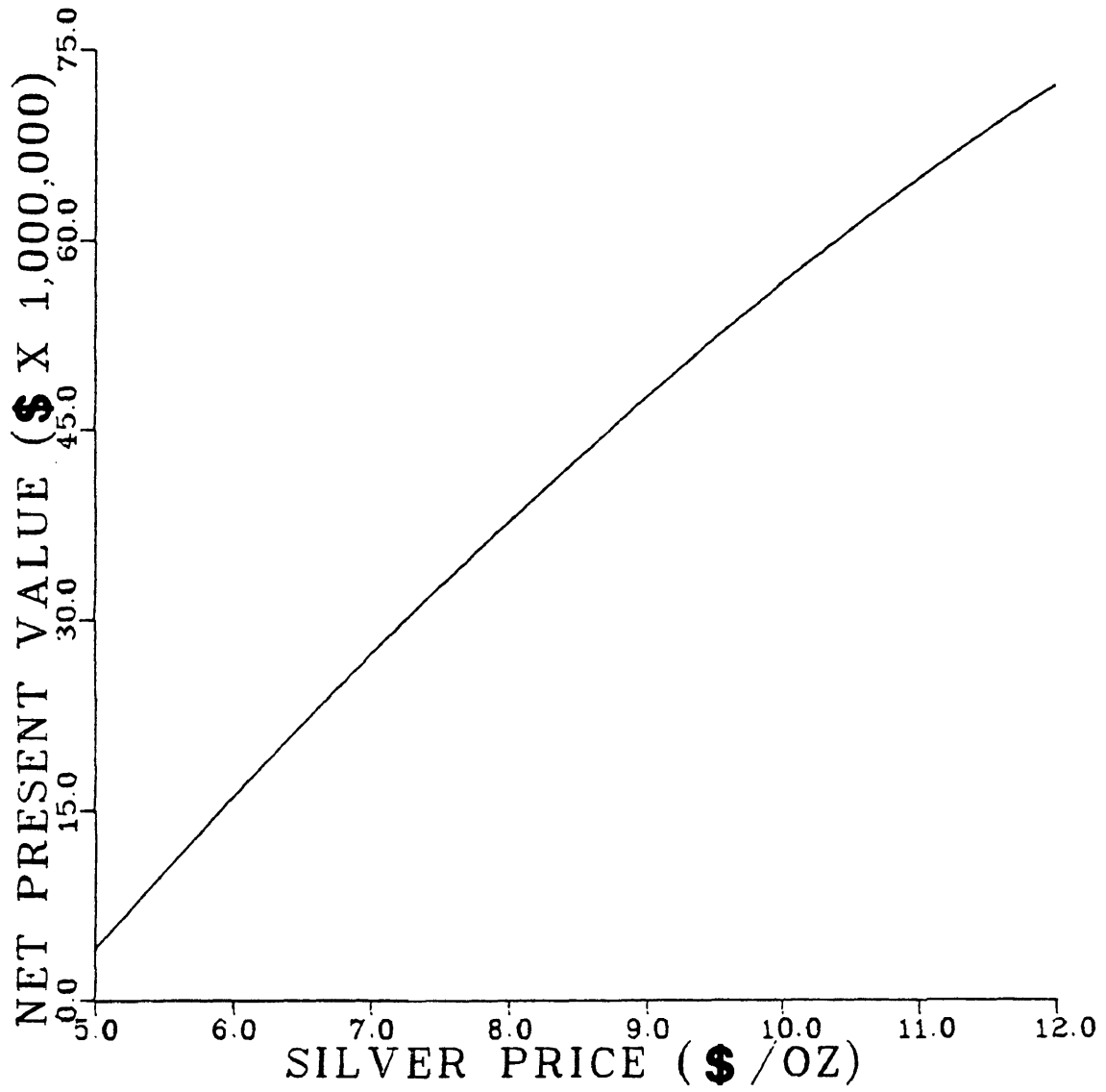


Figure 13
Relationship between Silver Price
and Net Present Value

5.3.2 Silver Recovery

Silver recovery, like silver price, is a very important parameter. Figure 14 shows an upward trend in net present value when silver recovery increases.

5.3.3 Silver Average Grade

As in previously discussed parameters, silver average grade and net present value have almost a linear variation, the greater the average grade, the higher the net present value. Figure 16 and Appendix L show that for an increase of 13% in average silver grade, net present value reports an increment of 123%.

5.3.4 Reserves

Reserves vary almost linearly with net present value. However its influence is not as great as might be expected because the reserves increment is going to be computed at the end of project life where cash flows do not have a great influence in present value computation. For instance, Figure 16 and Appendix L show that for an increment of 25% in reserves, there is an increase of 17% in net present value.

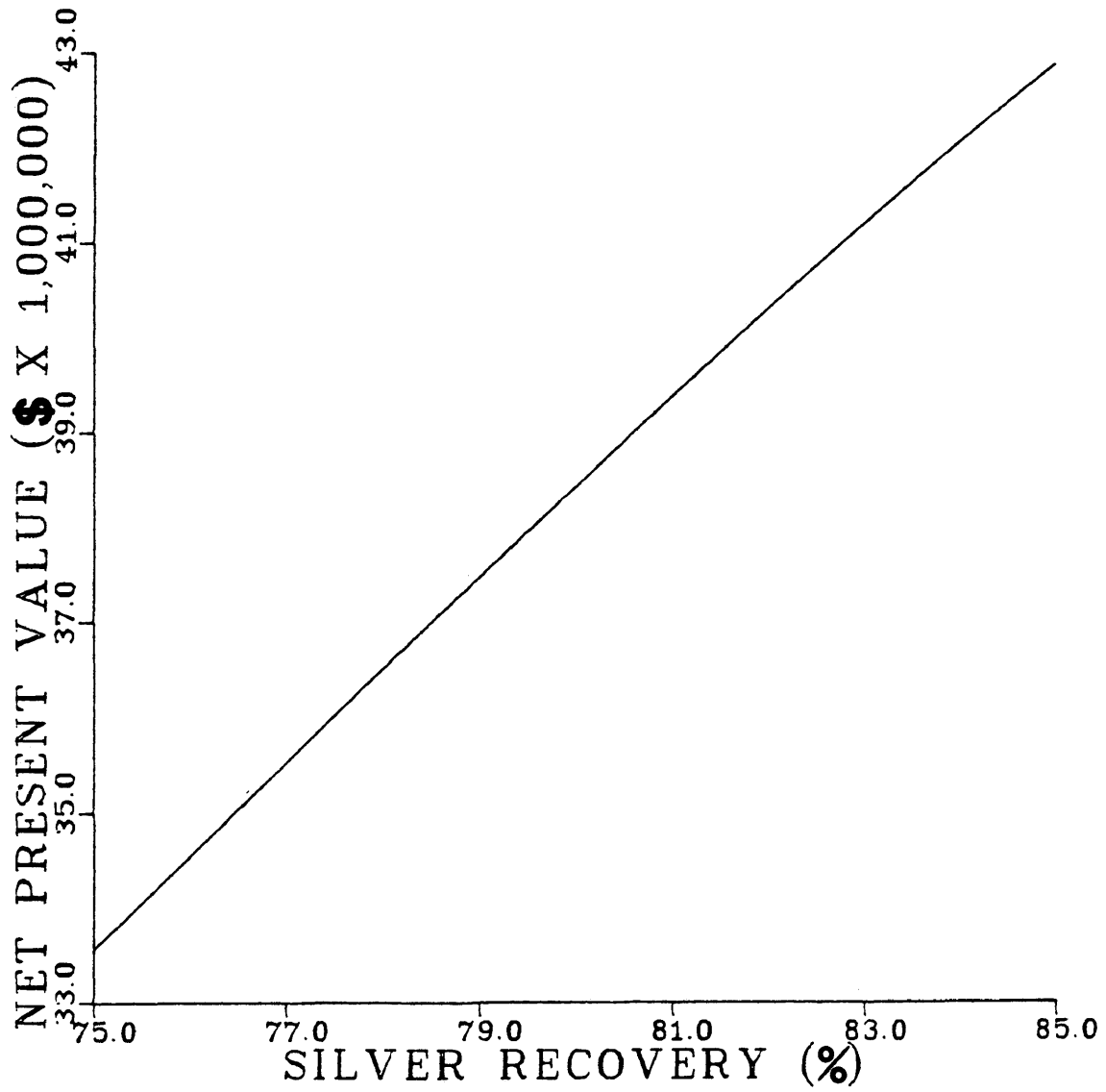


Figure 14
Relationship between Silver Recovery
and Net Present Value

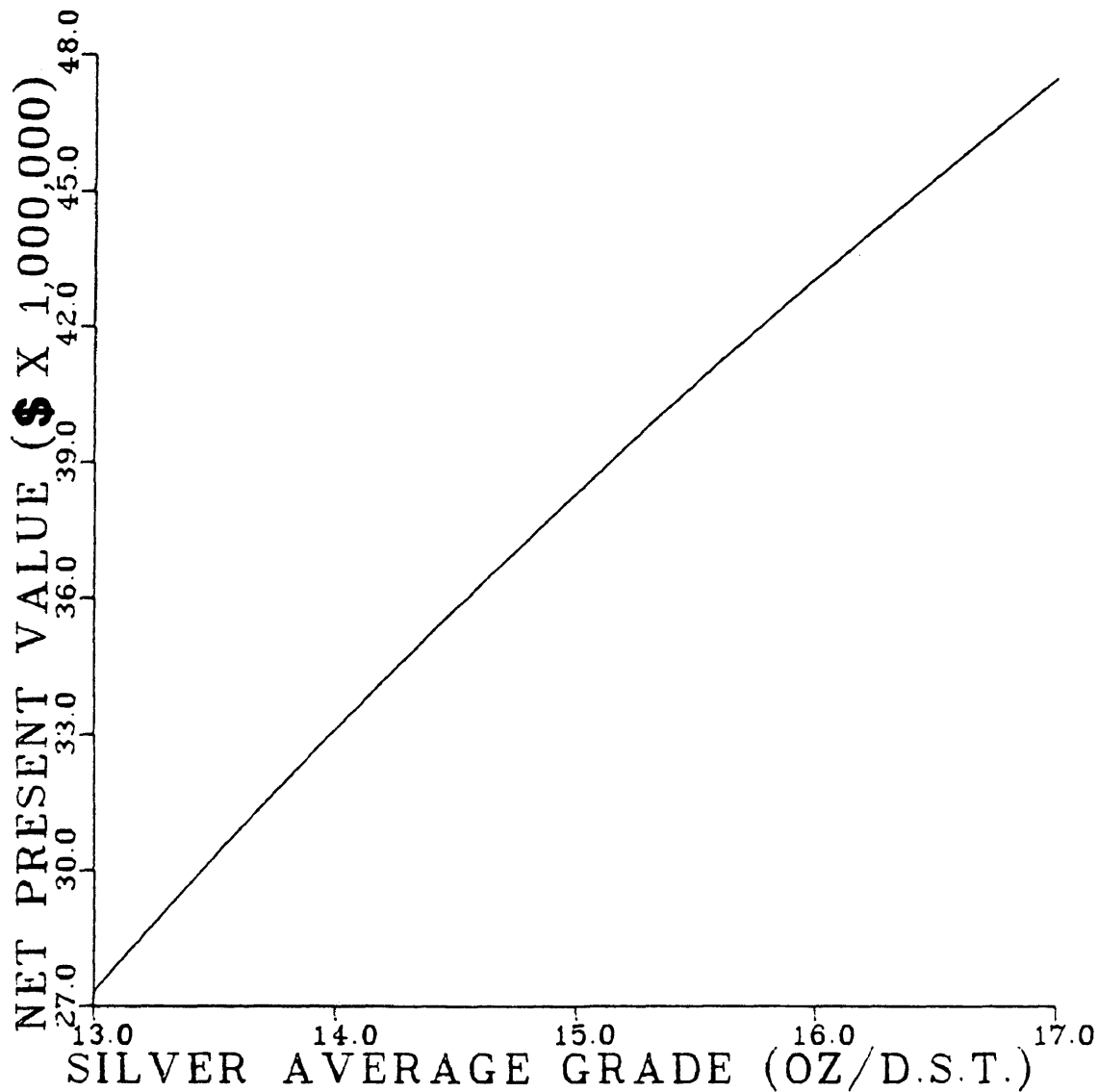


Figure 15
Relationship between Silver Average Grade
and Net Present Value

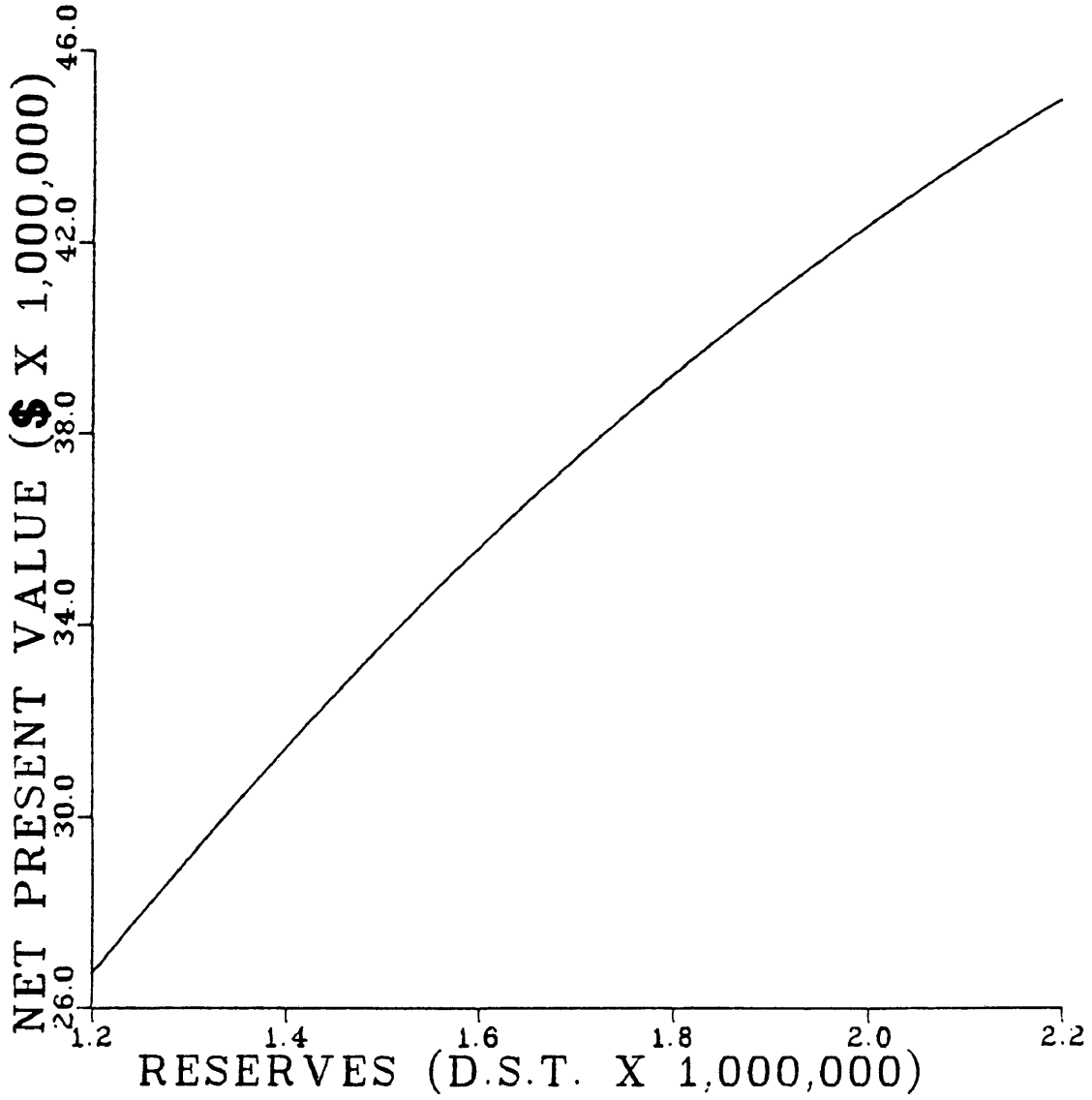


Figure 16
Relationship between Reserves
and Net Present Value

5.3.5 Inflation Rate and Discount Rate

The curve of the inflation rate as compared with the net present value has a downward trend as the rate of inflation increases, (see Figure 17). However, the relationship is not so important from a sensitivity viewpoint since an increase of 150% in the inflation rate causes only a decrease of 20% in net present value. Figure 18, as might be expected, shows a decrease of net present value as the discount rate increases.

5.3.6 Operating Costs

The higher the operating cost, the lower the net present value, (see Figure 19). Initial comparison suggests that a decrease in operating costs produces results similar to an increase in product price levels. Appendix L shows that a decrease of 25% in operating costs corresponds an increase of 15% in net present value.

5.3.7 Silver Price and Operating Cost Escalation

The relationship between silver price escalation and net present value is linearly upward, as is shown in Figure 20; conversely, the plot of operating cost escalation versus net present value, presented in Figure 21 is linearly downward. Increments in silver price escalation produce bigger changes in net present value than does the operating

