WAROX UPDATE

OCTOBER 1988

SECTION A - REQUEST FOR INTERIM FINANCING

SECTION B - REVIEW OF CRITICAL ELEMENTS

GIANT YELLOWKNIFE MINES LIMITED
YELLOWKNIFE DIVISION
WAROX PROJECT GROUP

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Section A

SECTION A

REQUEST FOR INTERIM FINANCING

SUMMARY

1. SUBJECT
2. NEED
3. IDEA
4. BENEFITS
5. CONCLUSIONS
6. RECOMMENDATIONS

SUMMARY

The Giant WAROX team requests the committtment of $50,000 to the WAROX project in October.

This sum will be used to pay for an independent assessment of the technical merit and intended methodology of the WAROX project.

This sum initiates the second phase of the project which spans the period of October 1988 to March 1989 and is described in this report.

1. SUBJECT

The second phase of the WAROX project requires the commitment of a further $650,000.

This sum will be spent over a period of six months ending March 1989 as shown in Section 3.2.

The highlights of this staged program are:

1.	Feasibility Study by an independent Engineering group	$ 50,000
2.	RPC pilot plant; Antimony elimination and nucleation testwork	$ 100,000
3.	Engineering design and procurement analysis leading to a firm project estimate	$ 300,000
4.	Giant Underground Development Costs	$ 100,000
5.	Giant WAROX project team costs	$ 100,000
	TOTAL	$ 650,000

2. NEED

The need to proceed with the requested financing is measured quantifiably as well as qualitatively.

2.1 QUANTIFIABLE ELEMENTS

2.1.1 Entering an excellent market opportunity. WAROX currently sells at C $0.45 per pound. Giant currently has stockpiled over 170,000 tons of contained WAROX (In-Situ Value = $153 M).

2.1.2 Increase Gold Production. Giant can recover 85% of the 126,000 ounces of gold contained in the stock-piled crude Arsenic Trioxide.

(Based on Giant's average recovery of cottrell dust gold) current market value at C $500 per ounce - C $53M.

2.2.3 Recover Antimony for Resale. Giant can recover and sell antimony as a by-product. (Value $ 8M).

2.2.4 Positive Net Cashflows for 24 Years. Between 5M and 10M annually for a project total of $135M.

2.2.5 Eliminate Storage Requirements. A savings of approximately $0.25M per year.

2.2 QUALITATIVE ELEMENTS

2.2.1 Environmental. Elimination of a legitimately sensitive issue and a potentially expensive one at abandonment. Monitoring and annual assessments are a continual process.

2.2.2 Recovery of Gold from Arsenic Crown Pillars. The crown pillars contain 27,054 ounces of gold valued at $13.5 M. This value has not been added to the cases considered because of the uncertainties surrounding their mineability.

3. IDEA

3.1 The $650,000 requested is justified as follows:

3.1.1 FEASIBILITY STUDY [$50,000]

As a project safeguard there is some value attached to a thorough independent review by a competant Engineering firm. Two firms have been shortlisted due to their experience in pyrometallurgical processes. These are Lavalin in Toronto and PROTON in Vancouver. The cost of the feasibility study is estimated at $50,000 and will include a complete review of the pilot plant testwork as well as the preliminary plant design.

The feasibility report is expected by December 15, 1989. This will include a project cost estimate at a +/- 25% degree of accuracy.

3.1.2 Research and Productivity Council (RPC) [$100,000]

The pilot plant established at RPC in New Brunswick presents Giant with an excellent opportunity to research two more unknowns which will make WAROX more saleable to customers and allow Giant to capture a dominant market share of the high quality market. These are:

1. <u>Antimony Elimination</u> [$50,000]

Antimony content in WAROX produced at RPC has averaged less than 1% with many samples assaying less than 0.5%. Two remaining theories are still to be tested that will produce a cleaner, near antimony free WAROX.

a. Electro-static separation of elemental antimony.

b. Research into the gaseous polymeric compound theory. [Compounds of arsenic and antimony oxides - As_2SbO_6, $As_3Sb_2O_6$, $AsSb_3O_6$].

2. <u>Condensation and Nucleation Testwork</u> [$50,000]

The WAROX produced at RPC has too fine a particle size to gain wide market acceptability.

Compaction testwork is scheduled for October 1988, however, a coarse product can be produced by regulating the condensation process. This is currently being performed by the I.M.M. plant in Mexico.

It is desirable to conduct nucleation testwork at RPC to gain basic information on the subject which when coupled with I.M.M.'s experience will greatly assist in the design of the appropriate condenser.

3.1.3 Engineering Design & Procurement Analysis by an Independent Engineering Firm [$300,000]

1. Engineering design services [$200,000]

Design of the plant and transfer facility to include all the following drawings:

- Flowsheets
- General Arrangement - Layout
- Architectural
- Building Services
- Civil Site Preparation
- Civil Underground Services
- Structural Steel
- Structural Concrete
- Mechanical
- Piping
- Electrical
- Instrumentation

Completion of the above drawings will lead to a project estimate @ +/- 15% degree of accuracy.

2. Equipment Procurement Services [$100,000]

These services include the following:

- Tender document preparation for major equipment
- Bid Analysis
- Recommendations

This step is critical in the identification of long delivery items which can impact schedules and reduce the probability of error in capital costs estimates.

3.1.4 Underground Development [$100,000]

Tunnel access to the top of the underground storage silos is required. This process is described in detail in Appendix 4 of Section B.

$100,000 is required initially to access the 2-30/35 group of stopes which are high in gold content.

3.1.5 Giant - WAROX Project Team [$100,000]

The Giant-WAROX project team expenditures include the following:

- Current staffing level. Technical Project Supervisor, WAROX Engineering Co-Ordinator, Miscellaneous Drafting,

- Travel to RPC, New Brunswick.

- Travel to Arsenic Purification Plants:
- Consultants - J. Reimers and Associates, D. Zeraldo, etc.

- Advanced marketing studies.

3.2 EXPENDITURE SCHEDULE
(ALL NUMBERS IN DOLLARS)

1988--------1989

	SEPT	OCT	NOV	DEC	JAN	FEB	MARCH
FEASIBILITY			50,000				
R.P.C.		50,000*	50,000				
ENGINEERING COSTS							
DESIGN SERVICES				50,000	50,000	50,000	50,000
PROCUREMENT SERVICES				25,000	25,000	25,000	~~250~~,000 25
GIANT COSTS							
U/G DEVELOPMENT				25,000	25,000	25,000	25,000
WAROX PROJECT GROUP	10,000	10,000	20,000	20,000	20,000	10,000	10,000
TOTAL EXCLUDING Y.T.D. EXPENDITURES	10,000	60,000	120,000	120,000	120,000	110,000	110,000
CUMULATIVE TOTAL	10,000	70,000	190,000	310,000	430,000	540,000	650,000

* AUTHORIZED BY K. BLOWER SEPTEMBER 16, 1988

4. BENEFITS

4.1 Expenditure of $650,000 will yield the following benefits:

a) Confirm capital cost estimates and by extension also confirm the operating philosophy and operating costs.
b) Confirm the pre-feasibility results.

4.2 Financial Benefits

- The pre-feasibility examined many different scenarios. These are discussed and included in Section B of this report. The results are summarized in the table overleaf.

- The parameters utilized in the pre-feasibility are given below:

1. North American WAROX market 50,000 t.p.a.

2. Giant share of WAROX market 7,000 t.p.a. (14%) Based on D. Zeraldo's report.

3. WAROX revenue @ 99% recovery C $0.45 per pound.

4. Gold revenue @ 85% recovery C $500 per ounce.

5. Capital costs: $5.9M in 1989.

6. Operating costs: $0.27 per pound of WAROX produced in 1990. Reducing in 1995.

7. All financial analysis based on 10 year project.

   The NPV and IRR are only marginally affected by the periods beyond 1999. The payback is of course totally unaffected.

8. Sensitivities were completed for each of the six scenarios summarized overleaf.

4.3 SUMMARY OF FINANCIAL ANALYSIS

TABLE 1 - PRE-TAX

CASE		PRODUCTION TONS PER YEAR	PAYBACK YEARS	I.R.R. %	NPV @ 15% $	UNDISCOUNTED NPV - $
OPTIMAL	CASE A	7,000	0.8	146	32.1 M	63.5 M
	CASE B	4,000 - 7,000	1.4	95	25.5 M	56.6 M
	CASE C	7,000	1.9	65	13.7 M	33 M
WORST	CASE D	4,000 - 7,000	3.1	49	9.8 M	26.8 M
	CASE E	7,000	1.6	80	22.6 M	56.2 M
MOST LIKELY	CASE F	4,000 - 7,000	2.9	57	16.2 M	46.5 M

TABLE 2 - AFTER TAX

CASE		PRODUCTION TONS PER YEAR	PAYBACK YEARS	I.R.R. %	NPV @ 15% $	UNDISCOUNTED NPV - $
OPTIMAL	CASE A	7,000	1.0	104	19.7 M	40.0 M
	CASE B	4,000 - 7,000	1.8	72	15.6 M	35.8 M
	CASE C	7,000	2.4	50	8.3 M	21.3 M
WORST	CASE D	4,000 - 7,000	3.5	39	5.8 M	17.5 M
	CASE E	7,000	2.0	62	13.8 M	35.6 M
MOST LIKELY	CASE F	4,000 - 7,000	3.3	46	9.8 M	29.6 M

5. CONCLUSION

Six cases were examined from the optimum to the worst and four sensitivities conducted on each case.

The sensitivities in each case show an attractive positive cashflow potential which is relatively insensitive to any one of the four variables considered; WAROX price, Gold price, Operating costs and Capital costs. The downside risk is restricted to poor marketing expertise.

The success of this project therefore hinges on two aspects:

1. Technical Aspect.

   Risk in this area has been reduced by the pilot plant testwork. It is technically possible to produce large quantities of WAROX.

2. Marketing Aspect.

   The risk in this area warrants the hiring of an in-house marketing expert to conduct advanced strategic marketing studies. He should be located in Vancouver initially, Canada's major marketplace for industrial minerals, or in the equivalent location in the U.S.A. Eventually the marketing experts' position could be relocated to Yellowknife and be merged into the operating superintendents' position.

6. RECOMMENDATION

The Giant WAROX project team is confident that Giant can safely reclaim crude Arsenic Trioxide dust from underground stockpiles, refine the material in a fuming plant and produce a high quality product labelled WAROX which is desirable to the North American market by virtue of its purity and competitive pricing.

It is therefore recommended that the project be granted the requested interim financing necessary to advance the project and to ensure that the scheduled production start-up date of January 1, 1990 is achievable.

The second part of this report will discuss and display the evidence which has led to the conclusion and recommendation mentioned above.

S.E. El-Alfy
Project Manager
WAROX Project

Section B

SECTION B

REVIEW OF CRITICAL ELEMENTS

APPENDICES

1. SUBJECT

This report with the included appendices updates the reader on the ongoing work by the WAROX Project Team and presents the evidence upon which conclusions and recommendations were based on in Section A.

2. SUMMARY

A pre-feasibility study on the purification of Arsenic Trioxide stored underground was completed in July 1988. Financial yardsticks used indicated an attractive project with a short payback, high NPV and net cashflow for 24 years. For the sake of completeness the original report dated August 4th is appended - [Appendix 1].

3. PROJECT DESCRIPTION

- Giant Yellowknife Mines Limited propose to construct an Arsenic Trioxide purification plant at the Yellowknife Division.

- The purified product will contain at least 99% purity arsenic trioxide and will be marketed under the trade name WAROX (white arsenic trioxide). The plant will produce 7000 tons per year of WAROX (5300 t.p.y arsenic). WAROX contains 75.7% arsenic from feed varying in grade between 70% arsenic (current material) down to 45% arsenic (oldest material). Giant maintains a stockpile of 217,920 tons of crude arsenic trioxide (129,006 tons arsenic) indicating a project life of 24 years excluding current production of 12 tons per day. In addition to WAROX, the plant will recover gold contained in the crude feed. 125,421 ounces of gold will report to the hot baghouse along with other impurities, mainly iron and antimony. The hot baghouse residue will be treated in the conventional mill carbon plant and 85% of the contained gold will be recovered (106,608 ounces). Figure 1 shows the status of the arsenic trioxide stockpile.

- Giant Yellowknife Mines Limited proposes to purify the crude product by fuming (distillation). Baghouse dust crude will be fed into a roaster at a temperature of 350oC to 500oC. The vapour produced will pass through a hot baghouse filter which will trap solid impurities. The vapour will then pass through a condensor. The condensate will be better than 99% pure arsenic trioxide and will be trapped in a cold baghouse.

- Giant Yellowknife Mines Limited proposes to ship the material in bulk using bulk haulage trucks. The existing 300T silo and load-out facility will be utilized. A drum filling facility will also be included in the plant.

- The prevailing operating philosophy includes transferring the material from road to rail at the nearest possible railhead south of Great Slave Lake. For that purpose, the design of an airtight road to rail transfer facility is included in the project. Giant Yellowknife Mines Limited intends to feed the plant from stockpiled material as well as current production. Current production will be conveyed pneumatically to the WAROX plant via apparatus presently in use in Giant's conventional arsenic plant.

- Stockpiled material will be reclaimed by mechanical means. Reclaim methods are discussed in detail in Appendix 5.

STOPE	TONS DUST	% As	Oz/t Au	TONS As_2O_3	Oz Au
B2-30-36	64,364	46.28	1.218	39,333	78,362
B2-12/13/14	65,355	61.75	0.452	53,285	29,567
B2-08	32,369	65.66	0.354	28,062	11,468
C-12	18,679	65.15	0.178	16,179	3,214
C-9	20,276	67.48	0.121	18,067	2,512
C-10	10,548	66.00	0.133	9,307	1,408
B-11	6,331	73.02	0.137	6,104	867
TOTAL	217,922	59.20	0.576	170,337	127,398

Figure 1

4. PROJECT HIGHLIGHTS

Sept. 87 - Discussion with RPC re pilot testwork.

Oct. 87 - Board approval for expenditure of $362,000 on Pilot Plant testwork.

Oct. 87 - RPC site visit.

Nov.26/87 - RPC given authorization to proceed with construction of airtight facility.

June 5/88 - 1st start-up - 31 hour run.

July 25 to Aug. 25/88 - 1st production run.

Aug.19/88 to Aug.25/88 - 2nd production run.

Sept. 16/88 - Antimony elimination test.

Oct. 12/88 - Request for interim financing - $650,000

5. FINANCIAL ANALYSIS

Financial analyses are summarized in the table on Page 8. The following definitions are required to eliminate confusion.

Current Production: Arsenic trioxide being produced and stockpiled currently. This material is known as high grade because it is 73% arsenic. Gold grades are low at 0.137. oz/ton. Giant produces crude arsenic trioxide at the rate of 12T per day.

Recent Product: More recent material accounting for approximately half the U/G stockpile. Arsenic grade is still high at 65%. Gold grades vary between 0.130 oz/ton and 0.354 oz/ton.

Older Material: Usually lower grade arsenic trioxide (45% to 60% arsenic) and higher grade gold ranging between 1.22 oz/ton and 0.452 oz/ton.

5.1 The ideal situation from a cash flow perspective is to process the older material first (due to its high gold content). This is the optimal case scenario considered. Two variations are presented on this case. These are:

CASE A - Optimal case scenario @ 7000 t.p.a. WAROX sold starting in 1990.

CASE B - Optimal case scenario @ 4000 t.p.a. WAROX sold in 1990 with market share increasing by 500 t.p.a. to a 7000 t.p.a. ceiling.

5.2 The worst case scenario from a cash flow perspective is to treat current production and to supplement it with recent production, thus drastically reducing the revenues from gold.

Two variations are presented.

CASE C: Worst case at 7000 t.p.a. WAROX sold starting 1990.

CASE D: Worst case at 4000 t.p.a. WAROX sold in 1990 with market share increasing by 500 t.p.a. to a 7000 t.p.a. ceiling.

5.3 The most likely scenario will occur between the optimal and worst cases. It is represented here by the case where current & recent production are used to commission the plant smoothly in 1990. After 1990 current production will be used supplemented by older material in order to improve cash flows. Two variations are presented here:

CASE E: 7000 t.p.a. WAROX produced from current & recent production in 1990 and current & older material thereafter.

CASE F: 4000 t.p.a. in 1990 increasing by increments of 500 t.p.a. thereafter to a maximum of 7000 t.p.a. using current production in 1990 and current & older material thereafter.

Calculations, sensitivites and revenue graphs are included in Appendix 2.

The results were summarized in Section A, Part 4.3 and are shown again overleaf for convenience.

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6. CRITICAL ELEMENTS IN THE WAROX PROJECT

Eight critical elements have been identified in the WAROX Project. Work is progressing concurrently in all elements. A short report on each item is presented in the attached documentation.

6.1 Environmental Issues:

Most individuals react negatively to the suggestion that arsenic can be handled safely. This in turn prompts environmental regulators to apply stricter controls on handling procedures than would otherwise be warranted.

The pilot plant has demonstrated that it is possible to surround the WAROX plant with an airtight enclosure with access only required for mechanical maintenance purposes. Self-contained breathing apparatus can then be used in conjunction with space type suits to give the operators a safe working environment.

The total environmental issue is presented in a report by K. Morton in Appendix 3.

6.2 Underground Development and Working Environment:

Though most of the underground development is straightforward enough, special precautions are required for the final breakthrough rounds into the arsenic stopes to prevent dust dispersal and contamination of underground airways.

This element is discussed in detail in Appendix 4.

6.3 Reclamation:

As mentioned elsewhere in this report reclamation of arsenic trioxide from underground storage chambers will provide the main feed source to the plant, occasionally supplemented by current production.

A detailed description of the two reclaim systems currently being proposed is available in Appendix 5.

6.4 **Transfer Facility Design:**

A detailed description of the transfer facility along with site selection criteria is included in Appendix 6.

6.5 Plant Design

Introduction

The basic fuming process is quite a simple one, relying on low temperature sublimation of arsenic trioxide to effect a solids/vapour mixture that is separated in a fabric filter. Downstream condensation of the vapour completes the physical reaction. Effective handling of dusty, toxic feedstocks and purified product is also a major element of plant design.

The Process

Arsenic trioxide will sublime at temperatures as low as 260 deg.C, while impuritities present in the crude feed will not vaporize until much higher temperatures are reached. In Giant's process, crude baghouse dust containing from 60 to 90% As_2O_3 is fed into a fluosolids roaster at a controlled rate to maintain a freeboard temperature of approximately 400 deg.C. An inert sand bed helps to disperse the feed in the bed of the roaster so that sublimation is almost instantaneous. An updraft airflow with a space velocity of .4 m/sec carries the As_2O_3 fume and fine particulate matter out of the reactor while leaving the sand bed behind.

The gas/solids mixture carried out of the roaster passes through an insulated flue to a hot baghouse containing ceramic fabric filters capable of trapping very fine particulates. This baghouse is maintained at a temperature of 400 deg.C to ensure that As_2O_3 does not condense out, to be trapped in the filter. Solids composed of Si, Fe, Ca, Cu, Zn, Au, etc. are captured in the filter while the filtered As_2O_3 fume passes through.

The solids captured in the hot baghouse contain varying amounts of gold, ranging from 1 oz to 5 oz/ton, and this material is quenched with water, the slurry to be pumped to the mill for gold recovery in the existing Carbon Plant. The filtered fume is passed through an air mixing condenser, maintained at sufficiently low temperature that condensation of the fume is complete. The condensed product formed is a very high purity arsenic trioxide to be sold under the trade name, Warox.

Depending upon the final design of the condenser, a very fine product may be formed, causing complications in shipping, dust generation during transfer, etc. Customers prefer a coarser product and a compaction step has been included in the design. Flake formed in the compactor will be about 100 lbs/cu.ft and can be crushed and screened to whatever particle size the customer wants. It has the further advantages of being free-flowing and dust-free. It may also be possible to form coarse, crystalline product in the condenser and this possibility is being examined.

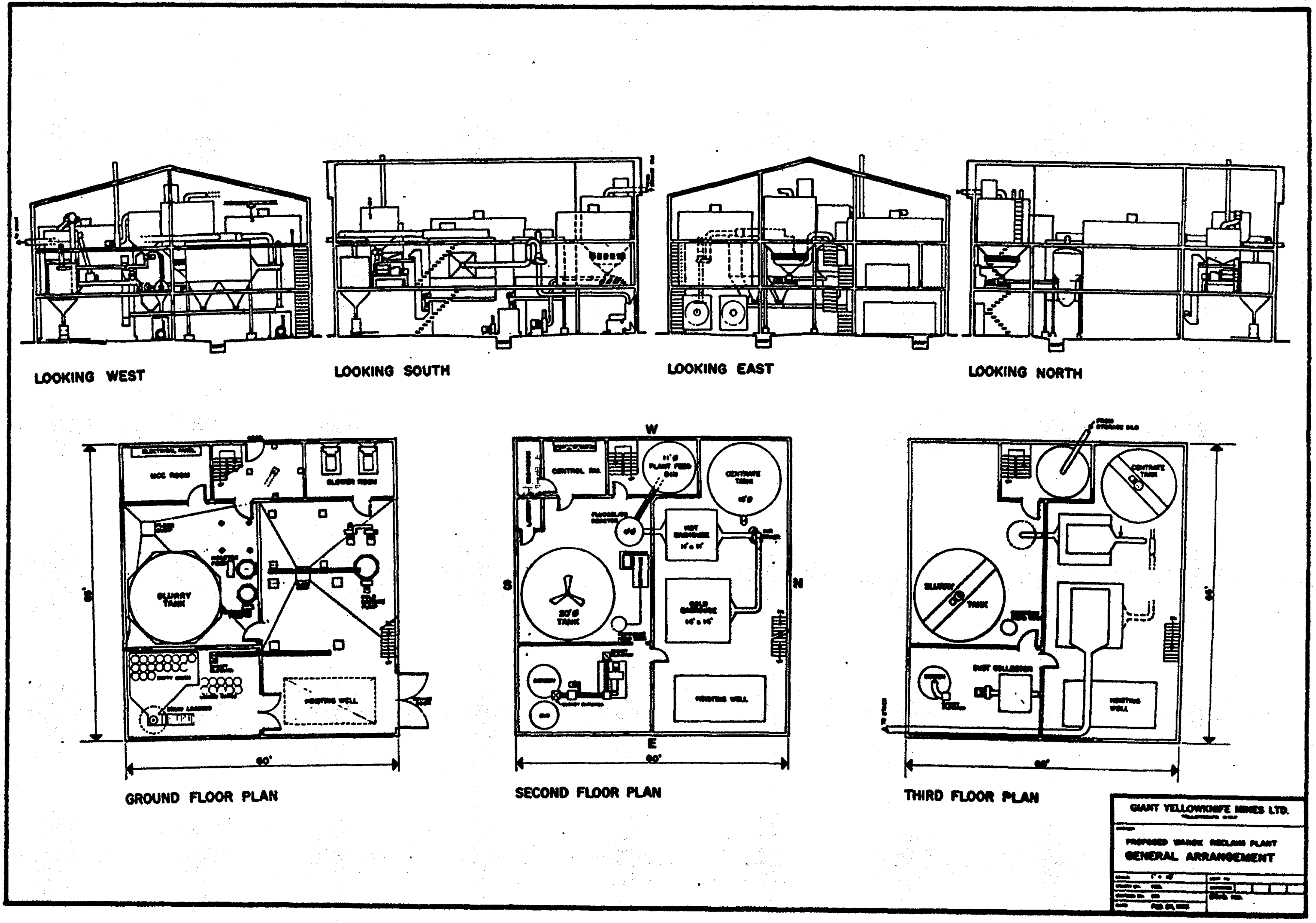
Material Handling

Handling of toxic feeds and products while providing protection to the workforce and to the environment is essential to the successful operation of the plant, and effective handling systems will be a major design consideration.

Positive displacement, fully enclosed mechanical transfer systems will be used to convey the material, while live bottom bins will be used for material storage. These will be necessary, particularly at the feed end of the plant, as it is very difficult to induce flow to baghouse dust.

One feature of baghouse dust is its tendency to rathole or arch over when being withdrawn from a bin. The existing silo will be used for storage of final product and a tubular drag conveyor will be used to convey product from the plant to the silo.

Some customers prefer the product to be packaged in steel drums and plant design includes a drum packaging facility.



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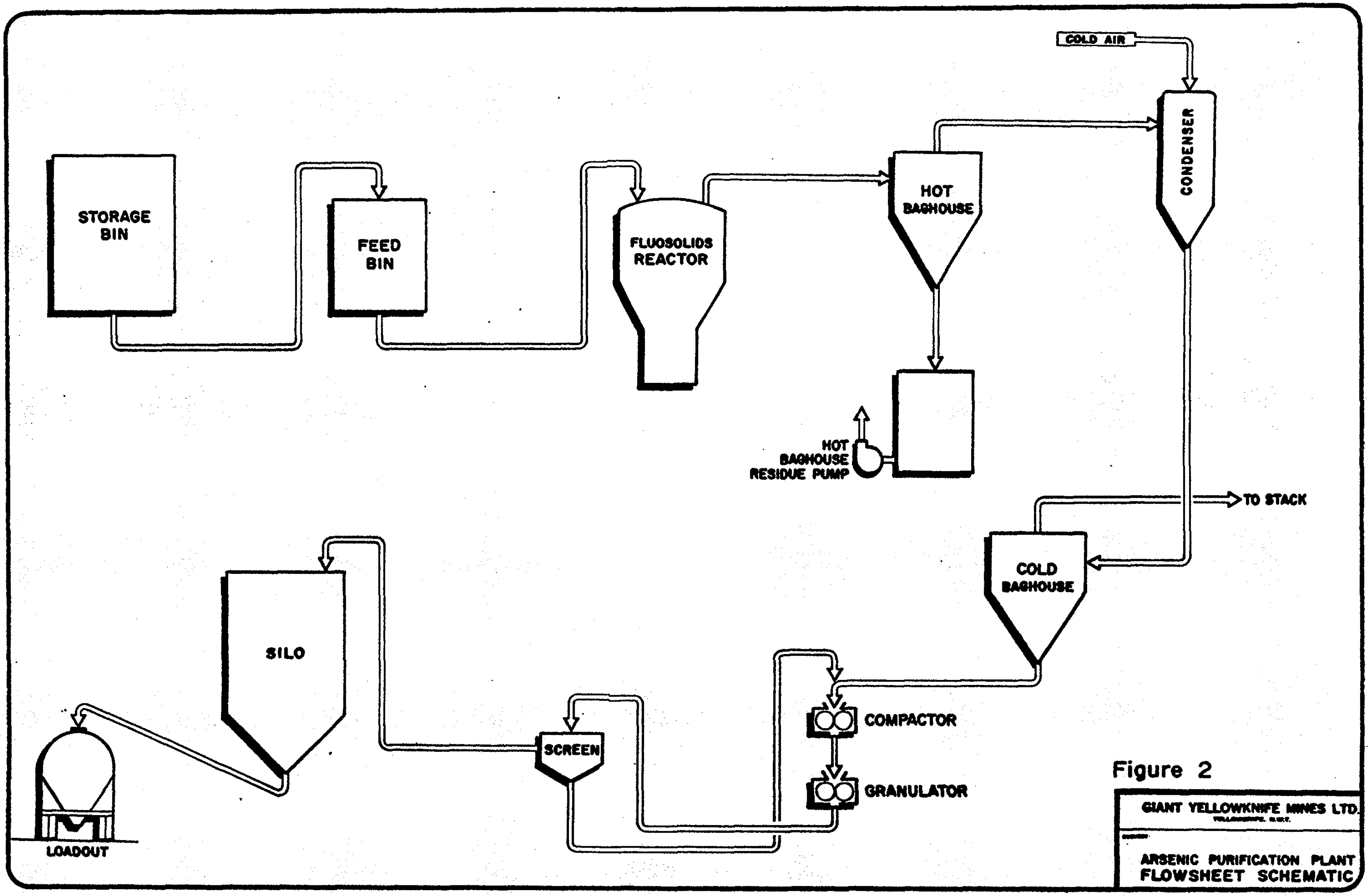
GENERAL ARRANGEMENT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COLD BAGHOUSE
SILO
COMPACTOR
GRANULATOR
SCREEN
LOADOUT
GIANT YELLOWKNIFE MINES LTD.
ARSENIC PURIFICATION PLANT
FLOWSHEET SCHEMATIC

Figure 2

6.6 Pilot Plant Testwork

Introduction

Laboratory work to test the fuming concept for purification of arsenic trioxide was originally undertaken for Giant by Falconbridge Metallurgical Laboratory in 1980. Using current production baghouse dust as feedstock, a purified product grading 99.7% As_2O_3 was readily produced using homemade laboratory fuming apparatus. Encouraged by the results, and by the relatively modest capital estimate as compared to a hydrometallurgical process, Giant began planning for pilot scale testwork in late 1987.

Instead of conducting pilot testing in a specially built plant at Giant, it was decided to have Research Productivity Council conduct the tests in their Fredericton, New Brunswick test facility. A number of modifications to plant configuration and equipment were made and testing began in June of 1988.

The 6" fluosolids reactor in the pilot plant is sized for a typical feedrate of 10 kg/h and approximately 15 tons of baghouse dust from a variety of sources was shipped from Giant for testing. The attached schematic flowsheet shows plant layout.

Discussion

Right from the beginning it was clear that a high purity product could be produced in the pilot plant and assays of 99.7% As_2O_3 were experienced in the initial 31 hour production run. Condenser design problems resulted in a lengthy plant shutdown however and the second production run was delayed by over a month. In late July, 1988, the second run produced results that confirmed the earlier test results, that good purity product could be produced from current production feedstock. Average product quality during this 11 day run was as follows:

As_2O_3	Fe	Sb	Insol
99.55	0.022	0.139	0.307

The next production run was designed to test the process using low grade feed from underground storage. The feed selected for this test was from B2-35 stope, which was filled during the early 1960's. This feed contained 2.74% antimony as compared to 0.196% antimony in the current production feed. It was expected that a high proportion of the antimony would report to the final product, as determined by the earlier run and by the FML experience and indeed, that is what occurred. Due to feeding problems using the low grade feed, the dust was later blended to an average 30:70 blend with current production to give an antimony concentration in the feed of 0.96%. Average concentration of Sb in the product was 0.58%.

The final test originally planned, was to develop roasting techniques to improve product purity, especially with regard to antimony elimination.

Tests using various temperatures and operating pressures conducted over a period of three days were only partially successful. It was demonstrated that antimony could be reduced in the final product by operating the roaster and the hot baghouse at temperatures below 300 deg.C. Unfortunately a high proportion of arsenic was captured in the hot baghouse under these conditions. Another solution was necessary.

Additional Testwork

Deportment of antimony in the gas stream is not clearly understood, though it is theorized that it may occur as extremely fine particulate, passing directly through the hot baghouse and providing nucleation sites for the formation of arsenic trioxide crystals in the condenser. Also, recent lab work has shown that when mixtures of arsenic trioxide and antimony trioxide with a high proportion of arsenic are purified by sublimation, gaseous polymeric compounds are formed, an effect that greatly enhances the volatilization of antimony. Both of these theories have beeen tested at RPC during late September, 1988.

Test Results

The fine particulate theory was tested by passing a portion of the gas stream through a .3 u borosilicate filter. Though the particulate captured on the filter assayed about 50% Sb, the weight of particulate was less than 10% of what was expected. 90% of the Sb passed through the filter with the fume. This does not prove that Sb occurs as a vapour but limitations of the test equipment have limited the value of the data collected.

The volatile polymer theory was also tested, by adding a number of air inlets to the freeboard of the roaster. The theory states that these polymeric compounds can be decomposed between 400 and 600 deg.C by adding oxygen (air) to the off gases of the roaster, to oxidize the antimony to SbO_2 and Sb_2O_3, which are both solid compounds below 450 deg.C. These solid compounds formed in the freeboard of the roaster should then be able to be captured in the hot baghouse.

Early test results did not offer much encouragement and finally the hot baghouse filter bags blinded, causing the test to be terminated. Assay results from the period just before the plant was shut down are quite interesting however, and do offer some hope for success in developing a method for antimony elimination.

Using feed from B2-35 stope having an antimony grade of 2.65%, a cold baghouse product having an antimony concentration of only 0.33% was produced. Hot baghouse product assayed 5.54% during the same period, confirming that the antimony was indeed collected in the hot baghouse. Other test results from this period were as follows:

Time	CBH	HBH	Oxygen	Temp deg.C
03:00	0.86	3.74	12%	350
05:00	0.39	4.83	12%	350
08:00	0.33	5.54	12%	350

These good antimony eliminations took place as the hot baghouse filter bags were blinding. Is it possible that the improved Sb elimination is due to reduced bag porosity during this period, or is it due to formation of Sb particles through oxygenation? The former case would probably be best for Giant, as the use of an electrostatic precipitator downstream of the hot baghouse would purify the arsenic while collecting a saleable antimony oxide product. Separating the antimony from the hot baghouse product (in the second case) would probably be quite a bit more difficult.