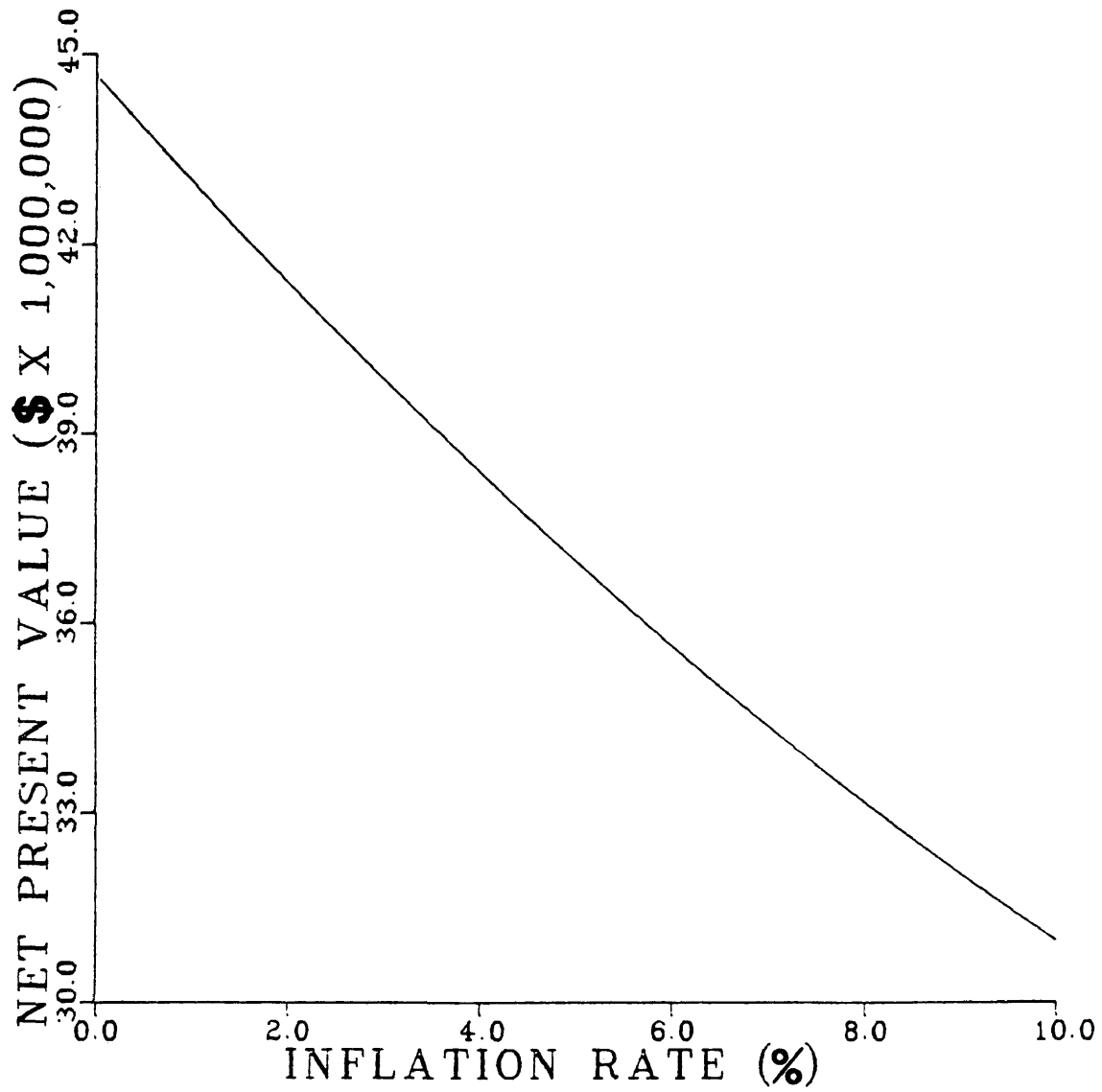


Figure 17

Relationship between Inflation Rate
and Net Present Value

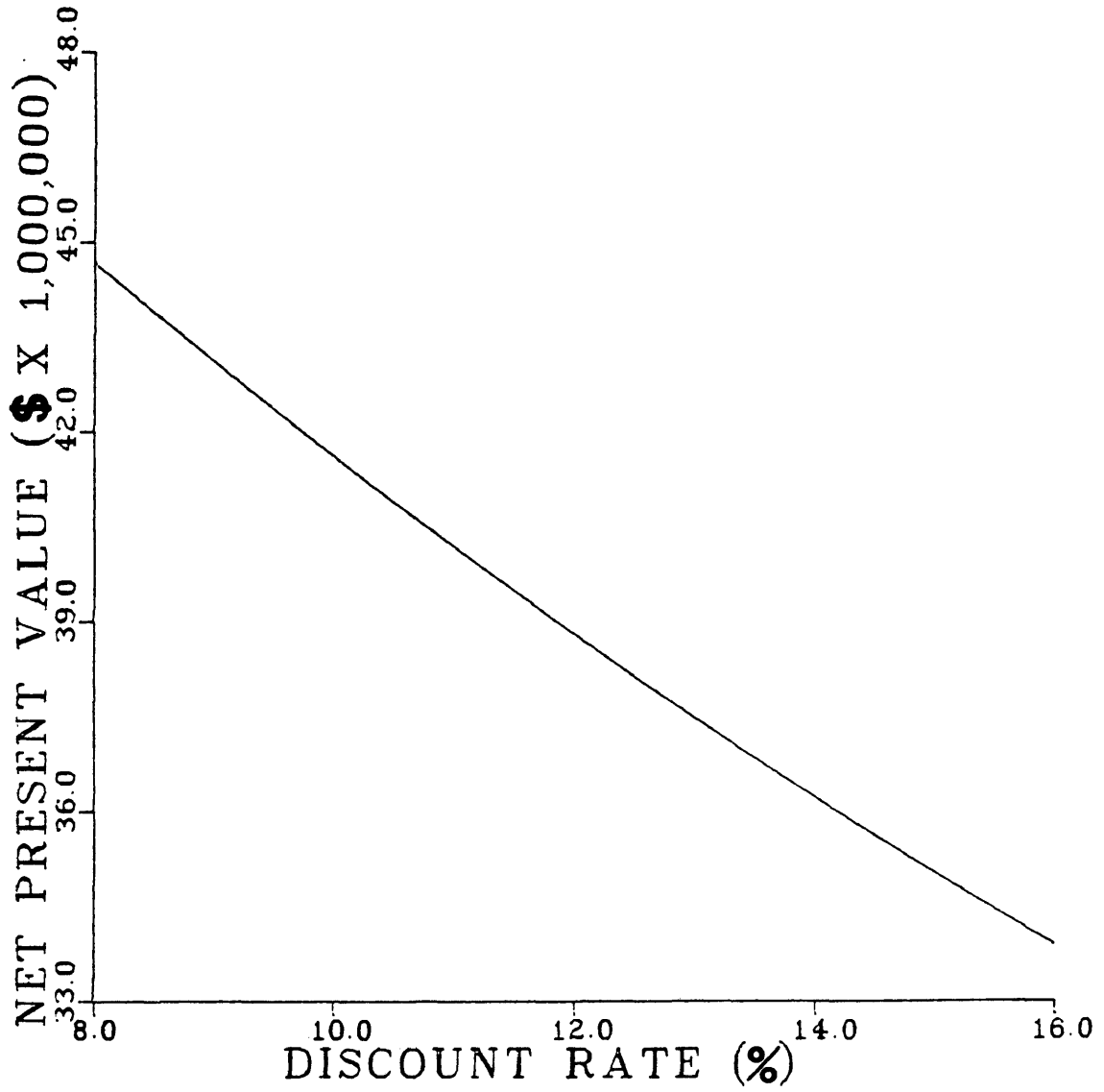


Figure 18
Relationship between Discount Rate
and Net Present Value

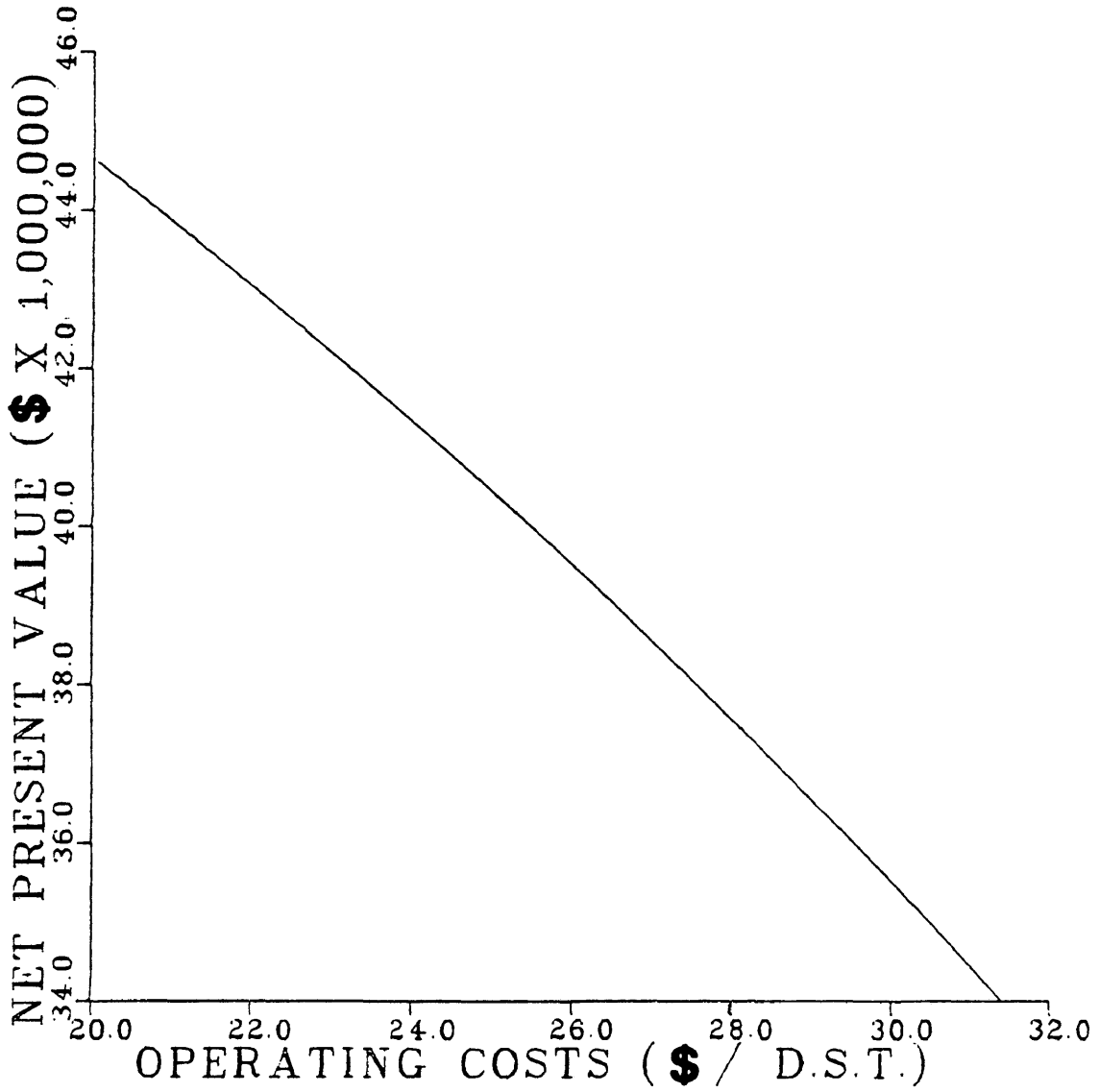


Figure 19
Relationship between Operating Costs
and Net Present Value

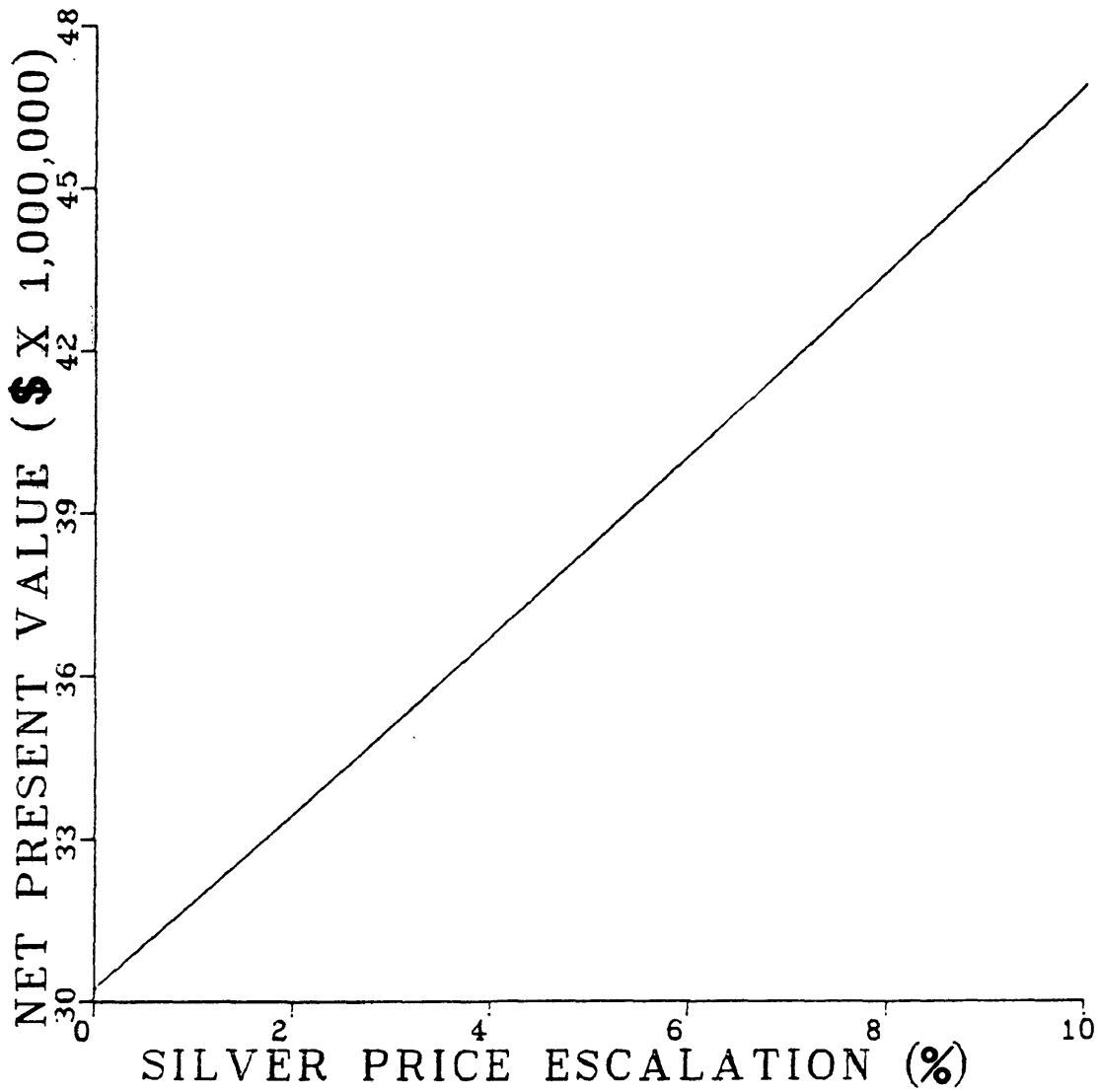


Figure 20

Relationship between Silver Price Escalation
and Net Present Value

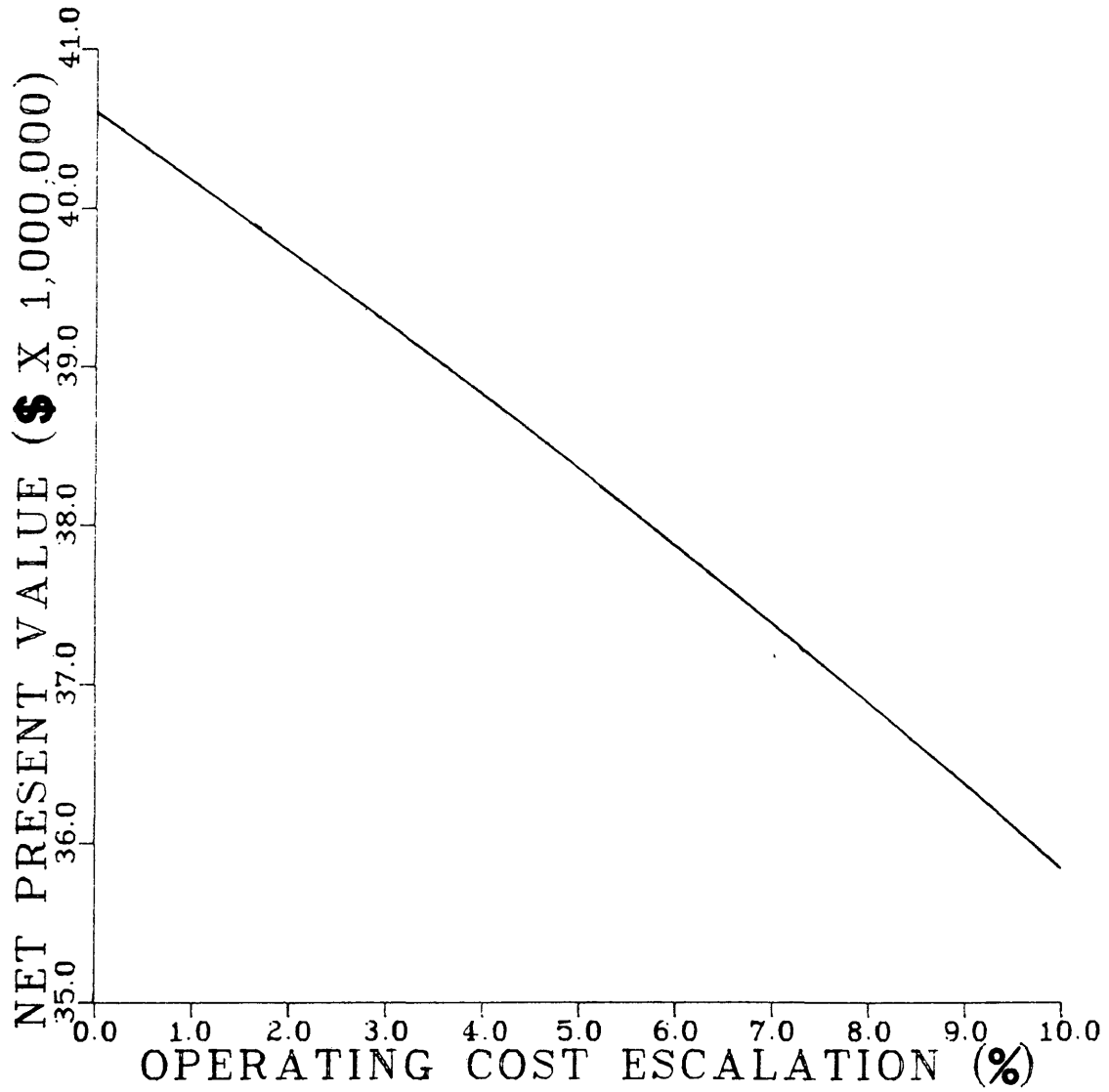


Figure 21

Relationship between Operating Cost Escalation
and Net Present Value

cost escalation.

5.3.8 Taxes

The Peruvian tax scale was presented earlier. By changing factors of the scale, such as 0.3, 0.4, 0.5, and 0.55, according to percentages presented in Appendix L, it is possible to conclude that taxes are not as sensitive as might have been expected. Figure 22 and Appendix L show that an increment of 75% in such factors causes a decrease of 14% in net present value.

5.3.9 Capital Costs

Surprisingly, capital costs do not affect net present value in as high a percentage as might be expected because items of cash flow such as investment tax credit, depreciation, and capital costs also vary and influence the outcome (see Figure 23).

5.3.10 Additional Parameters

Other parameters, such as lead price, lead price escalation, lead average grade, lead recovery, concentration ratio, leaching ratio, plant availability factor, average UIT value, and working capital, also have been studied in the sensitivity analysis. Appendix L contains the results. Table 16 presents a summary of the parameters of the sensitivity analysis.

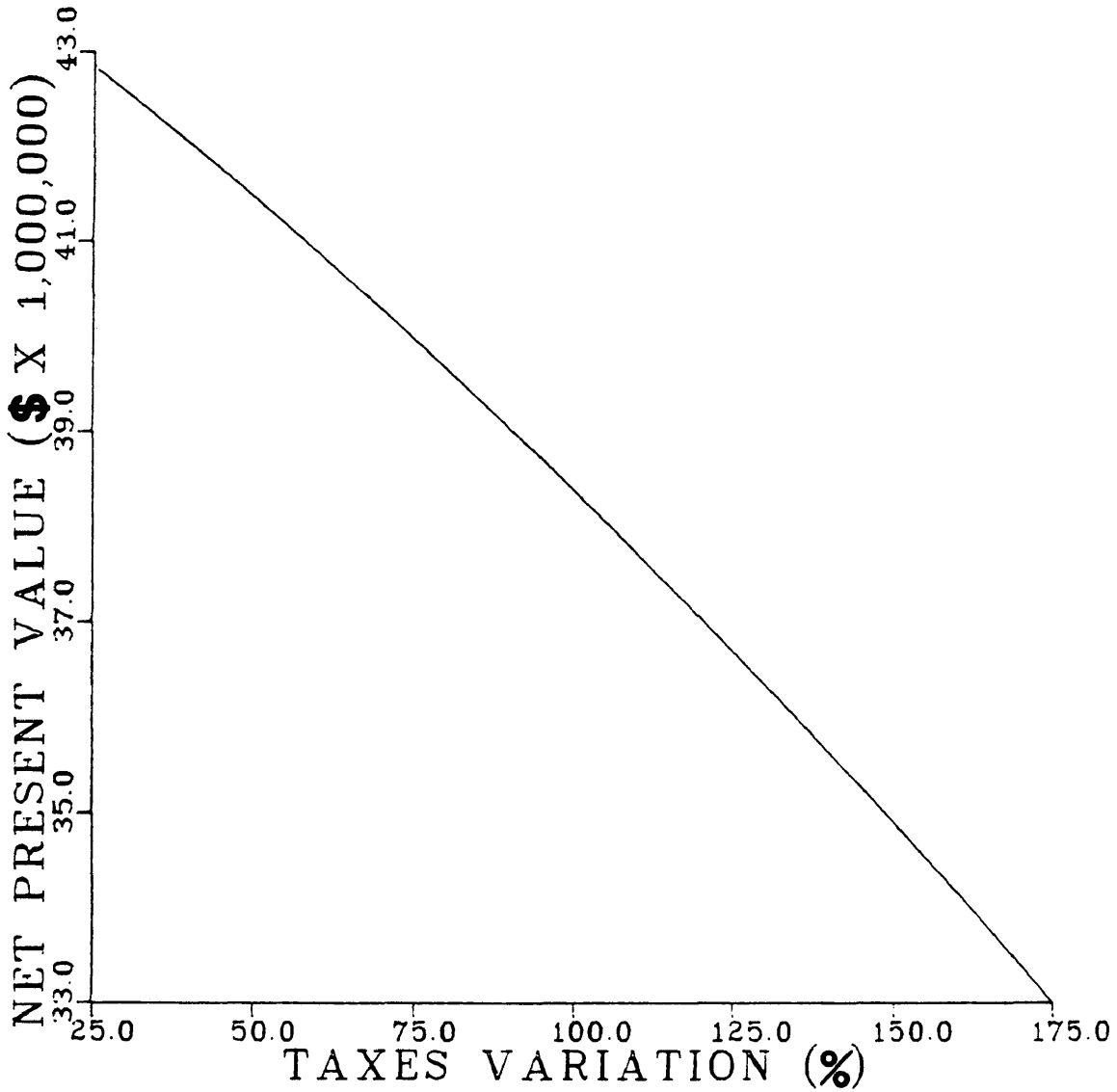


Figure 22
Relationship between Taxes
and Net Present Value

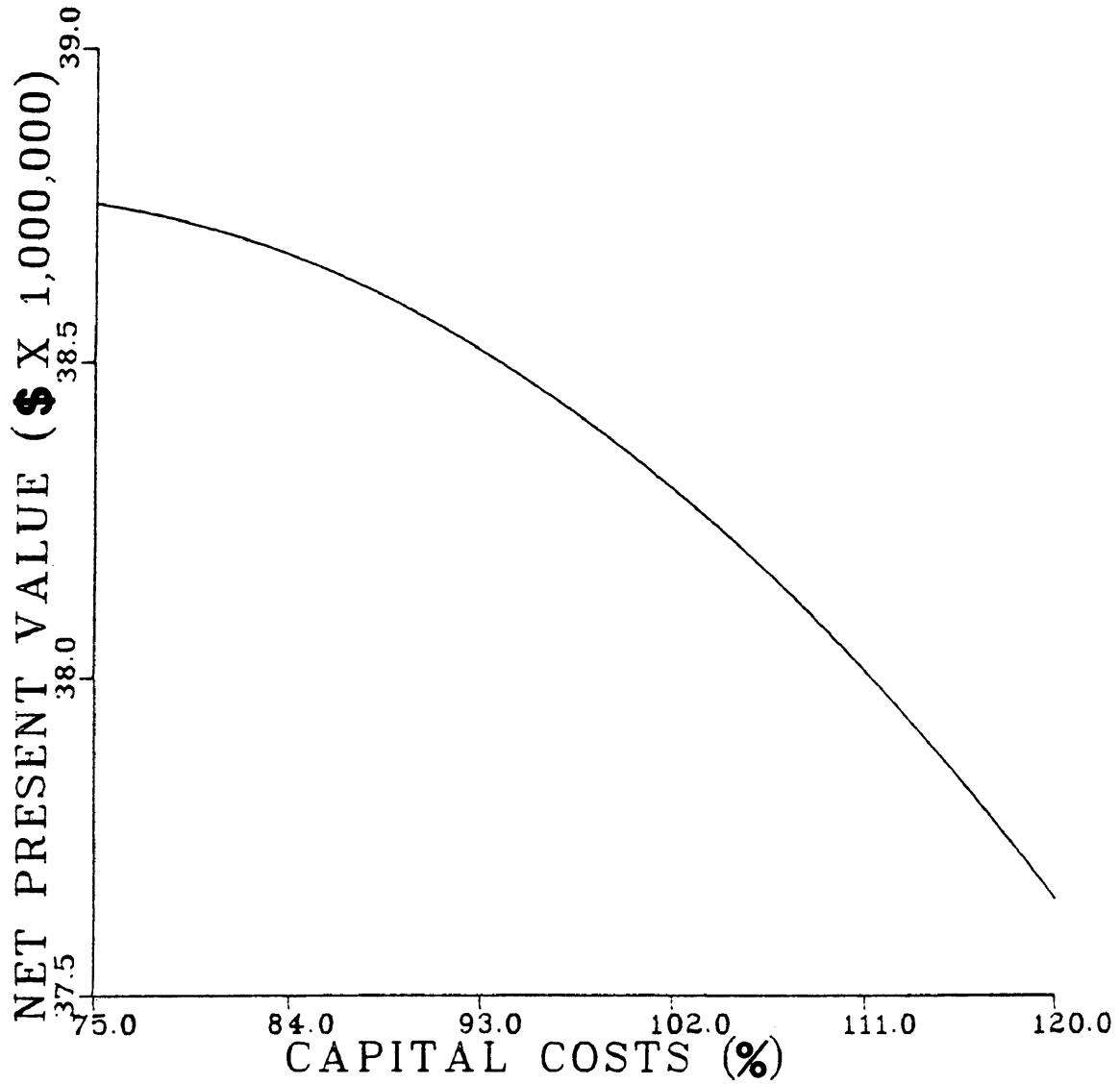


Figure 23

Relationship between Capital Costs
and Net Present Value

Table 16
Summary Results of the
Sensitivity Analysis

<u>Parameter</u>	<u>Percent Change in Parameter</u>	<u>Percent Change in Net Present Value</u>
Silver Price	+50.00	+90.38
Silver Recovery	+6.38	+11.79
Silver Average Grade	+13.33	+23.95
Operating Costs	+15.04	-11.02
Reserves	+25.71	+17.45
Discount Rate	+29.87	-11.66
Concentration Rate	+7.83	+2.74
Plant Availability F.	+7.53	+1.85
Silver Price Escalation	+100.00	+22.30
Leaching Rate	+53.85	+12.05
Taxes	+75.00	-13.87
Inflation Rate	+150.00	-19.30
Capital Costs	+20.00	-1.75
Working Capital	+20.00	-1.53
Lead Price	+41.67	+2.77
Operating Cost Escalation	+100.00	-6.56
Lead Recovery	+6.10	+0.31
Lead Average Grade	+5.56	+0.28
Average UIT Value	+17.21	+0.29
Lead Price Escalation	+80.00	+0.59

5.4 Conclusions

a) The best production expansion alternative is 1000 dry short tons per day because that production provides the highest net present value (\$38,353,323).

b) The optimum cut-off grade is 8 ounces of silver at an average price of \$8 per ounce, and operating costs of \$27.19 per dry short ton.

c) The best production expansion alternative and the optimum cut-off grade suggests a project life of 5.74 years, a total ore reserves of 1,750,000 dry short tons with an average silver grade of 15 ounces per dry short ton.

d) The best alternative requires a total investment of \$4,706,425 in the first preproduction expansion year, and \$1,963,395 in the second after escalation.

e) The production expansion alternative of 1000 dry short tons per day will receive a tax reduction allowance of one-third because the output will increase to over 20%, as called for in the Peruvian General Mining Law, Legislative Decree No. 109.

f) The second best production expansion alternative is 1200 dry short tons per day.

g) The three most sensitive parameters in the evaluation are silver price, silver recovery, and silver average grade.

h) The four least sensitive parameters are lead recovery, lead average grade, average UIT value, and lead price escalation.

5.5 Recommendations for Further Work

a) A study on the effects of operating cost on cut-off grade and their interrelation with average grade.

b) Additional sensitivity analysis on the combination of price and cost escalation, in the event of a strong price comeback.

c) Study on the effects of finding additional reserves.

LIST OF ABBREVIATIONS AND SYMBOLS

ASARCO: American Smelting and Refining Company
BISA: Buenaventura Ingenieros S.A.
CF: Cash Flow
CMBSA: Compania de Minas Buenaventura S.A.
FOB: Free on Board
FSW: Freight, Shipment, and Warehousing
IMAD: Additional Sales Tax
INGEMMET: Instituto Geologico Minero Metalurgico
ITC: Investment Tax Credit
IVEX: Export Sales Tax
IVIN: Internal Sales Tax
MT: Metric Ton
N/A: Not Available
NPV: Net Present Value
NSR: Net Smelter Return
PI: Profitability Index
PV: Present Value
UIT: Unidad Impositiva Tributaria

Ag: silver
cfm: cubic feet per minute
cu-ft: cubic feet
d.s.t.: dry short ton
hp: horsepower
i.e.: example
kw: kilowatt
kw-h: kilowatt-hour
lb: pound
mt: meter
m²: square meter
m³: cubic meter
No: number
%: percent
oz: ounce
Pb: lead
\$: US dollar

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APPENDIX A

Dispositions of the Peruvian General
Mining Law Legislative Decree No. 109

This Appendix contains the most important articles of the Peruvian General Mining Law Legislative Decree No.109

A.1 Mining Rights and Concessions

Article 8.- The exploration, exploitation, treatment, refinery, general works and mining transport activities are performed by local or foreign individuals or body corporates under the systems of mining concessions.

Article 9.- By virtue of the rights granted, the mining concessions are classified in: exploration, exploitation, treatment, refinery, general works, and mining transport.

Article 20.- According to the types of the substances, the concessions are classified as metallic, carboniferous, nonmetallic and geothermic. The metallic concessions include the auriferous and those of heavy minerals proceeding from detrital deposits. When the value of the gold production exceeds 50% of the total production value in a metallic concession, the concessionaire may apply for its qualification as gold bearing metallic and his incorporation into the regime of Decree Law Nr. 22178 Auriferous Promotion Law.

A.2 The State in the Mining Industry

Article 40.- Any corporation established in accordance with this Law wherein the State participates with a capital of not less than 25% together with national and/or foreign individuals and/or body corporates under private and/on intern public law, for the purposes of exercising any activity in the mining industry on the Special Rights of the State, and when relevant, on mining rights granted to private individuals or body corporates, is a Special Mining Company.

Article 52.- The Executive Power may grant to Special Mining Companies, the benefits and guarantees referred to in Article 157 of this

Law.

Article 53.- Special Mining Companies may avail themselves of the benefit determined by Article 158 of this Law, for the expansions which they undertake.

A.3 Obligations of the Holders of Mining Rights

Article 89.- The exploitation concessions are protected by the work, consisting in the compliance with the schedule within the period of execution of the operation schedule and during the subsequent effectively operative period in a minimum production proportional to the probable-proven mineral reserve and a simultaneous investment tending toward the replacement of the extracted reserve, until the economic-technical conditions indicate the impossibility to do so.

Article 92.- The compulsory annual minimum production shall correspond to part of the reserve of minerals contained in a concession or in a economic-administrative unit and shall be governed by the following scale.

A. For Metallic Non-Ferrous Minerals

Ore Reserves (millions of Metric tons)	Minimum Demandable Production per Year (Metric Tons)
Less than 10	1/15 of the Reserve
10 to 20	1/20 of the Reserve but not less than 670,000
20 to 50	1/30 of the Reserve but not less than 1,000,000
50 to 100	1/40 of the Reserve but not less than 1,670,000
100 or more	1/60 of the Reserve but not less than 2,500,000

A.4 Tax System and Promotional Provisions

Article 135.- The Purchase Value of the Mining Rights and of the Special Rights of the State shall be amortized as of the financial year in which according to the law it is necessary to comply with the obligation of minimum production, within a period which the holder of the mining activity shall determine at that time based on the probable life of the deposit, calculated taking into account the declared proven and probable reserves and the compulsory minimum production according to the law. The term thus determined must be made known to the General Tax Direction on submitting the Sworn Income Tax Statement referring to the financial year in which the amortization was begun, attaching the corresponding calculation.

The purchase value of the mining rights shall include the paid price or the claim expenses, whichever the case may be.

The investments in prospection and exploration made up to the date on which according to Law it is necessary to comply with the compulsory minimum production shall likewise be included, except when choosing to deduct the expenses incurred in prospection and/or exploration, in the financial year in which said expenses were incurred.

When for any reason whatsoever the mining right would have been abandoned or declared to have forfeited before being required to comply with the compulsory minimum production, their purchase value shall be fully amortized in the financial year or such occurring. Should the exploitable economic reserves come to be exhausted, abandoned or the forfeiture of the mining right be declared before the full amortization of its purchase value; the tax-payer may choose to amortize the balance immediately or continue amortizing it annually until paying off its cost within the term originally established.

Article 136.- The exploration expenses incurred in, once the mining rights is in the compulsory minimum production stage, may be fully deducted in the financial year or be amortized as of that financial year at a rate of an annual percentage

according to the probable lifetime of the mine established on closing said financial year, which shall be determined based on the volume of the proven and probable declared reserves and on the compulsory minimum production according to Law.

The expenses for the development and preparation which enable the exploitation of the deposit for a period of more than one financial year may be fully deducted in the financial year in which they were incurred or be amortized in said financial year and during the following up to a maximum of two additional years.

The tax-payer may choose in each case one of the deduction systems referred in the previous paragraph, at the time of closing the financial year in which the expenses were incurred, informing the General Tax Direction of his decision at the time of submitting the Sworn Income Tax Statement indicating, when relevant, the period in which the amortization shall be made and the calculation effected.

Should the exploitable economic reserves come to be exhausted, abandoned or the forfeiture of the mining right be declared before the full amortization of the investment in the exploitation, development or preparation; the tax-payer may choose to amortize the balance immediately or continue amortizing it annually until paying off its amount within the term originally established.

Article 139.- Any holder of a mining activity shall deduct one percent from the balance of his Net Income after applying the Income Tax for the maintenance of the Instituto Geologico Minero Metalurgico.

Article 142.- The holders of mining activities may depreciate at a rate of 100% the investments made for each financial year up to an amount equivalent to 300 UIT, for machinery, equipment, installations, housing and welfare, vehicles and others of infrastructure in general.

The higher investment for the same concepts, up to an amount equivalent to 900 UIT, may be depreciated at an annual rate of 20%, except in those cases where the usual rates permit higher depreciation percentages.

The excess of the investment shall be subject to the depreciation rates established for the mining activity.

This article shall not be applicable for the cases referred to in Article 157.

Article 144.- The profits originated in the mining activity may be reinvested and/or invested with a tax benefit in the companies which originated them; in other mining companies; and in companies engaged in the development of related mining activities.

Article 145.- Decree Law Nr.22401 and its amendment regulations, extensions and substitutes are applicable for the purposes of the investment and/or reinvestment.

When investing in other companies it is necessary that these have a reinvestment program, duly approved according to the legal regulations applicable to the Sector to which the company receiving the investment belongs and for which the contribution of third parties has been authorized.

When an investment in the activities of the proper mining company or receiving the investment from third parties, whether or not dedicated to the mining activity is concerned, it shall be necessary to count with an investment and/or reinvestment program approved by the mining authority.

The reinvestment of the profits of the holder of mining activities in his own company shall be made according to the following system:

The holders of mining activities with a total operations scale of 5000 MT/day, including those qualified as small producers of mineral, may choose until the closing of each financial year, the system described in the previous subclause, or that consisting in establishing annually a reinvestment reserve which shall constitute a tax credit against the Income Tax according to the system determined by Decree Law No. 22401. Both systems are excluding among themselves.

In case of choosing the second alternative, the reinvestment reserve shall be applied toward covering the reinvestment program or programs of

the holder, within a maximum period of five years including the financial year to which the profits withdrawn refer, as of the date of the approval of same.

The profits withdrawn for the purpose of their reinvestment, as long as they are not applied to covering the reinvestment program(s) must be kept on a special account subject to tax control to be called "Reserva de Reinversion-Ley General de Minería."

Article 146.- The Reinvestment and/or Investment Programmes of the mining companies shall have among other objectives, the execution of the prospection, exploration and development works for the search of mineral reserves or expansion of those existing; the installation or expansion of treatment and refinery plants, the execution of works and purchase of the necessary equipment to implement new mechanized systems for the exploitation and the treatment of minerals, the execution of general works and of transport of mineral, the installation or expansion of power plants, either of thermic, hydraulic or geothermic origin; the implementation of distribution or interconnection systems of electric energy, the construction of access roads, internal interconnection roads, airports and ports, the construction of housing for the personnel, the execution of Programmes of Welfare, training and health for the personnel.

These works may be undertaken by one single company or jointly by various companies in partnerships or establishing a new body corporate.

Whosoever makes investments and/or reinvestments of generating and/or electric transmission of hydraulic or geothermic origin, as well as expansions thereof and destines at least 20% to electricity for public utility and eventually distribution networks to render this service, shall obtain a credit against the Income Tax, up to one and a half times the amount of the investment made, attributable to the aliquote destined to electricity for public utility.

Article 154.- The property to be purchased according to the reinvestment programs may not be

transferred until the time when they are depreciated up to 90%, without considering for these purposes, the accelerated depreciation provided for by the Law.

The transfer before the expiry of these periods shall cause the holder of mining activities to lose the reinvestment benefits granted, and shall be obliged to reimburse, in this case, the unpaid Tax plus the extra charge and interests according to Law. The tax benefit shall not be lost when the transfer is made in favour of another holder of mining activities, in which case this latter may not enjoy the reinvestment benefit regarding the purchase value of said property.

Article 155.- The holders of mining activities who start operations exceeding 350 MT and up to 5000 MT/day, shall enjoy the tax stability for a period of ten complete taxable financial years computed as of the financial year in which the operations are initiated.

Such units which being in operation within the range of 350 MT/day to 5,000 MT/day, expand their production capacity by 100% and up to 5,000 MT/day, shall enjoy the tax stability for the same period of ten complete taxable financial years, computed as of that in which the expansion is completed.

Should the expansion be under 100% of the previous production capacity, the tax stability period shall be proportionally reduced by complete taxable financial years, and shall not be applicable when the expansions are under 50%. For these effects, the percentage fractions shall be adjusted to the nearest tenth.

Article 157.- In order to promote investment and to simplify the financing of the mining projects with an installed capacity of not less than 5,000 MT/day or of expansions destined to reach a capacity of not less than 5,000 MT/day referring to one or more economic and administrative units, the Executive Power, by means of a Supreme Decree with the approving vote of the Cabinet, is authorized to assure contractually the following system:

- a) Stability of the tax system in force at

- the time of signing the contract;
- b) Power to increase the annual rate of depreciation or reserve for the amortization of machinery, industrial equipment and other fixed assets up to the maximum limit of twenty percent per annum as a global rate according to the proper characteristics of each project;
 - c) Revaluation except when keeping accounting books in foreign currency of the balance to be depreciated regarding the machinery and installations when a fluctuation has occurred in the value of the local currency, in respect of the exchange rate of the foreign currency certificate proportionally exceeding five percent in relation to the currency of the country, The revaluation and capitalization of the revaluation excess shall be exempted from the income tax.
 - d) Reduction of up to one third of the application of the income tax scale for resident body corporates, in force at the time of signing the contract, for the period recovering the investment and for an additional period of up to five years.
 - e) In the case of contracts for the purpose of assigning to the export not less than 80% of the production or of the additional production, the holder of the mining activity, may request as part of the contract to keep accounting books in United States Dollars or in the currency in which the investment was made, subject to the following requisites:
 - 1) To keep accounting books in the stated foreign currency for a period of at least five years.
 - 2) During the period of keeping accounting books in foreign currency, the Company shall not be entitled to reevaluate their assets.

Article 158.- When an expansion is projected in one economic and administrative unit with a treatment capacity greater than 350 metric tons per day, which will increase the production by more than twenty percent in terms of fine

contents, as well as expansions or the introduction of processes which will improve the quality of the final product and the aggregate value thereof at least by the percentages to be determined by the Regulations or in investment projects of new deposits causing new economic units near to those existing, which shall permit to maintain the jobs, the contract referred to in Article 157 may be entered into upon prior favourable opinion of the General Mining Direction.

Article 159.- The period of the contract referred to in Article 157 shall be such as necessary to recover the investments by means of gross profits, less the Income Tax, the contribution to the Instituto Geologico Minero Metalurgico (INGEMMET) and the liquid and property participation payable to the workers, if relevant.

The difference to be obtained between the sales price and the costs, without deducting therefrom the depreciation and amortization of the invested capitals nor the investments and/or reinvestments with tax benefits, is to be understood as gross profit.

The amounts activated by the purchase of the mining rights, the prospection, exploration and development thereof, the purchase of machinery and mining equipment, the treatment plant and energy generation system, the installations, works of infrastructures, auxiliary works, housing and welfare works are to be understood as investment.

The investments and/or reinvestments carried out with tax benefit shall not be taken into account for determining the amount of the recoverable investment.

Article 286.- The compensation to be paid by the assignee to the assigner for the exploration or exploitation concessions shall not exceed 10% of the gross sales price of the mineral.

APPENDIX B

Current Uchucchacua Cost Summaries

700 d.s.t./day

Table B.1
 Current Uchucchacua Labor Cost Summary
 January-August 1984
 700 d.s.t./day
 (in US dollars)

	<u>Salaries</u> <u>Monthly</u>	<u>Salaries</u> <u>Daily</u>	<u>Fringe</u> <u>Benefits</u>	<u>Sundays &</u> <u>Holidays</u>	<u>Over-</u> <u>time</u>	<u>Total</u> <u>Labor</u> <u>Cost</u>	<u>Cost</u> <u>/ton</u>
Jan.	27,002	43,878	129,443	2,198	6,345	208,866	10.7
Feb.	22,249	35,749	100,589	2,382	4,286	165,215	10.2
Mar.	24,608	45,682	132,777	2,556	3,747	211,370	10.0
April	30,505	39,135	113,673	1,997	5,085	190,395	9.3
May	24,898	39,056	127,942	2,127	5,284	199,307	9.6
June	18,899	34,966	112,743	2,277	5,424	174,309	8.9
July	24,790	32,067	113,594	2,322	5,294	178,066	8.7
Aug.	20,773	28,470	147,120	3,582	1,436	201,381	9.9
Expenses							
Total	193,724	299,003	977,881	19,441	38,800	1,528,909	--
Aver.	24,215	37,375	122,235	2,430	4,850	191,113	--
Cost/d.s.t.							
% Total	12.69	19.34	63.99	1.27	2.51	100.00	--
Average	1.22	1.88	6.16	0.12	0.24	9.63	--

Source: Paz, Favio, 1984, Planeamiento Operacional Unidad Uchucchacua, Lima, CMBSA.

Table B.2
 Current Uchucchacua Supplies Cost Summary
 January-August 1984
 700 d.s.t./day
 (in US dollars)

Account	January	February	March	April	May	June	July	August	Expenses		Cost / ton	
									Total	Aver.	Total	Aver.
Explosives	21001	12035	16821	12321	16308	22060	18647	20901	140094	17511	9.97	0.88
Timber	4394	3867	5547	---	10248	3068	4067	3491	34682	4335	2.38	0.21
Fuel	39942	43823	65990	55918	70180	60677	73166	69765	479461	59932	34.20	3.02
Locomotives	2338	734	4587	---	8192	2737	1610	1287	21485	2685	1.47	0.13
Piping	874	303	463	---	880	1144	994	1103	5761	720	0.34	0.03
Compressors & Drills	8351	4981	5078	1795	10788	5778	3377	8322	48470	6058	3.40	0.3
Machinery:												
Mine	52	154	74	---	1938	1108	821	124	4271	533	0.23	0.02
Heavy	880	5203	38	---	2903	5169	3205	680	18078	2259	1.25	0.11
Elect. Mtls.	6896	2980	3312	1864	8378	6176	4693	2858	37157	4644	2.60	0.23
Lab & Plant	67669	66238	53235	34660	68562	41466	42737	42697	417264	52158	29.78	2.63
Safety	14625	4215	6417	28	8056	4620	5742	4386	38089	4761	2.72	0.24
Cars	3606	1524	5524	1342	5595	4386	4172	1867	28016	3502	1.93	0.17
Construction	2117	3097	1142	---	1473	3624	1517	1671	14641	1830	1.02	0.09
Hardware	4929	6041	2442	252	8962	10476	6909	5493	45504	5688	3.17	0.28
Miscellaneous	1067	1889	1291	457	3374	1906	1220	1244	12348	1543	0.79	0.07
Belt Conveyor	680	1064	5051	---	1874	2603	1447	1292	14011	1751	0.91	0.08
Mercantile	3450	2409	2050	2043	4167	2467	2636	94	19536	2442	1.36	0.12
Not Specific	---	332	53	---	---	1654	---	714	2753	344	0.11	0.01
Medicines	12539	---	---	---	1197	3006	3923	3586	24251	3031	1.70	0.15
TOTAL	173373	160889	185122	110680	232975	184145	181083	171575	1399842	174980	100.00	8.83
Cost/ton	8.86	9.97	8.79	5.39	11.97	9.36	8.83	8.45	---	---	---	---

Source: Paz, Favio, 1984, Planeamiento Operacional Unidad Uchucchacua, Lima, CMBSA.

Table B.3
 Current Uchucchacua Various Cost Summary
 January-August 1984
 700 d.s.t./day
 (in US dollars)

<u>Month</u>	<u>January</u>	<u>February</u>	<u>March</u>	<u>April</u>	<u>May</u>	<u>June</u>	<u>July</u>	<u>August</u>	<u>Expenses</u>	<u>Expenses</u>	<u>Cost / ton</u>	
									<u>Total</u>	<u>Aver.</u>	<u>%Total</u>	<u>Aver.</u>
Freight	9100	5309	3917	38802	7020	7877	9556	10833	92414	11551	9.86	0.58
Contractors	62443	66628	74804	52497	46952	64221	50247	84581	502373	62796	53.3	3.16
Insurance	9321	10039	8578	6168	6259	11645	6592	12983	71585	8948	7.58	0.45
Var. Services	3717	4446	14515	3133	3467	12168	17392	12783	71621	8952	7.58	0.45
Taxes	3254	2871	4592	2615	2781	2690	2238	11855	32896	4112	3.47	0.2
Rentals	94	---	---	---	---	442	3384	61249	65169	8146	6.9	0.41
Var. Exoenses	10356	12431	16126	12172	17468	15356	13446	9309	106664	13333	11.31	0.67
Financial Ch.	---	23	33	3	---	---	---	---	59	---	---	---
TOTAL	98275	101747	122565	115390	83947	114399	102855	203593	942771	117846	100	5.94
Cost/ton	5.02	6.31	5.82	5.62	4.02	5.82	5.02	10.03	---	---	---	---

Source: Paz, Favio, 1984, Planeamiento Operacional Unidad Uchucchacua, Lima, CMBSA.