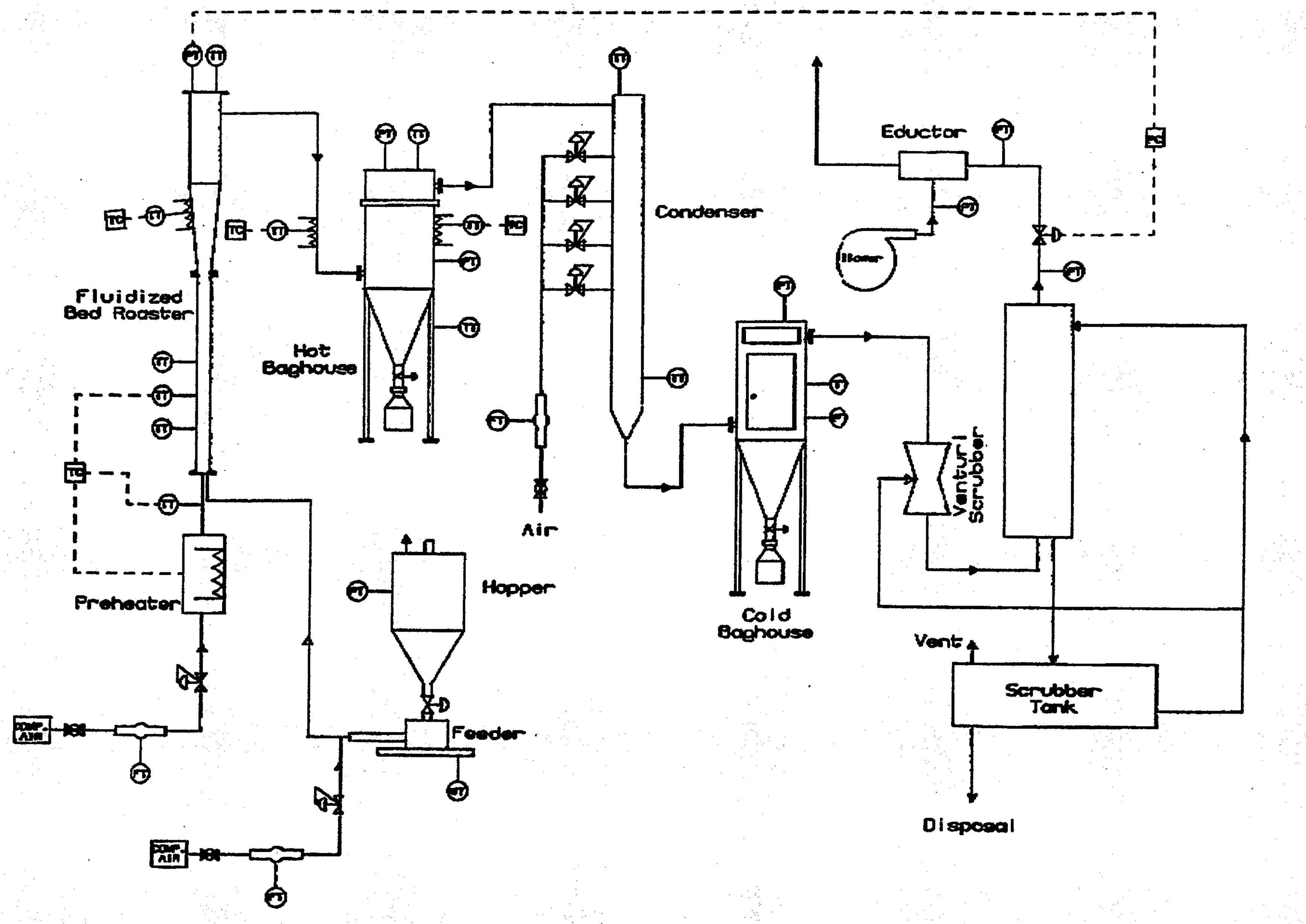


FIGURE 2 : SCHEMATIC FLOWSHEET OF PILOT PLANT

6.7 Marketing Studies:

Regrettably the marketing studies were not made available on time for this report.

Appendix 8 lists the companies which have been approached for comments with WAROX samples produced at R.P.C.

The scope of the marketing study was:

1. List of producers and capacities.

2. List of major consumers and quantities consumed.

3. Price history.

4. Market specifications.

5. Transportation methodology.

6. Five year projection of Giant's entry into the market.

6.8 Transfer Site Politics:

As expected, the announcement that Giant was considering the construction of a WAROX transfer facility south of Great Slave Lake has aroused public furor of the "Not in my backyard" type.

Appendix 9 updates the reader on the status of this element. It is important to note that while the transfer facility will enhance cashflows, the project success does not hinge on the facility being built; Giant could ship WAROX by road to the U.S.A. markets.

6.9 Arsenic Plants Site Visits:

Appendix 10 describes the operation of a number of plants with similarities to the proposed Giant WAROX plant.

The experience gained by these operations will be invaluable in both the technical as well as operator protection fields. Plant visits should be conducted before detailed engineering layouts are produced.

Appendices

APPENDIX 1

PRE-FEASIBILITY AUGUST 1988

GIANT
Yellowknife Mines Limited

MEMO TO: Steve McAlpine

CC: K. Blower; K. Morton

FROM: S.E. El-Alfy

DATE: August 04, 1988

SUBJECT: WAROX PROJECT

INTRODUCTION

Financial analyses of the Warox Project were completed recently for a base case scenario of $0.45/lb of Warox, $540/oz of gold, $6M capital expenditure, 15% discount factor and a market share of 7000 tpa of Warox.

Sensitivity analyses were conducted on the base case scenario and are shown in the Appendix.

CONCLUSION

As expected the project shows a high N.P.V., rapid payback and an attractive rate of return.

Reviewing the sensitivities it is seen that the project has a 3 year payback with zero arsenic sales.

It is recommended to proceed with the engineering of the Warox reclaim system as well as the Warox production plant. The analyses indicate that the downside potential is minimal as long as the material is not allowed to contact groundwater. When that happens the cost of treatment has been estimated at $15,000 per ton of dissolved Arsenic (See attached calculation).

DISCUSSION

Warox marketing should be approached differently from the traditional gold selling technique. The prevailing market price is not nearly as important as it is in case of gold. Since payback with no Warox revenue is achieved, it is obvious that a great latitude exists in the area of revenue and aggressive marketing can be considered in an effort to secure and expand Giant's market share. Furthermore, adding to the benefits of the project, (i.e. lowering the breakeven point) are the following advantages, which have not been assigned dollar values at this stage but which will certainly enhance cash flows or reduce cash drains.

1. <u>Recovery of the Arsenic Storage Crown Pillars</u>:

   The crown pillars listed in Table 1.09 of the Mineral Inventory (July 1988) read:

B208	-	15,102 ounces
C2-12	-	1,173 ounces
C3-12	-	8,681 ounces
C5-11	-	2,093 ounces
		27,054 ounces

   Assuming a 75% recovery and a price of $540/oz the value of this resources is estimated at $10.9M.

   This sum was not added to the financial analysis because of the following two reasons:

   1. The year in which mining will take place has not been established. It will likely be beyond year 5. Payback, DCF ROR and NPV are not greatly affected. Cashflow implications however are significant.

   2. When the pillars are recovered, fill raises will be dropped to fill the stopes with rock and overburden.

      In order to prevent dust from escaping to the environment, these stopes will be kept under negative pressure during the fill cycles.

      A portable baghouse (or several vacuum trucks) will be required. This technology can be developed at Giant but capital and operating costs have not been estimated.

2. Eliminating Underground Storage Requirements

A costs savings was not introduced in the analysis because #12 stope is available for the next five years. In 1993 a saving of $750,000 was added to the analysis. Once again this did not affect the payback, NPV, DCF ROR to any great extent.

3. Longterm Benefits of Reclaim

No cost saving was applied to this subject.

4. Market Share

The base case scenario looks at production and sale of 7000 t of Warox per year which indicates a 20 + year project. Current production of approximately 4000 t.p.a. of arsenic trioxide was not added to the life of the project. Based on the 7 Year Mineral Inventory the life of the project could be extended by five years.

The economics show that while it is desirable to obtain as high a price as possible for Warox, the project will stand on the revenue from gold recovery alone with no revenue from Warox, for five years. This is probably the worst case scenario. A market for Warox does exist and if it can be demonstrated to the market that the purity of Warox matches or surpasses competitors, coupled with a competitive price advantage, it follows that a portion of the market share will become Giant's. As with any firm attempting to break into an established market for the first time, Giant should be prepared to lower its expectation of a quick payback in favour of the longer term outlook and the potential for cash generation over the next 20-25 years.

Translated into action the above statement implies that some stockpiling of finished product might be required. There appears to be ample manoeuvring room in the market price of the product to allow for the stockpiling in a specially designed facility of conglomerated material in drums or silos. With a unit weight of 100 lb/cu. ft. (vs 40 lb/cu. ft. in-situ U/G) space requirements will be reduced.

SCHEDULE

A tentative schedule is shown overleaf. The project is split into two constituent projects:

Narox Plant:

It is recommended that the EPCM be awarded to an established engineering firm. Three Vancouver firms have expressed interest in this work.

The schedule shows commissioning of the plant in July 1989 with full production attained in October 1989.

Reclaim:

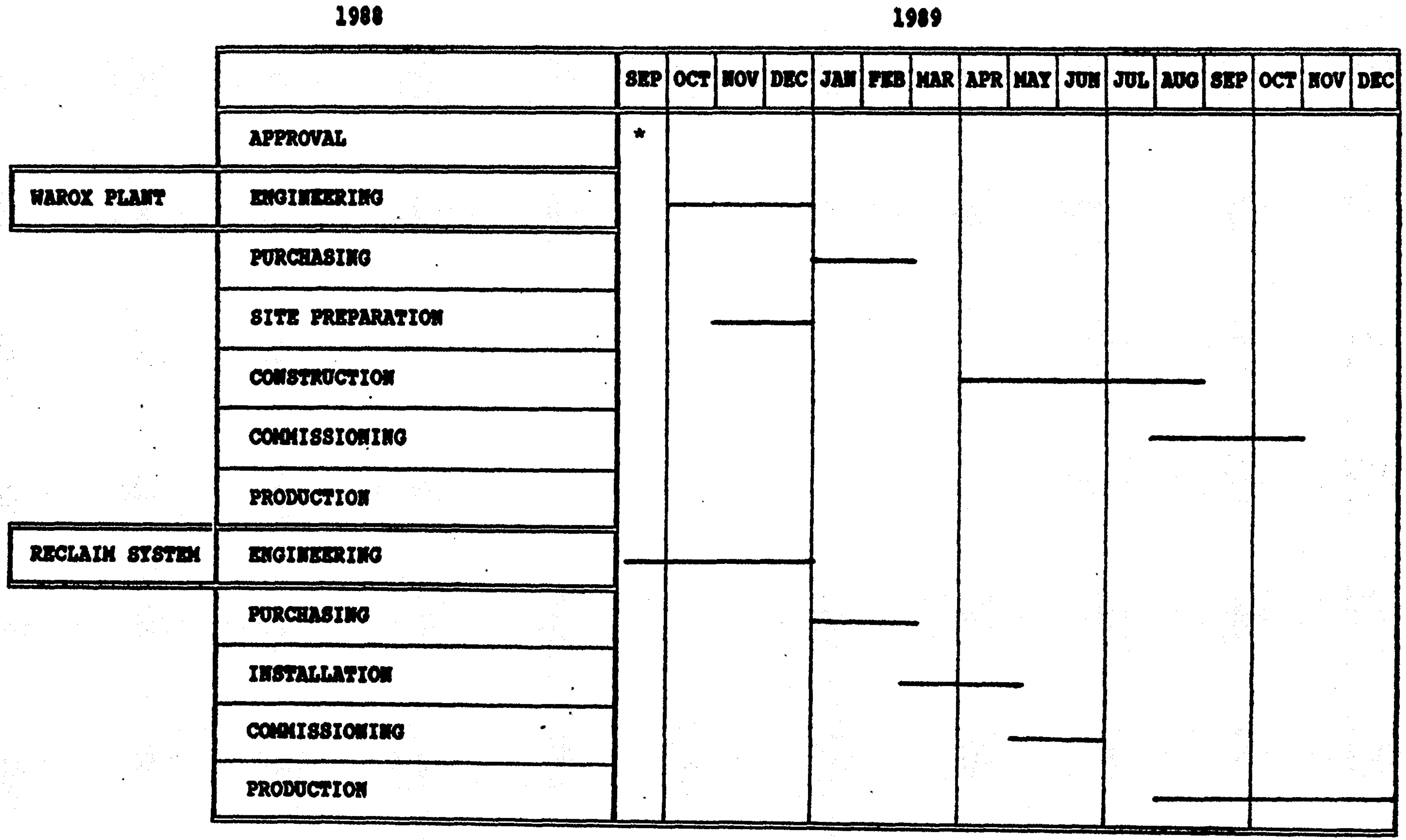
Most of the engineering for reclaim systems will be carried out in-house. The selected engineering firm might assist in equipment purchase.

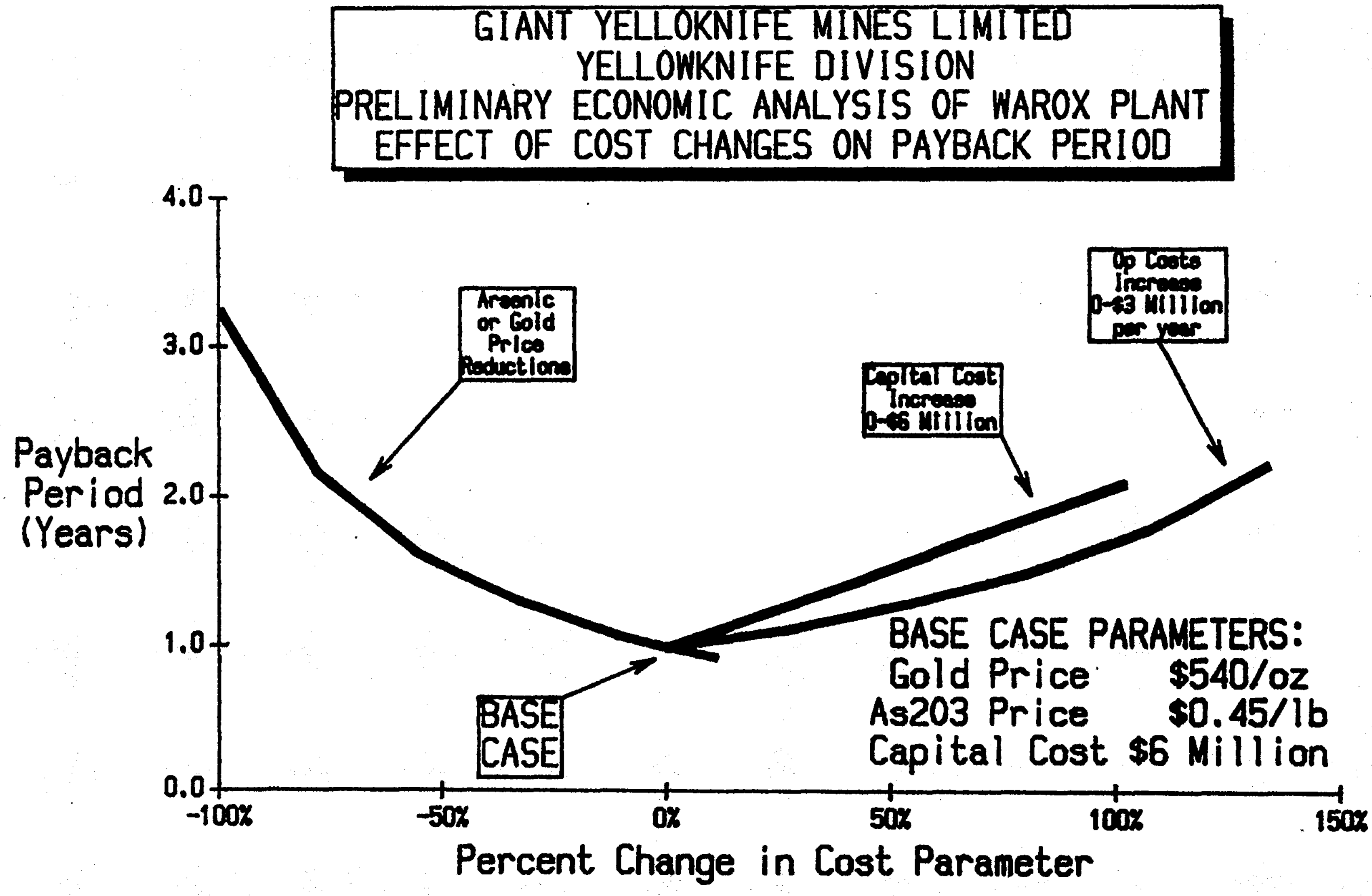
The decision to stay with a dry reclaim system was taken due to the potential problems and costs associated with solubilized arsenic in the vaults. As was discussed earlier in this report, the cost of treating this material can quickly negate any benefits from the project.

Another point of view is the protection of Underground workings from potential spills. It is difficult to attribute a cost to this risk but it is likely to be high. While bulkheads were designed to withstand hydrostatic heads, it will not be possible to assume that this was the case. Extensive research and testwork will be required in this area.

Mechanical dry reclaim methods are currently being investigated as a substitute for vacuum systems. One of these methods is shown in the attached diagram.

S.E. El-Alfy
Chief Engineer


1988
1989
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
APPROVAL
*
WAROX PLANT
ENGINEERING
PURCHASING
SITE PREPARATION
CONSTRUCTION
COMMISSIONING
PRODUCTION
RECLAIM SYSTEM
ENGINEERING
PURCHASING
INSTALLATION
COMMISSIONING
PRODUCTION

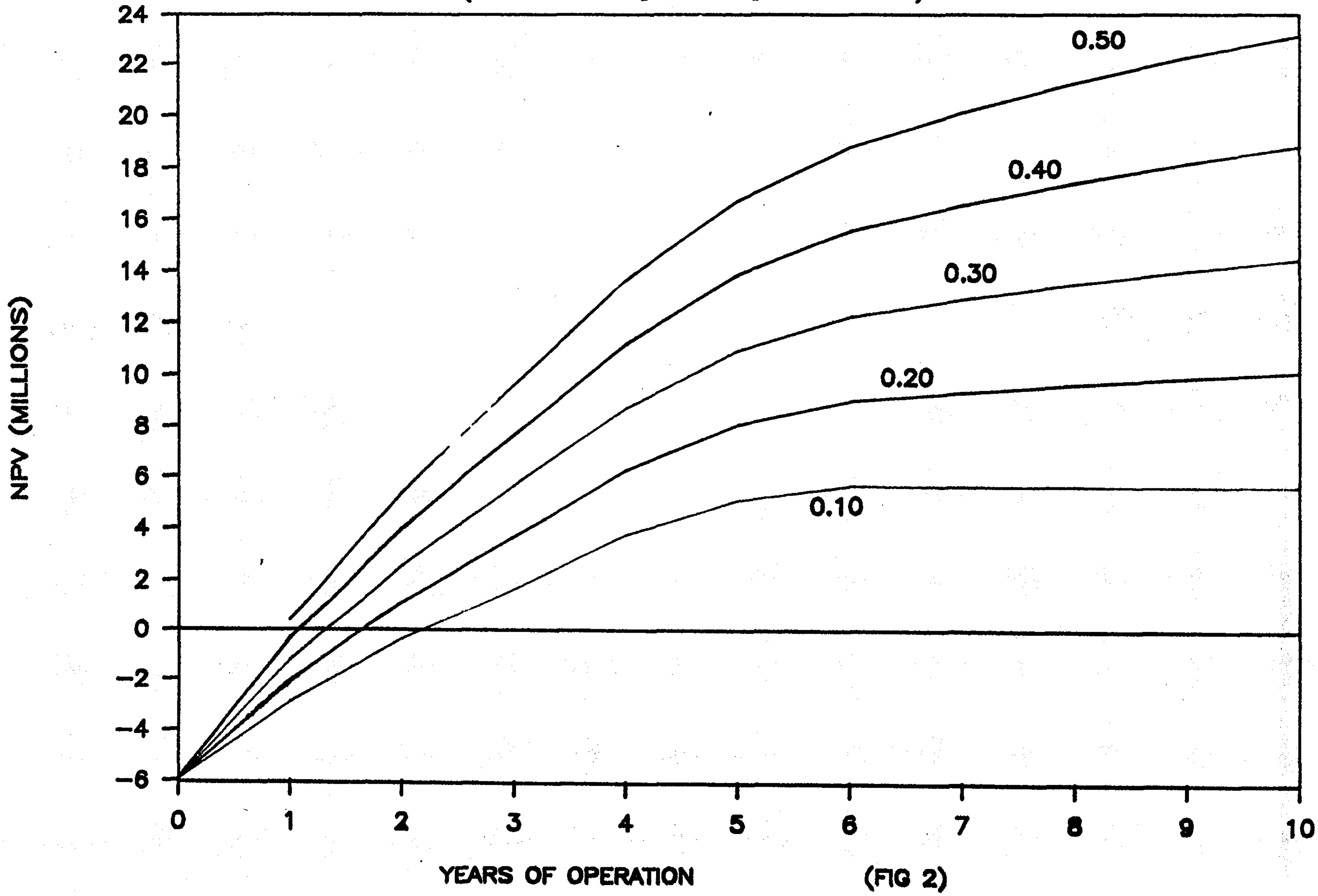


GIANT YELLOKNIFE MINES LIMITED
YELLOWKNIFE DIVISION
PRELIMINARY ECONOMIC ANALYSIS OF WAROX PLANT
EFFECT OF COST CHANGES ON PAYBACK PERIOD
Payback Period (Years)
4.0
3.0
2.0
1.0
0.0
Arsenic or Gold Price Reductions
Capital Cost Increase 0-$6 Million
Op Costs Increase 0-$3 Million per year
BASE CASE
BASE CASE PARAMETERS:
Gold Price $540/oz
As203 Price $0.45/lb
Capital Cost $6 Million
-100%
-50%
0%
50%
100%
150%
Percent Change in Cost Parameter

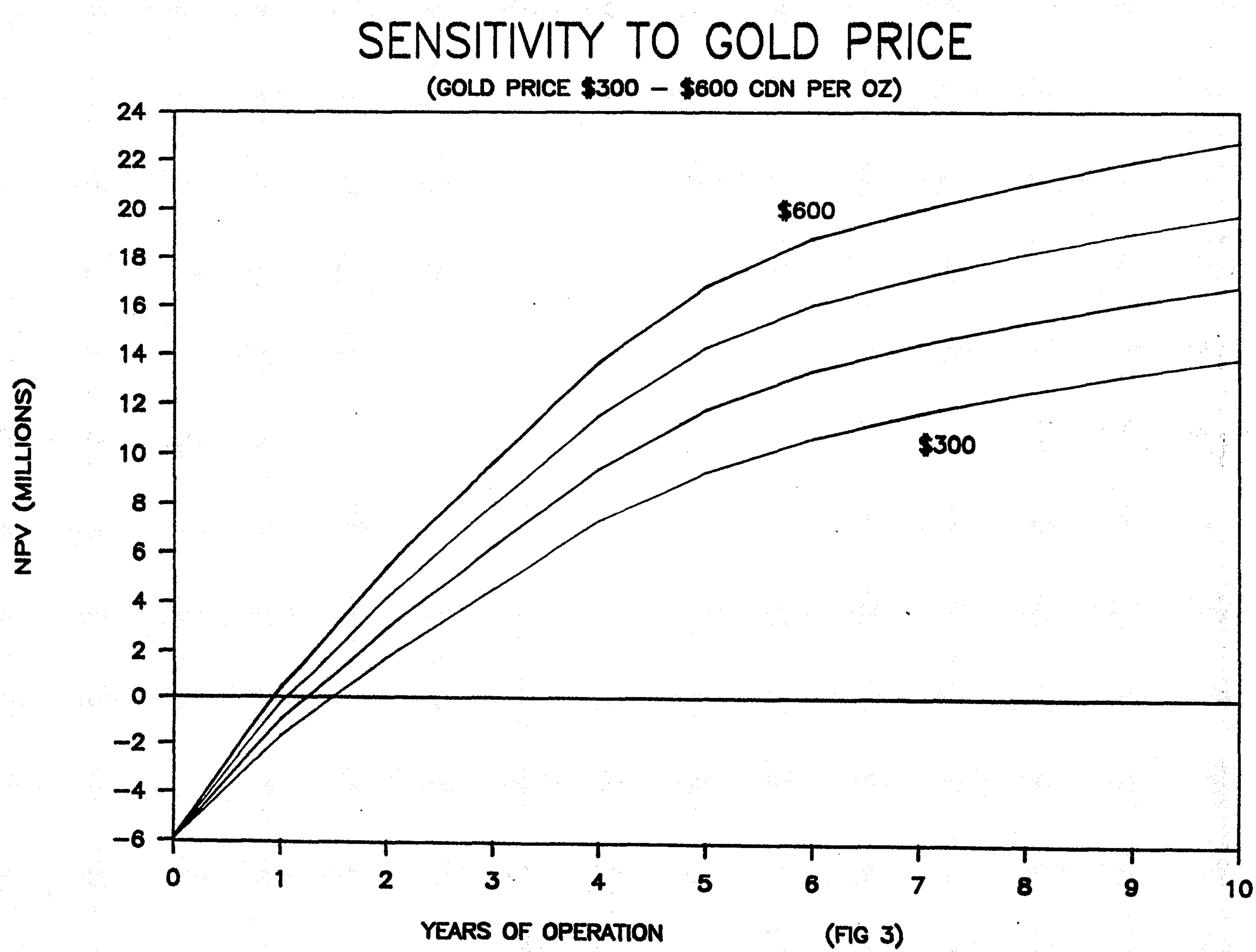
FIGURE 1

SENSITIVITY TO ARSENIC PRICE

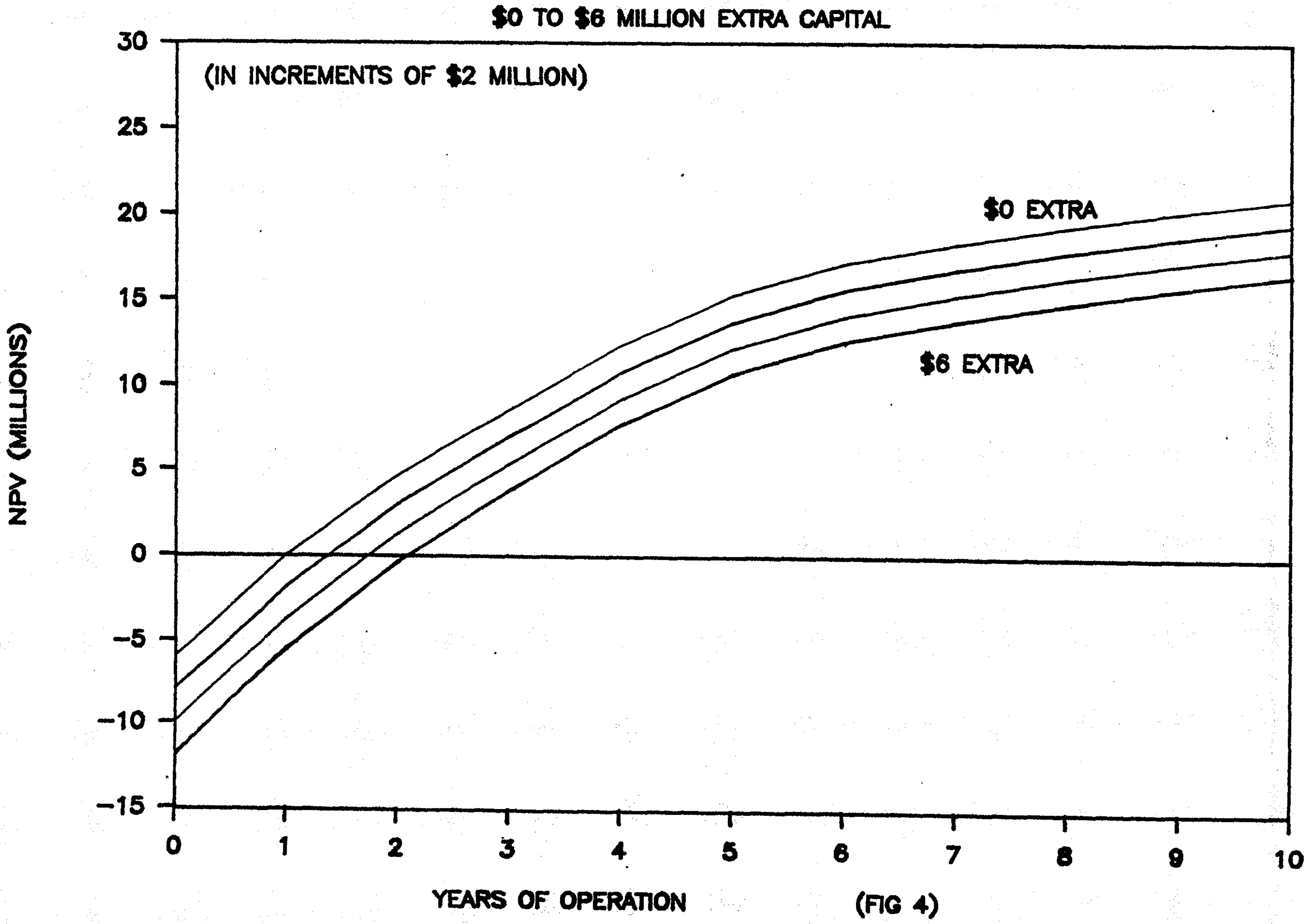
(As203 PRICE $0.10 – $0.50 PER LB)



(FIG 2)


SENSITIVITY TO GOLD PRICE
(GOLD PRICE $300 – $600 CDN PER OZ)
$600
$300
NPV (MILLIONS)
24
22
20
18
16
14
12
10
8
6
4
2
0
−2
−4
−6
0
1
2
3
4
5
6
7
8
9
10
YEARS OF OPERATION
(FIG 3)

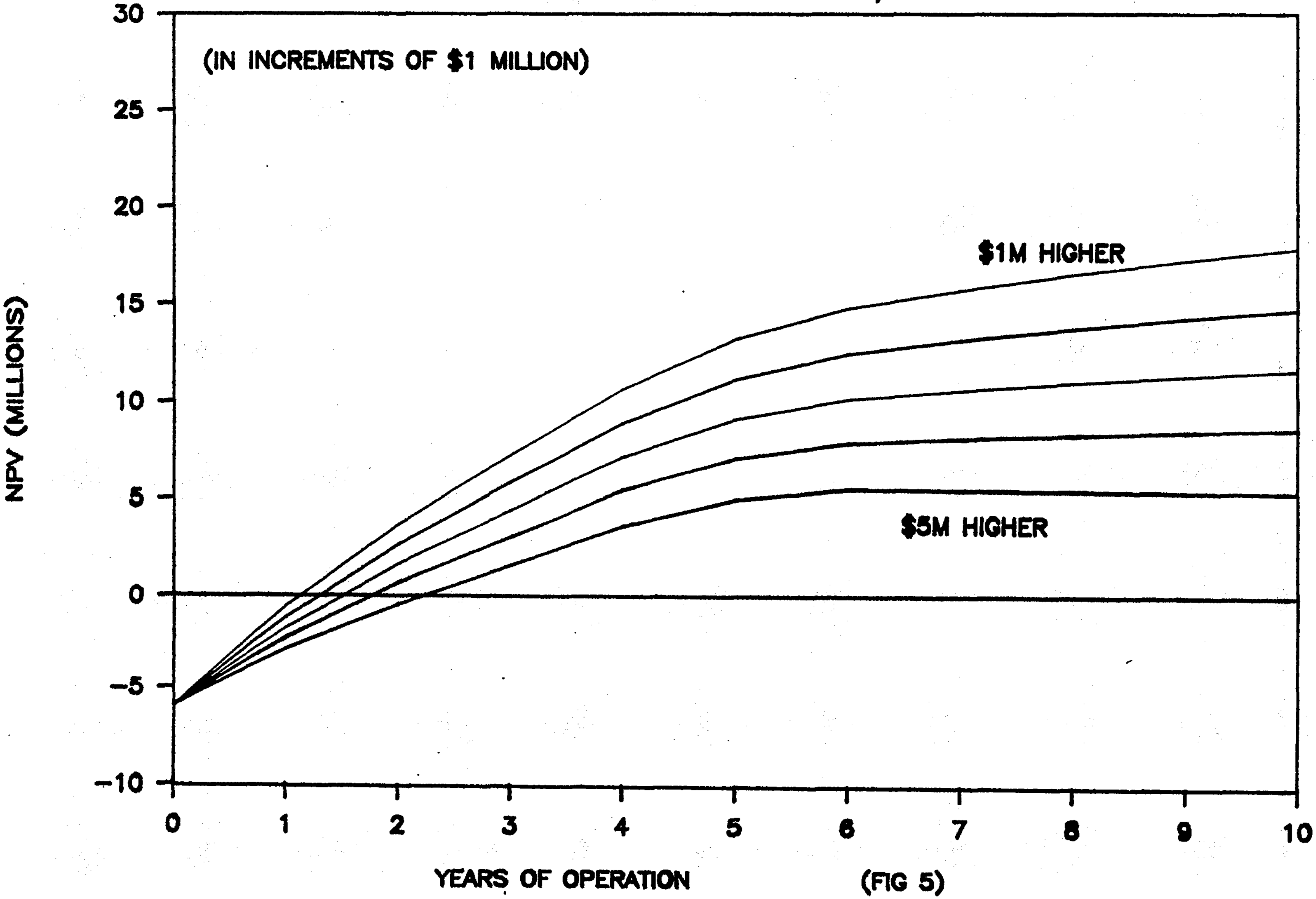
SENSITIVITY TO CAPITAL COST



(FIG 4)

SENSITIVITY TO OPERATING COSTS

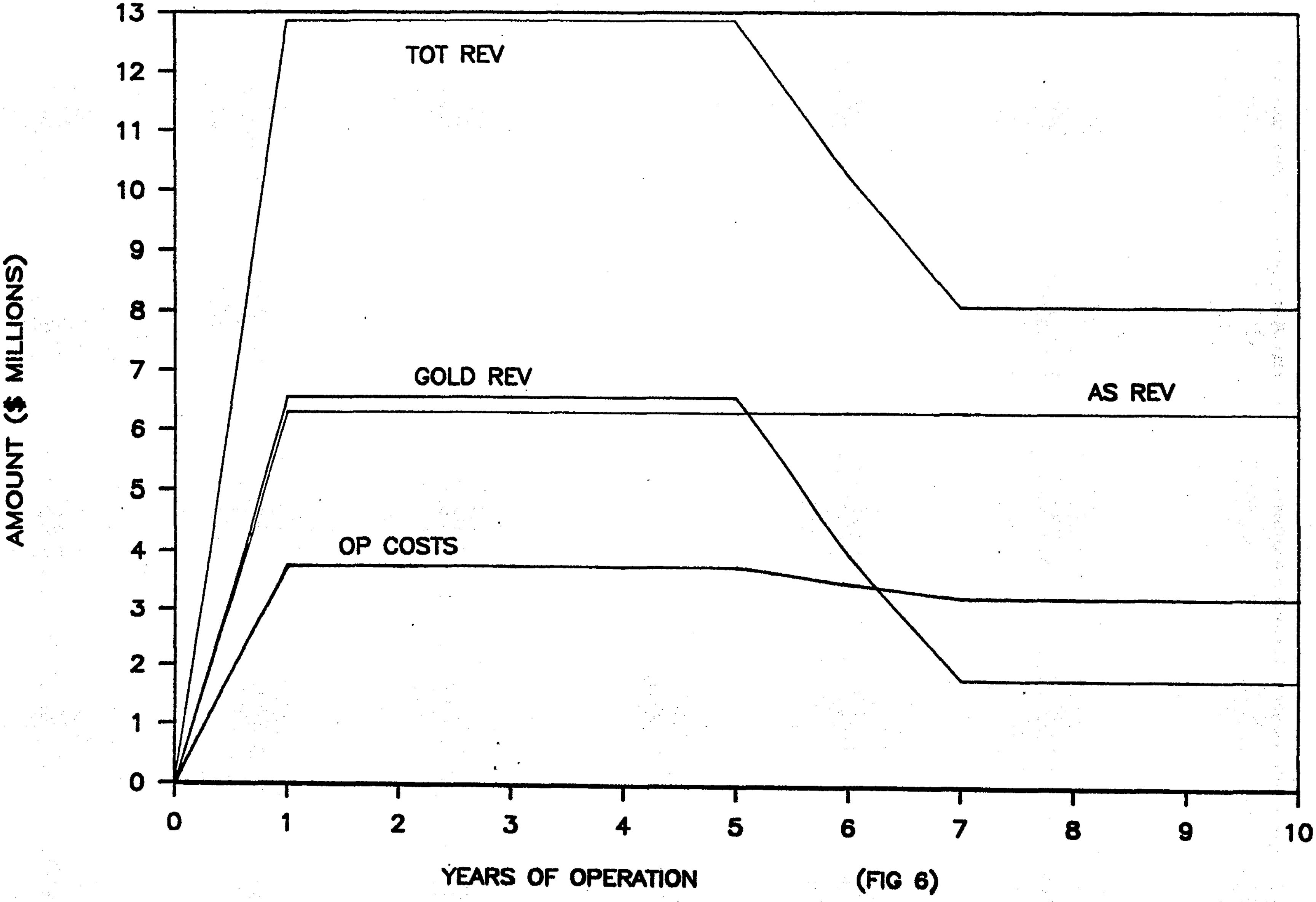
OP COSTS $1 TO $5 MILLION HIGHER/YEAR



(FIG 5)

TOTAL REVENUES AND OPERATING COSTS

FOR WAROX PLANT



(FIG 6)

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GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY
PRODUCTION RATES AND PRODUCT PRICES

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As_2O_3 Sold	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Feed Grade As	45.69%	45.69%	45.69%	45.69%	45.69%	45.69%	53.25%	61.75%	61.75%	61.75%	61.75%	
Feed Grade As_2O_3	60.33%	60.33%	60.33%	60.33%	60.33%	60.33%	70.31%	81.53%	81.53%	81.53%	81.53%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
PRODUCTION DATA												
ARSENIC												
Feed % As_2O_3	60.33%	60.33%	60.33%	60.33%	60.33%	60.33%	70.31%	81.53%	81.53%	81.53%	81.53%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As_2O_3	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
GOLD												
Feed Grade (oz/ton)	1.220	1.220	1.220	1.220	1.220	1.220	0.859	0.452	0.452	0.452	0.452	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	12,154	12,154	12,154	12,154	12,154	7,339	3,332	3,332	3,332	3,332	81,435
PRODUCT PRICES												
As_2O_3 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	540	540	540	540	540	540	540	540	540	540	540	
REVENUES												
As_2O_3	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Gold	0	6,563	6,563	6,563	6,563	6,563	3,963	1,799	1,799	1,799	1,799	43,975
TOTAL REVENUES	0	12,863	12,863	12,863	12,863	12,863	10,263	8,099	8,099	8,099	8,099	106,975

\ARSENIC\ARS_AU04.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY
OPERATING COSTS

YEAR		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS	U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
	Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
	Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
	Transfer $/ton As2O3	46	46	46	46	46	46	46	46	46	46	46	
	Freight $/ton As2O3	196	196	196	196	196	196	196	196	196	196	196	
	Tails $/ton As2O3	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons)	U/G	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
	Plant Feed	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
	Residue	0	4,720	4,720	4,720	4,720	4,720	3,056	1,672	1,672	1,672	1,672	33,346
	Transfer	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
	Freight	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
	As2O3 to Tails	0	70	70	70	70	70	70	70	70	70	70	700
COSTS	U/G	0	305	305	305	305	305	261	225	225	225	225	2,687
	Plant	0	1,641	1,641	1,641	1,641	1,641	1,408	1,214	1,214	1,214	1,214	14,468
	Residue	0	0	0	0	0	0	0	0	0	0	0	0
	Transfer	0	322	322	322	322	322	322	322	322	322	322	3,220
	Freight	0	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	13,720
	Tails	0	98	98	98	98	98	98	98	98	98	98	982
	Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS		0	3,730	3,730	3,730	3,730	3,730	3,462	3,232	3,232	3,232	3,232	35,077
NET OPERATING PROFIT		0	9,125	9,125	9,125	9,125	9,125	6,801	4,867	4,867	4,867	4,867	71,898
CAPITAL	U/G RECLAIM	1,000	0	0	0	0	0	0	0	0	0	0	1,000
	SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
	TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
	U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
	EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX		(5,902)	9,125	9,125	9,125	9,875	9,125	6,801	4,867	4,867	4,867	4,867	66,746
TOTAL TAXES		0	2,264	3,000	3,130	3,260	3,346	2,505	1,776	1,787	1,795	1,801	24,673
NET CASH FLOW		(5,902)	6,861	6,118	5,995	6,615	5,779	4,296	3,091	3,080	3,072	3,067	42,873
CUMULATIVE NET CASH FLOW		(5,902)	959	7,077	13,072	19,687	25,466	29,762	32,854	35,934	39,006	42,873	
DISCOUNT RATE		15.00%											
Discount Period		0	1	2	3	4	5	6	7	8	9	10	
DISCOUNTED CASH FLOW		(5,902)	5,966	4,626	3,942	3,782	2,873	1,857	1,162	1,007	873	758	20,945
CUMUL DISCOUNTED		(5,902)	64	4,690	8,632	12,414	15,288	17,145	18,307	19,314	20,187	20,945	

PAYBACK: 1.0 YEARS IRR: 109.26%

Date Printed: 04-Aug-88

Prepared by [illegible]

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed Processed	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
Tons As203 Produced	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Ounces Gold Produced	0	12,154	12,154	12,154	12,154	12,154	7,339	3,332	3,332	3,332	3,332	81,435
REVENUES ($1,000)												
Revenue Arsenic	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Revenue Gold	0	6,563	6,563	6,563	6,563	6,563	3,963	1,799	1,799	1,799	1,799	43,975
Total Revenue	0	12,863	12,863	12,863	12,863	12,863	10,263	8,099	8,099	8,099	8,099	106,975
Revenues/ton Feed	1,098	1,098	1,098	1,098	1,098	1,098	1,021	934	934	934	934	
Revenues/ton As203	1,838	1,838	1,838	1,838	1,838	1,838	1,466	1,157	1,157	1,157	1,157	
OPERATING ($1,000)												
Total Operating	0	3,738	3,738	3,738	3,738	3,738	3,462	3,232	3,232	3,232	3,232	35,077
Operating/Ton Feed	319	319	319	319	319	319	344	373	373	373	373	
Operating/Ton Product	534	534	534	534	534	534	495	462	462	462	462	
Total Capital	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
Total Taxes	0	2,264	3,008	3,130	3,260	3,346	2,505	1,776	1,787	1,795	1,801	24,673
Net Cash Flow	(5,902)	6,861	6,118	5,995	6,615	5,779	4,296	3,091	3,080	3,072	3,067	42,073
Discount Rate	15.0%											
Discounted Cash Flow	(5,902)	5,966	4,626	3,942	3,782	2,873	1,857	1,162	1,007	873	758	20,945
Cumulative Discounted Cash Flow (Net Present Value)	(5,902)	64	4,690	8,632	12,414	15,288	17,145	18,307	19,314	20,187	20,945	

Net Present Value 20,945 of first 10 years of operation.

Payback Period 1.0 Years

IRR 109.3%

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY

SENSITIVITY ANALYSES

SENSITIVITY TO ARSENIC PRICE

Table 1

	IRR	NET PRESENT VALUE											PAYBACK
0	22.73%	(5.902)	(3.726)	(1.932)	(0.434)	1.240	2.107	2.353	1.015	1.346	0.939	0.585	3.26
0.1	50.20%	(5.902)	(2.870)	(0.333)	1.700	3.771	5.149	5.698	5.686	5.676	5.666	5.650	2.16
0.2	68.67%	(5.902)	(2.015)	1.181	3.715	6.274	8.004	9.009	9.355	9.652	9.989	10.130	1.63
0.3	85.38%	(5.902)	(1.167)	2.592	5.691	8.741	10.970	12.270	12.951	13.532	14.035	14.471	1.31
0.4	101.49%	(5.902)	(0.324)	3.994	7.655	11.193	13.054	15.526	16.525	17.390	18.140	18.791	1.00
0.5	116.00%	(5.902)	0.435	5.384	9.607	13.633	16.719	18.761	20.005	21.233	22.229	23.094	0.93

SENSITIVITY TO GOLD PRICE

Table 2

	IRR	NET PRESENT VALUE											PAYBACK
0	35.38%	(5.902)	(3.886)	(2.233)	(0.856)	0.715	1.621	2.422	3.165	3.807	4.363	4.846	3.54
300	76.86%	(5.902)	(1.659)	1.774	4.546	7.311	9.299	10.691	11.666	12.511	13.244	13.879	1.48
400	90.42%	(5.902)	(0.927)	2.991	6.250	9.439	11.796	13.302	14.436	15.340	16.139	16.826	1.24
500	104.01%	(5.902)	(0.195)	4.200	7.955	11.567	14.293	16.073	17.204	18.184	19.034	19.771	1.04
600	117.11%	(5.902)	0.451	5.413	9.640	13.604	16.779	18.752	19.961	21.000	21.917	22.706	0.93

SENSITIVITY TO CAPITAL COST INCREASE

Table 3

	IRR	NET PRESENT VALUE											PAYBACK
0	109.26%	(5.902)	0.064	4.690	8.632	12.414	15.200	17.145	18.307	19.314	20.107	20.945	0.99
2000	82.10%	(7.902)	(1.758)	2.995	7.012	10.844	13.750	15.627	16.790	17.810	18.686	19.446	1.37
4000	65.55%	(9.902)	(3.613)	1.295	5.309	9.269	12.200	14.104	15.204	16.301	17.101	17.943	1.74
6000	54.35%	(11.902)	(5.468)	(0.404)	3.765	7.694	10.666	12.501	13.770	14.793	15.676	16.440	2.10

SENSITIVITY OF PAYBACK TO GOLD AND ARSENIC PRICES

Table 4

		--------- As2O3 Price ---------			
		0.1	0.2	0.3	0.4
Gold Price	300	ERR	3.4	2.2	1.7
	400	3.6	2.3	1.7	1.4
	500	2.5	1.8	1.4	1.1
	600	1.8	1.4	1.2	1.0

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GIANT YELLOWKNIFE MINES LIMITED
VAROX PLANT
PRELIMINARY ECONOMIC STUDY

SENSITIVITY ANALYSES

Table 5 — SENSITIVITY TO ARSENIC RECOVERY

Table 5	IRR	NET PRESENT VALUE											PAYBACK
0.99	109.3%	(5.902)	0.064	4.690	8.632	12.414	15.208	17.145	18.307	19.314	20.187	20.945	0.99
0.95	107.1%	(5.902)	(0.041)	4.493	8.356	12.069	14.002	16.661	17.735	18.666	19.472	20.173	1.01
0.90	104.5%	(5.902)	(0.160)	4.272	8.044	11.600	14.425	16.110	17.074	17.909	18.633	19.261	1.04

Table 6 — SENSITIVITY TO OPERATING COSTS

Table 6	IRR	NET PRESENT VALUE											PAYBACK
1000	98.1%	(5.902)	(0.505)	3.693	7.234	10.667	13.237	14.831	15.760	16.564	17.261	17.866	1.12
2000	86.5%	(5.902)	(1.107)	2.692	5.832	8.916	11.183	12.510	13.206	13.808	14.329	14.780	1.29
3000	74.8%	(5.902)	(1.710)	1.690	4.420	7.164	9.127	10.186	10.649	11.048	11.392	11.691	1.50
4000	62.4%	(5.902)	(2.320)	0.672	3.003	5.304	7.040	7.831	8.057	8.250	8.416	8.559	1.78
5000	48.7%	(5.902)	(2.931)	(0.448)	1.564	3.591	4.930	5.461	5.411	5.360	5.330	5.290	2.22

\ARSENIC\ARS_AU04.WK1

GIANT YELLOWKNIFE MINES LIMITED
VAROX PLANT
PRELIMINARY ECONOMIC STUDY

PAYBACK CALCS	64.04651	0	0	0	0	0	0	0	0	0	0	64.04651
	-5901.98	0	0	0	0	0	0	0	0	0	0	-5901.98
	0	0	0	0	0	0	0	0	0	0	0	0
												0.989264
FOR FIGURE 6												
AS REVENUES	0.000	6.300	6.300	6.300	6.300	6.300	6.300	6.300	6.300	6.300	6.300	
AU REVENUES	0.000	6.563	6.563	6.563	6.563	6.563	3.963	1.799	1.799	1.799	1.799	
TOT REVENUES	0.000	12.863	12.863	12.863	12.863	12.863	10.263	8.099	8.099	8.099	8.099	
OP COSTS	0.000	3.730	3.730	3.730	3.730	3.730	3.462	3.232	3.232	3.232	3.232	
	0	1	2	3	4	5	6	7	8	9	10	
for fig 6	12.3	4.1	6.9	0	0	0	0	0	6.7	0	0	
		OP COS	GOLD REV						AS REV			
FOR FIG 2	0	0	0	0	4	9	13	17	22	0	0	
									0.50			
FOR FIG 3	0	0	0	0	0	20	10.5	0	0	0	0	
						$600	$300					
FOR FIG 4	20	0	0	0	0	0	11.5	20.5	0	0	0	
	(IN INCREMENTS OF $2 MILLION)						$6 E $0 EXTRA					
FOR FIG 5	20	0	0	0	0	0	4	10	0	0	0	
	(IN INCREMENTS OF $1 MILLION)						$5M HI$1M HIGHER					

Date Printed: 04-Aug-88

Prepared by G. Wolfe, Engineering Department, Yellowknife Division.

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GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY
FEDERAL AND TERRITORIAL INCOME TAX CALCULATIONS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
TOTAL REVENUES	0	12,863	12,863	12,863	12,863	12,863	10,263	8,099	8,099	8,099	8,099	106,975
TOTAL OPERATING	0	3,738	3,738	3,738	3,738	3,738	3,462	3,232	3,232	3,232	3,232	35,077
OPERATING PROFIT	0	9,125	9,125	9,125	9,125	9,125	6,801	4,867	4,867	4,867	4,867	71,898
CAP CLASS 10	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
CAP CLASS 28	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
EDA ELIGIBLE	3,873	0	0	0	0	0	0	0	0	0	0	3,873
ITC ELIGIBLE	0	0	0	0	0	0	0	0	0	0	0	0
MAX CCA	0	9,125	9,125	9,125	9,125	9,125	6,801	4,867	4,867	4,867	4,867	
CLASS 10												
OLD UCC	0	5,902	4,131	2,892	2,024	700	546	382	267	187	131	
CURRENT UCC	5,902	0	0	0	(750)	0	0	0	0	0	0	
CCA OLD	0	1,771	1,239	868	607	234	164	115	80	56	39	
CCA CURRENT	0	0	0	0	(113)	0	0	0	0	0	0	
CLASS 28												
OLD UCC	0	0	0	0	0	0	0	0	0	0	0	
CURRENT UCC	0	0	0	0	0	0	0	0	0	0	0	
CCA OLD	0	0	0	0	0	0	0	0	0	0	0	
CCA CURRENT	0	0	0	0	0	0	0	0	0	0	0	
TOTAL CCA	0	1,771	1,239	868	495	234	164	115	80	56	39	
PROFIT BEF RESOURCE A	0	7,355	7,806	8,258	8,631	8,891	6,638	4,753	4,787	4,811	4,828	
RESOURCE ALLOWANCE	0	1,839	1,971	2,064	2,158	2,223	1,659	1,188	1,197	1,203	1,207	
PROFIT BEF EDA	0	5,516	5,914	6,193	6,473	6,669	4,978	3,565	3,590	3,608	3,621	
EARNED DEPLETION ALLOWANCE												
EDA POOL	0	1,291	0	0	0	0	0	0	0	0	0	
CURRENT	1,291	0	0	0	0	0	0	0	0	0	0	
TOTAL EDA AVAIL	1,291	1,291	0	0	0	0	0	0	0	0	0	
EDA TAKE	0	1,291	0	0	0	0	0	0	0	0	0	
PROFIT AFTER EDA	0	4,225	5,914	6,193	6,473	6,669	4,978	3,565	3,590	3,608	3,621	
LOSS CARRY FORWARD												
LCF	0	0	0	0	0	0	0	0	0	0	0	
CURRENT LOSS	0	0	0	0	0	0	0	0	0	0	0	
LOSS USE	0	0	0	0	0	0	0	0	0	0	0	
TAXABLE INCOME	0	4,225	5,914	6,193	6,473	6,669	4,978	3,565	3,590	3,608	3,621	
FED INCOME TAX	0	1,436	2,010	2,105	2,200	2,267	1,692	1,212	1,220	1,227	1,231	16,600
TERR INCOME TAX	0	423	591	619	647	667	498	356	359	361	362	4,804

NOTE: PROPOSAL EVALUATED AS A STAND ALONE PROJECT
NOTE: EARNED DEPLETION ALLOWANCE WAS INCLUDED IN THE CALCULATIONS

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY

CALCULATION OF MINING ROYALTY

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
OPERATING PROFIT	0	9,125	9,125	9,125	9,125	9,125	6,801	4,867	4,867	4,867	4,867	
DEPRECIATION												
CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	
Annual Deprec.	885	0	0	0	(113)	0	0	0	0	0	0	
Total Depr. Avail	885	885	885	885	773	773	773	773	773	773	773	
Unused Depr.	5,902	5,017	4,131	3,246	1,611	838	65	0	0	0	0	
DEPRECIATION	885	885	885	885	773	773	65	0	0	0	0	
NET BEF PROC ALL	(885)	8,240	8,240	8,240	8,353	8,353	6,736	4,867	4,867	4,867	4,867	
PROCESSING ASSETS	310	310	310	310	310	310	310	310	310	310	310	
PROCESSING ALLOWANCE	0	310	310	310	310	310	310	310	310	310	310	
TAXABLE INCOME	0	7,930	7,930	7,930	8,043	8,043	6,426	4,558	4,558	4,558	4,558	
ROYALTY												
BASE	0	230	230	230	230	230	230	30	30	30	30	
PERCENT	0	0	0	0	0	0	0	0	0	0	0	
ABOVE	0	5,000	5,000	5,000	5,000	5,000	5,000	1,000	1,000	1,000	1,000	
TOTAL	0	406	406	406	413	413	316	200	200	200	200	3,190
TAX SUMMARY												
FED TAX	0	1,436	2,010	2,105	2,200	2,267	1,692	1,212	1,220	1,227	1,231	16,600
TERR TAX	0	423	591	619	647	667	490	356	359	361	362	4,004
MINING ROYALTY	0	406	406	406	413	413	316	200	200	200	200	3,190
TOTAL TAX	0	2,264	3,000	3,130	3,260	3,346	2,505	1,776	1,787	1,795	1,801	24,673

NOTE: PROPOSAL EVALUATED AS A STAND ALONE PROJECT
NOTE: EARNED DEPLETION ALLOWANCE WAS INCLUDED IN THE CALCULATIONS

GIANT YELLOWKNIFE MINES LIMITED
VAROX PLANT
PRELIMINARY ECONOMIC STUDY

TAX CALCULATION PARAMETERS AND CONSTANTS

USE EDA 1

USEINTER 0

CONSTANTS

RESALL	25.0%	Resource Allowance
PALL1	0.0%	Lower Limit for Processing Allowance
PALL2	65.0%	Upper Limit for Processing Allowance
NWTDEPR	15.0%	NWT Mining Royalty Depreciation Rate
DEPALL	25.0%	Earned Depletion Allowance Rate
DEPEX	33.3%	Depletable Expenses to Depl pool
CCA10	30.0%	Class 10 deduction
CCA12	100.0%	Class 12 Deduction
CCA28	100.0%	Class 28 Deduction
ITCRATE	0.0%	Amount to add to ITC pool
ITCYEAR	0.0%	Can take this much off Fed tax even if pay no tax
PROASSETS	8.0%	8% of Original value of Processing assets
FED TAX	33.990%	33% + 3% SURTAX
NWT TAX	10.0%	
ROYALTY	VARIABLE	

INITIAL VALUES

	Fed	Terr	Mine Tax
UCC class 10	0	0	0
class 28	0	0	0
Depletion	0	0	0
UCEE	0	0	0

NWT MINING TAX TABLE

0	0	0	0.0%
10	1000	0	3.0%
1000	5000	30	5.0%
5000	10000	230	6.0%
10000	15000	530	7.0%
15000	20000	880	8.0%
20000	25000	1280	9.0%
25000	30000	1730	10.0%
30000	35000	2230	11.0%
35000	100000	2780	12.0%

EXAMPLE

TAXABLE	5500
BASE	230
PERCENT	6.0%
AMOUNT	5,000
TAX	30
TOTAL TAX	260

GIANT YELLOWKNIFE MINES LIMITED

WAROX PLANT
PRELIMINARY ECONOMIC STUDY

ORIGINAL INVENTORY

	Tons Dust	As %	Au oz/t	TONS AS203	OUNCES GOLD
B2-30/36	64157	45.69%	1.22	38,705	78,272
B2-12/13/14	65355	61.75%	0.452	53,287	29,540
B2-08	32369	65.66%	0.354	28,063	11,459
C-12	18679	65.15%	0.172	16,060	3,213
B-11	3084	68.42%	0.134	2,786	413
C-10	10548	66.00%	0.133	9,192	1,403
C-9	20276	67.40%	0.124	18,066	2,514
				166,160	126,814

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
YEAR OF PRODUCTION	0	1	2	3	4	5	6	7	8	9	10	
PRODUCTION RATE	0.01	7000	7000	7000	7000	7000	7000	7000	7000	7000	7000	70,000
STOPE	TONS MINED PER YEAR											
B2-30/36	0	7,000	7,000	7,000	7,000	7,000	3,705	0	0	0	0	
B2-12/13/14	0	0	0	0	0	0	3,295	7,000	7,000	7,000	7,000	
B2-08	0	0	0	0	0	0	0	0	0	0	0	
C-12	0	0	0	0	0	0	0	0	0	0	0	
B-11	0	0	0	0	0	0	0	0	0	0	0	
C-10	0	0	0	0	0	0	0	0	0	0	0	
C-9	0	0	0	0	0	0	0	0	0	0	0	
TOTAL	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	

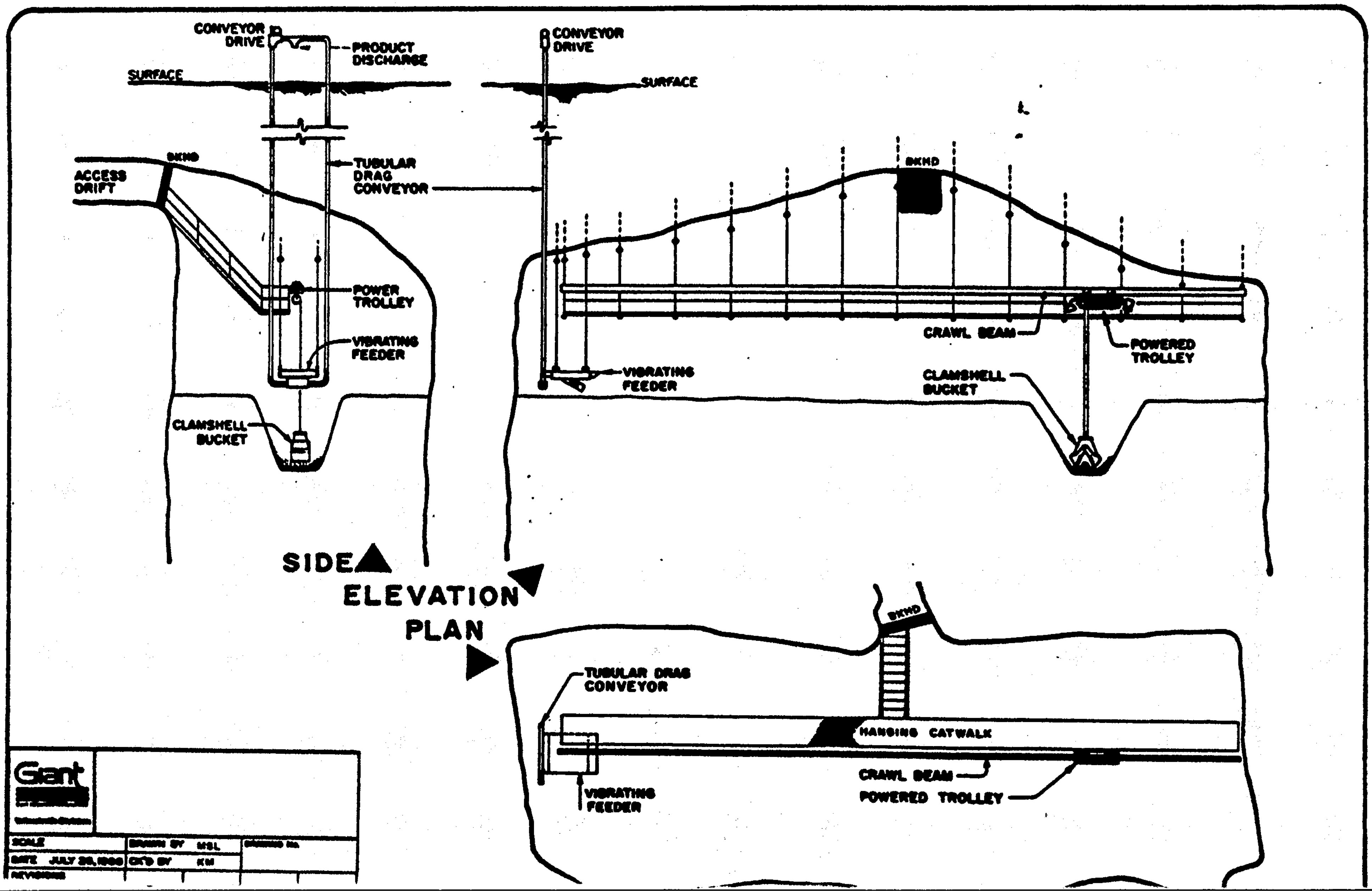
	ORIGINAL	|<---------- TONS REMAINING									------->|
B2-30/36	38,705	38,705	31,705	24,705	17,705	10,705	3,705	0	0	0	0	0
B2-12/13/	53,287	53,287	53,287	53,287	53,287	53,287	53,287	49,992	42,992	35,992	28,992	21,992
B2-08	28,063	28,063	28,063	28,063	28,063	28,063	28,063	28,063	28,063	28,063	28,063	28,063
C-12	16,060	16,060	16,060	16,060	16,060	16,060	16,060	16,060	16,060	16,060	16,060	16,060
B-11	2,786	2,786	2,786	2,786	2,786	2,786	2,786	2,786	2,786	2,786	2,786	2,786
C-10	9,192	9,192	9,192	9,192	9,192	9,192	9,192	9,192	9,192	9,192	9,192	9,192
C-9	18,066	18,066	18,066	18,066	18,066	18,066	18,066	18,066	18,066	18,066	18,066	18,066

UNITS AS203											
B2-30/36	0.004569	3198.3	3198.3	3198.3	3198.3	3198.3	1692.958	0	0	0	0
B2-12/13/14	0	0	0	0	0	0	2034.467	4322.5	4322.5	4322.5	4322.5
B2-08	0	0	0	0	0	0	0	0	0	0	0
C-12	0	0	0	0	0	0	0	0	0	0	0
B-11	0	0	0	0	0	0	0	0	0	0	0
C-10	0	0	0	0	0	0	0	0	0	0	0
C-9	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	3,198	3,198	3,198	3,198	3,198	3,727	4,323	4,323	4,323	4,323

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY

UNITS GOLD

B2-30/36	0.0122	8540	8540	8540	8540	8540	4520.484	0	0	0	0
B2-12/13/14	0	0	0	0	0	0	1489.197	3164	3164	3164	3164
B2-08	0	0	0	0	0	0	0	0	0	0	0
C-12	0	0	0	0	0	0	0	0	0	0	0
B-11	0	0	0	0	0	0	0	0	0	0	0
C-10	0	0	0	0	0	0	0	0	0	0	0
C-9	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	8,540	8,540	8,540	8,540	8,540	6,010	3,164	3,164	3,164	3,164



CONVEYOR DRIVE
PRODUCT DISCHARGE
SURFACE
BKHD
ACCESS DRIFT
TUBULAR DRAG CONVEYOR
POWER TROLLEY
VIBRATING FEEDER
CLAMSHELL BUCKET
CONVEYOR DRIVE
SURFACE
BKHD
CRAWL BEAM
POWERED TROLLEY
VIBRATING FEEDER
CLAMSHELL BUCKET
SIDE
ELEVATION
PLAN
BKHD
TUBULAR DRAG CONVEYOR
HANGING CATWALK
CRAWL BEAM
POWERED TROLLEY
VIBRATING FEEDER
Giant
SCALE
DRAWN BY MSL
DRAWING No.
DATE
CK'D BY KM
REVISIONS

MEMORANDUM

TO: S. El-Alfy

FROM: K. Morton

DATE: July 27, 1988

SUBJECT: COST OF TREATING ARSENIC IN HOT BAGHOUSE RESIDUES

One of the key pieces of equipment in the proposed arsenic reclaim plant is the hot baghouse. This is an insulated fabric filter that will capture micron sized particles of non volatiles in the gas stream. Although complete sublimation of arsenic is expected in the fluidizing reactor, it is difficult to design and maintain a filter that does not offer some sites suitable for premature condensation, with a consequent capture of arsenic trioxide in the hot baghouse product. Cold spots on the walls or even cold pulse jet cleaning air may be contributing factors.

Although no hard data exists that will permit a positive determination of the total weight of arsenic to be expected at this point, RPC has collected some data that may be useful. Unfortunately mass balances have not yet been done so weights are estimated.

Using current production baghouse dust, the hot baghouse product should represent about 10% of the total weight of feed to the plant. As_2O_3 concentrations shown in the hot baghouse product should be thus divided by 10 to determine wt% of As_2O_3 in the feed reporting to the hot baghouse product.

From the most recent series of assays done on pilot plant operation, arsenic concentrations in the hot baghouse product were 11.1, 29.3, 2.90, 24.15, 11.3, and 4.4%. This represents about 1.4% of the total weight of arsenic trioxide in the feed, or 98.6% recovery. Assuming a production rate of 20 tpd As_2O_3 product, about 560 lbs/d As_2O_3 would report to the hot baghouse product and thence to the tailings pond, probably via the carbon plant tails.