Table B.4
 Current Uchucchacua Depreciation Cost Summary
 January-August 1984
 700 d.s.t./day
 (in US dollars)

	<u>Depreciation</u>	<u>Cost/d.s.t.</u>
January	251,096	12.84
February	234,291	14.52
March	142,513	6.77
April	144,440	7.03
May	132,693	6.36
June	121,484	6.18
July	108,200	5.27
August	93,413	4.60
Total Expense	1,228,130	
Average Expense	153,516	
Average Cost/d.s.t.		7.74

Source: Paz, Favio, 1984, Planeamiento Operacional Unidad Uchucchacua, Lima, CMBSA.

APPENDIX C

Projected Uchucchacua Cost Summaries

850 d.s.t./day

Table C.1
 Projected Uchucchacua Labor Cost Summary
 850 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Salaries				
Monthly	342,228	28,519	13.21	1.18
Daily	511,668	42,639	19.75	1.76
Fringe Benefits	1,637,380	136,448	63.20	5.65
Sundays & Holidays	33,267	2,772	1.28	0.11
Overtime	<u>66,397</u>	<u>5,533</u>	<u>2.56</u>	<u>0.22</u>
Total	2,590,940	215,911	100.00	8.95
Cost/d.s.t.	8.95			

Table C.2
 Projected Uchucchacua Supplies Cost Summary
 850 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Explosives	255,160	21,263	10.23	0.88
Timber	63,167	5,263	2.53	0.21
Fuel	873,294	72,774	35.03	3.01
Locomotives	32,220	2,685	1.29	0.11
Piping	8,640	720	0.35	0.02
Compressors & Drills	88,273	7,356	3.54	0.30
Mine Machinery	7,766	647	0.31	0.02
Heavy Machinery	27,108	2,259	1.09	0.09
Electric Mtls.	67,669	5,639	2.71	0.23
Lab & Plant	760,016	63,334	30.48	2.62
Safety	57,132	4,761	2.29	0.19
Cars	42,024	3,502	1.69	0.14
Construction	21,960	1,830	0.88	0.07
Hardware	68,256	5,688	2.74	0.23
Miscellaneous	18,516	1,543	0.74	0.06
Belt Conveyor	21,012	1,751	0.84	0.07
Mercantile	35,583	2,965	1.43	0.12
Not Specific	4,128	344	0.17	0.01
Medicines	<u>41,221</u>	<u>3,435</u>	<u>1.65</u>	<u>0.14</u>
Total Expenses	2,493,145	207,762	100.00	8.61
Cost/d.s.t.	8.61			

Table C.3
Projected Uchucchacua Various Cost Summary
 850 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Freight	168,314	14,026	11.17	0.58
Contractors	915,027	76,252	60.70	3.16
Insurance	107,376	8,948	7.12	0.37
Various Services	107,424	8,952	7.13	0.37
Taxes	49,344	4,112	3.27	0.17
Various Expenses	<u>159,996</u>	<u>13,333</u>	<u>10.61</u>	<u>0.55</u>
Total	1,507,481	125,623	100.00	5.20
Cost/d.s.t.	5.20			

APPENDIX D

Projected Uchucchacua Cost Summaries

1000 d.s.t./day

Table D.1
 Projected Uchucchacua Labor Cost Summary
 1000 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Salaries				
Monthly	351,924	29,327	12.20	1.03
Daily	570,624	47,552	19.78	1.67
Fringe Benefits	1,850,581	154,215	64.16	5.43
Sundays & Holidays	37,100	3,091	1.29	0.10
Overtime	<u>74,047</u>	<u>6,170</u>	<u>2.57</u>	<u>0.21</u>
Total	2,884,276	240,356	100.00	8.47
Cost/d.s.t.	8.47			

Table D.2

Projected Uchucchacua Supplies Cost Summary

1000 d.s.t./day

(in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Explosives	300,188	25,015	14.73	0.88
Timber	74,314	6,192	3.65	0.21
Fuel	181,476	15,123	8.91	0.53
Locomotives	32,220	2,685	1.58	0.09
Piping	8,640	720	0.42	0.02
Compressors & Drills	103,851	8,654	5.10	0.30
Mine Machinery	9,137	761	0.45	0.02
Heavy Machinery	27,108	2,259	1.33	0.07
Electric Mtls.	79,611	6,634	3.91	0.23
Lab & Plant	894,137	74,511	43.88	2.62
Safety	57,132	4,761	2.80	0.16
Cars	42,024	3,502	2.06	0.12
Construction	21,960	1,830	1.08	0.06
Hardware	68,256	5,688	3.35	0.20
Miscellaneous	18,516	1,543	0.91	0.05
Belt Conveyor	21,012	1,751	1.03	0.06
Mercantile	41,862	3,488	2.05	0.12
Not Specific	4,128	344	0.20	0.01
Medicines	<u>51,960</u>	<u>4,330</u>	<u>2.55</u>	<u>0.15</u>
Total Expenses	2,037,532	169,791	100.00	5.98
Cost/d.s.t.		5.98		

Table D.3
 Projected Uchucchacua Various Cost Summary
 1000 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Freight	198,017	16,501	11.66	0.58
Contractors	1,076,502	89,708	63.37	3.16
Insurance	107,376	8,948	6.32	0.31
Various Services	107,424	8,952	6.32	0.31
Taxes	49,344	4,112	2.91	0.14
Various Expenses	<u>159,996</u>	<u>13,333</u>	<u>9.42</u>	<u>0.46</u>
Total	1,698,659	141,554	100.00	4.98
Cost/d.s.t.	4.98			

APPENDIX E

Projected Uchucchacua Cost Summaries

1200 d.s.t./day

Table E.1
 Projected Uchucchacua Labor Cost Summary
 1200 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Salaries				
Monthly	393,897	32,824	11.62	0.96
Daily	658,010	54,834	19.40	1.61
Fringe Benefits	2,210,992	184,249	65.20	5.41
Sundays & Holidays	42,781	3,565	1.26	0.10
Overtime	<u>85,387</u>	<u>7,115</u>	<u>2.52</u>	<u>0.20</u>
Total	3,391,067	282,588	100.00	8.28
Cost/d.s.t.	8.28			

Table E.2

Projected Uchucchacua Supplies Cost Summary

1200 d.s.t./day

(in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Explosives	360,216	30,018	15.08	0.88
Timber	89,177	7,431	3.73	0.21
Fuel	222,000	18,500	9.29	0.54
Locomotives	32,220	2,685	1.35	0.07
Piping	8,640	720	0.36	0.02
Compressors & Drills	124,621	10,835	5.44	0.30
Mine Machinery	10,964	913	0.46	0.02
Heavy Machinery	27,108	2,259	1.13	0.06
Electric Mtls.	95,533	7,961	4.00	0.23
Lab & Plant	1,072,963	89,413	44.91	2.62
Safety	57,132	4,761	2.39	0.13
Cars	42,024	3,502	1.76	0.10
Construction	21,960	1,830	0.92	0.05
Hardware	68,256	5,688	2.86	0.16
Miscellaneous	18,516	1,543	0.78	0.04
Belt Conveyor	21,012	1,751	0.88	0.05
Mercantile	50,235	4,186	2.10	0.12
Not Specific	4,128	344	0.17	0.01
Medicines	<u>62,351</u>	<u>5,195</u>	<u>2.61</u>	<u>0.15</u>
Total Expenses	2,389,056	199,088	100.00	5.84
Cost/d.s.t.		5.84		

Table E.3
 Projected Uchucchacua Various Cost Summary
 1200 d.s.t./day
 (in US dollars)

	<u>Expenses</u>		<u>Cost/d.s.t.</u>	
	<u>Total</u>	<u>Average</u>	<u>% Total</u>	<u>Average</u>
Freight	237,620	19,801	12.16	0.58
Contractors	1,291,802	107,650	66.13	3.16
Insurance	107,376	8,948	5.50	0.26
Various Services	107,424	8,952	5.50	0.26
Taxes	49,344	4,112	2.53	0.12
Various Expenses	<u>159,996</u>	<u>13,333</u>	<u>8.19</u>	<u>0.39</u>
Total	1,953,562	162,796	100.00	4.78
Cost/d.s.t.	4.78			

APPENDIX F

Projected Capital Investment Summary

700 d.s.t./day

Table F.1
 Projected Capital Investment Summary
 700 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>SCHOOL</u>			
1	Building with 3360m2 @ \$150/m2 Contingency 15%	504,000	504,000 75,600
	Total School Cost Escalated 1 year		579,600 608,580
<u>HOUSING</u>			
9	Buildings with 480m2 @ \$150/m2 Contingency 15%	72,000	648,000 97,200
	Total Housing Cost		745,200
<u>SHAFT MACHINERY</u>			
1	Double drum hoist		271,000
2	Pumps	14,750	29,500
	Installation Cost		40,000
	Contingency 15%		6,000
	Total Shaft Machinery Cost		346,500
<u>REPLACEMENT MINE MACHINERY</u>			
50	Atlas Copco BBC 37WTH jack-leg drills	2,600	130,000
30	Montabert S 3T stoper drills	2,500	75,000

Table F.1 (continuation)
 Projected Capital Investment Summary
 700 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
15	80 cu-ft Gramby cars	5,100	76,500
5	Atlas Copco LM36H over-shoot muckers	9,650	48,250
30	35 cu-ft cars	1,800	54,000
1	8-tons Clayton locomotive	20,300	20,300
1	5-tons Clayton locomotive	17,400	17,400
2	3.5-tons BEV WR18 locomotive	15,150	30,300
10	30-HP Derena slushers	11,000	110,000
2	90-HP fans	8,650	17,300
2	30-HP fans	4,500	9,000
	Total Replacement Mine Machinery Cost		588,050
	Escalated 3 years		680,961
<u>REPLACEMENT PLANT MACHINERY</u>			
15	30-HP electrical engines	2,550	38,250
4	6"x4" Wilfley pumps	8,150	32,600
	Total Replacement Plant Machinery Cost		70,850
	Escalated 3 years		82,044
<u>REPLACEMENT TRANSPORTATION UNITS</u>			
3	Volvo buses	65,000	195,000
6	Toyota 4x4 pick-ups	21,500	129,000
2	Toyota station wagons	10,500	21,000
	Total Replacement Transportation Units Cost		345,000
	Escalated 3 years		399,510

APPENDIX G

Projected Capital Investment Summary

850 d.s.t./day

Table G.1
 Projected Capital Investment Summary
 850 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>SCHOOL</u>			
1	Building with 3360m2 @ \$150/m2 Contingency 15%	504,000	504,000 75,600
	Total School Cost		579,600
	Escalated 1 year		608,580
<u>HOUSING</u>			
18	Buildings with 480m2 @ \$150/m2 Contingency 15%	72,000	1,296,000 194,400
	Total Housing Cost		1,490,400
	Investment 1st. Year		745,200
	Escalated Investment 2nd. Year		782,460
<u>HOSPITAL</u>			
1	Building with 1920m2 @ \$150/m2 Contingency 15%		288,000 43,200
	Total Construction Cost		331,200
	Hospital Equipment Cost		105,000
	Installation Cost		20,000
	Contingency 15%		3,000
	Total Equipment Cost		128,000
	Total Hospital Cost		459,200

Table G.1 (continuation)
 Projected Capital Investment Summary
 850 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>MERCANTILE</u>			
1	Building with 1000m2 @ \$150/m2		150,000
	Contingency 15%		22,500
	Total Mercantile Cost		172,500
	Escalated 1 year		181,125
<u>SHAFT MACHINERY</u>			
1	Double drum hoist		271,000
2	Pumps	14,750	29,500
	Installation Cost		40,000
	Contingency 15%		6,000
	Total Shaft Machinery Cost		346,500
<u>MINE MACHINERY</u>			
10	Atlas Copco BBC 37WTH jack-leg drills	2,600	26,000
6	Montabert S 3T stoper drills	2,500	15,000
1	5-tons Clayton locomotive	17,400	17,400
1	3.5-tons BEV WR18 locomotive	15,150	15,150
4	30-HP Derena slushers	11,000	44,000
1	Ingersoll Rand 1000 cfm compressor	105,000	105,000
	Installation Cost		10,000
	Contingency 15%		1,500
	Total Mine Machinery Cost		234,050

Table G.1 (continuation)
 Projected Capital Investment Summary
 850 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>PLANT MACHINERY</u>			
8	100 cu-ft flotation cells	7,400	59,200
1	Thickener 25'x 8'	42,000	42,000
2	Reactors tanks 8'x 11'	14,100	28,200
1	Metallic ore bin 400 d.s.t.	35,500	35,500
	Installation Cost		35,000
	Contingency 15%		5,250
	Total Plant Machinery Cost		205,150
<u>REPLACEMENT MINE MACHINERY</u>			
60	Atlas Copco BBC 37WTH jack-leg drills	2,600	156,000
40	Montabert S 3T stoper drills	2,500	100,000
20	80 cu-ft Gramby cars	5,100	102,000
5	Atlas Copco LM36H over-shoot muckers	9,650	48,250
40	35 cu-ft cars	1,800	72,000
1	8-tons Clayton locomotive	20,300	20,300
1	5-tons Clayton locomotive	17,400	17,400
3	3.5-tons BEV WR18 locomotive	15,150	45,450
15	30-HP Derena slushers	11,000	165,000
3	90-HP fans	8,650	25,950
3	30-HP fans	4,500	13,500
	Total Replacement Mine Machinery Cost		765,850
	Escalated 3 years		886,567

Table G.1 (continuation)
 Projected Capital Investment Summary
 850 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>REPLACEMENT PLANT MACHINERY</u>			
20	30-HP electrical engines	2,550	51,000
5	6"x4" Wilfley pumps	8,150	40,750
	Total Replacement Plant Machinery Cost		91,750
	Escalated 3 years		106,212
<u>REPLACEMENT TRANSPORTATION UNITS</u>			
4	Volvo buses	65,000	260,000
8	Toyota 4x4 pick-ups	21,500	172,000
2	Toyota station wagons	10,500	21,000
	Total Replacement Transportation Units Cost		453,000
	Escalated 3 years		524,404

APPENDIX H
Projected Capital Investment Summary
1000 d.s.t./day

Table H.1
 Projected Capital Investment Summary
 1000 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>SCHOOL</u>			
1	Building with 3360m2 @ \$150/m2 Contingency 15%	504,000	504,000 75,600
	Total School Cost		579,600
	Escalated 1 year		608,580
<u>HOUSING</u>			
27	Buildings with 480m2 @ \$150/m2 Contingency 15%	72,000	1,944,000 291,600
	Total Housing Cost		2,235,600
	Investment 1st. Year		1,117,800
	Escalated Investment 2nd. Year		1,173,690
<u>HOSPITAL</u>			
1	Building with 1920m2 @ \$150/m2 Contingency 15%		288,000 43,200
	Total Construction Cost		331,200
	Hospital Equipment Cost		105,000
	Installation Cost		20,000
	Contingency 15%		3,000
	Total Equipment Cost		128,000
	Total Hospital Cost		459,200

Table H.1 (continuation)

Projected Capital Investment Summary

1000 d.s.t./day

(in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>MERCANTILE</u>			
1	Building with 1000m2 @ \$150/m2		150,000
	Contingency 15%		22,500
	Total Mercantile Cost		172,500
	Escalated 1 year		181,125
<u>HYDROELECTRIC PLANT</u>			
	Preliminary facilities		28,500
	Water transporting channel		95,500
	Sand clearing		45,300
	Water captation		160,000
	2100-Kw turbine		550,000
	Piping		160,000
	Excess water transporting channel		85,000
	Installation Cost		165,000
	Contingency 15%		188,925
	Total Hydroelectric Plant Cost		1,443,425
<u>SHAFT MACHINERY</u>			
1	Double drum hoist		271,000
2	Pumps	14,750	29,500
	Installation Cost		40,000
	Contingency 15%		6,000
	Total Shaft Machinery Cost		346,500

Table H.1 (continuation)

Projected Capital Investment Summary

1000 d.s.t./day

(in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>MINE MACHINERY</u>			
15	Atlas Copco BBC 37WTH jack-leg drills	2,600	39,000
10	Montabert S 3T stoper drills	2,500	25,000
6	80 cu-ft Gramby cars	5,100	30,600
2	Atlas Copco LM36H over-shoot muckers	9,650	19,300
1	8-tons Clayton locomotive	20,300	20,300
1	5-tons Clayton locomotive	17,400	17,400
2	3.5-tons BEV WR18 locomotive	15,150	30,300
6	30-HP Derena slushers	11,000	66,000
1	90-HP fan	8,650	8,650
1	Ingersoll Rand 2500 cfm compressor	230,000	230,000
	Installation Cost		15,000
	Contingency 15%		2,250
	Total Mine Machinery Cost		503,800
<u>PLANT MACHINERY</u>			
1	24" x 36" jaw crusher	110,000	110,000
1	7'x 12' rod grinder	415,000	415,000
12	100 cu-ft flotation cells	7,400	88,800
2	Thickener 25'x 8'	42,000	84,000
4	Reactors tanks 8'x 11'	14,100	56,400
1	Metallic ore bin 400 d.s.t.	35,500	35,500
	Installation Cost		40,000
	Contingency 15%		6,000
	Total Plant Machinery Cost		835,700

Table H.1 (continuation)

Projected Capital Investment Summary

1000 d.s.t./day

(in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>REPLACEMENT MINE MACHINERY</u>			
70	Atlas Copco BBC 37WTH jack-leg drills	2,600	182,000
50	Montabert S 3T stoper drills	2,500	125,000
20	80 cu-ft Gramby cars	5,100	102,000
5	Atlas Copco LM36H over-shoot muckers	9,650	48,250
40	35 cu-ft cars	1,800	72,000
2	8-tons Clayton locomotive	20,300	40,600
2	5-tons Clayton locomotive	17,400	34,800
3	3.5-tons BEV WR18 locomotive	15,150	45,450
20	30-HP Derena slushers	11,000	220,000
4	90-HP fans	8,650	34,600
3	30-HP fans	4,500	13,500
	Total Replacement Mine Machinery Cost		918,200
	Escalated 3 years		1,062,931
<u>REPLACEMENT PLANT MACHINERY</u>			
20	30-HP electrical engines	2,550	51,000
7	6"x4" Wilfley pumps	8,150	57,050
	Total Replacement Plant Machinery Cost		108,050
	Escalated 3 years		125,081

Table H.1 (continuation)

Projected Capital Investment Summary

1000 d.s.t./day

(in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>REPLACEMENT TRANSPORTATION UNITS</u>			
4	Volvo buses	65,000	260,000
10	Toyota 4x4 pick-ups	21,500	215,000
2	Toyota station wagons	10,500	21,000
	Total Replacement Transportation Units Cost		496,000
	Escalated 3 years		574,182

APPENDIX I
Projected Capital Investment Summary
1200 d.s.t./day

Table I.1
 Projected Capital Investment Summary
 1200 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>SCHOOL</u>			
1	Building with 6500m2 @ \$150/m2 Contingency 15%	975,000	975,000 146,250
	Total School Cost		1,121,250
	Escalated 1 year		1,177,312
<u>HOUSING</u>			
45	Buildings with 480m2 @ \$150/m2 Contingency 15%	72,000	3,240,000 486,000
	Total Housing Cost		3,726,000
	Investment 1st. Year		1,863,000
	Escalated Investment 2nd. Year		1,956,150
<u>HOSPITAL</u>			
1	Building with 3500m2 @ \$150/m2 Contingency 15%		525,000 78,750
	Total Construction Cost		603,750
	Hospital Equipment Cost		175,000
	Installation Cost		40,000
	Contingency 15%		6,000
	Total Equipment Cost		221,000
	Total Hospital Cost		824,750

Table I.1 (continuation)
 Projected Capital Investment Summary
 1200 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>MERCANTILE</u>			
1	Building with 1500m2 @ \$150/m2		225,000
	Contingency 15%		33,750
	Total Mercantile Cost		258,750
	Escalated 1 year		271,687
<u>DISPOSAL DAM AND OTHERS</u>			
1	Disposal Dam		850,000
	Contingency 15%		127,500
	Enlargement Concentrator Building		425,000
	Contingency 15%		63,750
	Total Disposal Dam and Others		1,466,250
<u>HYDROELECTRIC PLANT</u>			
	Preliminary facilities		28,500
	Water transporting channel		95,500
	Sand clearing		45,300
	Water captation		160,000
	2100-Kw turbine		550,000
	Piping		160,000
	Excess water transporting channel		85,000
	Installation Cost		165,000
	Contingency 15%		188,925
	Total Hydroelectric Plant Cost		1,443,425

Table I.1 (continuation)
 Projected Capital Investment Summary
 1200 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>SHAFT MACHINERY</u>			
1	Double drum hoist		346,000
2	Pumps	14,750	29,500
	Installation Cost		45,000
	Contingency 15%		6,750
	Total Shaft Machinery Cost		427,250
<u>MINE MACHINERY</u>			
20	Atlas Copco BBC 37WTH jack-leg drills	2,600	52,000
15	Montabert S 3T stoper drills	2,500	37,500
10	80 cu-ft Gramby cars	5,100	51,000
5	Atlas Copco LM36H over-shoot muckers	9,650	48,250
2	8-tons Clayton locomotive	20,300	40,600
2	5-tons Clayton locomotive	17,400	34,800
10	30-HP Derena slushers	11,000	110,000
2	Ingersoll Rand 2500 cfm compressor	230,000	460,000
	Installation Cost		30,000
	Contingency 15%		4,500
	Total Mine Machinery Cost		868,650
<u>PLANT MACHINERY</u>			
1	24" x 36" jaw crusher	110,000	110,000
1	5' conic crusher	170,000	170,000
1	9 1/2' x 12' rod grinder	480,000	480,000

Table I.1 (continuation)

Projected Capital Investment Summary

1200 d.s.t./day

(in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
16	100 cu-ft flotation cells	7,400	118,400
8	Cyclons		20,500
2	Thickener 25'x 8'	42,000	84,000
6	Reactors tanks 8'x 11'	14,100	84,600
10	6'x 4' Wilfley pump	8,150	81,500
1	Filter	55,000	55,000
1	Metallic ore bin 800 d.s.t.	65,000	65,000
1	Concrete ore bin 800 d.s.t.	95,000	95,000
	Installation Cost		45,000
	Contingency 15%		30,750
	Total Plant Machinery Cost		1,439,750
 <u>REPLACEMENT MINE MACHINERY</u>			
85	Atlas Copco BBC 37WTH jack-leg drills	2,600	221,000
60	Montabert S 3T stoper drills	2,500	150,000
40	80 cu-ft Gramby cars	5,100	204,000
5	Atlas Copco LM36H over-shoot muckers	9,650	48,250
3	8-tons Clayton locomotive	20,300	60,900
3	5-tons Clayton locomotive	17,400	52,200
30	30-HP Derena slushers	11,000	330,000
8	90-HP fans	8,650	69,200
	Total Replacement Mine Machinery Cost		1,135,550
	Escalated 3 years		1,314,541

Table I.1 (continuation)
 Projected Capital Investment Summary
 1200 d.s.t./day
 (in US dollars)

<u>Qty.</u>	<u>Description</u>	<u>Unit Cost</u>	<u>Sub-Total</u>
<u>REPLACEMENT PLANT MACHINERY</u>			
25	30-HP electrical engines	2,550	63,750
10	6"x4" Wilfley pumps	8,150	81,500
	Total Replacement Plant Machinery Cost		145,250
	Escalated 3 years		168,145
<u>REPLACEMENT TRANSPORTATION UNITS</u>			
5	Volvo buses	65,000	325,000
13	Toyota 4x4 pick-ups	21,500	279,500
2	Toyota station wagons	10,500	21,000
	Total Replacement Transportation Units Cost		625,500
	Escalated 3 years		724,094

APPENDIX J

Minerals Selling Contract Between CMBSA and ASARCO

This Appendix contains the most important articles of the minerals' selling contract between CMBSA and ASARCO, an agreement reached on January 1, 1984

8.- Price: The purchase price of the product is the sum of the payments less the sum of the deductions specified below.