In full scale operation, more efficient baghouse design is possible and it is not unreasonable to expect As_2O_3 recoveries exceeding 99%, say 400 lb/d reporting to the tailings pond. If all this were to immediately go into solution, treatment costs would be horrendous but fortunately this will not happen. As shown by annual operating records, the effluent treatment plant removes about 20 tons/yr of arsenic at an arsenic component treatment cost of $300,000. Arsenic deposited in the pond each year amounts to about 164 tons, about a 12% removal ratio. The arsenic reclaim plant could contribute an equivalent amount of As to the pond, at an incremental treatment cost of $300,000/yr.

K. Morton

APPENDIX 2

FINANCIAL ANALYSIS

\WAROX\ARSASE23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE A)

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed From Mill	0	0	0	0	0	0	0	0	0	0	0	0
Tons Feed From U/G	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
Tons Feed Processed	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
Tons As2O3 Produced	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Ounces Gold Produced	0	12,154	12,154	12,154	12,154	12,154	7,339	3,332	3,332	3,332	3,332	81,435
REVENUES ($1,000)												
Revenue Arsenic	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Revenue Gold	0	6,077	6,077	6,077	6,077	6,077	3,669	1,666	1,666	1,666	1,666	40,718
Total Revenue	0	12,377	12,377	12,377	12,377	12,377	9,969	7,966	7,966	7,966	7,966	103,718
Revenues/ton Feed	917	1,056	1,056	1,056	1,056	1,056	991	919	919	919	919	10,863
Revenues/ton As2O3	961	1,768	1,768	1,768	1,768	1,768	1,424	1,138	1,138	1,138	1,138	15,778
OPERATING ($1,000)												
Total Operating	0	3,738	3,738	3,738	3,738	3,738	3,462	3,232	3,232	3,232	3,232	35,077
Operating/Ton Feed	410	319	319	319	319	319	344	373	373	373	373	3,840
Operating/Ton Product	430	534	534	534	534	534	495	462	462	462	462	5,441
Total Capital	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
Cash Flow Before Tax	(5,902)	8,639	8,639	8,639	9,389	8,639	6,508	4,734	4,734	4,734	4,734	63,489
Total Taxes	0	2,076	2,817	2,941	3,070	3,157	2,391	1,725	1,737	1,745	1,750	23,408
Net Cash Flow	(5,902)	6,563	5,823	5,699	6,319	5,483	4,117	3,009	2,997	2,990	2,984	40,080
Discount Rate	15.0%											
Aft Tax Discounted Cash Flow	(5,902)	5,707	4,403	3,747	3,613	2,726	1,780	1,131	980	850	738	19,771
Cum. Discounted Cash Flow	(5,902)	(195)	4,208	7,954	11,567	14,293	16,073	17,204	18,184	19,034	19,771	

BEFORE TAX

Net Present Value $32,144 of first 10 years of operation.

Payback Period 0.8 Years

IRR 146.34%

AFTER TAX

Net Present Value $19,771 of first 10 years of operation.

Payback Period 1.0 Years

IRR 104.0%

\WAROX\ARSASE23.WK1

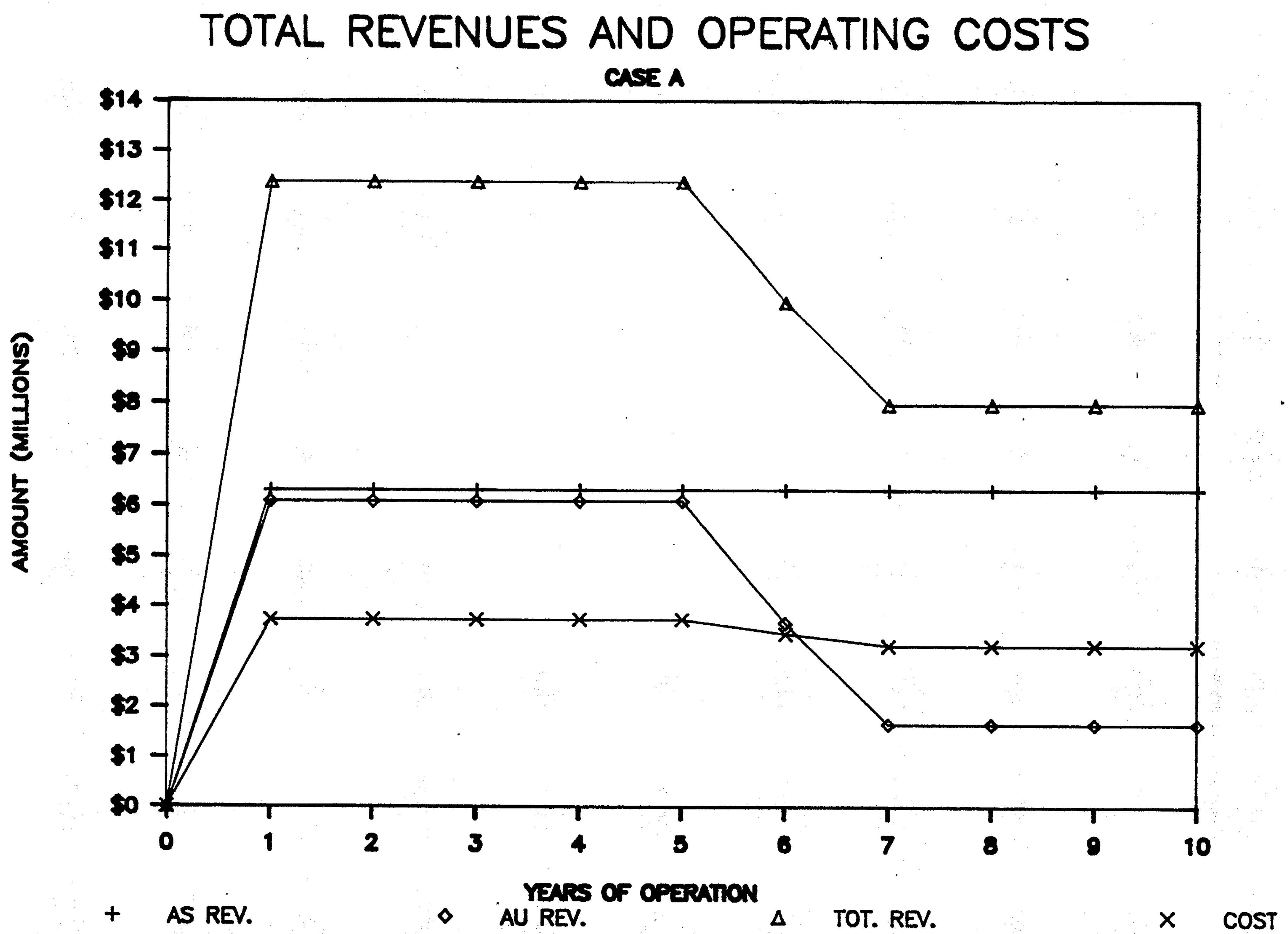
GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE A)
OPERATING COSTS

YEAR		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS	U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
	Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
	Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
	Transfer $/ton As203	46	46	46	46	46	46	46	46	46	46	46	
	Freight $/ton As203	196	196	196	196	196	196	196	196	196	196	196	
	Tails $/ton As203	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons)	U/G	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
	Plant Feed	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
	Residue	0	4,720	4,720	4,720	4,720	4,720	3,056	1,672	1,672	1,672	1,672	33,346
	Transfer	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
	Freight	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
	As203 to Tails	0	70	70	70	70	70	70	70	70	70	70	700
COSTS	U/G	0	305	305	305	305	305	261	225	225	225	225	2,687
	Plant	0	1,641	1,641	1,641	1,641	1,641	1,408	1,214	1,214	1,214	1,214	14,468
	Residue	0	0	0	0	0	0	0	0	0	0	0	0
	Transfer	0	322	322	322	322	322	322	322	322	322	322	3,220
	Freight	0	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	13,720
	Tails	0	98	98	98	98	98	98	98	98	98	98	982
	Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS		0	3,738	3,738	3,738	3,738	3,738	3,462	3,232	3,232	3,232	3,232	35,077
NET OPERATING PROFIT		0	8,639	8,639	8,639	8,639	8,639	6,508	4,734	4,734	4,734	4,734	68,641
CAPITAL	U/G RECLAIM	1,000	0	0	0	0	0	0	0	0	0	0	1,000
	SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
	TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
	U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
	EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX		(5,902)	8,639	8,639	8,639	9,389	8,639	6,508	4,734	4,734	4,734	4,734	63,489
TOTAL TAXES		0	2,076	2,817	2,941	3,070	3,157	2,391	1,725	1,737	1,745	1,750	23,408
NET CASH FLOW		(5,902)	6,563	5,823	5,699	6,319	5,483	4,117	3,009	2,997	2,990	2,984	40,080
CUMULATIVE NET CASH FLOW		(5,902)	661	6,484	12,182	18,501	23,984	28,100	31,109	34,107	37,096	40,080	
DISCOUNT RATE		15.00%											
Discount Period		0	1	2	3	4	5	6	7	8	9	10	
BEF TAX DISCOUNTED CASH FLOW		(5,902)	7,512	6,532	5,680	5,368	4,295	2,814	1,780	1,548	1,346	1,170	32,144
CUMUL DISCOUNTED		(5,902)	1,610	8,143	13,823	19,192	23,487	26,300	28,080	29,628	30,973	32,144	
AFT TAX DISCOUNTED CASH FLOW		(5,902)	5,707	4,403	3,747	3,613	2,726	1,780	1,131	980	850	738	19,771
CUMUL DISCOUNTED		(5,902)	(195)	4,208	7,954	11,567	14,293	16,073	17,204	18,184	19,034	19,771	

\WAROX\ARSASE23.WK1

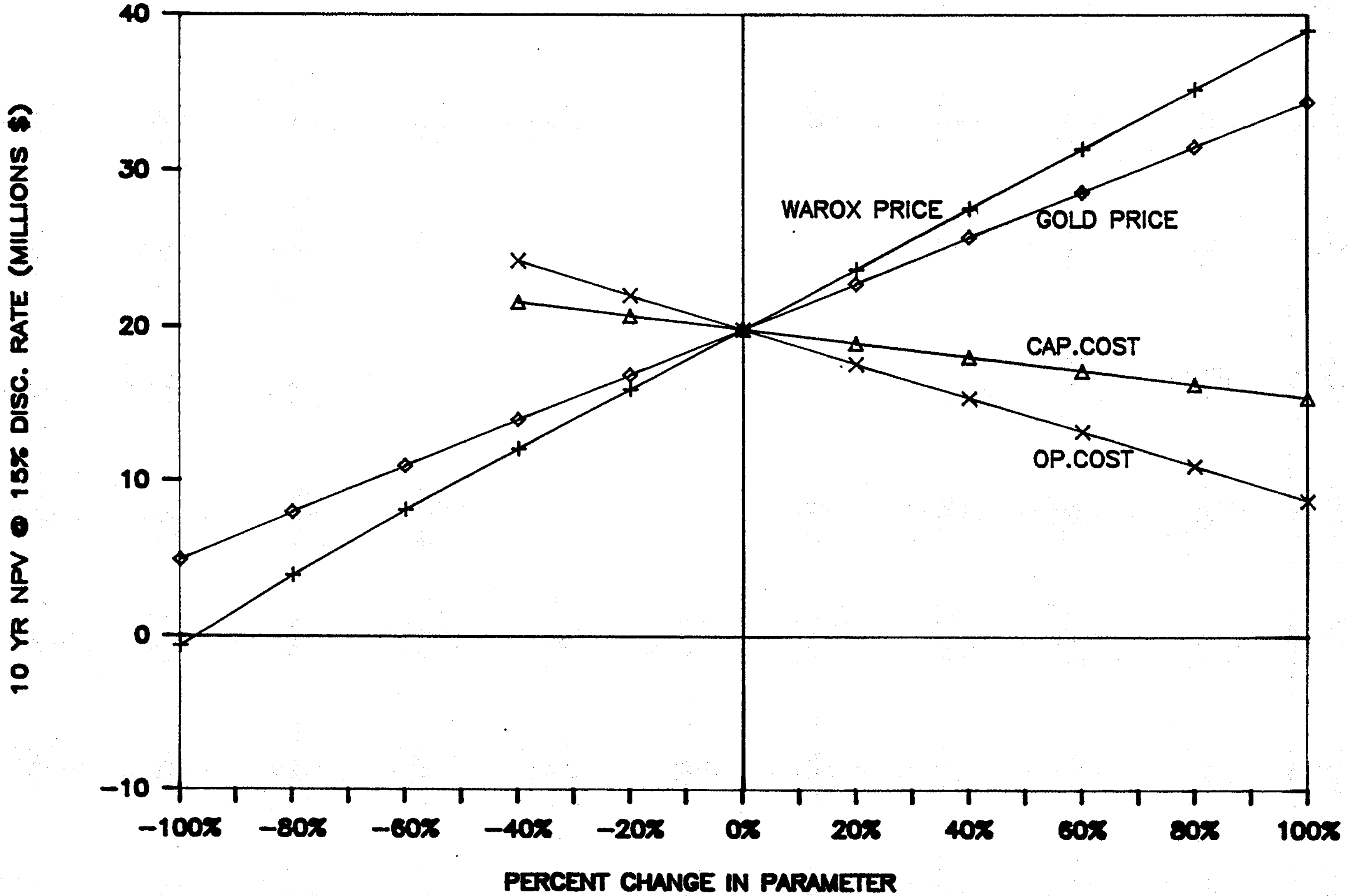
GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE A)
PRODUCTION RATES AND PRODUCT PRICES

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As203 Sold	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Feed Grade As	73.00%	45.69%	45.69%	45.69%	45.69%	45.69%	53.25%	61.75%	61.75%	61.75%	61.75%	
Feed Grade As203	96.39%	60.33%	60.33%	60.33%	60.33%	60.33%	70.31%	81.53%	81.53%	81.53%	81.53%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	11,720	11,720	11,720	11,720	11,720	10,056	8,672	8,672	8,672	8,672	103,346
PRODUCTION DATA												
ARSENIC												
Feed % As203	96.39%	60.33%	60.33%	60.33%	60.33%	60.33%	70.31%	81.53%	81.53%	81.53%	81.53%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As203	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
GOLD												
Feed Grade (oz/ton)	0.137	1.220	1.220	1.220	1.220	1.220	0.859	0.452	0.452	0.452	0.452	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	12,154	12,154	12,154	12,154	12,154	7,339	3,332	3,332	3,332	3,332	81,435
PRODUCT PRICES												
As203 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	500	500	500	500	500	500	500	500	500	500	500	
REVENUES												
As203	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Gold	0	6,077	6,077	6,077	6,077	6,077	3,669	1,666	1,666	1,666	1,666	40,718
TOTAL REVENUES	0	12,377	12,377	12,377	12,377	12,377	9,969	7,966	7,966	7,966	7,966	103,718


TOTAL REVENUES AND OPERATING COSTS
CASE A
AMOUNT (MILLIONS)
$14
$13
$12
$11
$10
$9
$8
$7
$6
$5
$4
$3
$2
$1
$0
0
1
2
3
4
5
6
7
8
9
10
YEARS OF OPERATION
+ AS REV.
◇ AU REV.
Δ TOT. REV.
× COST

EFFECTS OF CHANGES ON THE NPV

CASE A



\WAROX\ARSBSE23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE B)

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed From Mill	0	0	0	0	0	0	0	0	0	0	0	0
Tons Feed From U/G	0	6,697	7,534	8,372	9,209	10,046	10,883	11,720	8,739	8,672	8,672	90,544
Tons Feed Processed	0	6,697	7,534	8,372	9,209	10,046	10,883	11,720	8,739	8,672	8,672	90,544
Tons As2O3 Produced	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Ounces Gold Produced	0	6,945	7,813	8,681	9,549	10,418	11,286	12,154	3,525	3,332	3,332	77,035
REVENUES ($1,000)												
Revenue Arsenic	0	3,600	4,050	4,500	4,950	5,400	5,850	6,300	6,300	6,300	6,300	53,550
Revenue Gold	0	3,473	3,907	4,341	4,775	5,209	5,643	6,077	1,762	1,666	1,666	38,517
Total Revenue	0	7,073	7,957	8,841	9,725	10,609	11,493	12,377	8,062	7,966	7,966	92,067
Revenues/ton Feed	917	1,056	1,056	1,056	1,056	1,056	1,056	1,056	923	919	919	11,069
Revenues/ton As2O3	961	1,768	1,768	1,768	1,768	1,768	1,768	1,768	1,152	1,138	1,138	16,766
OPERATING ($1,000)												
Total Operating	0	2,136	2,403	2,670	2,937	3,204	3,471	3,738	3,243	3,232	3,232	30,264
Operating/Ton Feed	410	319	319	319	319	319	319	319	371	373	373	3,759
Operating/Ton Product	430	534	534	534	534	534	534	534	463	462	462	5,554
Total Capital	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
Cash Flow Before Tax	(5,902)	4,937	5,554	6,171	7,538	7,405	8,022	8,639	4,820	4,734	4,734	56,652
Total Taxes	0	951	1,315	1,978	2,349	2,675	2,982	3,242	1,769	1,745	1,750	20,755
Net Cash Flow	(5,902)	3,986	4,239	4,192	5,189	4,730	5,041	5,397	3,050	2,990	2,984	35,896
Discount Rate	15.0%											
Aft Tax Discounted Cash Flow	(5,902)	3,466	3,205	2,757	2,967	2,352	2,179	2,029	997	850	738	15,638
Cum. Discounted Cash Flow	(5,902)	(2,436)	770	3,526	6,493	8,845	11,024	13,053	14,050	14,900	15,638	

BEFORE TAX

Net Present Value $25,447 of first 10 years of operation.

Payback Period 1.4 Years

IRR 94.61%

AFTER TAX

Net Present Value $15,638 of first 10 years of operation.

Payback Period 1.8 Years

IRR 71.7%

\WAROX\ARSBSE23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE B)
OPERATING COSTS

YEAR		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS	U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
	Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
	Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
	Transfer $/ton As2O3	46	46	46	46	46	46	46	46	46	46	46	
	Freight $/ton As2O3	196	196	196	196	196	196	196	196	196	196	196	
	Tails $/ton As2O3	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons)	U/G	0	6,697	7,534	8,372	9,209	10,046	10,883	11,720	8,739	8,672	8,672	90,544
	Plant Feed	0	6,697	7,534	8,372	9,209	10,046	10,883	11,720	8,739	8,672	8,672	90,544
	Residue	0	2,697	3,034	3,372	3,709	4,046	4,383	4,720	1,739	1,672	1,672	31,044
	Transfer	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
	Freight	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
	As2O3 to Tails	0	40	45	50	55	60	65	70	70	70	70	595
COSTS	U/G	0	174	196	218	239	261	283	305	227	225	225	2,354
	Plant	0	938	1,055	1,172	1,289	1,406	1,524	1,641	1,223	1,214	1,214	12,676
	Residue	0	0	0	0	0	0	0	0	0	0	0	0
	Transfer	0	184	207	230	253	276	299	322	322	322	322	2,737
	Freight	0	784	882	980	1,078	1,176	1,274	1,372	1,372	1,372	1,372	11,662
	Tails	0	56	63	70	77	84	91	98	98	98	98	834
	Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS		0	2,136	2,403	2,670	2,937	3,204	3,471	3,738	3,243	3,232	3,232	30,264
NET OPERATING PROFIT		0	4,937	5,554	6,171	6,788	7,405	8,022	8,639	4,820	4,734	4,734	61,804
CAPITAL	U/G RECLAIM	1,000	0	0	0	0	0	0	0	0	0	0	1,000
	SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
	TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
	U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
	EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX		(5,902)	4,937	5,554	6,171	7,538	7,405	8,022	8,639	4,820	4,734	4,734	56,652
TOTAL TAXES		0	951	1,315	1,978	2,349	2,675	2,982	3,242	1,769	1,745	1,750	20,755
NET CASH FLOW		(5,902)	3,986	4,239	4,192	5,189	4,730	5,041	5,397	3,050	2,990	2,984	35,896
CUMULATIVE NET CASH FLOW		(5,902)	(1,916)	2,323	6,516	11,705	16,435	21,476	26,872	29,923	32,912	35,896	
DISCOUNT RATE		15.00%											
Discount Period		0	1	2	3	4	5	6	7	8	9	10	
BEF TAX DISCOUNTED CASH FLOW		(5,902)	4,293	4,199	4,057	4,310	3,682	3,468	3,248	1,576	1,346	1,170	25,447
CUMUL DISCOUNTED		(5,902)	(1,609)	2,590	6,648	10,958	14,639	18,107	21,355	22,931	24,276	25,447	
AFT TAX DISCOUNTED CASH FLOW		(5,902)	3,466	3,205	2,757	2,967	2,352	2,179	2,029	997	850	738	15,638
CUMUL DISCOUNTED		(5,902)	(2,436)	770	3,526	6,493	8,845	11,024	13,053	14,050	14,900	15,638	

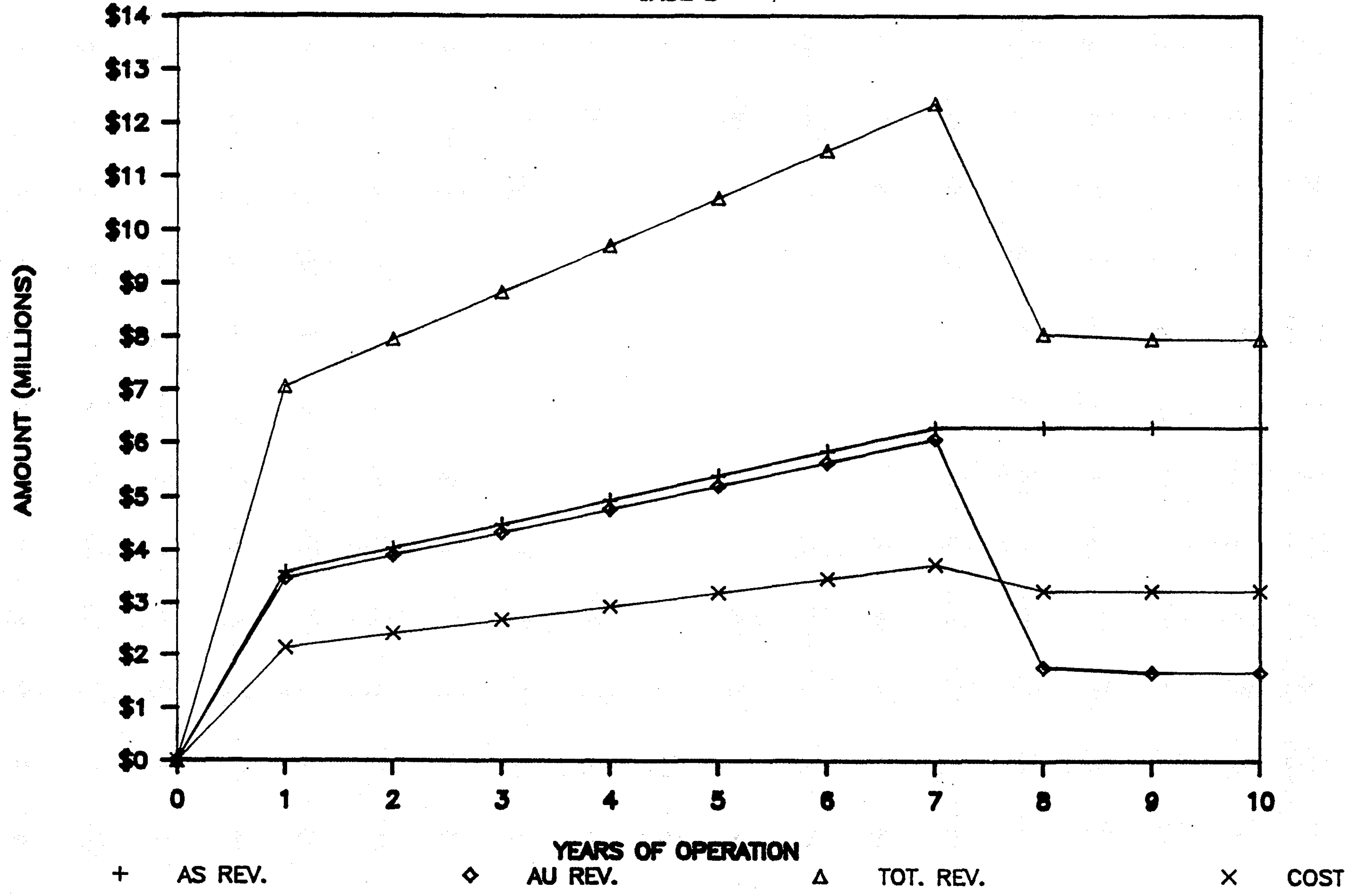
\WAROX\ARSBSE23.WK1

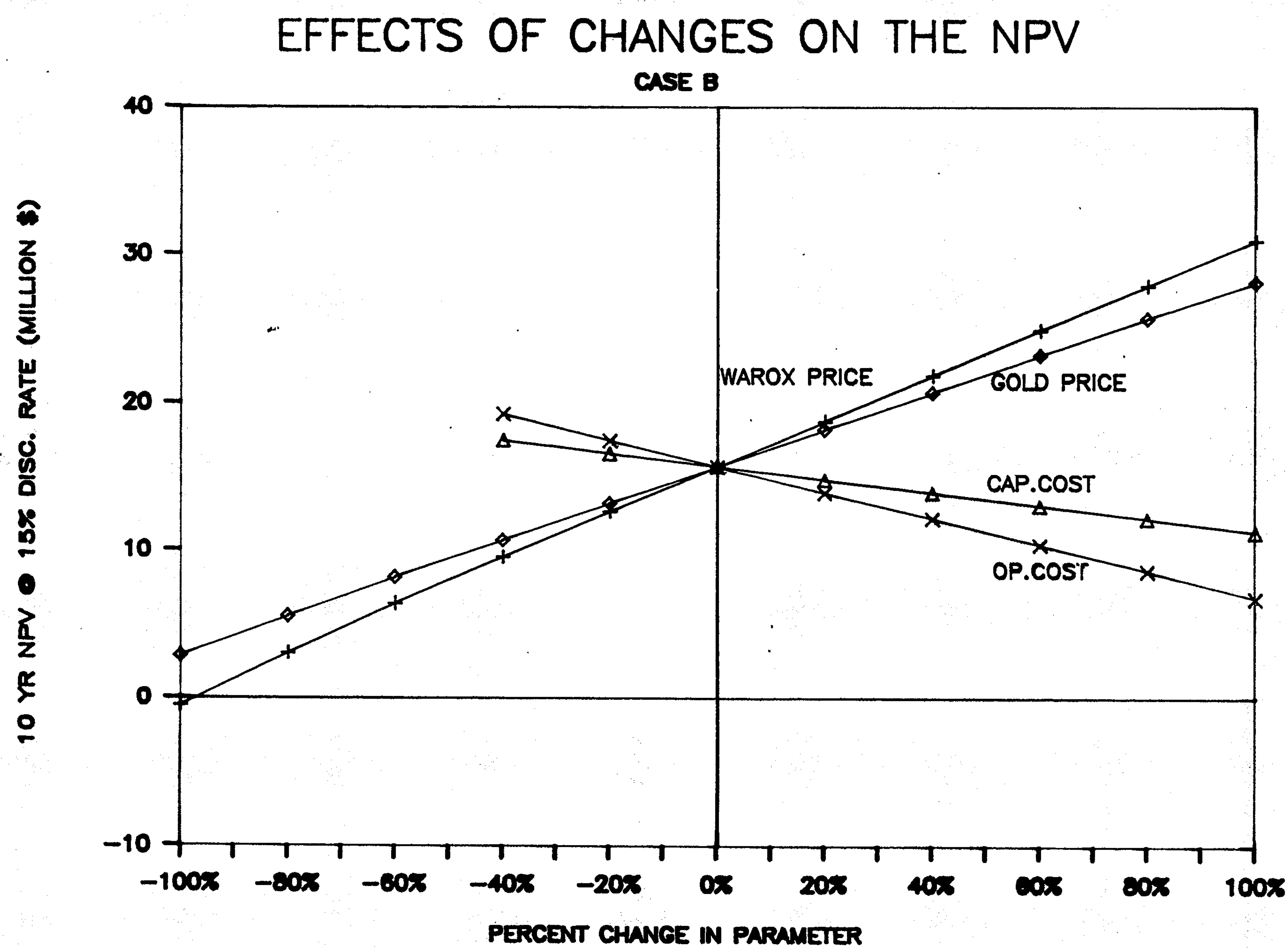
GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE B)
PRODUCTION RATES AND PRODUCT PRICES

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As2O3 Sold	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Feed Grade As	73.00%	45.69%	45.69%	45.69%	45.69%	45.69%	45.69%	45.69%	61.28%	61.75%	61.75%	
Feed Grade As2O3	96.39%	60.33%	60.33%	60.33%	60.33%	60.33%	60.33%	60.33%	80.91%	81.53%	81.53%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	6,697	7,534	8,372	9,209	10,046	10,883	11,720	8,739	8,672	8,672	90,544
PRODUCTION DATA												
ARSENIC												
Feed % As2O3	96.39%	60.33%	60.33%	60.33%	60.33%	60.33%	60.33%	60.33%	80.91%	81.53%	81.53%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As2O3	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
GOLD												
Feed Grade (oz/ton)	0.137	1.220	1.220	1.220	1.220	1.220	1.220	1.220	0.475	0.452	0.452	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	6,945	7,813	8,681	9,549	10,418	11,286	12,154	3,525	3,332	3,332	77,035
PRODUCT PRICES												
As2O3 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	500	500	500	500	500	500	500	500	500	500	500	
REVENUES												
As2O3	0	3,600	4,050	4,500	4,950	5,400	5,850	6,300	6,300	6,300	6,300	53,550
Gold	0	3,473	3,907	4,341	4,775	5,209	5,643	6,077	1,762	1,666	1,666	38,517
TOTAL REVENUES	0	7,073	7,957	8,841	9,725	10,609	11,493	12,377	8,062	7,966	7,966	92,067

TOTAL REVENUES AND OPERATING COSTS

CASE B





EFFECTS OF CHANGES ON THE NPV
CASE B
10 YR NPV @ 15% DISC. RATE (MILLION $)
40
30
20
10
0
−10
WAROX PRICE
GOLD PRICE
CAP.COST
OP.COST
−100%
−80%
−60%
−40%
−20%
0%
20%
40%
60%
80%
100%
PERCENT CHANGE IN PARAMETER

\WAROX\ARSESC23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE C)

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed From Mill	0	4,424	4,424	4,424	4,424	4,424	4,424	4,424	0	0	0	30,968
Tons Feed From U/G	0	2,911	2,911	3,092	3,139	3,139	3,139	3,139	7,993	8,114	8,156	45,730
Tons Feed Processed	0	7,335	7,335	7,516	7,563	7,563	7,563	7,563	7,993	8,114	8,156	76,698
Tons As2O3 Produced	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Ounces Gold Produced	0	854	854	849	847	847	847	847	862	936	2,454	10,199
REVENUES ($1,000)												
Revenue Arsenic	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Revenue Gold	0	427	427	424	424	424	424	424	431	468	1,227	5,099
Total Revenue	0	6,727	6,727	6,724	6,724	6,724	6,724	6,724	6,731	6,768	7,527	68,099
Revenues/ton Feed	917	917	917	895	889	889	889	889	842	834	923	9,801
Revenues/ton As2O3	961	961	961	961	961	961	961	961	962	967	1,075	10,690
OPERATING ($1,000)												
Total Operating	0	2,895	2,895	2,925	2,933	2,933	2,933	2,933	3,119	3,139	3,146	29,849
Operating/Ton Feed	410	395	395	389	388	388	388	388	390	387	386	4,303
Operating/Ton Product	430	414	414	418	419	419	419	419	446	448	449	4,694
Total Capital	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
Cash Flow Before Tax	(5,902)	3,832	3,832	3,800	4,541	3,791	3,791	3,791	3,612	3,629	4,381	33,099
Total Taxes	0	622	753	894	1,203	1,289	1,348	1,367	1,310	1,325	1,616	11,727
Net Cash Flow	(5,902)	3,210	3,079	2,906	3,338	2,502	2,444	2,424	2,302	2,304	2,765	21,372
Discount Rate	15.0%											
Aft Tax Discounted Cash Flow	(5,902)	2,792	2,328	1,911	1,909	1,244	1,056	911	752	655	683	8,340
Cum. Discounted Cash Flow	(5,902)	(3,110)	(782)	1,128	3,037	4,281	5,337	6,249	7,001	7,656	8,340	

BEFORE TAX

Net Present Value $13,667 of first 10 years of operation.

Payback Period 1.9 Years

IRR 65.38%

AFTER TAX

Net Present Value $8,340 of first 10 years of operation.

Payback Period 2.4 Years

IRR 50.1%

\WAROX\ARSESC23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE C)
OPERATING COSTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
Transfer $/ton As_2O_3	46	46	46	46	46	46	46	46	46	46	46	
Freight $/ton As_2O_3	196	196	196	196	196	196	196	196	196	196	196	
Tails $/ton As_2O_3	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons) U/G	0	2,911	2,911	3,092	3,139	3,139	3,139	3,139	7,993	8,114	8,156	45,730
Plant Feed	0	7,335	7,335	7,516	7,563	7,563	7,563	7,563	7,993	8,114	8,156	76,698
Residue	0	335	335	516	563	563	563	563	993	1,114	1,156	6,698
Transfer	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Freight	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
As_2O_3 to Tails	0	70	70	70	70	70	70	70	70	70	70	700
COSTS U/G	0	76	76	80	82	82	82	82	208	211	212	1,189
Plant	0	1,027	1,027	1,052	1,059	1,059	1,059	1,059	1,119	1,136	1,142	10,738
Residue	0	0	0	0	0	0	0	0	0	0	0	0
Transfer	0	322	322	322	322	322	322	322	322	322	322	3,220
Freight	0	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	13,720
Tails	0	98	98	98	98	98	98	98	98	98	98	982
Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS	0	2,895	2,895	2,925	2,933	2,933	2,933	2,933	3,119	3,139	3,146	29,849
NET OPERATING PROFIT	0	3,832	3,832	3,800	3,791	3,791	3,791	3,791	3,612	3,629	4,381	38,251
CAPITAL U/G RECLAIM	1,000	0	0	0	0	0	0	0	0	0	0	1,000
SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX	(5,902)	3,832	3,832	3,800	4,541	3,791	3,791	3,791	3,612	3,629	4,381	33,099
TOTAL TAXES	0	622	753	894	1,203	1,289	1,348	1,367	1,310	1,325	1,616	11,727
NET CASH FLOW	(5,902)	3,210	3,079	2,906	3,338	2,502	2,444	2,424	2,302	2,304	2,765	21,372
CUMULATIVE NET CASH FLOW	(5,902)	(2,692)	387	3,293	6,631	9,134	11,577	14,001	16,303	18,607	21,372	
DISCOUNT RATE	15.00%											
Discount Period	0	1	2	3	4	5	6	7	8	9	10	
BEF TAX DISCOUNTED CASH FLOW	(5,902)	3,332	2,898	2,498	2,596	1,885	1,639	1,425	1,181	1,031	1,083	13,667
CUMUL DISCOUNTED	(5,902)	(2,570)	328	2,827	5,423	7,308	8,947	10,372	11,553	12,585	13,667	
AFT TAX DISCOUNTED CASH FLOW	(5,902)	2,792	2,328	1,911	1,909	1,244	1,056	911	752	655	683	8,340
CUMUL DISCOUNTED	(5,902)	(3,110)	(782)	1,128	3,037	4,281	5,337	6,249	7,001	7,656	8,340	

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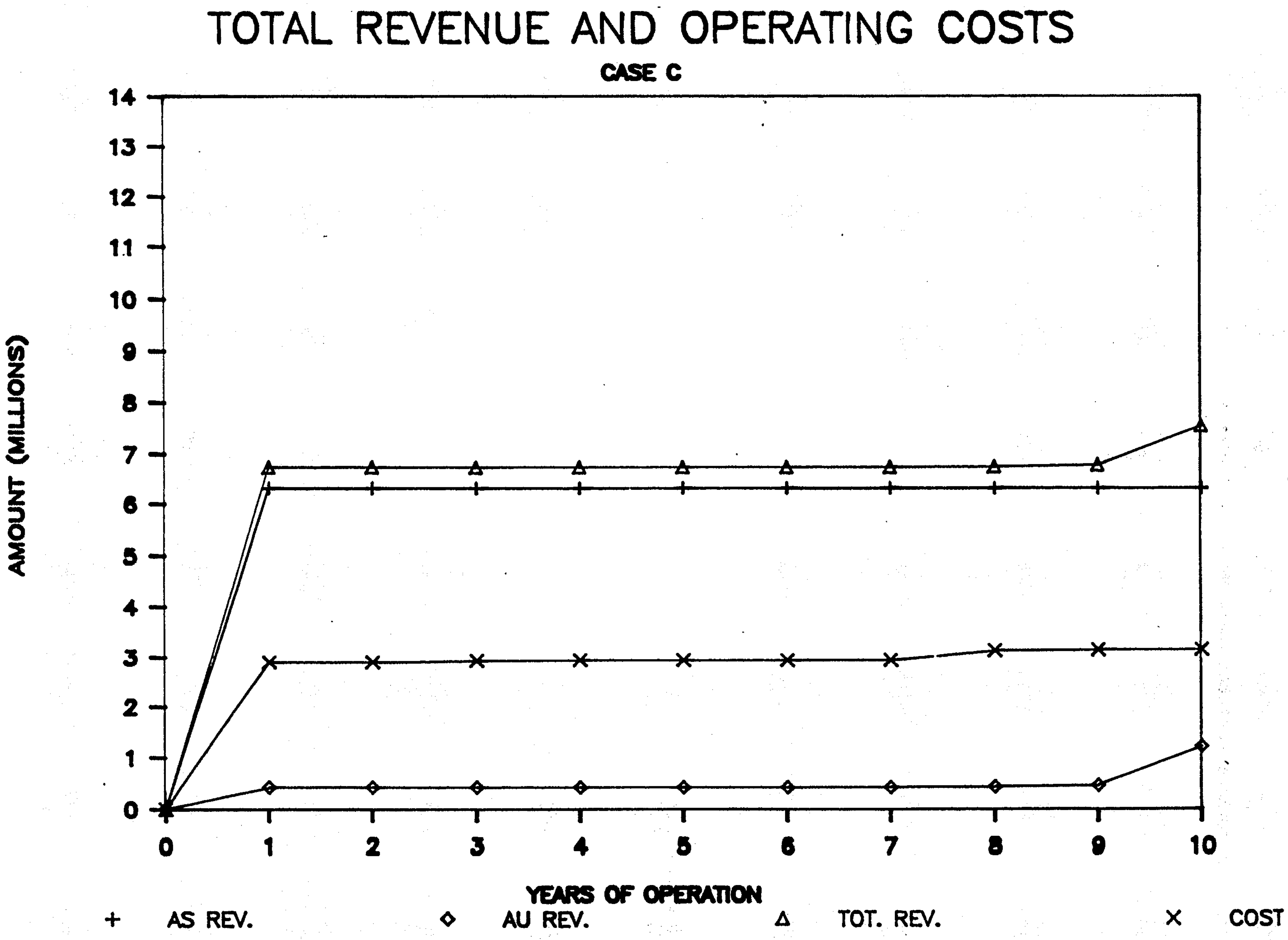
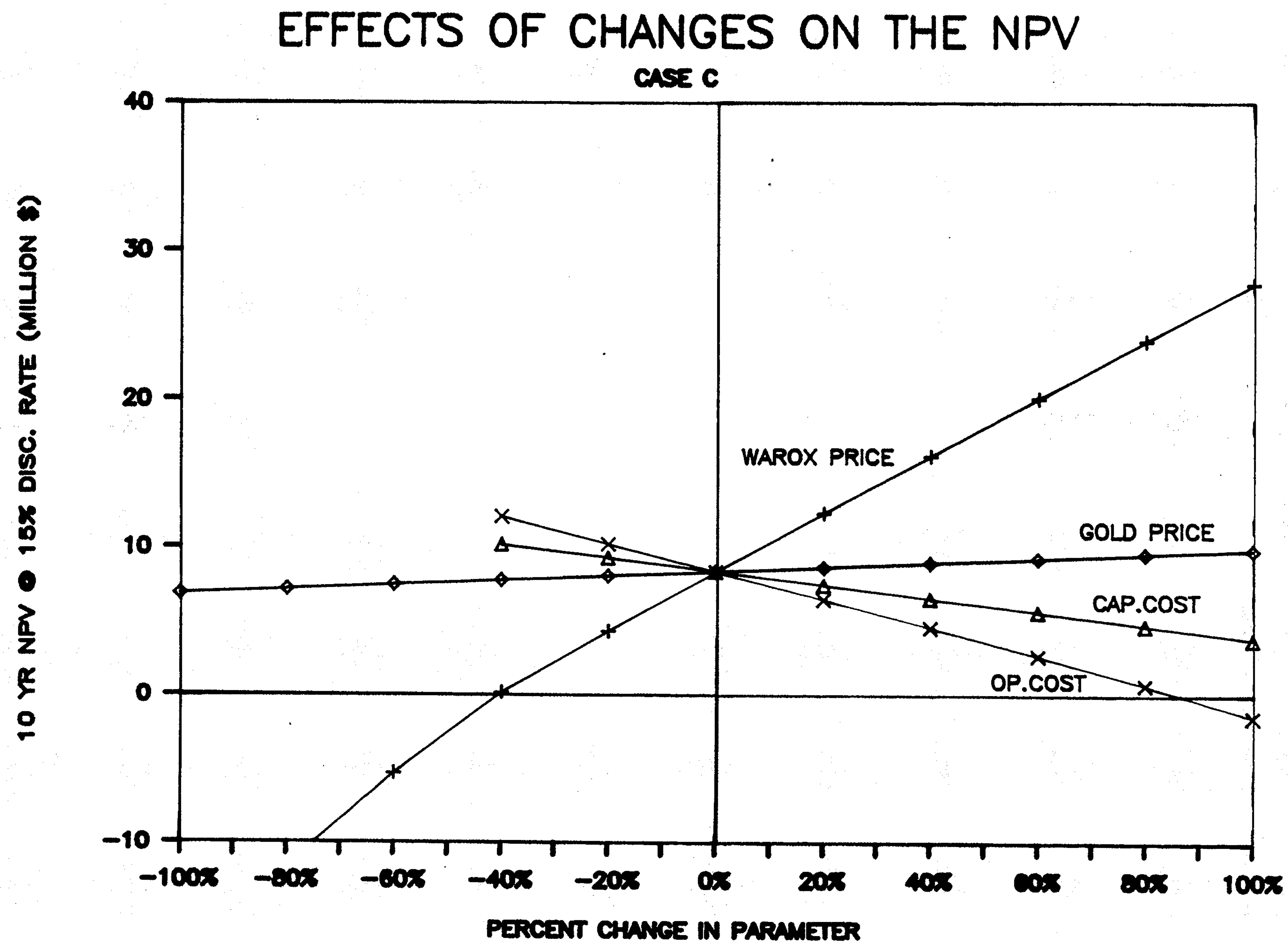
GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE C)
PRODUCTION RATES AND PRODUCT PRICES

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As2O3 Sold	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Feed Grade As	73.00%	73.01%	73.01%	71.24%	70.81%	70.81%	70.81%	70.81%	67.00%	66.00%	65.66%	
Feed Grade As2O3	96.39%	96.40%	96.40%	94.07%	93.50%	93.50%	93.50%	93.50%	88.47%	87.14%	86.70%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	7,335	7,335	7,516	7,563	7,563	7,563	7,563	7,993	8,114	8,156	76,698
PRODUCTION DATA												
ARSENIC												
Feed % As2O3	96.39%	96.40%	96.40%	94.07%	93.50%	93.50%	93.50%	93.50%	88.47%	87.14%	86.70%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As2O3	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
GOLD												
Feed Grade (oz/ton)	0.137	0.137	0.137	0.133	0.132	0.132	0.132	0.132	0.127	0.136	0.354	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	854	854	849	847	847	847	847	862	936	2,454	10,199
PRODUCT PRICES												
As2O3 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	500	500	500	500	500	500	500	500	500	500	500	
REVENUES												
As2O3	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Gold	0	427	427	424	424	424	424	424	431	468	1,227	5,099
TOTAL REVENUES	0	6,727	6,727	6,724	6,724	6,724	6,724	6,724	6,731	6,768	7,527	68,099


TOTAL REVENUE AND OPERATING COSTS
CASE C
AMOUNT (MILLIONS)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
YEARS OF OPERATION
+ AS REV.
◇ AU REV.
Δ TOT. REV.
× COST


EFFECTS OF CHANGES ON THE NPV
CASE C
10 YR NPV @ 15% DISC. RATE (MILLION $)
40
30
20
10
0
−10
WAROX PRICE
GOLD PRICE
CAP.COST
OP.COST
−100%
−80%
−60%
−40%
−20%
0%
20%
40%
60%
80%
100%
PERCENT CHANGE IN PARAMETER

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GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE D)

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed From Mill	0	4,192	4,424	4,424	4,424	4,424	4,424	4,424	0	0	0	30,736
Tons Feed From U/G	0	(0)	292	815	1,339	1,863	2,410	3,139	7,936	7,936	8,088	33,817
Tons Feed Processed	0	4,192	4,716	5,239	5,763	6,287	6,834	7,563	7,936	7,936	8,088	64,553
Tons As2O3 Produced	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Ounces Gold Produced	0	488	549	610	671	732	792	847	836	836	905	7,269
REVENUES ($1,000)												
Revenue Arsenic	0	3,600	4,050	4,500	4,950	5,400	5,850	6,300	6,300	6,300	6,300	53,550
Revenue Gold	0	244	275	305	336	366	396	424	418	418	453	3,634
Total Revenue	0	3,844	4,325	4,805	5,286	5,766	6,246	6,724	6,718	6,718	6,753	57,184
Revenues/ton Feed	917	917	917	917	917	917	914	889	847	847	835	9,834
Revenues/ton As2O3	961	961	961	961	961	961	961	961	960	960	965	10,572
OPERATING ($1,000)												
Total Operating	0	1,611	1,820	2,035	2,250	2,465	2,684	2,933	3,109	3,109	3,135	25,150
Operating/Ton Feed	410	384	386	388	390	392	393	388	392	392	388	4,303
Operating/Ton Product	430	403	404	407	409	411	413	419	444	444	448	4,632
Total Capital	4,902	1,000	0	0	(750)	0	0	0	0	0	0	5,152
Cash Flow Before Tax	(4,902)	1,233	2,505	2,770	3,786	3,301	3,563	3,791	3,609	3,609	3,618	26,882
Total Taxes	0	183	347	522	701	1,043	1,250	1,365	1,307	1,316	1,325	9,359
Net Cash Flow	(4,902)	1,050	2,157	2,248	3,085	2,258	2,313	2,427	2,301	2,293	2,293	17,523
Discount Rate	15.0%											
Aft Tax Discounted Cash Flow	(4,902)	913	1,631	1,478	1,764	1,123	1,000	912	752	652	567	5,890
Cum. Discounted Cash Flow	(4,902)	(3,989)	(2,358)	(880)	884	2,007	3,007	3,919	4,671	5,323	5,890	

BEFORE TAX

Net Present Value $9,757 of first 10 years of operation.

Payback Period 3.1 Years

IRR 48.8%

AFTER TAX

Net Present Value $5,890 of first 10 years of operation.

Payback Period 3.5 Years

IRR 39.0%

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GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE D)
OPERATING COSTS

YEAR		1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS	U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
	Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
	Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
	Transfer $/ton As2O3	46	46	46	46	46	46	46	46	46	46	46	
	Freight $/ton As2O3	196	196	196	196	196	196	196	196	196	196	196	
	Tails $/ton As2O3	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons)	U/G	0	(0)	292	815	1,339	1,863	2,410	3,139	7,936	7,936	8,088	33,817
	Plant Feed	0	4,192	4,716	5,239	5,763	6,287	6,834	7,563	7,936	7,936	8,088	64,553
	Residue	0	192	216	239	263	287	334	563	936	936	1,088	5,053
	Transfer	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
	Freight	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
	As2O3 to Tails	0	40	45	50	55	60	65	70	70	70	70	595
COSTS	U/G	0	(0)	8	21	35	48	63	82	206	206	210	879
	Plant	0	587	660	734	807	880	957	1,059	1,111	1,111	1,132	9,037
	Residue	0	0	0	0	0	0	0	0	0	0	0	0
	Transfer	0	184	207	230	253	276	299	322	322	322	322	2,737
	Freight	0	784	882	980	1,078	1,176	1,274	1,372	1,372	1,372	1,372	11,662
	Tails	0	56	63	70	77	84	91	98	98	98	98	834
	Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS		0	1,611	1,820	2,035	2,250	2,465	2,684	2,933	3,109	3,109	3,135	25,150
NET OPERATING PROFIT		0	2,233	2,505	2,770	3,036	3,301	3,563	3,791	3,609	3,609	3,618	32,034
CAPITAL	U/G RECLAIM	0	1,000	0	0	0	0	0	0	0	0	0	1,000
	SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
	TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
	U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
	EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL CAPITAL	4,902	1,000	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX		(4,902)	1,233	2,505	2,770	3,786	3,301	3,563	3,791	3,609	3,609	3,618	26,882
TOTAL TAXES		0	183	347	522	701	1,043	1,250	1,365	1,307	1,316	1,325	9,359
NET CASH FLOW		(4,902)	1,050	2,157	2,248	3,085	2,258	2,313	2,427	2,301	2,293	2,293	17,523
CUMULATIVE NET CASH FLOW		(4,902)	(3,852)	(1,695)	553	3,638	5,896	8,209	10,636	12,937	15,230	17,523	
DISCOUNT RATE		15.00%											
Discount Period		0	1	2	3	4	5	6	7	8	9	10	
BEF TAX DISCOUNTED CASH FLOW		(4,902)	1,072	1,894	1,821	2,165	1,641	1,540	1,425	1,180	1,026	894	9,757
CUMUL DISCOUNTED		(4,902)	(3,830)	(1,936)	(114)	2,050	3,691	5,232	6,657	7,837	8,863	9,757	
AFT TAX DISCOUNTED CASH FLOW		(4,902)	913	1,631	1,478	1,764	1,123	1,000	912	752	652	567	5,890
CUMUL DISCOUNTED		(4,902)	(3,989)	(2,358)	(880)	884	2,007	3,007	3,919	4,671	5,323	5,890	

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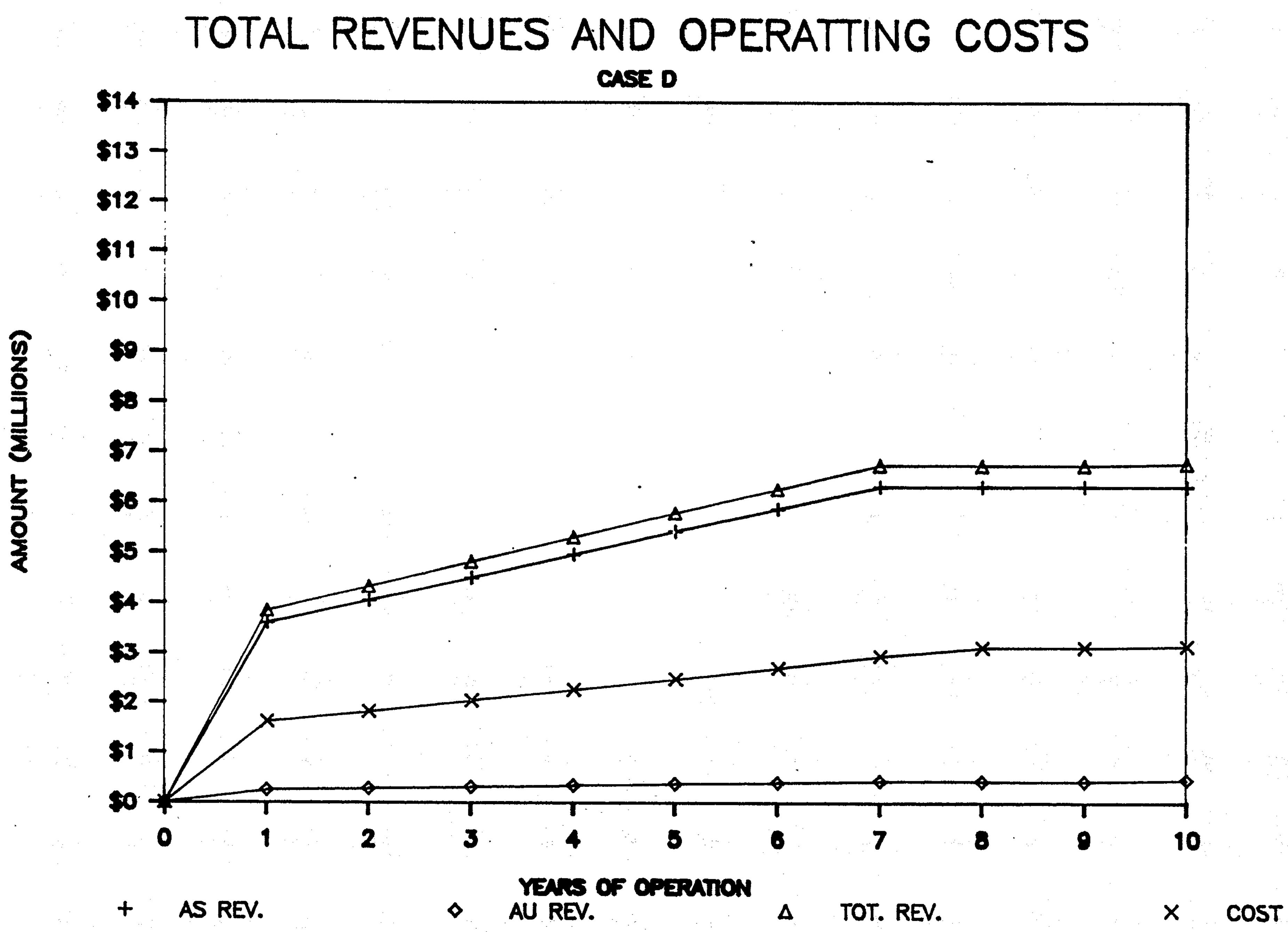
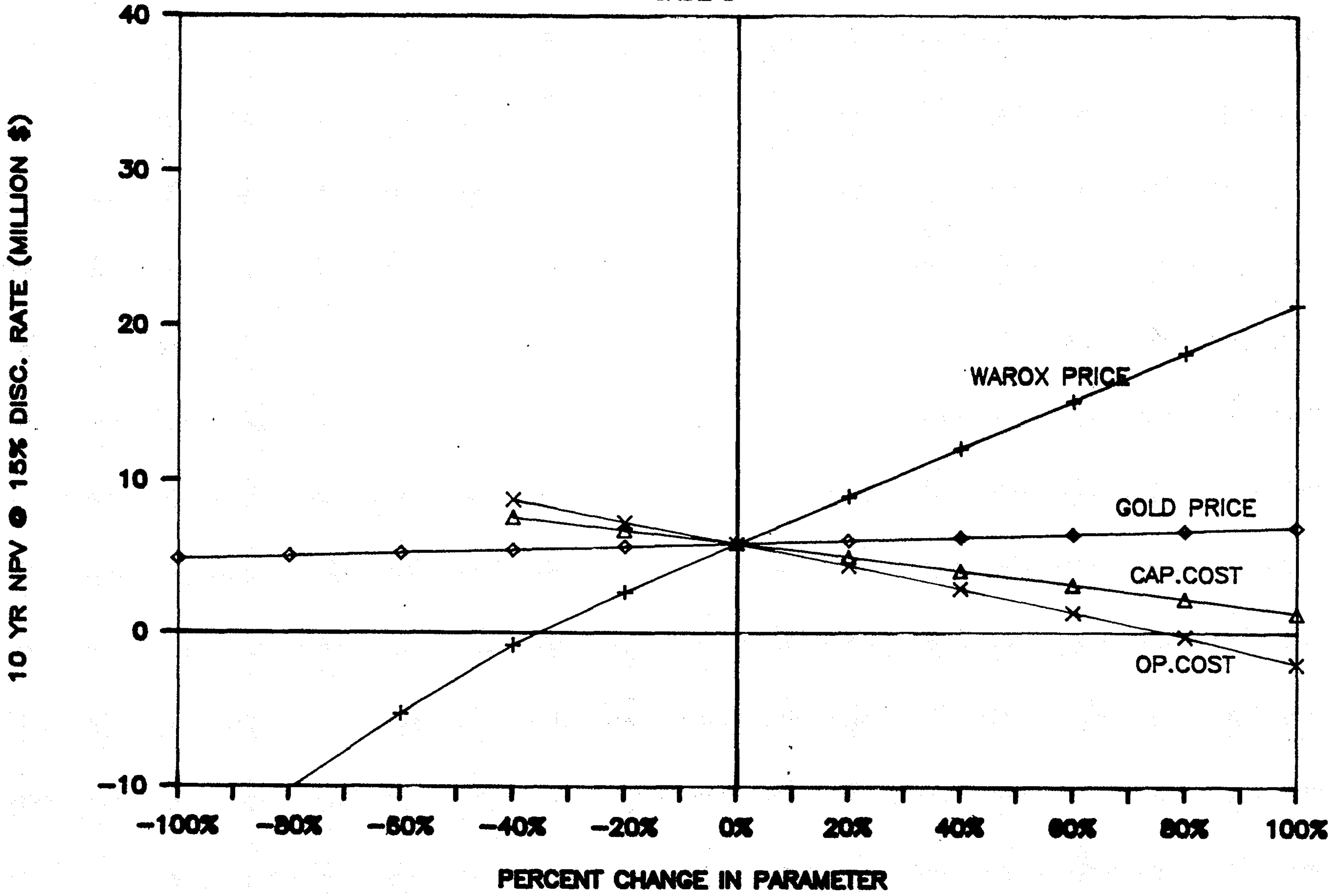
GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE D)
PRODUCTION RATES AND PRODUCT PRICES

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As203 Sold	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Feed Grade As	73.00%	73.00%	73.00%	73.00%	73.00%	73.01%	72.76%	70.81%	67.48%	67.48%	66.21%	
Feed Grade As203	96.39%	96.39%	96.39%	96.39%	96.40%	96.40%	96.08%	93.50%	89.10%	89.10%	87.43%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	4,192	4,716	5,239	5,763	6,287	6,834	7,563	7,936	7,936	8,088	64,553
PRODUCTION DATA												
ARSENIC												
Feed % As203	96.39%	96.39%	96.39%	96.39%	96.40%	96.40%	96.08%	93.50%	89.10%	89.10%	87.43%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As203	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
GOLD												
Feed Grade (oz/ton)	0.137	0.137	0.137	0.137	0.137	0.137	0.136	0.132	0.124	0.124	0.132	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	488	549	610	671	732	792	847	836	836	905	7,269
PRODUCT PRICES												
As203 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	500	500	500	500	500	500	500	500	500	500	500	
REVENUES												
As203	0	3,600	4,050	4,500	4,950	5,400	5,850	6,300	6,300	6,300	6,300	53,550
Gold	0	244	275	305	336	366	396	424	418	418	453	3,634
TOTAL REVENUES	0	3,844	4,325	4,805	5,286	5,766	6,246	6,724	6,718	6,718	6,753	57,184


TOTAL REVENUES AND OPERATTING COSTS
CASE D
AMOUNT (MILLIONS)
$14
$13
$12
$11
$10
$9
$8
$7
$6
$5
$4
$3
$2
$1
$0
0
1
2
3
4
5
6
7
8
9
10
YEARS OF OPERATION
AS REV.
AU REV.
TOT. REV.
COST

EFFECTS OF CHANGES ON THE NPV

CASE D



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GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE E)

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed From Mill	0	4,424	4,424	4,424	4,424	4,424	4,424	4,424	0	0	0	30,968
Tons Feed From U/G	0	2,911	4,191	4,191	4,191	4,191	4,191	4,191	11,720	11,720	11,720	63,215
Tons Feed Processed	0	7,335	8,615	8,615	8,615	8,615	8,615	8,615	11,720	11,720	11,720	94,183
Tons As_2O_3 Produced	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Ounces Gold Produced	0	854	4,150	4,150	4,150	4,150	4,150	4,150	12,154	12,154	12,154	62,218
REVENUES ($1,000)												
Revenue Arsenic	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Revenue Gold	0	427	2,075	2,075	2,075	2,075	2,075	2,075	6,077	6,077	6,077	31,109
Total Revenue	0	6,727	8,375	8,375	8,375	8,375	8,375	8,375	12,377	12,377	12,377	94,109
Revenues/ton Feed	917	917	972	972	972	972	972	972	1,056	1,056	1,056	10,836
Revenues/ton As_2O_3	961	961	1,196	1,196	1,196	1,196	1,196	1,196	1,768	1,768	1,768	14,405
OPERATING ($1,000)												
Total Operating	0	2,895	3,107	3,107	3,107	3,107	3,107	3,107	3,738	3,738	3,738	32,751
Operating/Ton Feed	410	395	361	361	361	361	361	361	319	319	319	3,926
Operating/Ton Product	430	414	444	444	444	444	444	444	534	534	534	5,109
Total Capital	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
Cash Flow Before Tax	(5,902)	3,832	5,268	5,268	6,018	5,268	5,268	5,268	8,639	8,639	8,639	56,206
Total Taxes	0	622	1,180	1,570	1,764	1,850	1,909	1,928	3,254	3,262	3,267	20,606
Net Cash Flow	(5,902)	3,210	4,087	3,698	4,254	3,418	3,359	3,340	5,386	5,378	5,372	35,600
Discount Rate	15.0%											
Aft Tax Discounted Cash Flow	(5,902)	2,792	3,091	2,432	2,432	1,699	1,452	1,256	1,761	1,529	1,328	13,868
Cum. Discounted Cash Flow	(5,902)	(3,110)	(20)	2,412	4,844	6,543	7,996	9,251	11,012	12,541	13,868	

BEFORE TAX

Net Present Value $22,611 of first 10 years of operation.

Payback Period 1.6 Years

IRR 79.94%

AFTER TAX

Net Present Value $13,868 of first 10 years of operation.