Payments:

10.- Silver: Deduct 1.0 troy ounce per ton of product from the silver assay and pay for 95% of the remaining silver content at the Handy & Harman, New York, quotation for refined silver, as published in Metals Week, averaged for the third calendar month following date of delivery of product, less a deduction of 25 cents per troy ounce of payable silver.

11.- Lead: Deduct 1.5 units from the wet lead assay and pay for 95% of the remaining lead content at the quotation for common domestic lead for delivery in the United States, as published in Metals Week (currently MW US PRODUCER), averaged for the third calendar month following the date of delivery of product.

12.- Treatment Deduction: The base treatment deduction shall be \$133.00 per ton of product based on:

- a) a cost of employment of \$16.30 per hour at East Helena;
- b) a cost of fuel of \$4.80 per MMBTU at East Helena;
- c) a cost of power of 13.1 mills per KWH at East Helena;
- d) a sum of the metal payments of \$1,850 or less per short ton and shall be adjusted pursuant to following.

13.- Treatment Deduction Adjustment:

- a) Increase or decrease the base treatment deduction by 8 cents for each one cent that the average hourly cost of unemployment at East Helena during the calendar month including the date of delivery of product is greater or less than \$16.30 per hour, fractions in proportion.
- b) Increase or decrease the base treatment deduction by 8 cents for each one cent per MMBTU that the average cost of fuel used at the East Helena plant during the calendar month including the date of delivery of product is greater or less than \$4.80 per MMBTU, fractions in proportion.
- c) Increase or decrease the base treatment deduction by 16 cents for each one mill per KWH that the average cost of electric power used at East Helena during the calendar month including the date of delivery of product is greater or less than 13.0 mills, fractions in proportion.
- d) Increase the base treatment deduction by 5% of the sum of the metal payments in excess of \$1,850 per ton of product.

14.- Lead Refining Deduction: the lead refining deduction shall be 9.0 cents per pound of payable lead.

15.- Bullion Freight: the bullion freight deduction per ton of payable lead shall be published all-rail freight rate applicable to a carload, minimum weight of fifty tons of lead bullion from East Helena, Montana, to New York, via Omaha, Nebraska (for refining) in effect during the calendar month following date of delivery of product.

16.- Penalties: the deductions specified above are for products free of deleterious impurities. Product delivered containing such impurities shall be subject to additional deductions in accordance with the schedule below.

If product should contain any other deleterious impurity which, in Asarco's sole judgement, precludes economic treatment of product, then Asarco may terminate this agreement on thirty (30 days) written notice unless mutual agreement is reached as to appropriate deductions for such impurity.

- a) Arsenic: 0.5 unit free; deduct \$5.00 per unit excess, fractions in proportion.
- b) Antimony: 0.5 unit free; deduct \$5.00 per unit excess, fractions in proportion.
- c) Bismuth: 0.1 unit free; deduct \$15.00 per unit excess, fractions in proportion.

25.- Definitions:

A ton means a dry short ton or 2,000 dry pounds.
A shipment when used as a quantity shall mean that quantity of product transported by an ocean-going vessel under one bill of loading.

A smelter lot means not more than three railcars.

A unit means 1% or 20 pounds per ton.

A calendar month means a named month in the calendar.

The cost of employment at Asarco's plant consists of all costs and expenditures paid or accrued to or on behalf of the employees of said plant (excluding foremen and other salaried employees and men on construction work) or incurred as a direct consequence of the employment of said employees. Such costs shall include, without limitation of the generality of the foregoing, wages, shift differentials, overtime premiums, pay for time not worked, vacation pay, holiday pay, payroll taxes, insurance costs, health and welfare costs, industrial accident and sickness expense (workmen's compensation), pension costs, costs of total and permanent disability benefits, costs of job. Securities guarantees, severance pay costs and any other employment cost or expense now or here after voluntarily assumed by Asarco or required under its collective bargaining contracts with its employees, or required by federal, state or local law regulations.

MMBTU means million gross British thermal units.
Mill means one tenth of one cent (0.1 cent).
KWH means kilowatt-hour.

For a better understanding how to calculate the net value of a ton of leaching concentrate based on the above contract, below is shown an example.

Payments:

Silver Payment

$$[139.65 \text{ oz/st} - 1 \text{ oz/st}] \times 0.95 \times$$

$$[\$8.0/\text{oz} - \$0.25] = \$1,020.82$$

Lead Payment:

$$[11.03\% - 1.5\%] \times 0.95 \times 20 \times [\$0.24 - \$0.09] = \underline{\$27.17}$$

Total Payments: \$1,047.99

Treatment Costs:

Smelter Charge \$133.00

Adjustment Labor Costs

$$(\$18.586 - \$16.300) \times 100 \times \$0.08 = \$18.29$$

Adjustment Fuel Costs

$$(\$4.809 - \$4.800) \times 100 \times \$0.08 = \$0.07$$

Adjustment Energy Costs

$$(\$17.300 - \$13.100) \times \$0.0016 = \underline{\$0.67}$$

Total Treatment Costs \$152.03

Penalties:

Arsenic [1.49% - 0.50%] x \$5.00 =	\$4.95
Antimony [0.78% - 0.50%] x \$5.00 =	\$1.40
Bullion Lead 181 lb x \$0.053050/lb =	<u>\$9.60</u>
Total Penalties	\$15.95
Total Treatment Costs and Penalties	\$167.98
Net Value before Other Deductions	\$880.01
Other Deductions	
Insurance \$880.01 x 1.1 x 0.002775	\$2.69
Freight + Shipment + Unshipment + Warehousing (F.S.W.)	<u>\$68.72</u>
Total Other Deductions	\$71.41
Net Value of a Ton of Leaching Concentrate	\$808.61

APPENDIX K

Highest Net Present Value Computer Runs

Highest Net Present Value Run

700 d.s.t./day

D A T A T A B L E

Tons/day	700.0
Ag Average Grade (oz/st)	15.00
Pb Average Grade (%)	0.9%
Cut-Off (oz/st)	8.0
Reserves (st)	1,750,000.0
Ag Recovery (%)	79.9%
Pb Recovery (%)	82.0%
Concentration Ratio	11.5
Leaching Ratio	1.3
Ag Price (\$/oz)	\$8.00
Pb Price (\$/lb)	\$0.24
Plant Availability (%)	93.29%
Annual Production (st)	238,356.0
Ag Price Escalation (%)	5.0%
Pb Price Escalation (%)	5.0%
Treatment Cost Escalation (%)	5.0%
F,S,& W Escalation (%)	5.0%
Penalties Escalation (%)	0.0%
Mine Life (years)	7.34
Sales Taxes (%)	5.0%
Export Taxes (%)	2.0%
Royalties (%)	0.0%
Production Costs (\$/st)	\$24.41
Administrative Costs (\$/st)	\$4.67
Financing Costs (\$/st)	\$6.43
Total Operating Costs (\$/st)	\$35.51
Depreciation Costs (\$/st)	\$7.74
Operating Cost Escalation (%)	5.0%
Mineral Rights (\$)	\$0.00
Ore Founded Ratio (st/mt)	67.62
Exploration Cost (\$/mt)	\$230.00
Average UIT Value (\$)	\$1,066.50
Selectivity Index	1.00
Liquid Participation (%)	4.0%
Property Participation (%)	6.0%
Ingenmet (%)	1.0%
Inflation Rate (%)	4.0%
Constant Discount Rate (%)	8.0%
Escalated Discount Rate (%)	12.3%

METALLURGICAL REPORT 700

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	238,356.0	15.00	0.9%	3,575,339	2,145.2	100.0%	100.0%
Pb-Ag Concentrate	20,726.6	137.83	8.5%	2,856,696	1,759.1	79.9%	82.0%
Leaching Concentrate	15,943.5	179.18	11.0%	2,856,696	1,759.1	100.0%	100.0%
Tailings	217,629.3	3.30	0.2%	718,643	386.1	20.1%	18.0%
Weight Lost	4,783.1						

PRODUCTION SCHEDULE TABLE:	Year 1	Year 2	Year 3	Year 4
Reserves (st)	1,750,000.0	1,511,644.1	1,273,288.1	1,034,932.2
Annual Production (st)	238,356.0	238,356.0	238,356.0	238,356.0
Cumulative Production (st)	238,356.0	476,711.9	715,067.9	953,423.8
Production Leaching Conc. (st)	15,943.5	15,943.5	15,943.5	15,943.5
Escalated Silver Price (\$/oz)	8.00	8.40	8.82	9.26
Escalated Lead Price (\$/lb)	0.24	0.25	0.26	0.28

NSR CALCULATION:

Silver Payment (\$)	\$1,311.82	\$1,379.53	\$1,450.62	\$1,525.26
Lead Payment (\$)	\$27.17	\$29.34	\$31.63	\$34.02
Total Payments (\$)	\$1,338.99	\$1,408.87	\$1,482.24	\$1,559.29
Treatment Costs (\$)	\$152.03	\$159.63	\$167.61	\$175.99
Penalties Costs (\$)	\$15.95	\$15.95	\$15.95	\$15.95
N.V. before other Deductions	\$1,171.01	\$1,233.29	\$1,298.68	\$1,367.34
Insurance Cost (\$)	\$3.57	\$3.76	\$3.96	\$4.17
F,S,& W Cost (\$)	\$68.72	\$72.16	\$75.76	\$79.55
NET VALUE (\$)	\$1,098.71	\$1,157.37	\$1,218.95	\$1,283.62

PRODUCTION SCHEDULE TABLE:	Year 5	Year 6	Year 7	Year 8
Reserves (st)	796,576.2	558,220.3	319,864.3	81,508.4
Annual Production (st)	238,356.0	238,356.0	238,356.0	81,508.4
Cumulative Production (st)	1,191,779.8	1,430,135.7	1,668,491.7	1,750,000.0
Production Leaching Conc. (st)	15,943.5	15,943.5	15,943.5	5,452.1
Escalated Silver Price (\$/oz)	9.72	10.21	10.72	11.26
Escalated Lead Price (\$/lb)	0.29	0.31	0.32	0.34
NSR CALCULATION:				
Silver Payment (\$)	\$1,603.64	\$1,685.94	\$1,772.35	\$1,863.09
Lead Payment (\$)	\$36.54	\$39.18	\$41.95	\$44.87
Total Payments (\$)	\$1,640.18	\$1,725.12	\$1,814.31	\$1,907.95
Treatment Costs (\$)	\$184.79	\$194.03	\$203.73	\$213.92
Penalties Costs (\$)	\$15.95	\$15.95	\$15.95	\$15.95
N.V. before other Deductions	\$1,439.44	\$1,515.14	\$1,594.62	\$1,678.08
Insurance Cost (\$)	\$4.39	\$4.62	\$4.87	\$5.12
F.S. & M Cost (\$)	\$83.53	\$87.71	\$92.09	\$96.70
NET VALUE (\$)	\$1,351.51	\$1,422.81	\$1,497.66	\$1,576.26

INVESTMENT SCHEDULE:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)	\$0.00	\$608,580.00	\$0.00	\$0.00
Housing I (\$)	\$745,200.00	\$0.00	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$346,500.00	\$0.00	\$0.00	\$0.00
Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$680,961.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$82,044.00
Rep. Transportation Units (\$)	\$0.00	\$0.00	\$0.00	\$399,510.00
TOTAL INVESTMENT/YEAR (\$)	\$1,091,700.00	\$608,580.00	\$0.00	\$1,162,515.00

DEPRECIATION CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)		\$0.00	\$60,858.00	\$60,858.00
Housing I (\$)		\$74,520.00	\$74,520.00	\$74,520.00
Housing II (\$)		\$0.00	\$0.00	\$0.00
Housing III (\$)		\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)		\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)		\$0.00	\$0.00	\$0.00
Hydroelectric Plant (\$)		\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)		\$69,300.00	\$69,300.00	\$69,300.00
Mine Machinery (\$)		\$0.00	\$0.00	\$0.00
Plant Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Plant Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Transportation Units (\$)		\$0.00	\$0.00	\$0.00
Current Depreciation (\$)	\$1,844,875.05	\$1,844,875.05	\$1,844,875.05	\$1,844,875.05
TOTAL DEPRECIATION/YEAR (\$)	\$1,844,875.05	\$1,988,695.05	\$2,049,553.05	\$2,049,553.05

INCOME TAX CALCULATION:	0.00	150.00	\$0.00	\$159,975.00	\$47,992.50
	150.00	1500.00	\$159,975.00	\$1,599,750.00	\$575,910.00
	1500.00	3000.00	\$1,599,750.00	\$3,199,500.00	\$799,875.00
	3000.00		\$3,199,500.00		

INCOME TAX TABLE	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$47,992.50	\$623,902.50	\$1,423,777.50	\$50,000,000.0
	0.30	0.40	0.50	0.55	1.00

INVESTMENT SCHEDULE:	YEAR 5	YEAR 6	YEAR 7	YEAR 8
School (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Housing I (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Rep. Transportation Units (\$)	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL INVESTMENT/YEAR (\$)	\$0.00	\$0.00	\$0.00	\$0.00

DEPRECIATION CALCULATION:	YEAR 5	YEAR 6	YEAR 7	YEAR 8
School (\$)	\$60,858.00	\$60,858.00	\$60,858.00	\$60,858.00
Housing I (\$)	\$74,520.00	\$74,520.00	\$74,520.00	\$74,520.00
Housing II (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$69,300.00	\$69,300.00	\$0.00	\$0.00
Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$136,192.20	\$136,192.20	\$136,192.20	\$136,192.20
Rep. Plant Machinery (\$)	\$16,408.80	\$16,408.80	\$16,408.80	\$16,408.80
Rep. Transportation Units (\$)	\$79,902.00	\$79,902.00	\$79,902.00	\$79,902.00
Current Depreciation (\$)	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL DEPRECIATION/YEAR (\$)	\$437,181.00	\$437,181.00	\$367,881.00	\$367,881.00

CASH FLOW CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GROSS INCOME (NSR) (\$)	\$17,517,389.27	\$18,452,521.45	\$19,434,410.25	\$20,465,393.48
SALES TAXES (\$)	\$875,869.46	\$922,626.07	\$971,720.51	\$1,023,269.67
EXPORT TAXES (\$)	\$350,347.79	\$369,050.43	\$388,688.20	\$409,307.87
GROSS SALES (\$)	\$16,291,172.02	\$17,160,844.95	\$18,074,001.53	\$19,032,815.93
ROYALTIES (\$)	\$0.00	\$0.00	\$0.00	\$0.00
OPERATING COSTS (\$)	\$8,464,019.78	\$8,887,220.77	\$9,331,581.81	\$9,798,160.90
GROSS PROFITS (\$)	\$7,827,152.24	\$8,273,624.18	\$8,742,419.72	\$9,234,655.03
DEPRECIATION (\$)	\$1,844,875.05	\$1,988,695.05	\$2,049,553.05	\$2,049,553.05
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$893,834.81	\$938,526.55
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$4,479,357.66	\$4,706,863.62	\$5,799,031.85	\$6,246,575.43
INCOME TAX (\$)	\$2,127,699.21	\$2,252,827.49	\$2,853,520.02	\$3,099,668.98
CREDIT SALES TAX (\$)	\$875,869.46	\$922,626.07	\$971,720.51	\$1,023,269.67
ITC CALCULATION:				
Investment per year (\$)	\$1,091,700.00	\$608,580.00	\$0.00	\$1,162,515.00
		itc2	itc3	itc4
Fwd (2nd + 3rd) + IPY (\$)		\$608,580.00	\$0.00	\$1,162,515.00
Available ITC (\$)	\$1,117,040.03	\$1,174,565.59	\$1,449,393.14	\$1,561,554.55
Fwd (2nd + 3rd) (\$)		\$0.00	\$0.00	\$0.00
Fwd (3rd) (\$)		\$0.00	\$0.00	\$0.00
Current ITC (\$)		\$608,580.00	\$1,449,393.14	\$1,162,515.00
FINAL ITC (\$)	\$1,091,700.00	\$608,580.00	\$0.00	\$1,162,515.00
Forward 2nd. Year (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Forward 3rd. Year (\$)	\$0.00	\$0.00	\$0.00	\$0.00
	itc2	itc3	itc4	itc5
	+C162>0	+D162>0	+E162>0	+F162>0
NET INCOME (\$)	\$4,319,227.91	\$3,985,242.20	\$3,917,232.34	\$5,332,691.12
LIQUID PARTICIPATION (\$)	\$172,769.12	\$159,409.69	\$156,689.29	\$213,307.64
PROPERTY PARTICIPATION (\$)	\$259,153.67	\$239,114.53	\$235,033.94	\$319,961.47
CONTRIBUTION TO INGEMMET (\$)	\$43,192.28	\$39,852.42	\$39,172.32	\$53,326.91
NET PROFIT (\$)	\$3,844,112.84	\$3,546,865.56	\$3,486,336.79	\$4,746,095.09
DEPRECIATION (\$)	\$1,844,875.05	\$1,988,695.05	\$2,049,553.05	\$2,049,553.05
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$893,834.81	\$938,526.55
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$1,091,700.00	\$608,580.00	\$0.00	\$1,162,515.00
WORKING CAPITAL (\$)	\$1,491,420.00	\$0.00	\$0.00	\$0.00
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00	\$0.00	\$0.00
NET CASH FLOW (\$)	\$4,608,787.42	\$6,505,046.11	\$6,429,724.65	\$6,571,659.70
CF NET PRESENT VALUE (\$)	\$29,011,743.45			

CASH FLOW CALCULATION:	YEAR 5	YEAR 6	YEAR 7	YEAR 8
GROSS INCOME (NSR) (\$)	\$21,547,925.87	\$22,684,584.89	\$23,878,076.85	\$8,593,895.74
SALES TAXES (\$)	\$1,077,396.29	\$1,134,229.24	\$1,193,903.84	\$429,694.79
EXPORT TAXES (\$)	\$430,958.52	\$453,691.70	\$477,561.54	\$171,877.91
GROSS SALES (\$)	\$20,039,571.06	\$21,096,663.94	\$22,206,611.47	\$7,992,323.04
ROYALTIES (\$)	\$0.00	\$0.00	\$0.00	\$0.00
OPERATING COSTS (\$)	\$10,288,068.95	\$10,802,472.40	\$11,342,596.02	\$4,072,657.30
GROSS PROFITS (\$)	\$9,751,502.11	\$10,294,191.55	\$10,864,015.46	\$3,919,665.74
DEPRECIATION (\$)	\$437,181.00	\$437,181.00	\$367,881.00	\$367,881.00
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$985,452.88	\$1,034,725.52	\$1,086,461.80	\$390,103.52
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$8,328,868.23	\$8,822,285.02	\$9,409,672.65	\$3,161,681.22
INCOME TAX (\$)	\$4,244,930.03	\$4,516,309.26	\$4,839,372.46	\$1,404,868.11
CREDIT SALES TAX (\$)	\$1,077,396.29	\$1,134,229.24	\$1,193,903.84	\$429,694.79
ITC CALCULATION:				
Investment per year (\$)	\$0.00	\$0.00	\$0.00	\$0.00
	itc5	itc6	itc7	itc8
Fwd (2nd + 3rd) + IPY (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Available ITC (\$)	\$2,081,439.09	\$2,204,317.61	\$2,350,494.61	\$780,626.05
Fwd (2nd + 3rd) (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Fwd (3rd) (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Current ITC (\$)	\$2,081,439.09	\$2,204,317.61	\$2,350,494.61	\$780,626.05
FINAL ITC (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Forward 2nd. Year (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Forward 3rd. Year (\$)	\$0.00	\$0.00	\$0.00	\$0.00
	itc6	itc7	itc8	itc9
	+6162>0	+H162>0	+I162>0	+J162>0
NET INCOME (\$)	\$5,161,334.50	\$5,440,205.00	\$5,764,204.04	\$2,186,507.90
LIQUID PARTICIPATION (\$)	\$206,453.38	\$217,608.20	\$230,568.16	\$87,460.32
PROPERTY PARTICIPATION (\$)	\$309,680.07	\$326,412.30	\$345,852.24	\$131,190.47
CONTRIBUTION TO INGEMMET (\$)	\$51,613.34	\$54,402.05	\$57,642.04	\$21,865.08
NET PROFIT (\$)	\$4,593,587.70	\$4,841,782.45	\$5,130,141.59	\$1,945,992.03
DEPRECIATION (\$)	\$437,181.00	\$437,181.00	\$367,881.00	\$367,881.00
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$985,452.88	\$1,034,725.52	\$1,086,461.80	\$390,103.52
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$0.00	\$0.00	\$0.00	\$0.00
WORKING CAPITAL (\$)	\$0.00	\$0.00	\$0.00	(\$1,491,420.00)
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00	\$0.00	\$0.00
NET CASH FLOW (\$)	\$6,016,221.58	\$6,313,688.98	\$6,584,484.39	\$4,195,396.55

Highest Net Present Value Run

850 d.s.t./day

DATA TABLE

Tons/day	700.0	850.0
Ag Average Grade (oz/st)	15.00	15.00
Pb Average Grade (%)	0.9%	0.9%
Cut-Off (oz/st)	8.0	8.0
Reserves (st)	1,750,000.0	1,750,000.0
Ag Recovery (%)	79.9%	79.9%
Pb Recovery (%)	82.0%	82.0%
Concentration Ratio	11.5	11.5
Leaching Ratio	1.3	1.3
Ag Price (\$/oz)	\$8.00	\$8.00
Pb Price (\$/lb)	\$0.24	\$0.24
Plant Availability (%)	93.29%	93.29%
Annual Production (st)	238,356.0	289,432.2
Ag Price Escalation (%)	5.0%	5.0%
Pb Price Escalation (%)	5.0%	5.0%
Treatment Cost Escalation (%)	5.0%	5.0%
F,S,& W Escalation (%)	5.0%	5.0%
Penalties Escalation (%)	0.0%	0.0%
Mine Life (years)	2.00	4.40
Sales Taxes (%)	5.0%	5.0%
Export Taxes (%)	2.0%	2.0%
Royalties (%)	0.0%	0.0%
Production Costs (\$/st)	\$24.41	\$22.76
Administrative Costs (\$/st)	\$4.67	\$3.84
Financing Costs (\$/st)	\$6.43	\$5.29
Total Operating Costs (\$/st)	\$35.51	\$31.89
Depreciation Costs (\$/st)	\$7.74	\$6.37
Operating Cost Escalation (%)	5.0%	5.0%
Mineral Rights (\$)	\$0.00	\$0.00
Ore Founded Ratio (st/mt)	67.62	67.62
Exploration Cost (\$/mt)	\$230.00	\$230.00
Average UIT Value (\$)	\$1,066.50	\$1,066.50
Selectivity Index	1.00	1.00
Liquid Participation (%)	4.0%	4.0%
Property Participation (%)	6.0%	6.0%
Ingenmet (%)	1.0%	1.0%
Inflation Rate (%)	4.0%	4.0%
Constant Discount Rate (%)	8.0%	8.0%
Escalated Discount Rate (%)	12.3%	12.3%

METALLURGICAL REPORT 700

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	238,356.0	15.00	0.9%	3,575,339	2,145.2	100.0%	100.0%
Pb-Ag Concentrate	20,726.6	137.83	8.5%	2,856,696	1,759.1	79.9%	82.0%
Leaching Concentrate	15,943.5	179.18	11.0%	2,856,696	1,759.1	100.0%	100.0%
Tailings	217,629.3	3.30	0.2%	718,643	386.1	20.1%	18.0%
Weight Lost	4,783.1						

METALLURGICAL REPORT 850

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	289,432.2	15.00	0.9%	4,341,483	2,604.9	100.0%	100.0%
Pb-Ag Concentrate	25,168.0	137.83	8.5%	3,468,845	2,136.0	79.9%	82.0%
Leaching Concentrate	19,360.0	179.18	11.0%	3,468,845	2,136.0	100.0%	100.0%
Tailings	264,264.2	3.30	0.2%	872,638	468.9	20.1%	18.0%
Weight Lost	3,806.0						

PRODUCTION SCHEDULE TABLE:

	Year 1	Year 2	Year 3	Year 4
Reserves (st)	1,750,000.0	1,511,644.1	1,273,288.1	983,855.9
Annual Production (st)	238,356.0	238,356.0	289,432.2	289,432.2
Cumulative Production (st)	238,356.0	476,711.9	766,144.1	1,055,576.4
Production Leaching Conc. (st)	15,943.5	15,943.5	19,360.0	19,360.0
Escalated Silver Price (\$/oz)	8.00	\$8.40	\$8.82	9.26
Escalated Lead Price (\$/lb)	0.24	\$0.25	\$0.26	0.28

NSR CALCULATION:

Silver Payment (\$)	\$1,311.82	\$1,379.53	\$1,450.62	\$1,525.26
Lead Payment (\$)	\$27.17	\$29.34	\$31.63	\$34.02
Total Payments (\$)	\$1,338.99	\$1,408.87	\$1,482.24	\$1,559.29
Treatment Costs (\$)	\$152.03	\$159.63	\$167.61	\$175.99
Penalties Costs (\$)	\$15.95	\$15.95	\$15.95	\$15.95
N.V. before other Deductions	\$1,171.01	\$1,233.29	\$1,298.68	\$1,367.34
Insurance Cost (\$)	\$3.57	\$3.76	\$3.96	\$4.17
F.S. & M Cost (\$)	\$68.72	\$72.16	\$75.76	\$79.55
NET VALUE (\$)	\$1,098.71	\$1,157.37	\$1,218.95	\$1,283.62

PRODUCTION SCHEDULE TABLE:	Year 5	Year 6	Year 7
Reserves (st)	694,423.7	404,991.4	115,559.2
Annual Production (st)	289,432.2	289,432.2	115,559.2
Cumulative Production (st)	1,345,008.6	1,634,440.8	1,750,000.0
Production Leaching Conc. (st)	19,360.0	19,360.0	7,729.7
Escalated Silver Price (\$/oz)	9.72	10.21	10.72
Escalated Lead Price (\$/lb)	0.29	0.31	0.32

NSR CALCULATION:

Silver Payment (\$)	\$1,603.64	\$1,685.94	\$1,772.35
Lead Payment (\$)	\$36.54	\$39.18	\$41.95
Total Payments (\$)	\$1,640.18	\$1,725.12	\$1,814.31
Treatment Costs (\$)	\$184.79	\$194.03	\$203.73
Penalties Costs (\$)	\$15.95	\$15.95	\$15.95
N.V. before other Deductions	\$1,439.44	\$1,515.14	\$1,594.62
Insurance Cost (\$)	\$4.39	\$4.62	\$4.87
F.S. & W Cost (\$)	\$83.53	\$87.71	\$92.09
NET VALUE (\$)	\$1,351.51	\$1,422.81	\$1,497.66

INVESTMENT SCHEDULE:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)	\$0.00	\$608,580.00	\$0.00	\$0.00
Housing I (\$)	\$745,200.00	\$0.00	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$782,460.00	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$459,200.00	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$181,125.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$346,500.00	\$0.00	\$0.00	\$0.00
Mine Machinery (\$)	\$234,050.00	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$205,150.00	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$886,567.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$106,212.00
Rep. Transportation Units (\$)	\$0.00	\$0.00	\$0.00	\$524,404.00
TOTAL INVESTMENT/YEAR (\$)	\$1,990,100.00	\$1,572,165.00	\$0.00	\$1,517,183.00

DEPRECIATION CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)		\$0.00	\$121,716.00	\$121,716.00
Housing I (\$)		\$149,040.00	\$149,040.00	\$149,040.00
Housing II (\$)		\$0.00	\$156,492.00	\$156,492.00
Housing III (\$)		\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)		\$91,840.00	\$91,840.00	\$91,840.00
Facilities: Mercantile (\$)		\$0.00	\$36,225.00	\$36,225.00
Hydroelectric Plant (\$)		\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)		\$69,300.00	\$69,300.00	\$69,300.00
Mine Machinery (\$)		\$46,810.00	\$46,810.00	\$46,810.00
Plant Machinery (\$)		\$41,030.00	\$41,030.00	\$41,030.00
Rep. Mine Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Plant Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Transportation Units (\$)		\$0.00	\$0.00	\$0.00
Current Depreciation (\$)	\$1,844,875.05	\$1,844,875.05	\$1,843,683.27	\$1,843,683.27
TOTAL DEPRECIATION/YEAR (\$)	\$1,844,875.05	\$2,242,895.05	\$2,556,136.27	\$2,556,136.27

INCOME TAX CALCULATION:	0.00	150.00	\$0.00	\$159,975.00	\$47,992.50
	150.00	1500.00	\$159,975.00	\$1,599,750.00	\$575,910.00
	1500.00	3000.00	\$1,599,750.00	\$3,199,500.00	\$799,875.00
	3000.00		\$3,199,500.00		

INCOME TAX TABLE	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$47,992.50	\$623,902.50	\$1,423,777.50	\$50,000,000.0
	0.30	0.40	0.50	0.55	1.00

INVESTMENT SCHEDULE:	YEAR 5	YEAR 6	YEAR 7
School (\$)	\$0.00	\$0.00	\$0.00
Housing I (\$)	\$0.00	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$0.00	\$0.00	\$0.00
Mine Machinery (\$)	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00	\$0.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00	\$0.00
Rep. Transportation Units (\$)	\$0.00	\$0.00	\$0.00
TOTAL INVESTMENT/YEAR (\$)	\$0.00	\$0.00	\$0.00

DEPRECIATION CALCULATION:	YEAR 5	YEAR 6	YEAR 7
School (\$)	\$121,716.00	\$121,716.00	\$121,716.00
Housing I (\$)	\$149,040.00	\$149,040.00	\$0.00
Housing II (\$)	\$156,492.00	\$156,492.00	\$156,492.00
Housing III (\$)	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$91,840.00	\$91,840.00	\$0.00
Facilities: Mercantile (\$)	\$36,225.00	\$36,225.00	\$36,225.00
Hydroelectric Plant (\$)	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$69,300.00	\$69,300.00	\$0.00
Mine Machinery (\$)	\$46,810.00	\$46,810.00	\$0.00
Plant Machinery (\$)	\$41,030.00	\$41,030.00	\$0.00
Rep. Mine Machinery (\$)	\$177,313.40	\$177,313.40	\$177,313.40
Rep. Plant Machinery (\$)	\$21,242.40	\$21,242.40	\$21,242.40
Rep. Transportation Units (\$)	\$104,880.80	\$104,880.80	\$104,880.80
Current Depreciation (\$)	\$0.00	\$0.00	\$0.00
TOTAL DEPRECIATION/YEAR (\$)	\$1,015,889.60	\$1,015,889.60	\$617,869.60

CASH FLOW CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GROSS INCOME (NSR) (\$)	\$17,517,389.27	\$18,452,521.45	\$23,598,926.73	\$24,850,834.94
SALES TAXES (\$)	\$875,869.46	\$922,626.07	\$1,179,946.34	\$1,242,541.75
EXPORT TAXES (\$)	\$350,347.79	\$369,050.43	\$471,978.53	\$497,016.70
GROSS SALES (\$)	\$16,291,172.02	\$17,160,844.95	\$21,947,001.86	\$23,111,276.49
ROYALTIES (\$)	\$0.00	\$0.00	\$0.00	\$0.00
OPERATING COSTS (\$)	\$8,464,019.78	\$8,887,220.77	\$10,176,068.00	\$10,684,871.41
GROSS PROFITS (\$)	\$7,827,152.24	\$8,273,624.18	\$11,770,933.85	\$12,426,405.09
DEPRECIATION (\$)	\$1,844,875.05	\$2,242,895.05	\$2,556,136.27	\$2,556,136.27
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$1,085,370.84	\$1,139,639.39
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$4,479,357.66	\$4,452,663.62	\$8,129,426.73	\$8,730,629.43
INCOME TAX (\$)	\$1,418,466.14	\$1,408,678.33	\$2,756,824.80	\$2,977,265.79
CREDIT SALES TAX (\$)	\$875,869.46	\$922,626.07	\$1,179,946.34	\$1,242,541.75
ITC CALCULATION:				
Investment per year (\$)	\$1,990,100.00	\$1,572,165.00	\$0.00	\$1,517,183.00
		itc2	itc3	itc4
Fwd (2nd + 3rd) + IPY (\$)		\$2,592,980.72	\$1,629,962.51	\$3,089,348.00
Available ITC (\$)	\$969,284.28	\$963,018.20	\$1,821,939.33	\$1,961,976.84
Fwd (2nd + 3rd) (\$)		\$1,020,815.72	\$1,629,962.51	\$1,572,165.00
Fwd (3rd) (\$)		\$0.00	\$57,797.51	\$1,572,165.00
Current ITC (\$)		\$963,018.20	\$57,797.51	\$1,572,165.00
FINAL ITC (\$)	\$969,284.28	\$963,018.20	\$57,797.51	\$1,572,165.00
Forward 2nd. Year (\$)	\$1,020,815.72	\$1,572,165.00	\$0.00	\$1,517,183.00
Forward 3rd. Year (\$)	\$0.00	\$57,797.51	\$1,572,165.00	\$0.00
	itc2	itc3	itc4	itc5
	+C168>0	+D168>0	+E168>0	+F168>0
NET INCOME (\$)	\$4,906,045.26	\$4,929,629.57	\$6,610,345.78	\$8,568,070.38
LIQUID PARTICIPATION (\$)	\$196,241.81	\$197,185.18	\$264,413.83	\$342,722.82
PROPERTY PARTICIPATION (\$)	\$294,362.72	\$295,777.77	\$396,620.75	\$514,084.22
CONTRIBUTION TO INGENMET (\$)	\$49,060.45	\$49,296.30	\$66,103.46	\$85,680.70
NET PROFIT (\$)	\$4,366,380.29	\$4,387,370.32	\$5,883,207.75	\$7,625,582.64
DEPRECIATION (\$)	\$1,844,875.05	\$2,242,895.05	\$2,556,136.27	\$2,556,136.27
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$1,085,370.84	\$1,139,639.39
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$1,990,100.00	\$1,572,165.00	\$0.00	\$1,517,183.00
WORKING CAPITAL (\$)	\$1,491,420.00	\$0.00	\$0.00	\$0.00
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00	\$0.00	\$0.00
NET CASH FLOW (\$)	\$4,232,654.86	\$6,636,165.87	\$9,524,714.86	\$9,804,175.30
CF NET PRESENT VALUE (\$)	\$35,553,197.10			

CASH FLOW CALCULATION:	YEAR 5	YEAR 6	YEAR 7
GROSS INCOME (NSRI) (\$)	\$26,165,338.56	\$27,545,567.36	\$11,576,515.96
SALES TAXES (\$)	\$1,308,266.93	\$1,377,278.37	\$578,825.80
EXPORT TAXES (\$)	\$523,306.77	\$550,911.35	\$231,530.32
GROSS SALES (\$)	\$24,333,764.86	\$25,617,377.65	\$10,766,159.84
ROYALTIES (\$)	\$0.00	\$0.00	\$0.00
OPERATING COSTS (\$)	\$11,219,114.98	\$11,780,070.72	\$4,938,497.52
GROSS PROFITS (\$)	\$13,114,649.88	\$13,837,306.92	\$5,827,662.32
DEPRECIATION (\$)	\$1,015,889.60	\$1,015,889.60	\$617,869.60
DEPLETION (\$)	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$1,196,621.36	\$1,256,452.42	\$526,735.99
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$10,902,138.93	\$11,564,964.90	\$4,683,056.73
INCOME TAX (\$)	\$3,773,485.94	\$4,016,522.13	\$2,239,733.70
CREDIT SALES TAX (\$)	\$1,308,266.93	\$1,377,278.37	\$578,825.80
ITC CALCULATION:			
Investment per year (\$)	\$0.00	\$0.00	\$0.00
	itc5	itc6	itc7
Fwd (2nd + 3rd) + IPY (\$)	\$1,517,183.00	\$0.00	\$0.00
Available ITC (\$)	\$2,467,393.97	\$2,621,580.58	\$1,168,551.49
Fwd (2nd + 3rd) (\$)	\$1,517,183.00	\$0.00	\$0.00
Fwd (3rd) (\$)	\$0.00	\$0.00	\$0.00
Current ITC (\$)	\$1,517,183.00	\$2,621,580.58	\$1,168,551.49
FINAL ITC (\$)	\$1,517,183.00	\$0.00	\$0.00
Forward 2nd. Year (\$)	\$0.00	\$0.00	\$0.00
Forward 3rd. Year (\$)	\$0.00	\$0.00	\$0.00
	itc6	itc7	itc8
	+6168>0	+1168>0	+1168>0
NET INCOME (\$)	\$9,954,102.92	\$8,925,721.14	\$3,022,148.83
LIQUID PARTICIPATION (\$)	\$398,164.12	\$357,028.85	\$120,885.95
PROPERTY PARTICIPATION (\$)	\$597,246.17	\$535,543.27	\$181,328.93
CONTRIBUTION TO INGEMMET (\$)	\$99,541.03	\$89,257.21	\$30,221.49
NET PROFIT (\$)	\$8,859,151.60	\$7,943,891.81	\$2,689,712.45
DEPRECIATION (\$)	\$1,015,889.60	\$1,015,889.60	\$617,869.60
DEPLETION (\$)	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$1,196,621.36	\$1,256,452.42	\$526,735.99
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$0.00	\$0.00	\$0.00
WORKING CAPITAL (\$)	\$0.00	\$0.00	(\$1,491,420.00)
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00	\$0.00
NET CASH FLOW (\$)	\$11,071,662.55	\$10,216,233.84	\$5,325,738.04

Highest Net Present Value Run

1000 d.s.t./day

D A T A T A B L E

Tons/day	700.0	1000.0
Ag Average Grade (oz/st)	15.00	15.00
Pb Average Grade (%)	0.9%	0.9%
Cut-Off (oz/st)	8.0	8.0
Reserves (st)	1,750,000.0	1,750,000.0
Ag Recovery (%)	79.9%	79.9%
Pb Recovery (%)	82.0%	82.0%
Concentration Ratio	11.5	11.5
Leaching Ratio	1.3	1.3
Ag Price (\$/oz)	\$8.00	\$8.00
Pb Price (\$/lb)	\$0.24	\$0.24
Plant Availability (%)	93.29%	93.29%
Annual Production (st)	238,356.0	340,508.5
Ag Price Escalation (%)	5.0%	5.0%
Pb Price Escalation (%)	5.0%	5.0%
Treatment Cost Escalation (%)	5.0%	5.0%
F,S,& W Escalation (%)	5.0%	5.0%
Penalties Escalation (%)	0.0%	0.0%
Mine Life (years)	2.00	3.74
Sales Taxes (%)	5.0%	5.0%
Export Taxes (%)	2.0%	2.0%
Royalties (%)	0.0%	0.0%
Production Costs (\$/st)	\$24.41	\$19.43
Administrative Costs (\$/st)	\$4.67	\$3.26
Financing Costs (\$/st)	\$6.43	\$4.50
Total Operating Costs (\$/st)	\$35.51	\$27.19
Depreciation Costs (\$/st)	\$7.74	\$5.41
Operating Cost Escalation (%)	5.0%	5.0%
Mineral Rights (\$)	\$0.00	\$0.00
Ore Founded Ratio (st/mt)	67.62	67.62
Exploration Cost (\$/mt)	\$230.00	\$230.00
Average UIT Value (\$)	\$1,066.50	\$1,066.50
Selectivity Index	1.00	1.00
Liquid Participation (%)	4.0%	4.0%
Property Participation (%)	6.0%	6.0%
Ingenmet (%)	1.0%	1.0%
Inflation Rate (%)	4.0%	4.0%
Constant Discount Rate (%)	8.0%	8.0%
Escalated Discount Rate (%)	12.3%	12.3%

METALLURGICAL REPORT 700

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	238,356.0	15.00	0.9%	3,575,339	2,145.2	100.0%	100.0%
Pb-Ag Concentrate	20,726.6	137.83	8.5%	2,856,696	1,759.1	79.9%	82.0%
Leaching Concentrate	15,943.5	179.18	11.0%	2,856,696	1,759.1	100.0%	100.0%
Tailings	217,629.3	3.30	0.2%	718,643	386.1	20.1%	18.0%
Weight Lost	4,783.1						

METALLURGICAL REPORT 1000

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	340,508.5	15.00	0.9%	5,107,628	3,064.6	100.0%	100.0%
Pb-Ag Concentrate	29,609.4	137.83	8.5%	4,080,994	2,513.0	79.9%	82.0%
Leaching Concentrate	22,776.5	179.18	11.0%	4,080,994	2,513.0	100.0%	100.0%
Tailings	310,899.1	3.30	0.2%	1,026,633	551.6	20.1%	18.0%
Weight Lost	6,832.9						

PRODUCTION SCHEDULE TABLE:

	Year 1	Year 2	Year 3	Year 4
Reserves (st)	1,750,000.0	1,511,644.1	1,273,288.1	932,779.6
Annual Production (st)	238,356.0	238,356.0	340,508.5	340,508.5
Cumulative Production (st)	238,356.0	476,711.9	817,220.4	1,157,728.9
Production Leaching Conc. (st)	15,943.5	15,943.5	22,776.5	22,776.5
Escalated Silver Price (\$/oz)	8.00	\$8.40	\$8.82	9.26
Escalated Lead Price (\$/lb)	0.24	\$0.25	\$0.26	0.28