Payback Period 2.0 Years

IRR 61.6%

\WAROX\ARSESE23.WK1

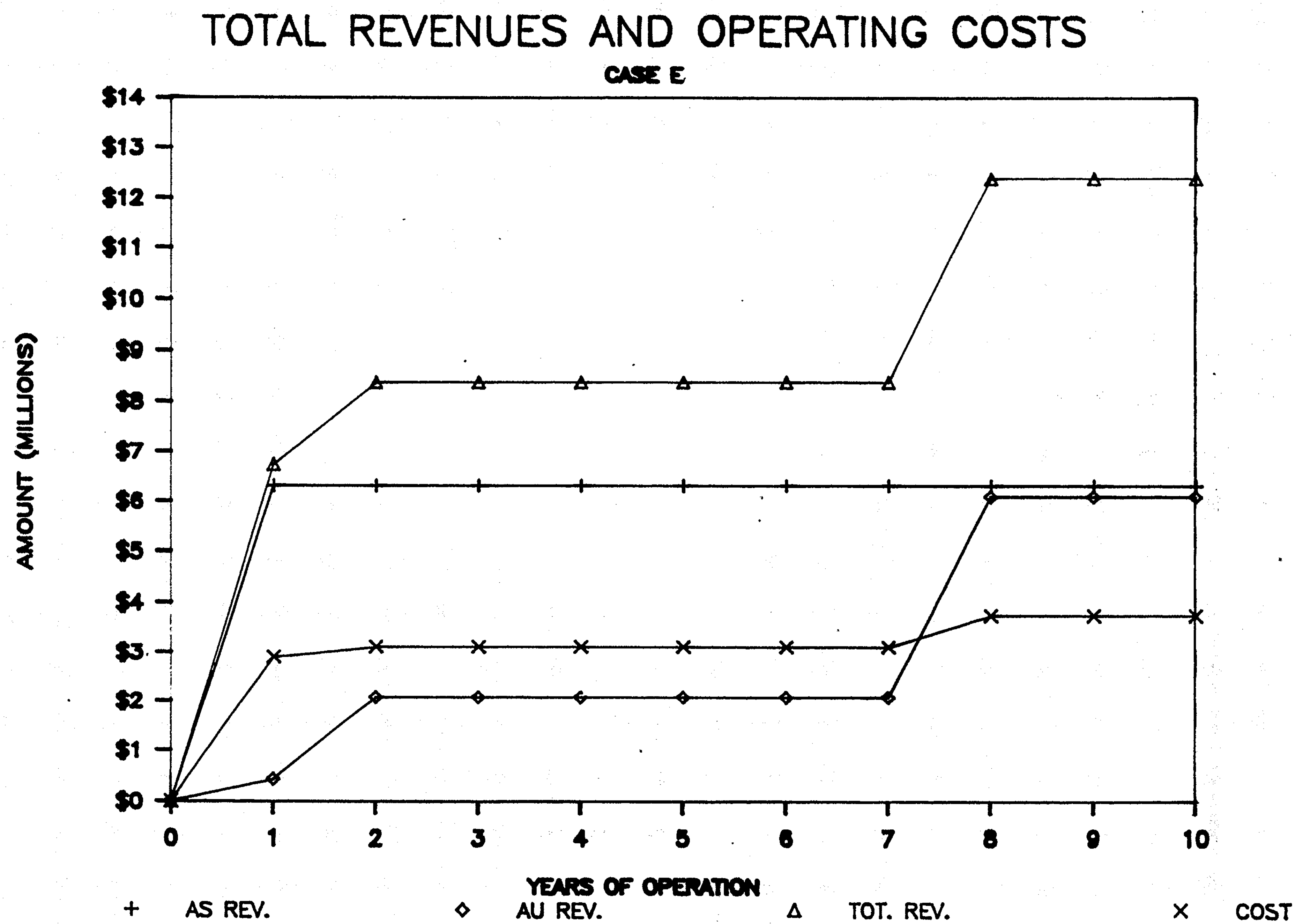
GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE E)
PRODUCTION RATES AND PRODUCT PRICES

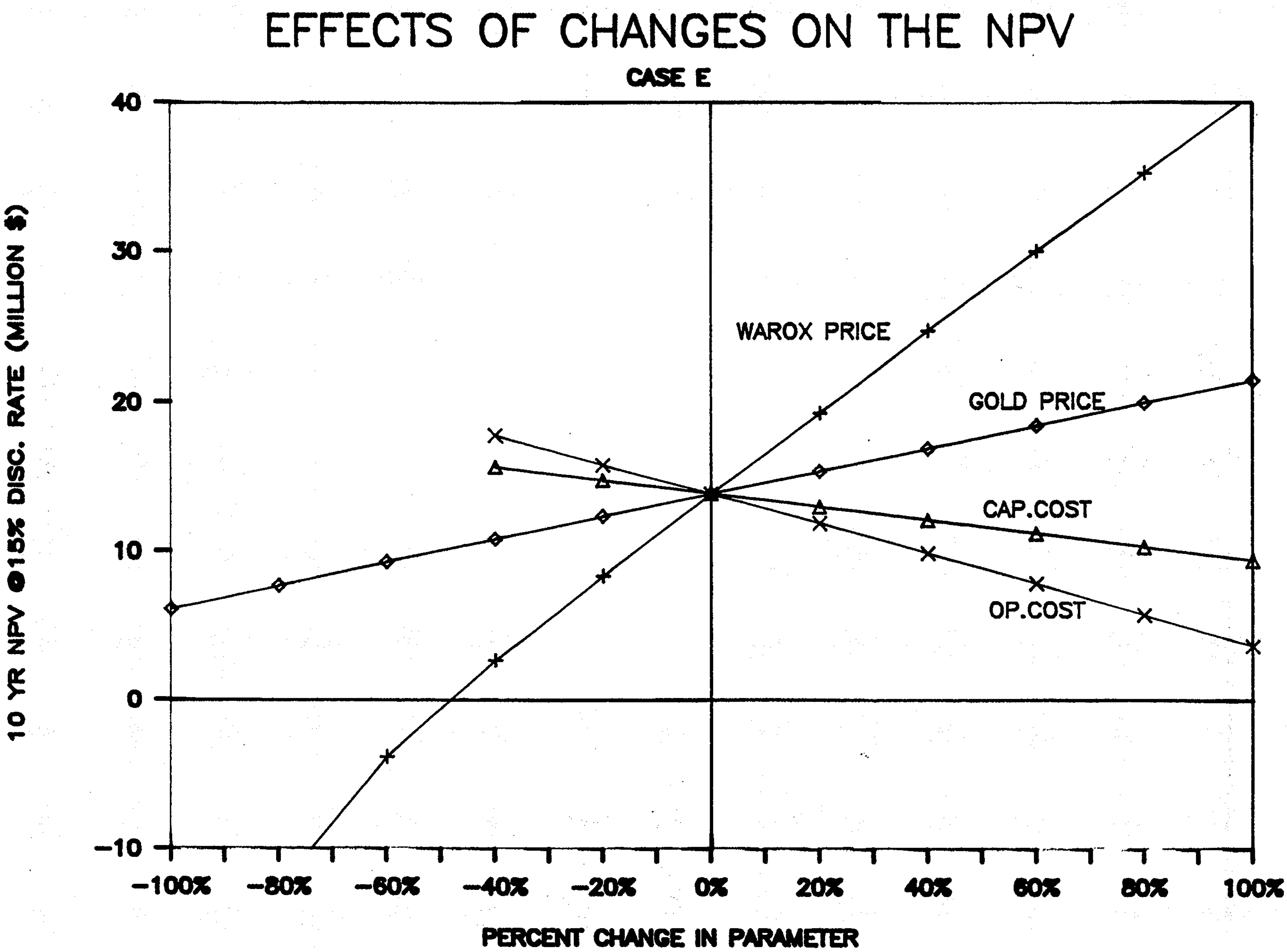
YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As203 Sold	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Feed Grade As	73.00%	73.01%	62.16%	62.16%	62.16%	62.16%	62.16%	62.16%	45.69%	45.69%	45.69%	
Feed Grade As203	96.39%	96.40%	82.08%	82.08%	82.08%	82.08%	82.08%	82.08%	60.33%	60.33%	60.33%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	7,335	8,615	8,615	8,615	8,615	8,615	8,615	11,720	11,720	11,720	94,183
PRODUCTION DATA												
ARSENIC												
Feed % As203	96.39%	96.40%	82.08%	82.08%	82.08%	82.08%	82.08%	82.08%	60.33%	60.33%	60.33%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As203	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
GOLD												
Feed Grade (oz/ton)	0.137	0.137	0.567	0.567	0.567	0.567	0.567	0.567	1.220	1.220	1.220	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	854	4,150	4,150	4,150	4,150	4,150	4,150	12,154	12,154	12,154	62,218
PRODUCT PRICES												
As203 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	500	500	500	500	500	500	500	500	500	500	500	
REVENUES												
As203	0	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	6,300	63,000
Gold	0	427	2,075	2,075	2,075	2,075	2,075	2,075	6,077	6,077	6,077	31,109
TOTAL REVENUES	0	6,727	8,375	8,375	8,375	8,375	8,375	8,375	12,377	12,377	12,377	94,109

\WAROX\ARSESE23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE E)
OPERATING COSTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
Transfer $/ton As2O3	46	46	46	46	46	46	46	46	46	46	46	
Freight $/ton As2O3	196	196	196	196	196	196	196	196	196	196	196	
Tails $/ton As2O3	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons) U/G	0	2,911	4,191	4,191	4,191	4,191	4,191	4,191	11,720	11,720	11,720	63,215
Plant Feed	0	7,335	8,615	8,615	8,615	8,615	8,615	8,615	11,720	11,720	11,720	94,183
Residue	0	335	1,615	1,615	1,615	1,615	1,615	1,615	4,720	4,720	4,720	24,183
Transfer	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
Freight	0	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	70,000
As2O3 to Tails	0	70	70	70	70	70	70	70	70	70	70	700
COSTS U/G	0	76	109	109	109	109	109	109	305	305	305	1,644
Plant	0	1,027	1,206	1,206	1,206	1,206	1,206	1,206	1,641	1,641	1,641	13,186
Residue	0	0	0	0	0	0	0	0	0	0	0	0
Transfer	0	322	322	322	322	322	322	322	322	322	322	3,220
Freight	0	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372	13,720
Tails	0	98	98	98	98	98	98	98	98	98	98	982
Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS	0	2,895	3,107	3,107	3,107	3,107	3,107	3,107	3,738	3,738	3,738	32,751
NET OPERATING PROFIT	0	3,832	5,268	5,268	5,268	5,268	5,268	5,268	8,639	8,639	8,639	61,358
CAPITAL U/G RECLAIM	1,000	0	0	0	0	0	0	0	0	0	0	1,000
SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL	5,902	0	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX	(5,902)	3,832	5,268	5,268	6,018	5,268	5,268	5,268	8,639	8,639	8,639	56,206
TOTAL TAXES	0	622	1,180	1,570	1,764	1,850	1,909	1,928	3,254	3,262	3,267	20,606
NET CASH FLOW	(5,902)	3,210	4,087	3,698	4,254	3,418	3,359	3,340	5,386	5,378	5,372	35,600
CUMULATIVE NET CASH FLOW	(5,902)	(2,692)	1,396	5,094	9,348	12,766	16,125	19,465	24,851	30,228	35,600	
DISCOUNT RATE	15.00%											
Discount Period	0	1	2	3	4	5	6	7	8	9	10	
BEF TAX DISCOUNTED CASH FLOW	(5,902)	3,333	3,983	3,464	3,441	2,619	2,277	1,980	2,824	2,456	2,135	22,611
CUMUL DISCOUNTED	(5,902)	(2,569)	1,414	4,878	8,319	10,938	13,215	15,196	18,020	20,476	22,611	
AFT TAX DISCOUNTED CASH FLOW	(5,902)	2,792	3,091	2,432	2,432	1,699	1,452	1,256	1,761	1,529	1,328	13,868
CUMUL DISCOUNTED	(5,902)	(3,110)	(20)	2,412	4,844	6,543	7,996	9,251	11,012	12,541	13,868	


TOTAL REVENUES AND OPERATING COSTS
CASE E
$14
$13
$12
$11
$10
$9
$8
$7
$6
$5
$4
$3
$2
$1
$0
AMOUNT (MILLIONS)
0
1
2
3
4
5
6
7
8
9
10
YEARS OF OPERATION
+ AS REV.
◇ AU REV.
Δ TOT. REV.
× COST


EFFECTS OF CHANGES ON THE NPV
CASE E
10 YR NPV @15% DISC. RATE (MILLION $)
40
30
20
10
0
−10
WAROX PRICE
GOLD PRICE
CAP.COST
OP.COST
−100%
−80%
−60%
−40%
−20%
0%
20%
40%
60%
80%
100%
PERCENT CHANGE IN PARAMETER

\WAROX\ARSESF23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE F)

SUMMARY OF RESULTS

YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
PRODUCTION												
Tons Feed From Mill	0	4,192	4,424	4,424	4,424	4,424	4,424	4,424	0	0	0	30,736
Tons Feed From U/G	0	(0)	403	1,140	1,888	2,648	3,415	4,191	11,720	11,720	11,720	48,845
Tons Feed Processed	0	4,192	4,827	5,564	6,312	7,072	7,839	8,615	11,720	11,720	11,720	79,581
Tons As2O3 Produced	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Ounces Gold Produced	0	488	837	1,445	2,085	2,753	3,442	4,150	12,154	12,154	12,154	51,661
REVENUES ($1,000)												
Revenue Arsenic	0	3,600	4,050	4,500	4,950	5,400	5,850	6,300	6,300	6,300	6,300	53,550
Revenue Gold	0	244	418	722	1,043	1,376	1,721	2,075	6,077	6,077	6,077	25,831
Total Revenue	0	3,844	4,468	5,222	5,993	6,776	7,571	8,375	12,377	12,377	12,377	79,381
Revenues/ton Feed	917	917	926	939	949	958	966	972	1,056	1,056	1,056	10,712
Revenues/ton As2O3	961	961	993	1,044	1,090	1,129	1,165	1,196	1,768	1,768	1,768	13,844
OPERATING ($1,000)												
Total Operating	0	1,611	1,838	2,089	2,341	2,595	2,850	3,107	3,738	3,738	3,738	27,645
Operating/Ton Feed	410	384	381	375	371	367	364	361	319	319	319	3,970
Operating/Ton Product	430	403	409	418	426	433	439	444	534	534	534	5,001
Total Capital	4,902	1,000	0	0	(750)	0	0	0	0	0	0	5,152
Cash Flow Before Tax	(4,902)	1,233	2,630	3,134	4,402	4,181	4,721	5,268	8,639	8,639	8,639	46,584
Total Taxes	0	183	385	630	921	1,432	1,690	1,926	3,252	3,260	3,266	16,944
Net Cash Flow	(4,902)	1,050	2,245	2,504	3,481	2,749	3,031	3,342	5,387	5,379	5,373	29,639
Discount Rate	15.0%											
Aft Tax Discounted Cash Flow	(4,902)	913	1,698	1,646	1,990	1,367	1,310	1,257	1,761	1,529	1,328	9,897
Cum. Discounted Cash Flow	(4,902)	(3,989)	(2,292)	(645)	1,345	2,712	4,022	5,279	7,040	8,569	9,897	

BEFORE TAX

Net Present Value $16,252 of first 10 years of operation.

Payback Period 2.9 Years

IRR 56.49%

AFTER TAX

Net Present Value $9,897 of first 10 years of operation.

Payback Period 3.3 Years

IRR 45.7%

Date Printed: 23-Sep-88

Original Spreadsheet by G. Wolfe, Engineering Department, Yellowknife Division

\WAROX\ARSESF23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE F)
OPERATING COSTS

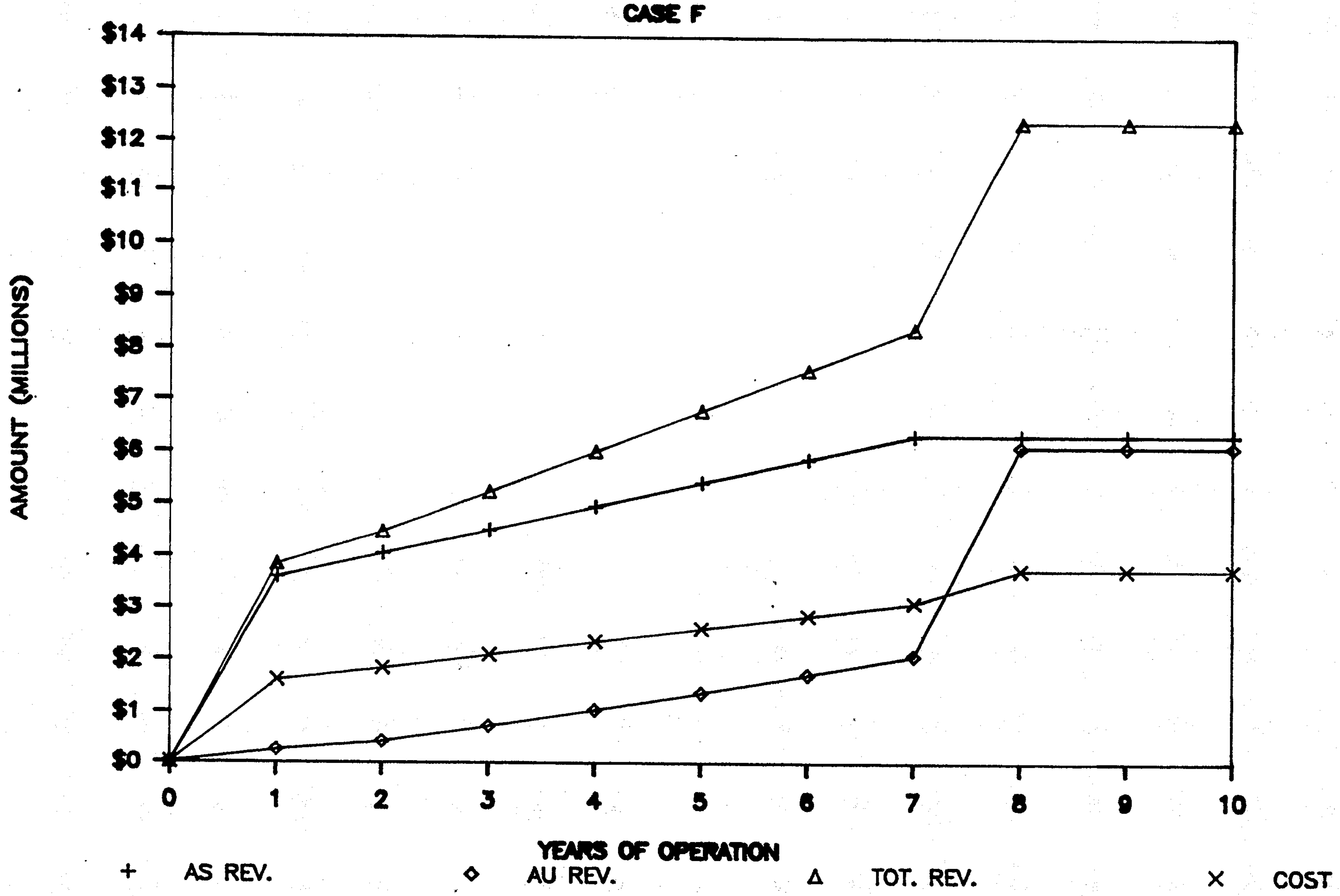
YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
UNIT COSTS U/G $/ton Feed	26	26	26	26	26	26	26	26	26	26	26	
Plant $/ ton Feed	140	140	140	140	140	140	140	140	140	140	140	
Plant $/ton Residue	0	0	0	0	0	0	0	0	0	0	0	
Transfer $/ton As_2O_3	46	46	46	46	46	46	46	46	46	46	46	
Freight $/ton As_2O_3	196	196	196	196	196	196	196	196	196	196	196	
Tails $/ton As_2O_3	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	1,402	
UNITS (Tons) U/G	0	(0)	403	1,140	1,888	2,648	3,415	4,191	11,720	11,720	11,720	48,845
Plant Feed	0	4,192	4,827	5,564	6,312	7,072	7,839	8,615	11,720	11,720	11,720	79,581
Residue	0	192	327	564	812	1,072	1,339	1,615	4,720	4,720	4,720	20,081
Transfer	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Freight	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
As_2O_3 to Tails	0	40	45	50	55	60	65	70	70	70	70	595
COSTS U/G	0	(0)	10	30	49	69	89	109	305	305	305	1,270
Plant	0	587	676	779	884	990	1,098	1,206	1,641	1,641	1,641	11,141
Residue	0	0	0	0	0	0	0	0	0	0	0	0
Transfer	0	184	207	230	253	276	299	322	322	322	322	2,737
Freight	0	784	882	980	1,078	1,176	1,274	1,372	1,372	1,372	1,372	11,662
Tails	0	56	63	70	77	84	91	98	98	98	98	834
Additional Operating	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL OPERATING COSTS	0	1,611	1,838	2,089	2,341	2,595	2,850	3,107	3,738	3,738	3,738	27,645
NET OPERATING PROFIT	0	2,233	2,630	3,134	3,652	4,181	4,721	5,268	8,639	8,639	8,639	51,736
CAPITAL U/G RECLAIM	0	1,000	0	0	0	0	0	0	0	0	0	1,000
SURFACE PLANT	3,873	0	0	0	0	0	0	0	0	0	0	3,873
TRANSFER FACILITY	1,029	0	0	0	0	0	0	0	0	0	0	1,029
U/G Storage Const.	0	0	0	0	(750)	0	0	0	0	0	0	(750)
EXTRA CAPITAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CAPITAL	4,902	1,000	0	0	(750)	0	0	0	0	0	0	5,152
CASH FLOW BEFORE TAX	(4,902)	1,233	2,630	3,134	4,402	4,181	4,721	5,268	8,639	8,639	8,639	46,584
TOTAL TAXES	0	183	385	630	921	1,432	1,690	1,926	3,252	3,260	3,266	16,944
NET CASH FLOW	(4,902)	1,050	2,245	2,504	3,481	2,749	3,031	3,342	5,387	5,379	5,373	29,639
CUMULATIVE NET CASH FLOW	(4,902)	(3,852)	(1,607)	897	4,378	7,127	10,158	13,500	18,888	24,266	29,639	
DISCOUNT RATE	15.00%											
Discount Period	0	1	2	3	4	5	6	7	8	9	10	
BEF TAX DISCOUNTED CASH FLOW	(4,902)	1,072	1,989	2,060	2,517	2,079	2,041	1,980	2,824	2,456	2,135	16,252
CUMUL DISCOUNTED	(4,902)	(3,830)	(1,841)	219	2,736	4,815	6,856	8,836	11,660	14,116	16,252	
AFT TAX DISCOUNTED CASH FLOW	(4,902)	913	1,698	1,646	1,990	1,367	1,310	1,257	1,761	1,529	1,328	9,897
CUMUL DISCOUNTED	(4,902)	(3,989)	(2,292)	(645)	1,345	2,712	4,022	5,279	7,040	8,569	9,897	

\WAROX\AR6E8F23.WK1

GIANT YELLOWKNIFE MINES LIMITED
WAROX PLANT
PRELIMINARY ECONOMIC STUDY (CASE F)
PRODUCTION RATES AND PRODUCT PRICES

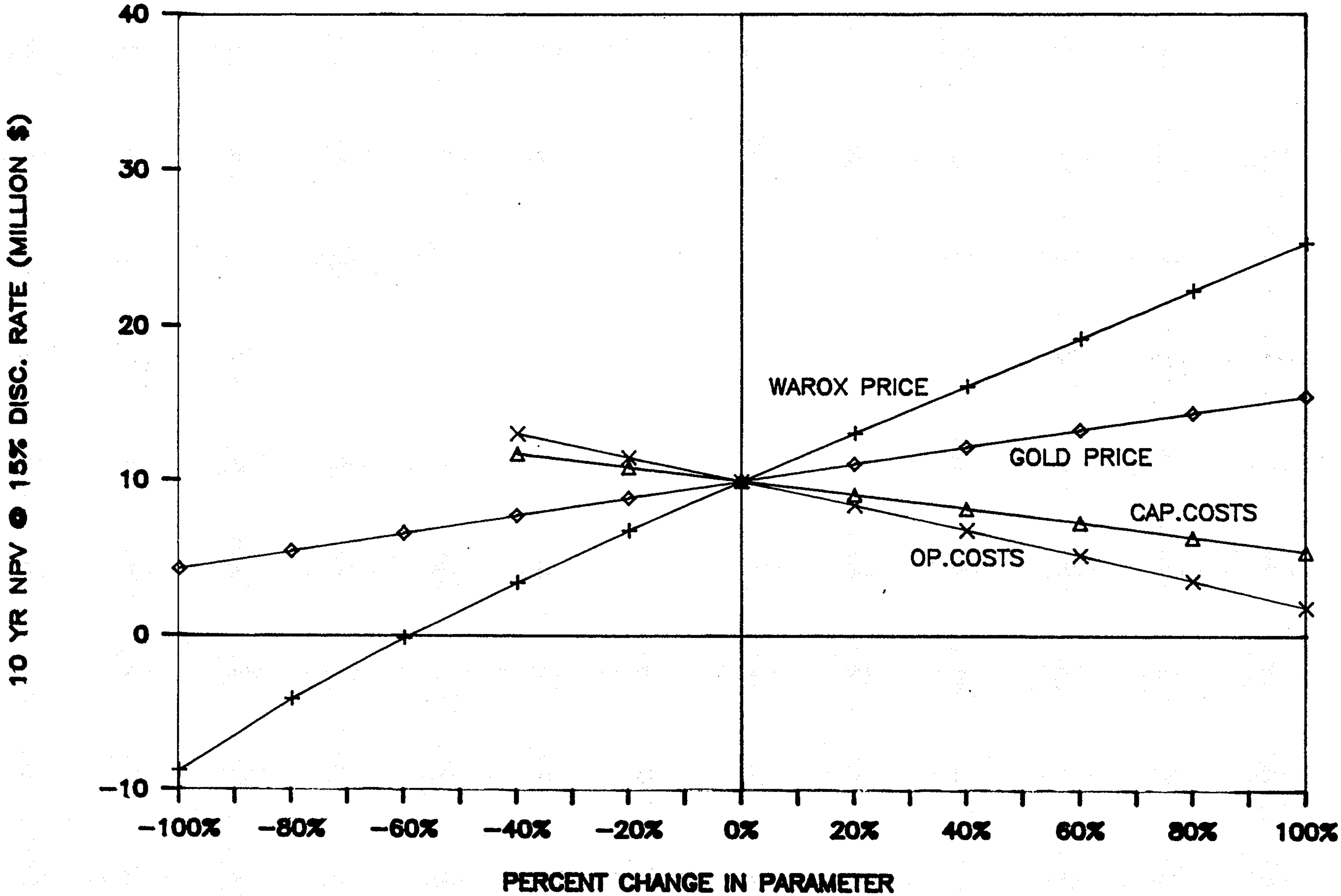
YEAR	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	TOTAL
VOLUME PARAMETERS												
Tons As203 Sold	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
Feed Grade As	73.00%	73.00%	71.31%	68.75%	66.65%	64.91%	63.43%	62.16%	45.69%	45.69%	45.69%	
Feed Grade As203	96.39%	96.39%	94.16%	90.78%	88.01%	85.70%	83.75%	82.08%	60.33%	60.33%	60.33%	
As Recovery	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons Feed	0	4,192	4,827	5,564	6,312	7,072	7,839	8,615	11,720	11,720	11,720	79,581
PRODUCTION DATA												
ARSENIC												
Feed % As203	96.39%	96.39%	94.16%	90.78%	88.01%	85.70%	83.75%	82.08%	60.33%	60.33%	60.33%	
Recovery (%)	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	99.00%	
Tons As203	0	4,000	4,500	5,000	5,500	6,000	6,500	7,000	7,000	7,000	7,000	59,500
GOLD												
Feed Grade (oz/ton)	0.137	0.137	0.204	0.306	0.389	0.458	0.517	0.567	1.220	1.220	1.220	
Recovery (%)	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	85.00%	
Ounces Gold	0	488	837	1,445	2,085	2,753	3,442	4,150	12,154	12,154	12,154	51,661
PRODUCT PRICES												
As203 / lb CDN	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	
Gold / oz CDN	500	500	500	500	500	500	500	500	500	500	500	
REVENUES												
As203	0	3,600	4,050	4,500	4,950	5,400	5,850	6,300	6,300	6,300	6,300	53,550
Gold	0	244	418	722	1,043	1,376	1,721	2,075	6,077	6,077	6,077	25,831
TOTAL REVENUES	0	3,844	4,468	5,222	5,993	6,776	7,571	8,375	12,377	12,377	12,377	79,381

TOTAL REVENUES AND OPERATING COSTS



EFFECTS OF CHANGES ON THE NPV

CASE F



APPENDIX 3

ENVIRONMENTAL ISSUES

APPENDIX 3

ENVIRONMENTAL ISSUES

Introduction

Operation of an arsenic reclaim/purification plant can be a hazardous undertaking, especially if safety features are only incidentally included in plant design. To guard against the many environmental hazards associated with handling of this toxic chemical, we must first take care to identify the hazards, and then take effective steps to neutralize them, right from the design stage. Activities should focus on two main areas of environmental concern that can be broadly categorized as the 'natural' environment and the 'workplace' environment. Each of the three main elements of the operation, Underground Reclaim, Purification Plant, and Transfer Facility must be designed and operated to minimize risks to both the natural and to the workplace environmments.

The following discussion lists the potential hazards that should be considered for each element and suggests actions that can be taken to reduce the hazards.

Underground - Natural Environment

Risks to the natural environment here are quite limited, since the storage chambers have been designed to prevent contact of stored material with the environment. The two areas of concern relate to potential spillage from the reclaim apparatus and the possibility of groundwater flow into the chambers as the dust is extracted, causing permafrost to recede.

The possibility of spillage from the reclaim apparatus can be guarded against by careful design and by incorporating fully enclosed conveying equipment. One of the strong points of the tubular drag conveyor planned for this installation is the fact that it is totally sealed and can be set up to operate in a variety of configurations. This reduces the number of transfer points that are often the source of dust losses and product spills.

Groundwater flow into arsenic stopes is a definite hazard and indeed one environmental argument in favour of reclaim is that removal of the dust will nullify the effects of groundwater inflows into the chambers.

There is probably no simple way to prevent inflow of groundwater but it may be useful to take the precaution of installing a sump pump near the 2nd level bulkhead where arsenic contaminated water may be expected to appear. Water would be pumped to surface for treatment in the ETP.

After the dust has been removed, it may be possible to induce permafrost into the area to stop the flow of water.

Underground - Workplace Environment

It is expected that the reclaim apparatus will be operated remotely from surface and that the operator will thus be normally well protected against exposure. The reclaim equipment is simple, and special protective clothing will be worn when maintenance is required.

Installation of the equipment is another matter, and extensive planning and close supervision will be required during equipment installation.

The crews involved will have to be well trained in working safely in the toxic environment, as well as being proficient in the job of erecting and working from suspended scaffolding.

Headspace required for installation of the equipment is about 14 feet and in some cases, the stopes have been filled too close to the backs.

In these case it will be necessary to clear enough space, either through vacuuming some material to surface or by slushing enough material aside to permit at least a partial installation of the reclaim system. After some material has been removed through normal production requirements, the installation can be completed. This work can only take place by having workmen in the stopes. It may be possible to provide protection by isolating the slusher in the the access drift and by using water sprays to settle the dust but, in addition, it will be necessary to have the workmen dressed in totally enclosed protective clothing with externally supplied air source.

Protection of underground workings from exposure to arsenic must also be considered and all accesses to arsenic stopes should be completely isolated from the rest of the mine. To date this has been accomplished through the construction of massive bulkheads capable of withstanding high hydrostatic heads of contaminated water, slurry or fluidized dust.

Access to B area arsenic stopes will be from new drifting at approximately 1st level and will be completely isolated from C area workings.

Purification Plant - Natural Environment

Dust losses from feedstock storage and handling equipment, or product losses from baghouse malfunction are the two most likely sources of risk to the natural environment in the purification plant. Soluble arsenic losses from quenched hot baghouse product are also possible but less likely.

To protect against dust losses and spillage from feedstock storage and handling equipment, totally enclosed transfer and conveying equipment to bring the dust from underground to surface storage will be used. High level alarms and controllers will prevent overfilling of storage silos and bins, and mechanical conveying will avoid pressurization of systems, reducing the risk of fugitive dust emissions.

Losses due to baghouse failure can be monitored by stack gas opacity sensors, and the enviromental effects of losses from this source can be neutralized by passing the exhaust gas through the existing baghouse.

The close proximity of the baghouse building makes such an installation relatively easy.

Losses of arsenic in solution can be prevented by the use of a floor sump in the hot baghouse quench area. The sump should be absolutely leakproof and the pipeline from the sump pump to the appropriate mill process should be closely monitored for any signs of leakage.

EPS has been conducting surveys for several years now to determine arsenic concentration in soil and snow. The main source of arsenic measured in the surveys is the Giant stack, which has such an influence on arsenic concentration in the natural environment that any losses from the purification plant are not likely to be detected. Though this may be a good thing from a regulatory aspect, it does remove a useful tool for monitoring the effectiveness of our loss control measures.

Purification Plant - Workplace Environment

Arsenic contamination of the workplace is guaranteed to result in controversy, low morale, elevated health risk and high operating costs.

Avoidance of contamination should therefore be designed in from the outset and all possible steps taken to maintain a clean working environment. This will be something of a challenge since it will not be possible to prevent product spillage altogether and the extremely dusty nature of the plant feed ensures that it will disperse throughout the room in which the spill takes place. Efforts to maintain a clean environment must be concentrated, first on minimizing the number of spills and the amount of material spilled and secondly, on isolating the effects of a spill from the rest of the plant. Once a spill has occurred, prompt cleanup action will help to prevent the spread of arsenic to other areas of the plant. Installation of reliable, low maintenance equipment and a good monitoring system will help to minimize the amount of material spilled, while airtight partitions between unit operations will prevent the spread of spilled material. Airlocks for access between rooms and good ventilation control (eg. airflow from clean to dirty areas) will also help in containing a spill.

Control Room Operators for both the purification plant and the underground reclaim operation will operate from a control room that is totally separate from the plant, minimizing the risk of arsenic contamination. Plant Operators will not be permitted into the control room unless they have been fully decontaminated.

It is likely that Plant Operators will also normally work in an arsenic free environment and this will be accomplished in three ways. First, by installing trouble-free, low maintenance equipment, second, by installing very complete remote sensing and controlling instrumentation, and third, by equipping the plant with a system of corridors throughout the working areas. The corridors will enable operators to visit all areas of the plant regularly without being exposed to arsenic. The corridors will be equipped with windows throughout, with an airlock and shower where access into the plant is made. With careful design and construction, it should be possible to perform many routine maintenance and lubrication functions from within the safety of the corridor. It should also be possible to service most instrumentation sensors in this way.

Depending upon the quality of the air within the plant, it may be necessary for workmen to wear protective breathing and dust protection apparatus when working in the plant outside of the corridors. Good plant design and operating procedures will minimize the need for this equipment, but will not eliminate it altogether.

Transfer Facility - Natural Environment

In order to gain approval for the location of the Transfer Facility, a number of environmental review processes have been outlined. There are three possible locations for which we have made application and the review process differs for each location, depending on the regulatory authority.

1. Alberta site, near Indian Cabins, Alta. This application was made after it became clear that the applications for land within the NWT might be rejected for environmental or political reasons. The regulatory authority in Alta. is the Forestry Service and and it is this department that defines the environmental review process required for the project.

   In this case the process has so far involved telephone discussions, distribution of information booklets, physical site selection, and answering environmental questionnaires related to the project. It is possible that we have satisfied their environmental concerns and the application may now proceed to the next step, a public meeting in the community of Indian Cabins to discuss the project with local residents.

2. Crown Land 15 km south of Enterprise, NWT. This site was selected because it is the nearest rail access for Giant outside of the Enterprise Block Land Transfer. Application for this land can be approved by DIAND without the need for approval of the residents of Enterprise. Instead, the application will be subjected to the Environmental Assessment Review Process (EARP), the first step of which is a meeting of the Regional Environmental Review Committee (RERC), scheduled for September 29. Depending upon the findings of the committee the application may be approved or it may require an Initial Environmental Evaluation (IEE) study. The committee may then approve the application or it may refer the matter to the Minister of the Environment where it will be handled by the Federal Environmental Assessment Review Office (FEARO). Though this is an issue of some local controversy, the environmental aspects are quite straightforward and it is quite likely that the application will be approved following the IEE study.

3. Enterprise Site 5 km north of Enterprise, NWT. This is the preferred site for two reasons. It is the closest point of rail access, and it is well located to provide operating labour and services. The proposed site is located on good ground and is far enough from flowing water and from residential areas that environmental sensitivity is moderate.

There is quite a bit of local opposition to this location however, and it is likely that a number of meetings will have to be held with a special committee of concerned residents before all concerns have been dealt with satisfactorily.