NSR CALCULATION:

Silver Payment (\$)	\$1,311.82	\$1,379.53	\$1,450.62	\$1,525.26
Lead Payment (\$)	\$27.17	\$29.34	\$31.63	\$34.02
Total Payments (\$)	\$1,338.99	\$1,408.87	\$1,482.24	\$1,559.29
Treatment Costs (\$)	\$152.03	\$159.63	\$167.61	\$175.99
Penalties Costs (\$)	\$15.95	\$15.95	\$15.95	\$15.95
N.V.before other Deductions	\$1,171.01	\$1,233.29	\$1,298.68	\$1,367.34
Insurance Cost (\$)	\$3.57	\$3.76	\$3.96	\$4.17
F,S,& W Cost (\$)	\$68.72	\$72.16	\$75.76	\$79.55
NET VALUE (\$)	\$1,098.71	\$1,157.37	\$1,218.95	\$1,283.62

PRODUCTION SCHEDULE TABLE:	Year 5	Year 6
Reserves (st)	592,271.1	251,762.6
Annual Production (st)	340,508.5	251,762.6
Cumulative Production (st)	1,498,237.4	1,750,000.0
Production Leaching Conc. (st)	22,776.5	16,840.3
Escalated Silver Price (\$/oz)	9.72	10.21
Escalated Lead Price (\$/lb)	0.29	0.31

NSR CALCULATION:

Silver Payment (\$)	\$1,603.64	\$1,685.94
Lead Payment (\$)	\$36.54	\$39.18
Total Payments (\$)	\$1,640.18	\$1,725.12
Treatment Costs (\$)	\$184.79	\$194.03
Penalties Costs (\$)	\$15.95	\$15.95
N.V. before other Deductions	\$1,439.44	\$1,515.14
Insurance Cost (\$)	\$4.39	\$4.62
F,S,& W Cost (\$)	\$83.53	\$87.71
NET VALUE (\$)	\$1,351.51	\$1,422.81

INVESTMENT SCHEDULE:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)	\$0.00	\$608,580.00	\$0.00	\$0.00
Housing I (\$)	\$1,117,800.00	\$0.00	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$1,173,690.00	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$459,200.00	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$181,125.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$1,443,425.00	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$346,500.00	\$0.00	\$0.00	\$0.00
Mine Machinery (\$)	\$503,800.00	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$835,700.00	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$1,062,931.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$125,081.00
Rep. Transportation Units (\$)	\$0.00	\$0.00	\$0.00	\$574,182.00
TOTAL INVESTMENT/YEAR (\$)	\$4,706,425.00	\$1,963,395.00	\$0.00	\$1,762,194.00

DEPRECIATION CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)		\$0.00	\$121,716.00	\$121,716.00
Housing I (\$)		\$223,560.00	\$223,560.00	\$223,560.00
Housing II (\$)		\$0.00	\$234,738.00	\$234,738.00
Housing III (\$)		\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)		\$91,840.00	\$91,840.00	\$91,840.00
Facilities: Mercantile (\$)		\$0.00	\$36,225.00	\$36,225.00
Hydroelectric Plant (\$)		\$288,685.00	\$288,685.00	\$288,685.00
Shaft Machinery (\$)		\$69,300.00	\$69,300.00	\$69,300.00
Mine Machinery (\$)		\$100,760.00	\$100,760.00	\$100,760.00
Plant Machinery (\$)		\$167,140.00	\$167,140.00	\$167,140.00
Rep. Mine Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Plant Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Transportation Units (\$)		\$0.00	\$0.00	\$0.00
Current Depreciation (\$)	\$1,844,875.05	\$1,844,875.05	\$1,842,150.99	\$1,842,150.99
TOTAL DEPRECIATION/YEAR (\$)	\$1,844,875.05	\$2,786,160.05	\$3,176,114.99	\$3,176,114.99

INCOME TAX CALCULATION:	0.00	150.00	\$0.00	\$159,975.00	\$47,992.50
	150.00	1500.00	\$159,975.00	\$1,599,750.00	\$575,910.00
	1500.00	3000.00	\$1,599,750.00	\$3,199,500.00	\$799,875.00
	3000.00		\$3,199,500.00		

INCOME TAX TABLE	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$47,992.50	\$623,902.50	\$1,423,777.50	\$50,000,000.0
	0.30	0.40	0.50	0.55	1.00

INVESTMENT SCHEDULE:	YEAR 5	YEAR 6
School (\$)	\$0.00	\$0.00
Housing I (\$)	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$0.00
Housing III (\$)	\$0.00	\$0.00
Facilities: Hospital (\$)	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00
Shaft Machinery (\$)	\$0.00	\$0.00
Mine Machinery (\$)	\$0.00	\$0.00
Plant Machinery (\$)	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00
Rep. Transportation Units (\$)	\$0.00	\$0.00
TOTAL INVESTMENT/YEAR (\$)	\$0.00	\$0.00

DEPRECIATION CALCULATION:	YEAR 5	YEAR 6
School (\$)	\$121,716.00	\$121,716.00
Housing I (\$)	\$223,560.00	\$223,560.00
Housing II (\$)	\$234,738.00	\$234,738.00
Housing III (\$)	\$0.00	\$0.00
Facilities: Hospital (\$)	\$91,840.00	\$91,840.00
Facilities: Mercantile (\$)	\$36,225.00	\$36,225.00
Hydroelectric Plant (\$)	\$288,685.00	\$288,685.00
Shaft Machinery (\$)	\$69,300.00	\$69,300.00
Mine Machinery (\$)	\$100,760.00	\$100,760.00
Plant Machinery (\$)	\$167,140.00	\$167,140.00
Rep. Mine Machinery (\$)	\$212,586.20	\$212,586.20
Rep. Plant Machinery (\$)	\$25,016.20	\$25,016.20
Rep. Transportation Units (\$)	\$114,836.40	\$114,836.40
Current Depreciation (\$)	\$0.00	\$0.00
TOTAL DEPRECIATION/YEAR (\$)	\$1,686,402.80	\$1,686,402.80

CASH FLOW CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GROSS INCOME (NSR) (\$)	\$17,517,389.27	\$18,452,521.45	\$27,763,443.21	\$29,236,276.40
SALES TAXES (\$)	\$875,869.46	\$922,626.07	\$1,388,172.16	\$1,461,813.82
EXPORT TAXES (\$)	\$350,347.79	\$369,050.43	\$555,268.86	\$584,725.53
GROSS SALES (\$)	\$16,291,172.02	\$17,160,844.95	\$25,820,002.18	\$27,189,737.05
ROYALTIES (\$)	\$0.00	\$0.00	\$0.00	\$0.00
OPERATING COSTS (\$)	\$8,464,019.78	\$8,887,220.77	\$10,207,414.79	\$10,717,785.53
GROSS PROFITS (\$)	\$7,827,152.24	\$8,273,624.18	\$15,612,587.39	\$16,471,951.52
DEPRECIATION (\$)	\$1,844,875.05	\$2,786,160.05	\$3,176,114.99	\$3,176,114.99
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$1,276,906.88	\$1,340,752.22
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$4,479,357.66	\$3,909,398.62	\$11,159,565.53	\$11,955,084.31
INCOME TAX (\$)	\$1,418,466.14	\$1,209,481.16	\$3,867,875.69	\$4,159,565.92
CREDIT SALES TAX (\$)	\$875,869.46	\$922,626.07	\$1,388,172.16	\$1,461,813.82
ITC CALCULATION:				
Investment per year (\$)	\$4,706,425.00	\$1,963,395.00	\$0.00	\$1,762,194.00
		itc2	itc3	itc4
Fwd (2nd + 3rd) + IPY (\$)		\$5,700,535.72	\$4,865,241.18	\$3,725,589.00
Available ITC (\$)	\$969,284.28	\$835,294.54	\$2,527,280.28	\$2,712,316.51
Fwd (2nd + 3rd) (\$)		\$3,737,140.72	\$4,865,241.18	\$1,963,395.00
Fwd (3rd) (\$)		\$0.00	\$2,901,846.18	\$1,963,395.00
Current ITC (\$)		\$835,294.54	\$2,527,280.28	\$1,963,395.00
FINAL ITC (\$)	\$969,284.28	\$835,294.54	\$2,527,280.28	\$1,963,395.00
Forward 2nd. Year (\$)	\$3,737,140.72	\$1,963,395.00	\$0.00	\$1,762,194.00
Forward 3rd. Year (\$)	\$0.00	\$2,901,846.18	\$1,963,395.00	\$0.00
	itc2	itc3	itc4	itc5
	+C168>0	+0168>0	+E168>0	+F168>0
NET INCOME (\$)	\$4,906,045.26	\$4,457,838.07	\$11,207,142.28	\$11,220,727.22
LIQUID PARTICIPATION (\$)	\$196,241.81	\$178,313.52	\$448,285.69	\$448,829.09
PROPERTY PARTICIPATION (\$)	\$294,362.72	\$267,470.28	\$672,428.54	\$673,243.63
CONTRIBUTION TO INGEMMET (\$)	\$49,060.45	\$44,578.38	\$112,071.42	\$112,207.27
NET PROFIT (\$)	\$4,366,380.29	\$3,967,475.88	\$9,974,356.63	\$9,986,447.22
DEPRECIATION (\$)	\$1,844,875.05	\$2,786,160.05	\$3,176,114.99	\$3,176,114.99
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$1,276,906.88	\$1,340,752.22
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$4,706,425.00	\$1,963,395.00	\$0.00	\$1,762,194.00
WORKING CAPITAL (\$)	\$1,491,420.00	\$0.00	\$0.00	\$0.00
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00	\$0.00	\$0.00
NET CASH FLOW (\$)	\$1,516,329.86	\$6,368,306.44	\$14,427,378.49	\$12,741,120.43
CF NET PRESENT VALUE (\$)	\$38,353,323.89			

CASH FLOW CALCULATION:	YEAR 5	YEAR 6
GROSS INCOME (NSR) (\$)	\$30,782,751.25	\$23,960,509.78
SALES TAXES (\$)	\$1,539,137.56	\$1,198,025.49
EXPORT TAXES (\$)	\$615,655.02	\$479,210.20
GROSS SALES (\$)	\$28,627,958.66	\$22,283,274.09
ROYALTIES (\$)	\$0.00	\$0.00
OPERATING COSTS (\$)	\$11,253,674.81	\$8,736,689.83
GROSS PROFITS (\$)	\$17,374,283.85	\$13,546,584.26
DEPRECIATION (\$)	\$1,686,402.80	\$1,686,402.80
DEPLETION (\$)	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$1,407,789.83	\$1,092,925.05
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$14,280,091.22	\$10,767,256.41
INCOME TAX (\$)	\$5,012,068.45	\$3,724,029.02
CREDIT SALES TAX (\$)	\$1,539,137.56	\$1,198,025.49
ITC CALCULATION:		
Investment per year (\$)	\$0.00	\$0.00
	itc5	itc6
Fwd (2nd + 3rd) + IPY (\$)	\$1,762,194.00	\$0.00
Available ITC (\$)	\$3,252,917.91	\$2,436,013.61
Fwd (2nd + 3rd) (\$)	\$1,762,194.00	\$0.00
Fwd (3rd) (\$)	\$0.00	\$0.00
Current ITC (\$)	\$1,762,194.00	\$2,436,013.61
FINAL ITC (\$)	\$1,762,194.00	\$0.00
Forward 2nd. Year (\$)	\$0.00	\$0.00
Forward 3rd. Year (\$)	\$0.00	\$0.00
	itc6	itc7
	+6168>0	+H168>0
NET INCOME (\$)	\$12,569,354.34	\$8,241,252.88
LIQUID PARTICIPATION (\$)	\$502,774.17	\$329,650.12
PROPERTY PARTICIPATION (\$)	\$754,161.26	\$494,475.17
CONTRIBUTION TO INGEMMET (\$)	\$125,693.54	\$82,412.53
NET PROFIT (\$)	\$11,186,725.36	\$7,334,715.06
DEPRECIATION (\$)	\$1,686,402.80	\$1,686,402.80
DEPLETION (\$)	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$1,407,789.83	\$1,092,925.05
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$0.00	\$0.00
WORKING CAPITAL (\$)	\$0.00	(\$1,491,420.00)
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00
NET CASH FLOW (\$)	\$14,280,917.99	\$11,605,462.91

Highest Net Present Value Run

1200 d.s.t./day

D A T A T A B L E

Tons/day	700.0	1200.0
Ag Average Grade (oz/st)	15.00	15.00
Pb Average Grade (%)	0.9%	0.9%
Cut-Off (oz/st)	8.0	8.0
Reserves (st)	1,750,000.0	1,750,000.0
Ag Recovery (%)	79.9%	79.9%
Pb Recovery (%)	82.0%	82.0%
Concentration Ratio	11.5	11.5
Leaching Ratio	1.3	1.3
Ag Price (\$/oz)	\$8.00	\$8.00
Pb Price (\$/lb)	\$0.24	\$0.24
Plant Availability (%)	93.29%	93.29%
Annual Production (st)	238,356.0	408,610.2
Ag Price Escalation (%)	5.0%	5.0%
Pb Price Escalation (%)	5.0%	5.0%
Treatment Cost Escalation (%)	5.0%	5.0%
F,S,& M Escalation (%)	5.0%	5.0%
Penalties Escalation (%)	0.0%	0.0%
Mine Life (years)	2.00	3.12
Sales Taxes (%)	5.0%	5.0%
Export Taxes (%)	2.0%	2.0%
Royalties (%)	0.0%	0.0%
Production Costs (\$/st)	\$24.41	\$18.90
Administrative Costs (\$/st)	\$4.67	\$3.10
Financing Costs (\$/st)	\$6.43	\$4.25
Total Operating Costs (\$/st)	\$35.51	\$26.25
Depreciation Costs (\$/st)	\$7.74	\$4.51
Operating Cost Escalation (%)	5.0%	5.0%
Mineral Rights (\$)	\$0.00	\$0.00
Ore Founded Ratio (st/mt)	67.62	67.62
Exploration Cost (\$/mt)	\$230.00	\$230.00
Average UIT Value (\$)	\$1,066.50	\$1,066.50
Selectivity Index	1.00	1.00
Liquid Participation (%)	4.0%	4.0%
Property Participation (%)	6.0%	6.0%
Ingenmet (%)	1.0%	1.0%
Inflation Rate (%)	4.0%	4.0%
Constant Discount Rate (%)	8.0%	8.0%
Escalated Discount Rate (%)	12.3%	12.3%

METALLURGICAL REPORT 700

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	238,356.0	15.00	0.9%	3,575,339	2,145.2	100.0%	100.0%
Pb-Ag Concentrate	20,726.6	137.83	8.5%	2,856,696	1,759.1	79.9%	82.0%
Leaching Concentrate	15,943.5	179.18	11.0%	2,856,696	1,759.1	100.0%	100.0%
Tailings	217,629.3	3.30	0.2%	718,643	386.1	20.1%	18.0%
Weight Lost	4,783.1						

METALLURGICAL REPORT 1200

	Weight (dst)	Ag Grade (oz/dst)	Pb Grade (%)	Ag Content (oz)	Pb Content (dst)	Ag Recovery	Pb Recovery
Feed Tonnage	408,610.2	15.00	0.9%	6,129,153	3,677.5	100.0%	100.0%
Pb-Ag Concentrate	35,531.3	137.83	8.5%	4,897,193	3,015.5	79.9%	82.0%
Leaching Concentrate	27,331.8	179.18	11.0%	4,897,193	3,015.5	100.0%	100.0%
Tailings	373,078.9	3.30	0.2%	1,231,960	661.9	20.1%	18.0%
Weight Lost	8,199.5						

PRODUCTION SCHEDULE TABLE:

	Year 1	Year 2	Year 3	Year 4
Reserves (st)	1,750,000.0	1,511,644.1	1,273,288.1	864,677.9
Annual Production (st)	238,356.0	238,356.0	408,610.2	408,610.2
Cumulative Production (st)	238,356.0	476,711.9	885,322.1	1,293,932.3
Production Leaching Conc. (st)	15,943.5	15,943.5	27,331.8	27,331.8
Escalated Silver Price (\$/oz)	8.00	\$8.40	\$8.82	9.26
Escalated Lead Price (\$/lb)	0.24	\$0.25	\$0.26	0.28

NSR CALCULATION:

Silver Payment (\$)	\$1,311.82	\$1,379.53	\$1,450.62	\$1,525.26
Lead Payment (\$)	\$27.17	\$29.34	\$31.63	\$34.02
Total Payments (\$)	\$1,338.99	\$1,408.87	\$1,482.24	\$1,559.29
Treatment Costs (\$)	\$152.03	\$159.63	\$167.61	\$175.99
Penalties Costs (\$)	\$15.95	\$15.95	\$15.95	\$15.95
N.V.before other Deductions	\$1,171.01	\$1,233.29	\$1,298.68	\$1,367.34
Insurance Cost (\$)	\$3.57	\$3.76	\$3.96	\$4.17
F,S,& M Cost (\$)	\$68.72	\$72.16	\$75.76	\$79.55
NET VALUE (\$)	\$1,098.71	\$1,157.37	\$1,218.95	\$1,283.62

PRODUCTION SCHEDULE TABLE:	Year 5	Year 6
Reserves (st)	456,067.7	47,457.5
Annual Production (st)	408,610.2	47,457.5
Cumulative Production (st)	1,702,542.5	1,750,000.0
Production Leaching Conc. (st)	27,331.8	3,174.4
Escalated Silver Price (\$/oz)	9.72	10.21
Escalated Lead Price (\$/lb)	0.29	0.31

NSR CALCULATION:

Silver Payment (\$)	\$1,603.64	\$1,685.94
Lead Payment (\$)	\$36.54	\$39.18
Total Payments (\$)	\$1,640.18	\$1,725.12
Treatment Costs (\$)	\$184.79	\$194.03
Penalties Costs (\$)	\$15.95	\$15.95
N.V. before other Deductions	\$1,439.44	\$1,515.14
Insurance Cost (\$)	\$4.39	\$4.62
F.S. & W Cost (\$)	\$83.53	\$87.71
NET VALUE (\$)	\$1,351.51	\$1,422.81

INVESTMENT SCHEDULE:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)	\$0.00	\$1,177,312.00	\$0.00	\$0.00
Housing I (\$)	\$1,863,000.00	\$0.00	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$1,956,150.00	\$0.00	\$0.00
Waste Dam & Others (\$)	\$1,466,250.00	\$0.00	\$0.00	\$0.00
Facilities: Hospital (\$)	\$824,750.00	\$0.00	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$271,687.00	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$1,443,425.00	\$0.00	\$0.00	\$0.00
Shaft Machinery (\$)	\$427,250.00	\$0.00	\$0.00	\$0.00
Mine Machinery (\$)	\$868,650.00	\$0.00	\$0.00	\$0.00
Plant Machinery (\$)	\$1,439,750.00	\$0.00	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00	\$0.00	\$1,314,541.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00	\$0.00	\$168,145.00
Rep. Transportation Units (\$)	\$0.00	\$0.00	\$0.00	\$724,094.00
TOTAL INVESTMENT/YEAR (\$)	\$8,333,075.00	\$3,405,149.00	\$0.00	\$2,206,780.00

DEPRECIATION CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
School (\$)		\$0.00	\$235,462.40	\$235,462.40
Housing I (\$)		\$372,600.00	\$372,600.00	\$372,600.00
Housing II (\$)		\$0.00	\$391,230.00	\$391,230.00
Waste Dam & Others (\$)		\$293,250.00	\$293,250.00	\$293,250.00
Facilities: Hospital (\$)		\$164,950.00	\$164,950.00	\$164,950.00
Facilities: Mercantile (\$)		\$0.00	\$54,337.40	\$54,337.40
Hydroelectric Plant (\$)		\$288,685.00	\$288,685.00	\$288,685.00
Shaft Machinery (\$)		\$85,450.00	\$85,450.00	\$85,450.00
Mine Machinery (\$)		\$173,730.00	\$173,730.00	\$173,730.00
Plant Machinery (\$)		\$287,950.00	\$287,950.00	\$287,950.00
Rep. Mine Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Plant Machinery (\$)		\$0.00	\$0.00	\$0.00
Rep. Transportation Units (\$)		\$0.00	\$0.00	\$0.00
Current Depreciation (\$)	\$1,844,875.05	\$1,844,875.05	\$1,842,832.00	\$1,842,832.00
TOTAL DEPRECIATION/YEAR (\$)	\$1,844,875.05	\$3,511,490.05	\$4,190,476.80	\$4,190,476.80

INCOME TAX CALCULATION:	0.00	150.00	\$0.00	\$159,975.00	\$47,992.50
	150.00	1500.00	\$159,975.00	\$1,599,750.00	\$575,910.00
	1500.00	3000.00	\$1,599,750.00	\$3,199,500.00	\$799,875.00
	3000.00		\$3,199,500.00		

INCOME TAX TABLE	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$159,975.00	\$1,599,750.00	\$3,199,500.00	\$100,000,000.0
	\$0.00	\$47,992.50	\$623,902.50	\$1,423,777.50	\$50,000,000.0
	0.30	0.40	0.50	0.55	1.00

INVESTMENT SCHEDULE:	YEAR 5	YEAR 6
School (\$)	\$0.00	\$0.00
Housing I (\$)	\$0.00	\$0.00
Housing II (\$)	\$0.00	\$0.00
Waste Dam & Others (\$)	\$0.00	\$0.00
Facilities: Hospital (\$)	\$0.00	\$0.00
Facilities: Mercantile (\$)	\$0.00	\$0.00
Hydroelectric Plant (\$)	\$0.00	\$0.00
Shaft Machinery (\$)	\$0.00	\$0.00
Mine Machinery (\$)	\$0.00	\$0.00
Plant Machinery (\$)	\$0.00	\$0.00
Rep. Mine Machinery (\$)	\$0.00	\$0.00
Rep. Plant Machinery (\$)	\$0.00	\$0.00
Rep. Transportation Units (\$)	\$0.00	\$0.00
TOTAL INVESTMENT/YEAR (\$)	\$0.00	\$0.00