Approval of an application for lease of Territorial Lands requires that residents of the community nearest the land in question must also approve of the use of the land for the purpose applied for. This makes it almost essential that the community benefit in some way from the project and in this case, we must satisfy the environmental concerns while convincing the residents that the benefits will outweigh the risks.

The environmental risks associated with the plant, whatever the location, are quite small. The transfer process is a simple one using fully enclosed mechanical conveyors operated under negative pressure to reduce the possibility of dust leaks. The product will be granular and generation of dust through product degradation will be minimal.

Compaction tests followed by degradation tests have demonstrated that there will be essentially no product degradation during transportation or transfer operations. The airtight doors to the building will be kept closed during the transfer operation, further reducing the risk to the natural environment. Only small amounts of Warox will be stored at the transfer site as the 100 ton silo is for transfer purposes, not for storage. There will be space on the spur line for 5 empty and 5 loaded hopper cars and an 8 ft chainlink fence will surround the site to protect against vandals.

It may be useful to provide the settlement volunteer fire department with emergency response apparatus in case of highway accident or major spill at the transfer facility. A trailer mounted, diesel powered industrial vacuum could be quite useful to minimize the environmental effects of such an occurence and the truck mounted vacuum at Giant may not be able to respond quickly enough to be of value. The PR value of this kind of action is also quite significant.

High volume dustfall samplers in the area of the transfer facility will be maintained to measure the effectiveness of our environmental protection program. A background survey will also be done to collect information on naturally occurring arsenic in the area prior to putting the transfer facility in operation.

Transfer Facility - Workplace Environment

As mentioned, the Warox product will be almost totally dust-free and it will be a fairly simple matter to avoid airborne contamination of the workplace environment. The equipment will be totally enclosed and under negative pressure to prevent dust losses to the atmosphere, and the greatest risk is likely to be from product spills during the transfer process. This can occur from failure of the boot connector between the trailer hopper or from some other point in the transfer system, or it can occur by overfilling the railcar being loaded. In either case, the volume of material spilled should be minimal, as the operator's sole function during transfer or loading operations is to watch for problems of this nature. A high level sensor in the loading spout will reduce the possibility of overloading hopper cars but there will be no similar alarm to warn of spillage from the trailer dump hoppers. Spillage from this source will be contained in the dump pit and will be cleaned up by a special vacuum system designed for the job. The operator will have protective clothing available to protect him during cleanup operations.

Shower facilities will also be available in the plant.

Plant equipment is very simple and designed for low maintenance and there should be little need for the plant operator to be exposed to Warox as a result of equipment breakdown. Occasional changes of filter bags and repairs to the vertical conveyor belt will be the major maintenance items. Other, more routine maintenance requirements such as lubrication, inspections, and minor repairs could result in some exposure risk unless precautions are taken. A thorough training program to familiarize operators with safe handling and operating procedures will be required.

APPENDIX 4

UNDERGROUND DEVELOPMENT

UNDERGROUND DEVELOPMENT FOR THE RECOVERY OF ARSENIC BEARING DUST - AREA 1

1. INTRODUCTION

For the simplicity of design of the recovery program, the underground storage chambers of arsenic bearing dust have been divided into five areas. The first area includes the B 2-30, 33, 34, 35 and 36 chambers. The second area covers the B 2-12/13/14 chamber. The third area covers the B 2-08 chamber. The fourth covers the C 2-12, C-9 and C-10 chambers. And the fifth area covers the B-11 and B-12 chambers. The order of mining the dust is in the same order as described by area. This report summarizes the background information required for the development for reclamation of arsenic bearing dust in Area 1.

2. ARSENIC CHAMBER FILLING INFORMATION

The chambers in Area 1 were filled during the period starting from October 28, 1951 ending at March 15, 1962. At the present time additional arsenic bearing dust is being placed in the B 2-35 chamber. Table 1 summarizes the dates and contents of filling for each chamber in Area 1.

In October, 1951 a Cottrell electrostatic precipator was installed to collect the combined dust and arsenic from the exit gases of the roaster. Selective recovery of dust and arsenic was finally successful in early 1959 by using the Cottrell as a hot precipitator to colllect the dust in series with a Dracco baghouse to collect the arsenic. The result of these changes is that the arsenic bearing dust collected from 1951 to 1959 have a lower arsenic trioxide content and a higher gold residue content than the years to follow.

TABLE 1

GIANT YELLOWKNIFE MINES LIMITED
UNDERGROUND WAROX RECOVERY PROJECT

AREA 1

STOPE	DATES FILLED	VOLUME (CU.FT.)	TONS OF DUST	ASSAY: Au oz/ton	GEOCON: Au oz/ton	GEOCON: As %	GEOCON: # SAMPLES	GEOCON: Oz Au	GEOCON: (X 1000) lbs As2O3
B 2-30	Oct. 28/51 - Dec. 15/52	100,000	3,125	0.724	0.766	45.32	5	2,394	3,700
B 2-33	Dec. 16/52 - Mar. 1/56	434,626	12,595		1.325	36.93	8	16,688	12,300
B 2-34	Mar. 2/56 - Jul. 10/58	425,000	13,281		2.380	36.10	6	31,609	12,700
B 2-35	Jul. 11/58 - Mar. 15/62*				0.776	55.20	6	--	--
	Aug. 22/88 -								0
B 2-36	Jul. 11/58 - Mar. 15/62*	1,125,000	35,156	0.790	0.660	50.62	4	25,650	49,600
AREA TOTAL		2,084,626	64,157					76,341	78,300

* TONNAGE AND VOLUME RECORDS FOR THESE TWO STOPES ARE COMBINED DURING THESE DATES

Daily arsenic and gold assays have been made on all of the material stored underground. The data collected for the B 2-33 and 34 chambers has not been reduced. There are no tonnage figures available for the B 2-30, 33 and 34 chambers, therefore the figures used are calculated based on the volume of each chamber.

In 1981, GEOCON took samples from the chambers in Area 1 to test for the physical characteristics of the stored arsenic bearing dust. The samples were returned to Giant and assayed for gold and arsenic. The results of the assays of the GEOCON samples are used to represent the arsenic and gold content in this area.

3. ARSENIC CHAMBER DUST CHARACTERISTICS

In 1981 Giant contracted GEOCON to sample the dust in the arsenic chambers. Five and one half inch diameter holes were drilled from surface into 8 chambers. Split spoon, shelby tube and bulk samples were taken from these holes. GEOCON then analysed the samples for water content, grain size, unit weight, specific gravity, angle of repose, internal angle of friction and consolidation. The samples were returned to Giant to be analysed for gold and arsenic content. The following table summarizes the results for the chambers in Area 1.

TABLE 2

GEOCON SAMPLING

STOPE	B 2-30	B 2-33	B 2-34	B 2-35	B 2-36
BOREHOLE NUMBER	5	6	7	8	9
# OF SPLIT SPOON SAMPLES	0	4	5	5	4
# OF SHELBY TUBE SAMPLES	3	2	2	0	0
MAXIMUM DENSITY (LB./CU.FT.)*	77.3	82.3	85.3	84.2	74.6
MINIMUM DENSITY (LB./CU.FT.)*	48.3	50.7	53.3	53.3	41.6
SPECIFIC GRAVITY	3.17	3.15	3.23	2.59	3.79
ANGLE OF REPOSE	47.7	46.7	46.1	46.7	48.7
PER CENT MOISTURE	6.4	2 - 6	1	<2	<1
# OF SAMPLES FOR CONTENT	5	8	6	6	4
GRADE OF GOLD (OZ/TON)	0.766	1.325	2.380	0.776	0.660
GRADE OF ARSENIC (PER CENT)	45.32	36.93	36.10	55.20	50.62

* DETERMINED USING BULK SAMPLES

4. CURRENT ACCESS

The tops of the B 2-33, 35 and 36 chambers can accessed through the B 2-33 raise from surface. The B 2-30 and 34 chambers cannot be accessed for inspection. The raise from the top of the B 2-30 chamber has been sealed with a concrete plug and then the raise was filled to surface. The raise from the top of the B 2-34 chamber has been sealed with a concrete plug.

The B 2-08 chamber baracades access to the bottom bulkheads of the B 2-30, 33 and 34 chambers. The bulkhead for the B 2-35 and 36 chambers is in the B 2-09 south drift and is accessible.

5. BULKHEADS

The bulkheads for the chambers in Area 1 are made of reinforced concrete with specifications as set out by the Ontario Department of Mines. They were designed to withstand the full hydrostatic head up to surface.

Approval by the Mining Inspector has been received for all bulkheads. The construction drawings for the bulkheads have recently been reanalysed by G. Bailey. His analysis found that the bulkheads for the B 2-34, 35 and 36 chambers lacked temperature steel and flexural bars on the compression faces. As a result there could be cracking on this face which would reduce the overall strength. The compression faces cannot be inspected, since they are on the arsenic dust side, the integrity of these bulkheads under a static head to surface cannot be guarenteed. The bulkhead designs for the B 2-30 and 33 chambers are satisfactory.

Appendix I contains a copy of Mr. Bailey's report.

6. DIAMOND DRILL HOLES

Diamond drill holes are sealed prior to using a chamber for arsenic storage. Area 1 was specifically designed for arsenic dust storage and has few diamond drill holes. The following table lists the holes intersecting the chambers in this area.

TABLE 3

DIAMOND DRILL HOLES INTERSECTING ARSENIC STORAGE AREAS

HOLE #	FROM	SECTION	ANGLE	INTERSECTIONS	COMMENTS
U-B 980	B 2-30 E.X-C	1	0	B 2-30	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 981	B 2-30 E.X-C	1	45	B 2-30	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 982	B 2-30 E.X-C	2	0	B 2-30	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 983	B 2-30 E.X-C	2	45	B 2-30	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 984	B 2-30 E.X-C	3	0	B 2-30	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 985	B 2-30 E.X-C	3	45	B 2-30	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 987	B 2-30 E.X-C	1	0	B 2-33	HOLE IS ENCLOSED WITHIN STORAGE AREA
U-B 994	B 2-10 S. DR.	5	27	B 2-33	HOLE IS NOT ACCESSABLE
GEOCON #5	SURFACE	059S	-90	B 2-30	SEALED WITH A PNEUMATIC PLUG AND 4 BAGS OF PORTLAND
GEOCON #6	SURFACE	032S	-90	B 2-33	SEALED WITH A PNEUMATIC PLUG AND 4 BAGS OF PORTLAND
GEOCON #7	SURFACE	062N	-90	B 2-34	SEALED WITH A PNEUMATIC PLUG AND 4 BAGS OF PORTLAND
GEOCON #8	SURFACE	050S	-90	B 2-35	SEALED WITH A PNEUMATIC PLUG AND 4 BAGS OF PORTLAND
GEOCON #9	SURFACE	047S	-90	B 2-36	SEALED WITH A CARDBOARD PLUG AND PORTLAND CEMENT
S 1091	SURFACE	00	-60	--	CLOSE TO B 2-33

7. PROPOSED MINING METHODS

The required mining rate of the arsenic bearing dust will be approximately 50 tons per day. Three of the potential methods of reclaim include vacuum the dust to surface, slurry the dust with water jets and pump to surface and mechanically transport the dust to a conveyor feed to surface.

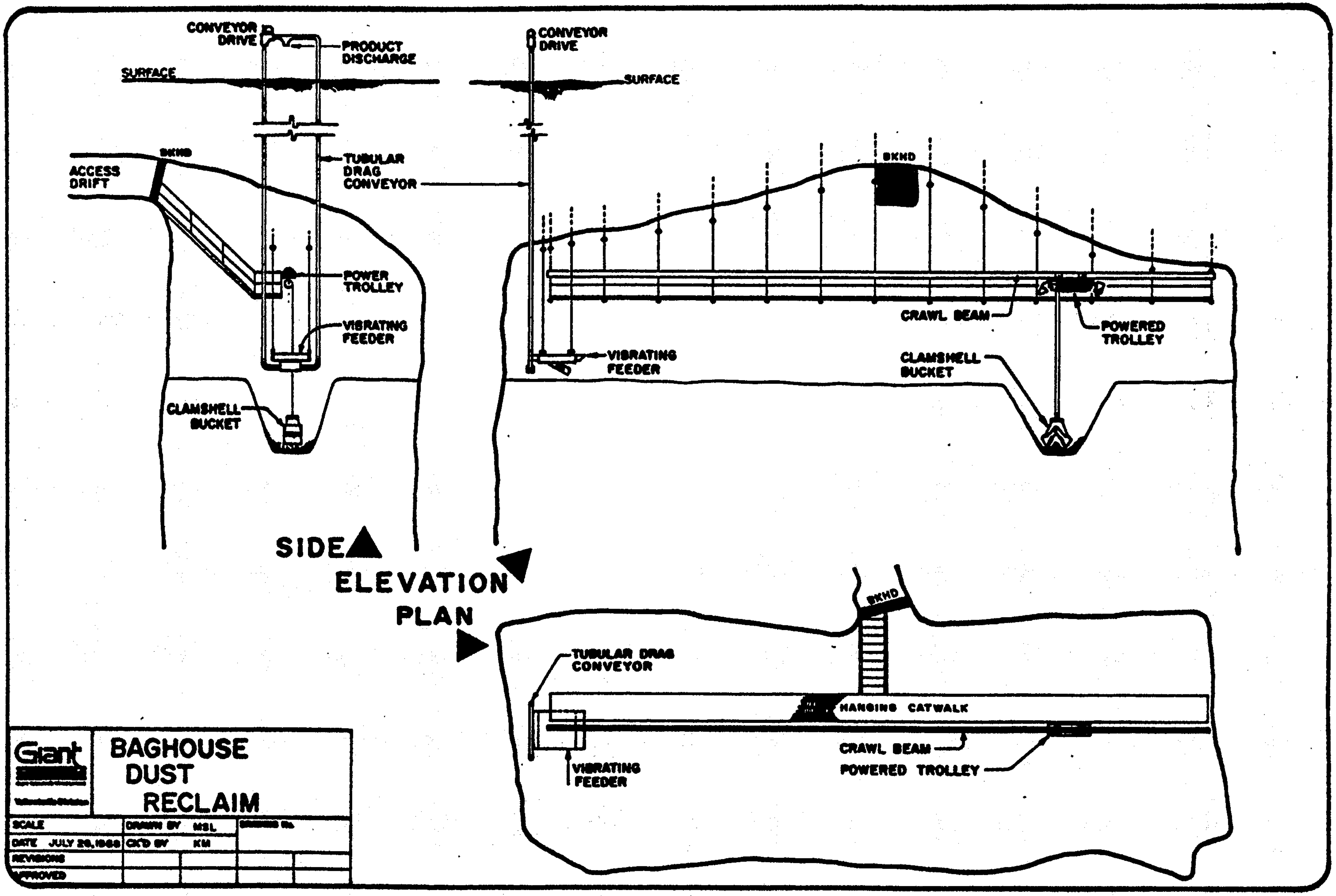
Slurry reclaim is ruled out due to potential hazards of arsenics bearing water entering the underground mine through diamond drill holes, bulkead seepage or through fissures in the rock. Also an arsenic slurry would have to be dewatered prior to the refining process. Vacuum reclaim will be difficult if there is any moisture in the dust. The arsenic bearing dust has a tendency to clog the suction hoses. Some trials of vacuum have been made with partial success (see Appendix II). Further research into the vacuum reclaim method will be required. The preferred method at this time is mechanical reclaim.

8. MECHANICAL RECLAIM

The mechanical reclaim proposal uses a clamshell bucket (similiar to the Riddell mucker used in shaft sinking) to hoist and transport the dust to a feed for a tubular drag conveyor (see Figure 1). A 10 cu. ft. clamshell operating in a shaft would produce 30 tph. Accounting for the difference in densities and the longer distances of travel, an average production rate closer to 10 tph may be expected for this application. A production rate of 50 tons per day is required. Operation of a clamshell bucket would fit well into a five day week, one shift per day work schedule.

The chambers in Area 1 are ideal for mechanical reclaim. They are regular in shape and have vertical walls. These chambers were specifically mined for arsenic storage.

Some of the chambers in Area 1 have been filled too close to the back for installation of the catwalk and crawl beam. Some dust will have to be removed from the chambers prior to the equipment installation. If the dust is dry vacuum reclamation may be used for this purpose. Otherwise a slusher may be used to transport the dust to the feed for the tubular drag conveyor.



CONVEYOR DRIVE
PRODUCT DISCHARGE
SURFACE
BKHD
ACCESS DRIFT
TUBULAR DRAG CONVEYOR
POWER TROLLEY
VIBRATING FEEDER
CLAMSHELL BUCKET
CONVEYOR DRIVE
SURFACE
BKHD
CRAWL BEAM
POWERED TROLLEY
VIBRATING FEEDER
CLAMSHELL BUCKET
SIDE
ELEVATION
PLAN
BKHD
TUBULAR DRAG CONVEYOR
HANGING CATWALK
CRAWL BEAM
POWERED TROLLEY
VIBRATING FEEDER
Giant
BAGHOUSE DUST RECLAIM
SCALE
DRAWN BY MSL
CK'D BY KM
REVISIONS
APPROVED

Figure 1

9. UNDERGROUND DEVELOPMENT

To use the mechanical method of reclamation, access to the chambers at the back elevation is required. The lowest back elevation is chosen because it will be easier to install the crawl beam and catwalk when starting at back elevation, and the maximum span of the chambers is reached at this elevation. The Area 1 access ramp will be driven from the #12 Pipe Drift. The first 440 feet of development will provide access to the B 2-33 and 34 chambers. An additional 440 feet will provide access to the B 2-35 and 36 chambers. To access B 2-30, a further 520 feet of development will be required.

The ramp will be driven in three phases. The first phase of development is highlighted in Figure 2. While the B 2-33 and 34 chambers are being mined, the second phase of development to the B 2-35 and 36 chambers will be proceeding. The final phase will be to access B 2-30.

Test holes will be drilled ahead of the development when approaching the chambers. The breakthrough round will be mucked to a temporary storage area since the muck may contain arsenic dust. When reclamation of the dust in a chamber is complete, the breakthrough round muck will be dumped into it. The control of airborne arsenic dust is discussed in the following section.

10. VENTILATION

Figure 3 illustrates the proposed ventilation system. Air will be taken from the B Ramp, through the no. 12 pipe drift, the B 2-08 arsenic distribution drift and then up the B 2-34 raise to surface. A 20,000 cfm booster fan is required to ensure the flow of air. The fan and set of doors currently installed in the no. 12 access cross cut is suitable for this purpose. An auxilary fan will be required to ventilate the ramp development. A main feature of this ventilation system is that the air passing through the reclamation area does not re-enter the rest of the mine.

Raises from the various chambers to surface will be used to exhaust the air during the reclamation process. This will keep the air in the ramp free of airborne arsenic dust so that further development may proceed. Baghouse filters will have to be installed on surface to remove the dust from the air prior to being released to the atmosphere. Since the raises into the B 2-30 and B 2-34 chambers have been sealed with concrete plugs,a alternate raises will be driven. The filter systems are to be in place and functional prior to the ramp breaking through into the chambers. Most of the chambers are filled up to or above the break through elevation, thus the break through blast may cause significant amounts of dust to become airborne.

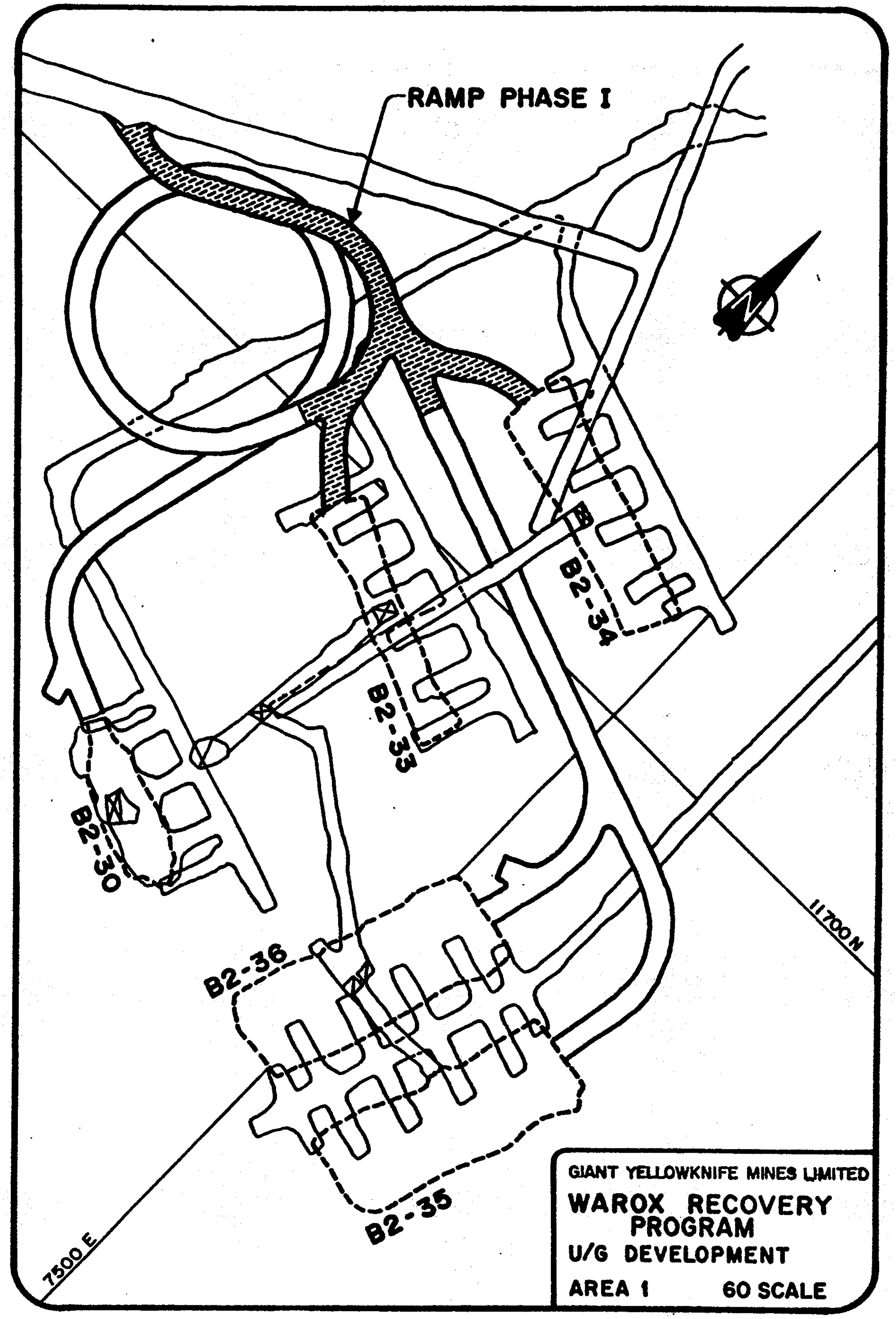

RAMP PHASE I
B2-34
B2-33
B2-30
B2-36
B2-35
11700 N
7500 E
GIANT YELLOWKNIFE MINES LIMITED
WAROX RECOVERY PROGRAM
U/G DEVELOPMENT
AREA 1
60 SCALE

Figure 2

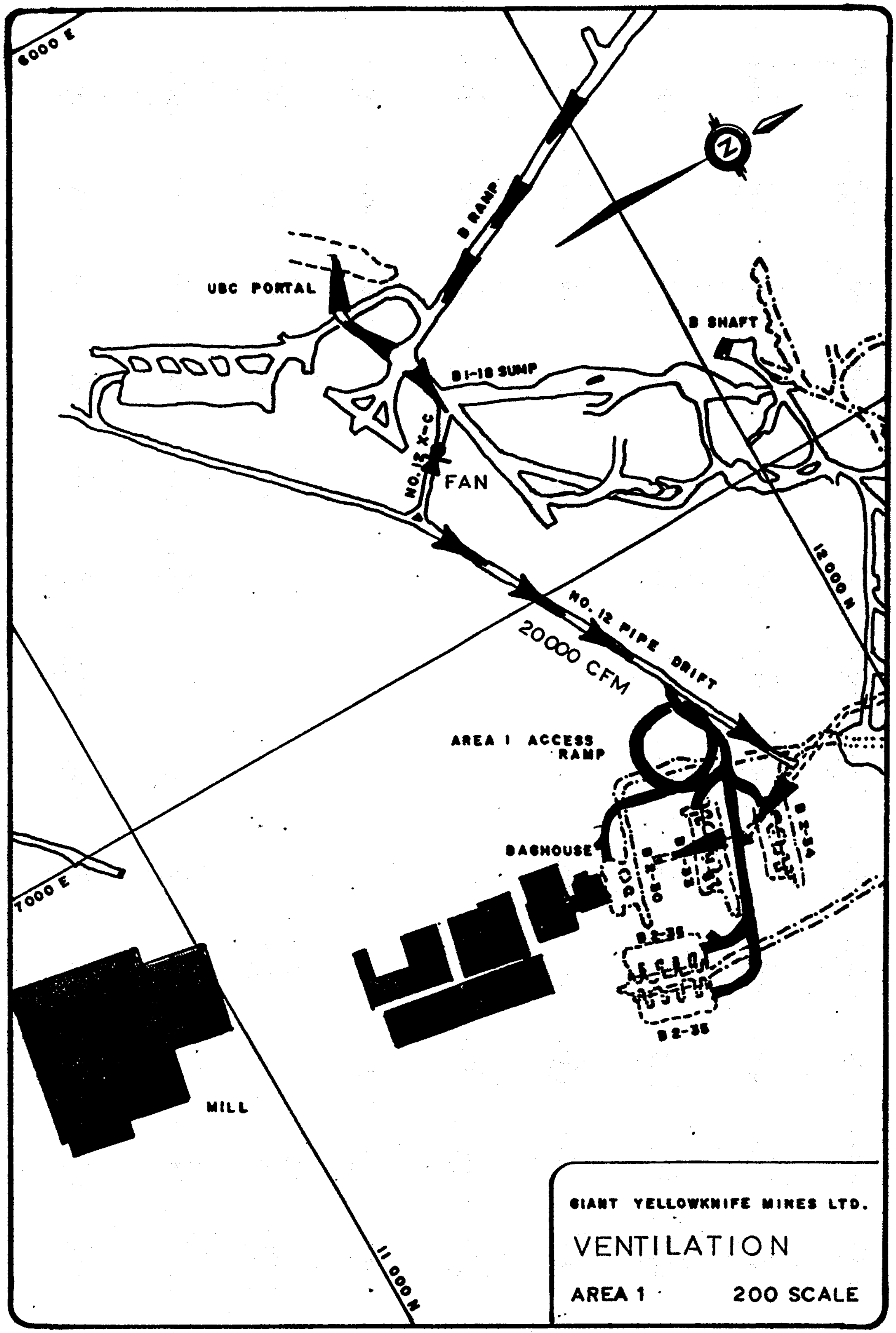

6000 E
B RAMP
UBC PORTAL
B SHAFT
B1-18 SUMP
NO. 13 X-C
FAN
NO. 12 PIPE DRIFT
20000 CFM
12 000 N
AREA 1 ACCESS RAMP
BAGHOUSE
B 2-35
B 2-34
7000 E
MILL
11 000 N
GIANT YELLOWKNIFE MINES LTD.
VENTILATION
AREA 1
200 SCALE

FIGURE 3

11. WATER DRAINAGE

Water will be pumped from the various sumps in the Area 1 access ramp to the no. 12 pipe drift. It will then drain to the sump in the B 1-18 drift. The water in the B 1-18 sump is pumped into the B shaft workings where it makes its way to the main underground sump and is pumped to surface. If the pumping system at the B 1-18 sump should fail, more than 225,000 gallons of water will fill the area prior to any going into the Area 1 access ramp.

The Area 1 access ramp is declined at -15% to access the chambers. The last 25 feet to breakthrough into each chamber is slightly inclined. Sumps are strategically located throughout the ramp to prevent water from entering the chambers. If the water in the sumps near the chambers become contaminated with arsenic, the water will be pumped directly to surface for treatment via the B 2-34 raise.

APPENDIX I

Giant **Memorandum**
Yellowknife Mines Limited

To Barb Mossop **Date** 8 sept/88

Copies To

From Geoff Bailey

Subject Analysis of old Arsenic bulkheads

As requested I have analysed the following concrete bulkheads to determine their capacity to withstand 275 ft. of hydrostatic head. The concrete cylinder strength was conservatively estimated to be 2000 psi while the yield strength of the reinforcing bars was estimated to be 40 ksi. In all cases, checks on the bending strength, shear strength, steel/concrete ratios, dowel development length and shear friction were made.

BACKGROUND

Bulkheads are generally designed as two-way systems. That is, flexural reinforcement is provided in both directions in the plane of the wall in order to resist applied bending moments. Shrinkage/temperature steel is provided in both directions on the compression face in order to prevent cracks from propagating due to temperature fluctuations. This ensures that the resisting moment arm (measured from the active compression face to the centre of the flexural bars) does not get shortened due to large cracks.

Shear steel (stirrups) are placed perpendicular to the wall faces and are especially important near the supporting edges where shear loading is maximum. Shear resistance is shared between the concrete and the stirrups. Designers usually provide enough steel in the concrete matrix to ensure that the steel will yield before the concrete crushes, thus ensuring that a possible failure would be slow and not catastrophic.

Calculations of shear friction at the supports and in the supporting collar define the number of dowels required to carry the loads from the bulkhead to the surrounding rock. Dowel development lengths are calculated to ensure that enough surface area is available along the dowel to prevent it from slipping relative to the concrete matrix.

B2-30, B2-33 Bulkheads

These two bulkheads are of similar design and if built acording to the design drawings, should be more than adequate to resist the required loading.

The drawings indicate that 1 in. dia. drill steel was used in place of standard reinforcing bars thus it was necessary to reduce the yield stress of the steel from 40 to 20 ksi in the analysis. It must be assumed, however, that adequate vibration of the concrete was achieved between the closely spaced bars.

B2-34, B2-35, B3-36 Bulkheads

These bulkheads are disigned to have a 24 in. slot all around the drift. This slot should enable bending moments to be transferred to the drift walls, hence reducing the stresses in the centre of the bulkhead. However, for this to be effective, flexural bars would have to be present on both faces. Alternatively, one may analyse the bulkhead with simple supports (ie. no bending moment transfer) but even with this model, temperature steel would have to be provided on the compression face to ensure its integrity.

Since the design drawings show neither flexural steel nor temperature steel on the compression face, their integrity under the required loading cannot be guaranteed.

GIANT
Yellowknife Mines Limited

MEMO TO: Sadek El-Alfy

CC: R. Braconnier; B. Mossop; S. Gibson, K. Morton

FROM: Wayne Cassidy

DATE: July 08, 1988

SUBJECT: COLLECTION OF ARSENIC DUST FROM B2-35 AND B2-36 STOPES

Working Environment

A sixteen inch fan was mounted on surface and connected to existing duct work leading into the B2-35 and B2-36 stopes. The access drift was ventilated for twenty-four hours and since there was a lack of oxygen previously, open flames were used on the first descent in checking the work area. An oxygen test was then done with a reading of 20% O_2. It was observed that the duct work was still half full of As_2O_3 so ventilation tubing was installed from surface. This gave a 21% O_2 reading with 3000 cfm flowing out of the access drift. Two dust samples were taken with both having 0.01 mg/m^3 As and 0.90 mg/m^3 respirable dust which was well below the respective 0.05 mg/m^3 and 5 mg/m^3 limits. It was noted however that skin rashes around the eyes, neck and forehead occurred due to sweating. When using the disposable dust filters irritation within the nose was felt but switching to a respirator cleared this up.

Arsenic Dust Recovery

The set-up consisted of the Kenworth truck hooked up to a 4" pipeline already in place. Three sections of 4" hose were connected onto the end of this line and lowered into the B2-36 stope with an end guide line attached. This proved unsuccessful due to the moisture content of the As_2O_3 which continually clogged the hose.

The next attempt was made in the B2-35 stope in which bolts were broken to remove a four foot square steel plate. The hose was lowered but a ledge hindered vision to start a proper suction. Therefore guiding the hose was done from within the stope. The arsenic dust was dry enough to fill 1/3 of the truck's box and took approximately 3 hrs. The arsenic was then dumped into 12, 45 gallon drums for shipping. The hoses from the stope were brought to surface and the fan was left in place.

Wayne Cassidy

Wayne Cassidy
Ventilation Engineer

APPENDIX 5

RECLAMATION OF UNDERGROUND MATERIAL

APPENDIX 5

RECLAMATION OF UNDERGROUND MATERIAL

Introduction

Simply stated, objectives for recovery of baghouse dust from underground storage are,"the material must be recoverable at low cost with little risk to the workforce or to the environment." Achievement of these objectives is essential to the success of the Arsenic Reclaim Program and so a good deal of effort has gone into development of the reclaim processes described below.

Physical Conditions

Baghouse dust and/or Cottrell dust has been stored underground in sealed vaults located in permafrost since 1951. As the dust has settled over time, the vaults have continually been topped up with fresh dust until now the vaults are nearly filled with compacted dust. As storage space has been depleted, new vaults have been constructed and today there are twelve separate storage chambers filled with dust.