DEPRECIATION CALCULATION:	YEAR 5	YEAR 6
School (\$)	\$235,462.40	\$235,462.40
Housing I (\$)	\$372,600.00	\$372,600.00
Housing II (\$)	\$391,230.00	\$391,230.00
Waste Dam & Others (\$)	\$293,250.00	\$293,250.00
Facilities: Hospital (\$)	\$164,950.00	\$164,950.00
Facilities: Mercantile (\$)	\$54,337.40	\$54,337.40
Hydroelectric Plant (\$)	\$288,685.00	\$288,685.00
Shaft Machinery (\$)	\$85,450.00	\$85,450.00
Mine Machinery (\$)	\$173,730.00	\$173,730.00
Plant Machinery (\$)	\$287,950.00	\$287,950.00
Rep. Mine Machinery (\$)	\$262,908.20	\$262,908.20
Rep. Plant Machinery (\$)	\$33,629.00	\$33,629.00
Rep. Transportation Units (\$)	\$144,818.80	\$144,818.80
Current Depreciation (\$)	\$0.00	\$0.00
TOTAL DEPRECIATION/YEAR (\$)	\$2,789,000.80	\$2,789,000.80

CASH FLOW CALCULATION:	YEAR 1	YEAR 2	YEAR 3	YEAR 4
GROSS INCOME (NSR) (\$)	\$17,517,389.27	\$18,452,521.45	\$33,316,131.85	\$35,083,531.68
SALES TAXES (\$)	\$875,869.46	\$922,626.07	\$1,665,806.59	\$1,754,176.58
EXPORT TAXES (\$)	\$350,347.79	\$369,050.43	\$666,322.64	\$701,670.63
GROSS SALES (\$)	\$16,291,172.02	\$17,160,844.95	\$30,984,002.62	\$32,627,684.46
ROYALTIES (\$)	\$0.00	\$0.00	\$0.00	\$0.00
OPERATING COSTS (\$)	\$8,464,019.78	\$8,887,220.77	\$11,825,434.57	\$12,416,706.30
GROSS PROFITS (\$)	\$7,827,152.24	\$8,273,624.18	\$19,158,568.05	\$20,210,978.16
DEPRECIATION (\$)	\$1,844,875.05	\$3,511,490.05	\$4,190,476.80	\$4,190,476.80
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$1,532,288.25	\$1,608,902.66
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$4,479,357.66	\$3,184,068.62	\$13,435,803.00	\$14,411,598.70
INCOME TAX (\$)	\$1,418,466.14	\$944,041.21	\$4,702,496.10	\$5,060,287.86
CREDIT SALES TAX (\$)	\$875,869.46	\$922,626.07	\$1,665,806.59	\$1,754,176.58
ITC CALCULATION:				
Investment per year (\$)	\$8,333,075.00	\$3,405,149.00	\$0.00	\$2,206,780.00
		itc2	itc3	itc4
Fwd (2nd + 3rd) + IPY (\$)		\$10,768,939.72	\$10,104,796.31	\$5,611,929.00
Available ITC (\$)	\$969,284.28	\$664,143.41	\$3,056,634.70	\$3,283,488.92
Fwd (2nd + 3rd) (\$)		\$7,363,790.72	\$10,104,796.31	\$3,405,149.00
Fwd (3rd) (\$)		\$0.00	\$6,699,647.31	\$3,405,149.00
Current ITC (\$)		\$664,143.41	\$3,056,634.70	\$3,283,488.92
FINAL ITC (\$)	\$969,284.28	\$664,143.41	\$3,056,634.70	\$3,283,488.92
Forward 2nd. Year (\$)	\$7,363,790.72	\$3,405,149.00	\$0.00	\$2,206,780.00
Forward 3rd. Year (\$)	\$0.00	\$6,699,647.31	\$3,405,149.00	\$0.00
	itc2	itc3	itc4	itc5
	+C168>0	+D168>0	+E168>0	+F168>0
NET INCOME (\$)	\$4,906,045.26	\$3,826,796.90	\$13,455,748.19	\$14,388,976.35
LIQUID PARTICIPATION (\$)	\$196,241.81	\$153,071.88	\$538,229.93	\$575,559.05
PROPERTY PARTICIPATION (\$)	\$294,362.72	\$229,607.81	\$807,344.89	\$863,338.58
CONTRIBUTION TO INGEMMET (\$)	\$49,060.45	\$38,267.97	\$134,557.48	\$143,889.76
NET PROFIT (\$)	\$4,366,380.29	\$3,405,849.24	\$11,975,615.89	\$12,806,188.95
DEPRECIATION (\$)	\$1,844,875.05	\$3,511,490.05	\$4,190,476.80	\$4,190,476.80
DEPLETION (\$)	\$0.00	\$0.00	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$810,734.52	\$851,271.25	\$1,532,288.25	\$1,608,902.66
DEVELOPMENT AMORTIZATION (\$)	\$692,185.00	\$726,794.25	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$8,333,075.00	\$3,405,149.00	\$0.00	\$2,206,780.00
WORKING CAPITAL (\$)	\$1,491,420.00	\$0.00	\$0.00	\$0.00
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00	\$0.00	\$0.00
NET CASH FLOW (\$)	(\$2,110,320.14)	\$5,090,255.79	\$17,698,380.94	\$16,398,788.41
CF NET PRESENT VALUE (\$)	\$36,957,293.49			

CASH FLOW CALCULATION:	YEAR 5	YEAR 6
GROSS INCOME (NSR) (\$)	\$36,939,301.49	\$4,516,579.88
SALES TAXES (\$)	\$1,846,965.07	\$225,828.99
EXPORT TAXES (\$)	\$738,786.03	\$90,331.60
GROSS SALES (\$)	\$34,353,550.39	\$4,200,419.29
ROYALTIES (\$)	\$0.00	\$0.00
OPERATING COSTS (\$)	\$13,037,541.61	\$1,589,939.72
GROSS PROFITS (\$)	\$21,316,008.78	\$2,610,479.56
DEPRECIATION (\$)	\$2,789,000.80	\$2,789,000.80
DEPLETION (\$)	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$1,689,347.80	\$206,017.46
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00
TAXABLE INCOME (\$)	\$16,837,660.18	(\$384,538.69)
INCOME TAX (\$)	\$5,949,843.73	\$0.00
CREDIT SALES TAX (\$)	\$1,846,965.07	\$0.00
ITC CALCULATION:		
Investment per year (\$)	\$0.00	\$0.00
	itc5	itc6
Fwd (2nd + 3rd) + IPY (\$)	\$2,206,780.00	\$0.00
Available ITC (\$)	\$3,847,375.81	\$0.00
Fwd (2nd + 3rd) (\$)	\$2,206,780.00	\$0.00
Fwd (3rd) (\$)	\$0.00	\$0.00
Current ITC (\$)	\$2,206,780.00	\$0.00
FINAL ITC (\$)	\$2,206,780.00	\$0.00
Forward 2nd. Year (\$)	\$0.00	\$0.00
Forward 3rd. Year (\$)	\$0.00	\$0.00
	itc6	itc7
	+6168>0	+H168>0
NET INCOME (\$)	\$14,941,561.52	(\$384,538.69)
LIQUID PARTICIPATION (\$)	\$597,662.46	(\$15,381.55)
PROPERTY PARTICIPATION (\$)	\$896,493.69	(\$23,072.32)
CONTRIBUTION TO INGEMMET (\$)	\$149,415.62	(\$3,845.39)
NET PROFIT (\$)	\$13,297,989.76	(\$342,239.44)
DEPRECIATION (\$)	\$2,789,000.80	\$2,789,000.80
DEPLETION (\$)	\$0.00	\$0.00
EXPLORATION AMORTIZATION (\$)	\$1,689,347.80	\$206,017.46
DEVELOPMENT AMORTIZATION (\$)	\$0.00	\$0.00
CAPITAL COSTS (\$)	\$0.00	\$0.00
WORKING CAPITAL (\$)	\$0.00	(\$1,491,420.00)
SALVAGE CASH FLOW (\$)	\$0.00	\$0.00
NET CASH FLOW (\$)	\$17,776,338.35	\$4,144,198.82

APPENDIX L
Sensitivity Analysis

SENSITIVITY ANALYSIS

AG PRICE PERCENTAGE	AG PRICE	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(\$/oz)	(\$)	(%)
62.50	\$5.00	\$3,302,925.80	8.61
75.00	\$6.00	\$16,501,295.29	43.02
87.50	\$7.00	\$27,776,960.44	72.42
100.00	\$8.00	\$38,353,323.89	100.00
112.50	\$9.00	\$47,172,188.55	122.99
125.00	\$10.00	\$55,755,217.09	145.37
137.50	\$11.00	\$64,528,211.61	168.25
150.00	\$12.00	\$73,018,649.22	190.38

PB PRICE PERCENTAGE	PB PRICE	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(\$/lb)	(\$)	(%)
75.00	\$0.18	\$37,716,540.87	98.34
83.33	\$0.20	\$37,928,808.94	98.89
91.67	\$0.22	\$38,141,069.85	99.45
100.00	\$0.24	\$38,353,323.89	100.00
108.33	\$0.26	\$38,565,571.33	100.55
116.67	\$0.28	\$38,777,812.41	101.11
125.00	\$0.30	\$38,990,047.39	101.66
133.33	\$0.32	\$39,202,276.48	102.21
141.67	\$0.34	\$39,414,499.90	102.77

SENSITIVITY		ANALYSIS	
AG RECOVERY PERCENTAGE	AG RECOVERY	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
93.87	75.00%	\$33,525,837.89	87.41
95.12	76.00%	\$34,551,297.88	90.09
96.37	77.00%	\$35,537,711.17	92.66
97.62	78.00%	\$36,509,104.55	95.19
98.87	79.00%	\$37,479,820.10	97.72
100.00	79.90%	\$38,353,323.89	100.00
101.38	81.00%	\$39,420,789.69	102.78
102.63	82.00%	\$40,353,002.52	105.21
103.88	83.00%	\$41,193,179.48	107.40
105.13	84.00%	\$42,033,344.66	109.60
106.38	85.00%	\$42,873,499.66	111.79

PB RECOVERY PERCENTAGE	PB RECOVERY	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
93.90	77.00%	\$38,234,218.66	99.69
95.12	78.00%	\$38,258,039.86	99.75
96.34	79.00%	\$38,281,860.99	99.81
97.56	80.00%	\$38,305,682.03	99.88
98.78	81.00%	\$38,329,503.00	99.94
100.00	82.00%	\$38,353,323.89	100.00
101.22	83.00%	\$38,377,144.71	100.06
102.44	84.00%	\$38,400,965.44	100.12
103.66	85.00%	\$38,424,786.11	100.19
104.88	86.00%	\$38,448,606.69	100.25
106.10	87.00%	\$38,472,427.20	100.31

SENSITIVITY ANALYSIS

CONCENTRATION R. PERCENTAGE	CONCENTRATION RATIO	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)		(\$)	(%)
86.96	10.00	\$36,180,115.87	94.33
89.57	10.30	\$36,665,473.43	95.60
92.17	10.60	\$37,123,313.34	96.79
94.78	10.90	\$37,555,914.86	97.92
97.39	11.20	\$37,965,311.61	98.99
100.00	11.50	\$38,353,323.89	100.00
102.61	11.80	\$38,721,586.14	100.96
105.22	12.10	\$39,071,570.08	101.87
107.83	12.40	\$39,404,604.55	102.74

LEACHING R. PERCENTAGE	LEACHING RATIO	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)		(\$)	(%)
76.92	1.00	\$33,957,768.03	88.54
84.62	1.10	\$35,719,008.36	93.13
92.31	1.20	\$37,146,093.69	96.85
100.00	1.30	\$38,353,323.89	100.00
107.69	1.40	\$39,387,918.68	102.70
115.38	1.50	\$40,259,640.21	104.97
123.08	1.60	\$40,938,489.97	106.74
130.77	1.70	\$41,537,468.27	108.30
138.46	1.80	\$42,069,888.63	109.69
146.15	1.90	\$42,546,261.25	110.93
153.85	2.00	\$42,974,994.02	112.05

		SENSITIVITY ANALYSIS	
P. AVAILABILITY PERCENTAGE	P. AVAILABILITY	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
91.40	85.00%	\$37,382,885.93	97.55
93.55	87.00%	\$37,721,167.22	98.43
95.70	89.00%	\$37,911,880.84	98.93
97.85	91.00%	\$38,117,701.33	99.46
100.00	93.00%	\$38,323,487.56	100.00
102.15	95.00%	\$38,529,242.33	100.54
104.30	97.00%	\$38,734,968.13	101.07
106.45	99.00%	\$38,940,667.20	101.61
107.53	100.00%	\$39,033,433.40	101.85

		SENSITIVITY ANALYSIS	
AG AVERAGE G. PERCENTAGE	AG AVERAGE GRADE	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(oz/d.s.t.)	(\$)	(%)
86.67	13.00	\$27,287,660.16	71.15
90.00	13.50	\$30,306,956.63	79.02
93.33	14.00	\$33,087,930.04	86.27
96.67	14.50	\$35,767,993.57	93.26
100.00	15.00	\$38,353,323.89	100.00
103.33	15.50	\$40,826,303.77	106.45
106.67	16.00	\$43,063,933.52	112.28
110.00	16.50	\$45,301,501.63	118.12
113.33	17.00	\$47,539,025.90	123.95

SENSITIVITY		ANALYSIS	
PB AVERAGE G. PERCENTAGE	PB AVERAGE GRADE	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
94.44	0.85%	\$38,244,805.87	99.72
95.56	0.86%	\$38,266,509.61	99.77
96.67	0.87%	\$38,288,213.27	99.83
97.78	0.88%	\$38,309,916.88	99.89
98.89	0.89%	\$38,331,620.42	99.94
100.00	0.90%	\$38,353,323.89	100.00
101.11	0.91%	\$38,375,027.30	100.06
102.22	0.92%	\$38,396,730.65	100.11
103.33	0.93%	\$38,418,433.94	100.17
104.44	0.94%	\$38,440,137.16	100.23
105.56	0.95%	\$38,461,840.32	100.28

RESERVES PERCENTAGE	RESERVES	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(d. s. t.)	(\$)	(%)
68.57	1,200,000	\$26,633,566.25	69.44
74.29	1,300,000	\$29,236,452.47	76.23
80.00	1,400,000	\$31,507,017.37	82.15
85.71	1,500,000	\$33,451,048.83	87.22
91.43	1,600,000	\$35,629,699.71	92.90
97.14	1,700,000	\$37,445,449.16	97.63
100.00	1,750,000	\$38,353,323.89	100.00
102.86	1,800,000	\$39,261,198.62	102.37
108.57	1,900,000	\$41,011,494.64	106.93
114.29	2,000,000	\$42,352,510.95	110.43
120.00	2,100,000	\$43,678,749.01	113.89
125.71	2,200,000	\$45,045,969.46	117.45

SENSITIVITY		ANALYSIS	
AG P. ESCALATION PERCENTAGE	AG P. ESCALATION	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
0.00	0.00%	\$30,205,043.24	78.75
20.00	1.00%	\$31,853,714.78	83.05
40.00	2.00%	\$33,466,404.31	87.26
60.00	3.00%	\$35,058,599.31	91.41
80.00	4.00%	\$36,687,327.22	95.66
100.00	5.00%	\$38,353,323.89	100.00
120.00	6.00%	\$40,057,333.06	104.44
140.00	7.00%	\$41,799,104.00	108.98
160.00	8.00%	\$43,462,089.11	113.32
180.00	9.00%	\$45,164,574.25	117.76
200.00	10.00%	\$46,907,335.32	122.30

FB P. ESCALATION PERCENTAGE	FB P. ESCALATION	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
0.00	0.00%	\$38,097,674.13	99.33
20.00	1.00%	\$38,146,498.42	99.46
40.00	2.00%	\$38,196,452.83	99.59
60.00	3.00%	\$38,247,559.91	99.72
80.00	4.00%	\$38,299,842.53	99.86
100.00	5.00%	\$38,353,323.89	100.00
120.00	6.00%	\$38,408,027.53	100.14
140.00	7.00%	\$38,463,977.32	100.29
160.00	8.00%	\$38,521,197.47	100.44
180.00	9.00%	\$38,579,712.53	100.59

SENSITIVITY		ANALYSIS	
D.C. ESCALATION PERCENTAGE	D.C. ESCALATION	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
0.00	0.00%	\$40,610,500.54	105.89
20.00	1.00%	\$40,178,605.47	104.76
40.00	2.00%	\$39,737,131.76	103.61
60.00	3.00%	\$39,285,889.33	102.43
80.00	4.00%	\$38,824,685.29	101.23
100.00	5.00%	\$38,353,323.89	100.00
120.00	6.00%	\$37,871,606.48	98.74
140.00	7.00%	\$37,379,331.47	97.46
160.00	8.00%	\$36,876,294.32	96.15
180.00	9.00%	\$36,362,287.47	94.81
200.00	10.00%	\$35,837,100.32	93.44

AVERAGE U.I.T. PERCENTAGE	AVERAGE U.I.T.	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(\$)	(\$)	(%)
79.70	\$850.00	\$38,221,800.86	99.66
84.39	\$900.00	\$38,252,327.55	99.74
89.08	\$950.00	\$38,282,763.04	99.82
93.76	\$1,000.00	\$38,313,107.32	99.90
98.45	\$1,050.00	\$38,343,360.39	99.97
100.00	\$1,066.50	\$38,353,323.89	100.00
103.14	\$1,100.00	\$38,373,522.26	100.05
107.83	\$1,150.00	\$38,403,592.93	100.13
112.52	\$1,200.00	\$38,433,572.38	100.21
117.21	\$1,250.00	\$38,463,460.64	100.29

SENSITIVITY		ANALYSIS	
INFLATION RATE PERCENTAGE	INFLATION RATE	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
0.00	0.00%	\$44,714,590.58	116.59
25.00	1.00%	\$42,995,289.11	112.10
50.00	2.00%	\$41,365,730.61	107.85
75.00	3.00%	\$39,820,178.45	103.82
100.00	4.00%	\$38,353,323.89	100.00
125.00	5.00%	\$36,960,249.83	96.37
150.00	6.00%	\$35,636,398.07	92.92
175.00	7.00%	\$34,377,539.61	89.63
200.00	8.00%	\$33,179,747.65	86.51
225.00	9.00%	\$32,039,373.05	83.54
250.00	10.00%	\$30,953,022.05	80.70

WORKING CAPITAL		NET PRESENT VALUE	
DAYS	(\$)	(\$)	NET PRESENT VALUE PERCENTAGE
			(%)
0.00	\$0.00	\$38,938,379.89	101.53
15.00	\$372,855.00	\$38,792,115.89	101.14
30.00	\$745,710.00	\$38,645,851.89	100.76
45.00	\$1,118,565.00	\$38,499,587.89	100.38
60.00	\$1,491,420.00	\$38,353,323.89	100.00
75.00	\$1,864,275.00	\$38,207,059.89	99.62
90.00	\$2,237,130.00	\$38,060,795.89	99.24
105.00	\$2,609,985.00	\$37,914,531.89	98.86
120.00	\$2,982,840.00	\$37,768,267.89	98.47

SENSITIVITY ANALYSIS

CAPITAL COSTS PERCENTAGE	CAPITAL COSTS	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
75.00	75.00%	\$38,603,444.44	100.65
80.00	80.00%	\$38,600,472.73	100.64
85.00	85.00%	\$38,597,500.76	100.64
90.00	90.00%	\$38,594,528.54	100.63
95.00	95.00%	\$38,520,804.01	100.44
100.00	100.00%	\$38,353,323.89	100.00
105.00	105.00%	\$38,185,840.94	99.56
110.00	110.00%	\$38,018,355.07	99.13
115.00	115.00%	\$37,850,866.16	98.69
120.00	120.00%	\$37,683,374.11	98.25

OPERATING COSTS PERCENTAGE	OPERATING COSTS	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(\$)	(\$)	(%)
75.03	\$20.40	\$44,371,500.83	115.69
80.03	\$21.76	\$43,213,952.00	112.67
85.03	\$23.12	\$42,056,383.98	109.66
90.03	\$24.48	\$40,898,788.72	106.64
95.03	\$25.84	\$39,707,911.45	103.53
100.00	\$27.19	\$38,353,323.89	100.00
105.04	\$28.56	\$36,987,037.87	96.44
110.04	\$29.92	\$35,600,042.56	92.82
115.04	\$31.28	\$34,127,653.33	88.98

SENSITIVITY ANALYSIS

TAXES PERCENTAGE	TAXES	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
		\$38,353,323.89	
25.00	25.00%	\$42,790,112.18	111.57
50.00	50.00%	\$41,554,556.77	108.35
75.00	75.00%	\$39,987,105.20	104.26
100.00	100.00%	\$38,353,323.89	100.00
125.00	125.00%	\$36,653,212.83	95.57
150.00	150.00%	\$34,885,918.96	90.96
175.00	175.00%	\$33,032,820.83	86.13

DISCOUNT RATE PERCENTAGE	DISCOUNT RATE	NET PRESENT VALUE	NET PRESENT VALUE PERCENTAGE
(%)	(%)	(\$)	(%)
		\$38,353,323.89	
73.05	9.00%	\$43,119,493.86	112.43
81.17	10.00%	\$41,601,712.30	108.47
91.72	11.30%	\$39,736,669.02	103.61
100.00	12.32%	\$38,353,323.89	100.00
107.95	13.30%	\$37,086,262.91	96.70
116.07	14.30%	\$35,852,416.27	93.48
121.75	15.00%	\$35,022,416.86	91.32
129.87	16.00%	\$33,882,391.42	88.34