As mine workings have recently encroached on some of these storage chambers, permafrost has receded and ground water has flowed in, mixing with the dust and changing the consistency from a fine dust with less than 1% moisture to a moist cake with greater than 14% moisture. This range of conditions means that the reclaim process must be quite flexible, minimizing the number of alternatives available to us. The various alternatives that have been given serious consideration are as follows:

Vacuum reclaim followed by pneumatic conveying

Slurrying of dust, pumping and dewatering

Clamshell bucket, tubular drag conveyor to surface.

All three methods have advantages but only one, the clamshell bucket, is judged capable of meeting the stated objectives.

Discussion

Vacuum Reclaim

Ever since 1980, when recovery of baghouse dust first began to be seriously discussed, vacuum reclaim has been regarded as the superior recovery method. It can be done remotely from surface, it can move large amounts of material over long distances, and it can be installed at low cost. Unfortunately, attempted collection of test samples from stopes B2-36 and B2-14 demonstrated that vacuum cannot recover damp material. Dust containing moisture around 10% simply will not move, while dust containing lesser amounts of moisture will quickly build up in the vacuum piping, blocking off the flow.

Vacuum reclaim may still play a significant role however, in manually clearing the top few feet of storage chambers to permit installation of the clamshell apparatus, which needs a certain minimum headspace to operate. A portable vacuum system could prove to be invaluable for this job, for localized cleanup work, for emergency dust transfer jobs, etc.

A sketch of the portable reclaim apparatus, most of which already exists at Giant, is shown on the following page. The vacuum blower, baghouse and cyclone already exist and the major additional requirement is the large hose reel and 300 ft of 6" suction hose.

Slurry Reclaim

This would probably be the simplest method of recalim if environmental considerations could be ignored. Slurrying of dust using high pressure water jets followed by pumping of slurry to surface would be a relatively easy installation. Slurry would be dewatered in a decanter type centrifuge prior to the centrifuge cake being fed to the fluosolids reactor and the centrate would be returned underground under high pressure to provide the slurry medium. Centrifuge testing by Bird Machine indicates that a cake of 70% solids and a centrate of <1% solids can be produced. Cost of evaporating water in the reactor would be approximately $0.01/lb. of dry feed.

The risk of contaminating underground workings with arsenic through groundwater seepage and leakage through bulkheads is considered to be high when using this method. The very serious results that would then occur has caused this method to be rejected.

Clamshell Reclaim

The one method that has satisfied all of the stated objectives is strictly mechanical. It consists of 4 main components, a clamshell grab bucket, a double drum hoist and monorail, a vibrating (or screw) feeder and a tubular drag conveyor. The 1 cu.yd. grab bucket is capable of recovering material of any consistency. The variable speed hoist will be sized so that cycle time under the most difficult of conditions will still permit recovery of a full day's supply of feed in less than one operating shift.

Operation of the equipment is expected to be very simple. The grizzley equipped vibrating feeder will receive the baghouse dust from the grab bucket and feed it into the tubular drag conveyor at a controlled rate.

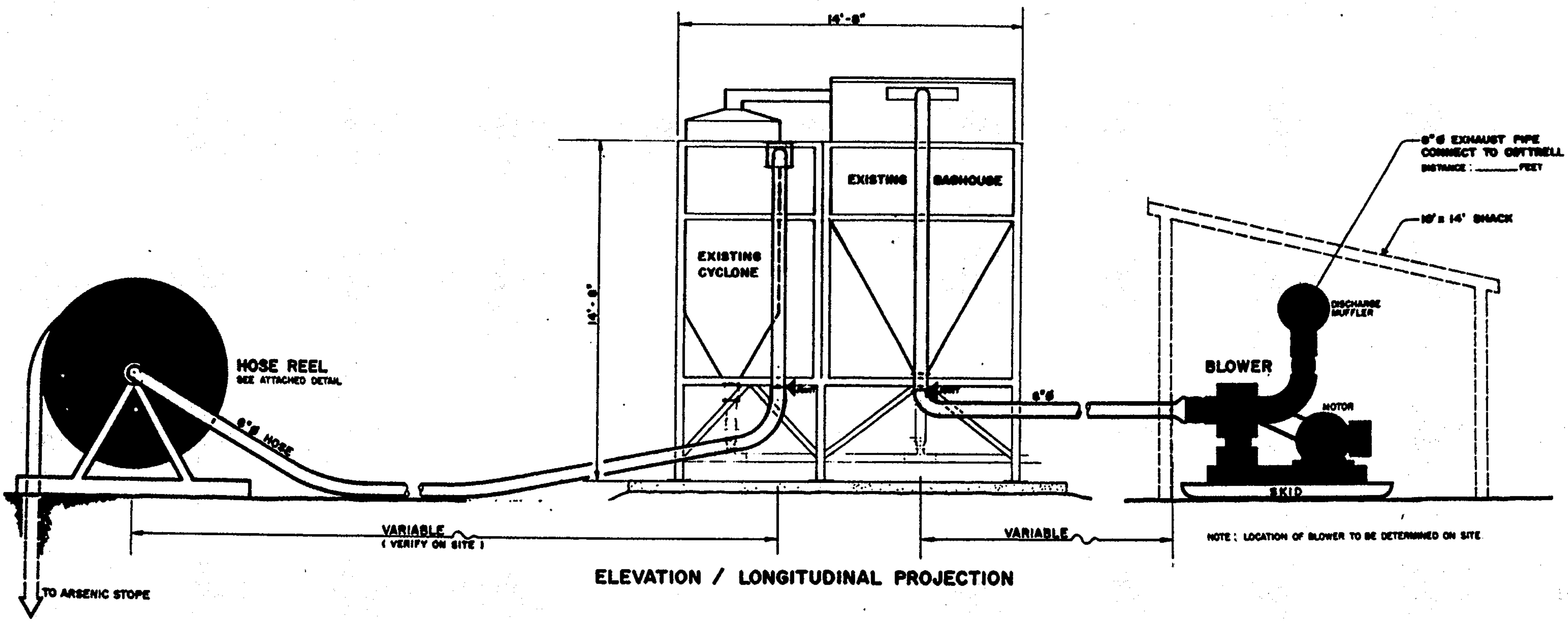
The 8" tubular drag conveyor will transfer the material to surface and discharge into the surface storage silo or a surface conveying system.

The entire system is to be remotely controlled from the suface control room and the risk of arsenic exposure to workmen will be limited to periods of installation or maintenance.

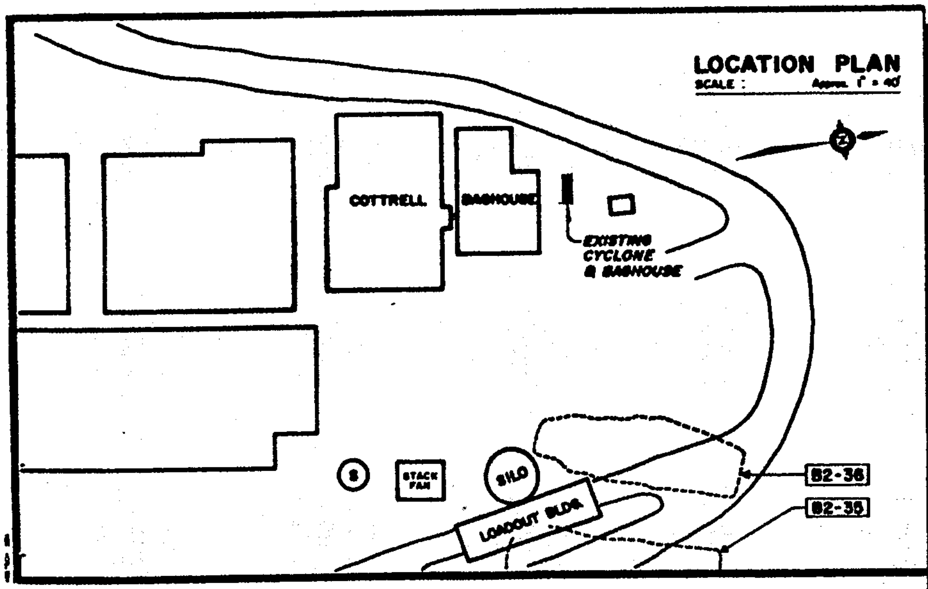
The equipment will be selected so that maintenance requirements will be minimal and so there will be little exposure risk, workmen being required to wear special protective clothing and external air supply while they are in the stope. The risk of exposure will be somewhat higher during installation of the equipment and careful work procedures coupled with close supervision will be required.

Ordinarily, installation will involve the wearing of totally enclosed protective equipment and the practice of strict personal hygeine. The workmen will initially be required to advance a suspended platform to create a catwalk along the full length of the stope. Once the catwalk is in place, installation of the remaining equipment can proceed. In some cases, baghouse dust has been placed right up to the back of the stopes and it will be necessary to first clear enough space to permit installation of at least a portion of the catwalk and monorail. As production proceeds, natural depletion of the material will create space to complete the installation. The tubular drag conveyor will require the drilling of 10" holes from surface to permit the installation of 8" ID pipes. Absolute accuracy of the drill holes is not critical, as tubular drag conveyors are quite flexible as to configuration and alignment.

In operation, the material reclaimed from the stopes will be stored in a 300 ton surface silo, allowing some surge capacity for maintenance and other interruptions to production. Ideally, the tubular drag conveyor will discharge into the silo but, as distances increase due to reclaim from more distant storage vaults, a surface conveying system will be required. This may be a pneumatic conveying system or perhaps a second tubular conveyor will be used.



ELEVATION / LONGITUDINAL PROJECTION



SCOPE OF WORK

MECHANICAL

1. FABRICATE STEEL BASE FOR BLOWER & MOTOR AND SKID.
2. INSTALL BLOWER - c/w INTERCONNECTING PIPING AND SILENCER.
3. CONNECT BAGHOUSE EXHAUST TO BLOWER INLET.
4. CONNECT BLOWER EXHAUST TO COTTRELL FLUE.
5. CONNECT COOLING WATER TO BLOWER.
6. FABRICATE HOSE REEL ON SKIDS.
7. CONNECT HOSE REEL TO CYCLONE INLET.
8. INSTALL 6"Ø HOSE ON REEL.
9. INSPECT FILTER BAGS - REPLACE IF NECESSARY.
10. BUILD 10' x 14' SHACK OVER BLOWER ASSEMBLY.

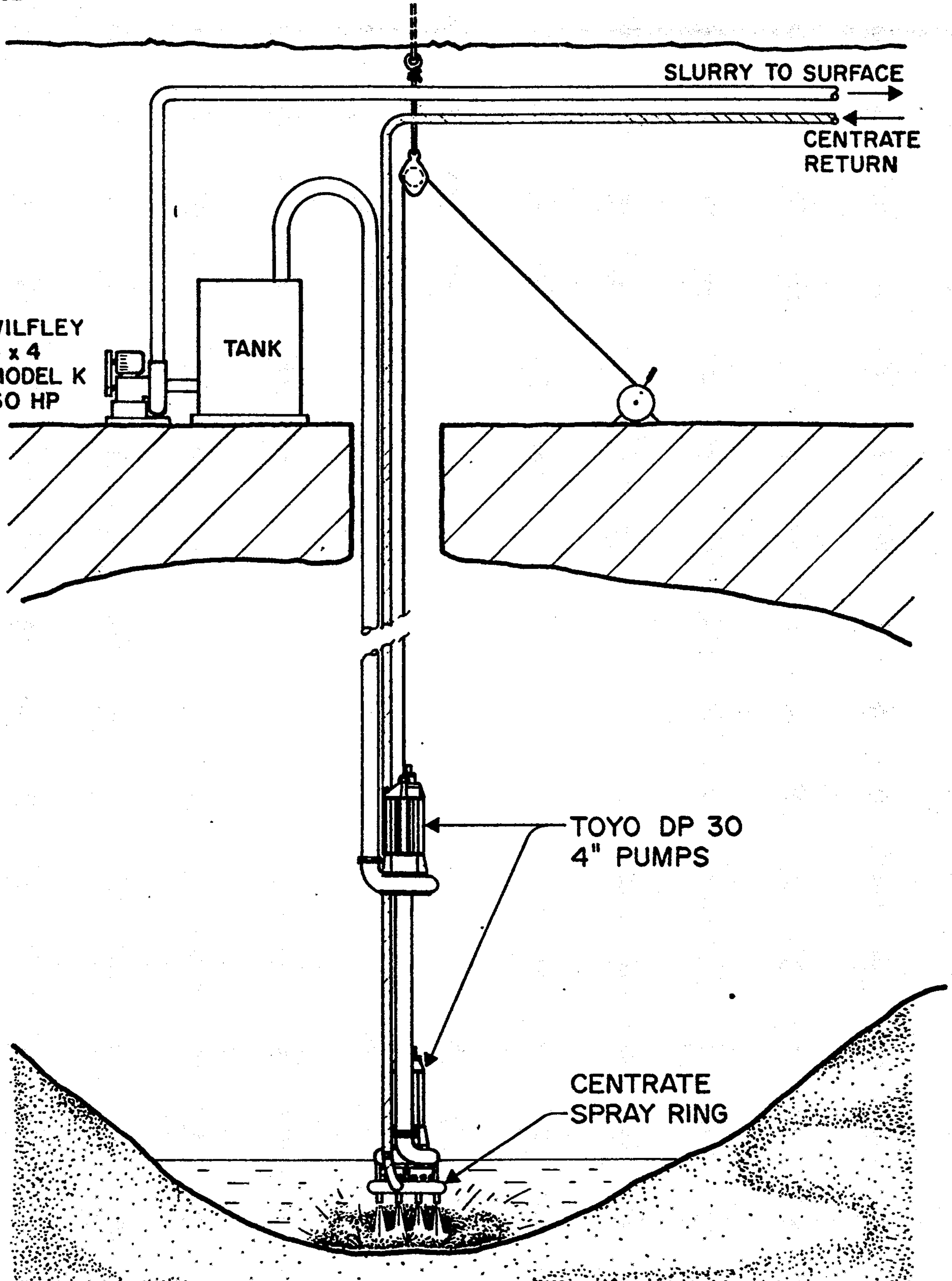
ELECTRICAL

1. PROVIDE ELECTRICAL SERVICE TO 150 HP BLOWER MOTOR.
2. ALSO SERVICE TO 3 HP HOSE REEL DEVICE.

NOTES :

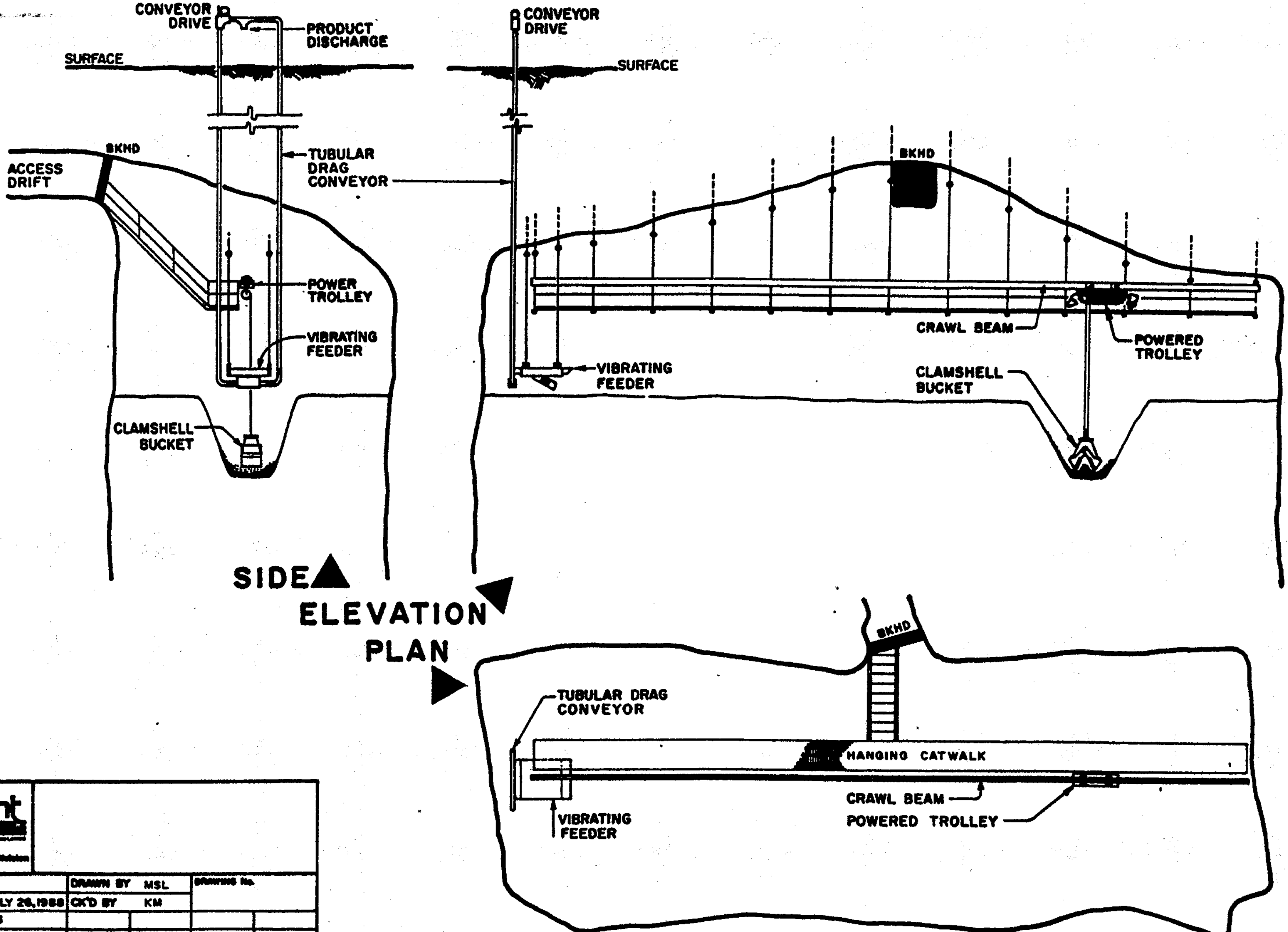
GIANT YELLOWKNIFE

SCALE	3/8" = 1'	
DRAWN BY	MGL	
CHECKED BY	KM	DWG.
DATE	AUG 30, 1988	



ARSENIC SLURRY RECLAIM SYSTEM

MARCH '88 KM·MSL



Giant

Yellowknife Division

SCALE	DRAWN BY	MSL	DRAWING No.	
DATE JULY 26,1988	CK'D BY	KM		
REVISIONS				
APPROVED				

APPENDIX 6

TRANSFER FACILITY DESIGN

APPENDIX 6

TRANSFER FACILITY DESIGN

Introduction

The main design criteria for all elements of the Arsenic Reclaim Project relate to environmental protection and workplace safety, and the Transfer Facility is no exception. Plant layout and equipment selection is specifically designed for safe operation and fortunately, the simplicity of the process permits maximization of safety features without detracting from productivity.

This is important, as the plant will be operated without close supervision most of the time. The plant must also be capable of handling all production, up to 15,000 stpy, without difficulty.

Transfer Process

It is expected that the plant will receive one to two truckloads of Warox product each day during dayshift and that approximately two 80 ton hopper cars will be despatched each week. In order that material transfer can be accomplished, along with all paperwork, cleanup and maintenance, the equipment will be sized to effect both unloading and loading in an average of 4 hours per day.

Typically, one truckload of Warox will arrive at the Transfer Facility each day. The truck will be spotted so that one of the truck hoppers is aligned with the feed hopper of the transfer conveyor. A retractable "boot" will be raised to provide a dust tight seal between the dump hopper and the feed hopper. The conveyor will be started and the dump valve opened on the truck hopper to start the flow of feed. As each chamber of the trailer is emptied, the trailer is respotted over the dump hopper and the process repeated until the contents of the trailer have been transferred into the 100 ton transfer bin, about 1 1/2 hours.

During the transfer process, the operator monitors the equipment to prevent overloading, spillage, etc. After the trailer has been emptied, the dump valves are closed and the truck returns to Yellowknife, about a 5 hour trip.

The arrival of the truck will probably have interrupted loading of a hopper car from the transfer silo. The two processes, unloading a trailer and loading a railcar, cannot take place simultaneously since there is a danger of spillage if equipment is left unattended. Unloading of the trailer is the operator's first priority as long as there is room in the transfer bin.

Loading Process

The rail spur will have space for 5 empty and 5 full hopper cars. This will normally be adequate since the present rail schedule is two trains per week. As the full cars are attached to the train, empty cars will be dropped off and shunted to the back side of the building. Once filled, cars will be stored at the front side of the building, ready for pickup by the next train. Cars will be moved in and out of the building, and spotted under the loading spout by means of winches and blocks especially designed for the job.

When the empty car has been spotted under the loading spout, the circular hatch cover will be removed, the retractable spout will be lowered into the hatch, the dust collection system will be operating and the rotary valve will be started, beginning the flow of product into the hopper car. After a short while, the electronic scale will actuate a signal at a preset weight that will stop the rotary valve. The spout will then be retracted and the car moved so that the next hatch is spotted under the spout. The process is repeated and continued until the maximum weight has been loaded into the car. The car will then be cleaned of any spillage around the hatches, the hatches will be closed and sealed, the dump hoppers will be inspected for leakage and the car moved outside to make way for the next empty. Occasionally, the dust collector hopper will be dumped into the car by means of a flexible screw conveyor.

Plant Equipment

The plant equipment has been specially selected for dust containment and simplicity of operation and maintenance. This is important as the plant is intended to be operated and maintained by one operator without close supervision.

The transfer apparatus consists of 4 main components, a boot-lift seal, a vibrating feeder, a Cambelt conveyor and a 100 ton transfer bin. All equipment is totally sealed and maintained under negative pressure by connection to a baghouse dust collector. This will help to ensure a dust-free working environment, which is even further protected by granulating the product prior to shipment. The vibrating feeder and the transfer bin are of conventional design while the boot-lift connector will be custom fitted for this application. Some redesign of trailer hoppers will be required to permit fitting of the boot-lift connector and installation of a slide-gate valve. The Cambelt conveyor is a near vertical conveyor specially designed for unloading trucks and railcars.

It is completely enclosed and permits unloading processes to take place in a relatively small space. Unlike a bucket elevator, it is completely dust-free.

The loading equipment is very simple, consisting of a rotary feeder, a retractable feed spout and a weighbridge. The rotary feeder is started manually when loading is ready to proceed and it can be stopped in a number of ways. For example, the rotary valve will stop when a sensor in the feedspout detects a product high level or if the spout is not fitted securely in the hatch. It will stop if the dust collector is not running or if a negative pressure is not maintained at the hatch/spout interface. It will stop when the weighbridge sensor reaches a preselected weight, and finally, it will stop if the stop switch is pressed.

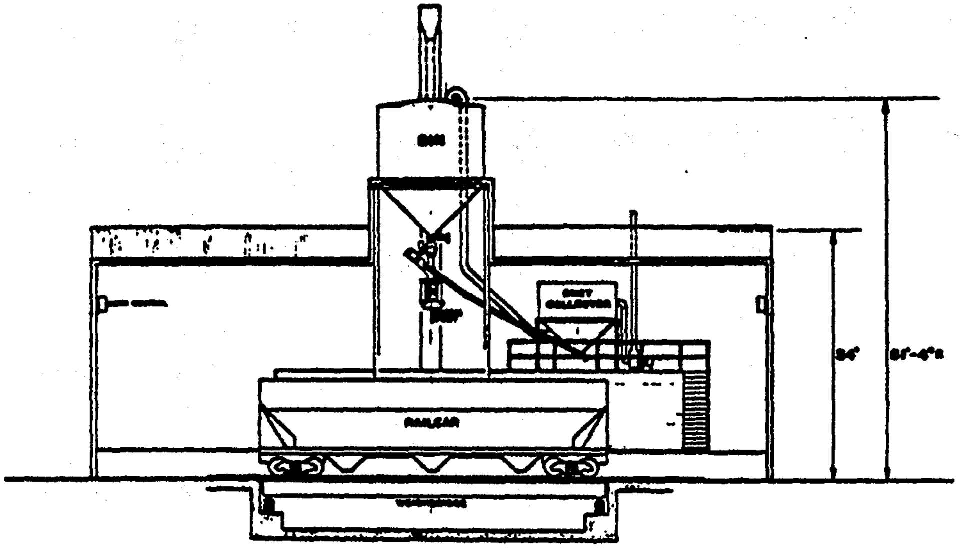
The retractable spout is quite a long one, since railroad specifications require approximately 8 ft. clearance above the railcar. As mentioned in the previous paragraph, there are a number of built in safety features that ensure proper operation of the spout before feeding can commence.

The discharge spout of a flexible screw conveyor, carrying dust from the dust collector hopper, is built into the main loading spout, and all the conditions that must be met to operate the rotary valve apply equally to operation of the flexible screw conveyor.

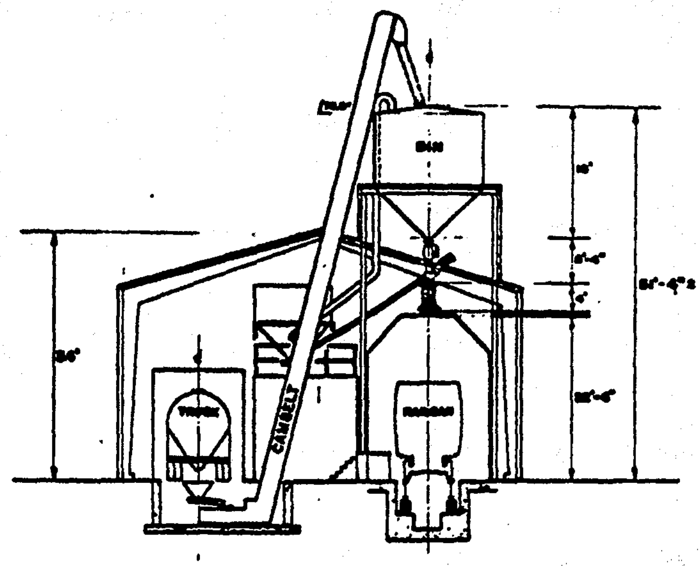
The weighbridge is necessary to ensure that maximum loads are shipped while avoiding penalties due to overloading. The scale is completely electronic and programmable to permit very precise loading. Equipped with a printer, it will print tare, gross and net weights on the shipping documents. A crawl space will be provided under the scale to enable cleanup to be done in case of a spill. Cleanup of this nature will be done using a small portable vacuum cleaner exhausting into the baghouse dust collector.

The plant will be powered with a 50 kva diesel generator backed up by a 10 kva lighting plant to operate the oil heater and lights. Rubber main doors will provide an airtight seal during winter operations and when product transfer is taking place. These doors are extremely durable and able to sustain heavy impacts without damage.

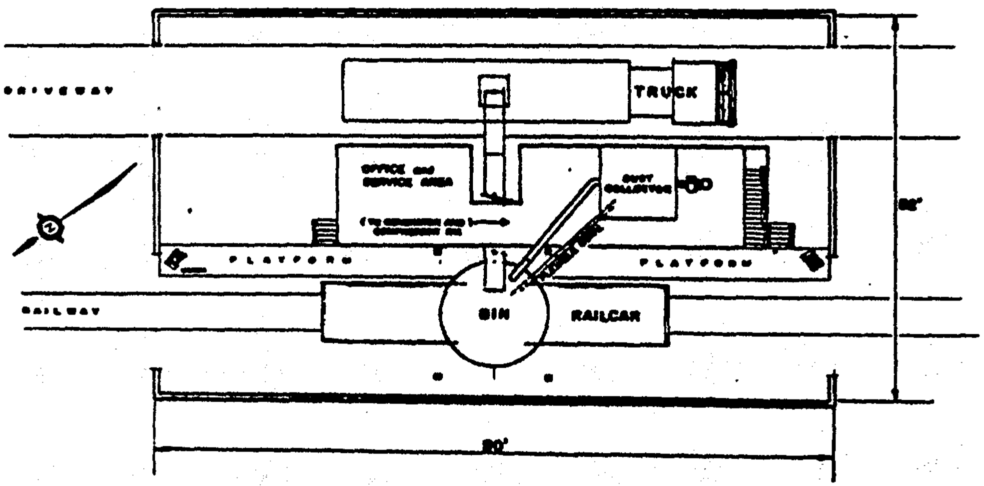
The plant operator's personal hygeine is very important and shower and laundry facilities will be included in plant design. Water use will be limited to domestic purposes since there will be no means of disposal of contaminated water. Domestic sewage will be pumped out and disposed of in the normal fashion using the commercial service presently engaged in this work.



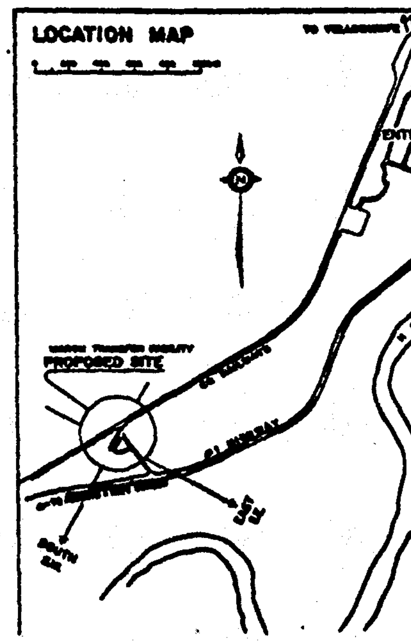
SECTION / ELEVATION
LOOKING EAST S.E.



SECTION / ELEVATION
LOOKING SOUTH S.W.



FLOOR PLAN



GIANT YELLOWKNIFE MINES LTD

WAROX TRANSFER FACILITY

APPENDIX 7

SUMMARY OF PILOT PLANT TESTWORK

2.0 SUMMARY

Giant Yellowknife Mines Ltd. requested the New Brunswick Research and Productivity Council to demonstrate the feasibility of recovering a high purity arsenic trioxide product from crude baghouse dust produced in their smelter operation. This report summarizes the results of pilot plant testwork to assess the technical feasibility of such a process.

The conceptual flowsheet developed from the results of bench-scale testwork carried out by Falconbridge Mines Limited was shown to be technically viable for the treatment of current production baghouse dust with an antimony content of <0.2%. When stockpiled baghouse dust, containing high antimony content (>0.2%) was treated, the antimony content of the arsenic trioxide was above the specification of 0.2%.

A continuous pilot plant, incorporating the principle features of the conceptual flowsheet developed from the results of bench-scale testwork, was constructed at RPC. A key component of the flowsheet is a high temperature baghouse, using woven ceramic fibre filters, capable of sustained operation at elevated temperatures (1150°C). It is this unit which is used to separate the non-volatile components of the feed material from the gas phase containing the arsenic trioxide. Subsequent cooling of the gas phase yields a high quality arsenic trioxide product.

Current production baghouse dust was successfully treated in the pilot plant over a temperature range of 260°C to 450°C, the feed rate varying from 5 kg/h to 16 kg/h. At lower temperatures (<300°C), some evidence of blinding of the hot baghouse filters was noticed. A continuous run of 252h duration was successfully completed during which more than 2000 kg of current production baghouse dust was treated. A high quality arsenic trioxide product, meeting the specification with respect to antimony and iron content, was consistently produced.

Attempts to feed high antimony content stockpiled dust to the pilot plant were unsuccessful due to the physical characteristics of the material. A blend of stockpiled dust and current production dust was fed successfully and the results indicated that under the conditions employed for the treatment of current production dust, the antimony content of the arsenic trioxide product exceeded the specification

for the material. A supplementary study has been initiated to examine methods of feeding stockpiled dust and identify process conditions which will yield a low antimony content arsenic product.

APPENDIX 8

MARKETING STUDIES

APPENDIX 8

WAROX SALES - LIST OF COMPANIES APPROACHED

Summary

So far, only chemical manufacturing firms using arsenic trioxide in wood preservatives, pesticides and defoliants have been approached as potential customers. The following list of seven companies represents at least 90% of North American consumption capacity for arsenic trioxide.

(a) Osmose Wood Preserving, Inc.
980 Ellicott Street
Buffalo, New York
14209

Attention: Mr. Bill O'Brien

(b) Amax Zinc Company
Route 3
Monsanto Avenue
Sauget, Illinois
62201

Attention: Mr. McGown

(c) Koppers Company, Inc.
1579 Koppers Road
Conley, Georgia
30027

Attention: Ms. Avis Williams

(d) Penwalt Corporation
201 West Dodge Street
Bryan, Texas
77801

Attention: Mr. Blair Phares

(e) Applied Research Group, Inc
2221 North Davidson Street
Charlotte, North Carolina
28205

Attention: Mr. Bill Drinkard

(f) Chemical Specialties, Inc.
Mineral Research and Development Corp.
Highway 49 (at Rocky River)
Harrisburg, North Carolina
28075

Attention: Mr. O'Connell

(g) Voluntary Purchasing Group
P.O. Box 460
Highway 82 West
Bonham, Texas
75418

Attention: Mr. Mike Smith

Samples of purified Warox produced at RPC have been sent to each of these companies for their evaluaton and so far, Penwalt and Osmose have responded favorably. The product was extremely fine however, and Penwalt commented that this characteristic is definitely not desireable.

Giant has known this from the beginning, and all potential clients will be assured by Marketing Consultant, D. Zeraldo, that the product produced in the full scale plant will be much coarser. In fact, it is intended that granular product, produced from compaction testing on October 15 at Ferro-Tech's Detroit plant, will be sent to clients for their further evaluation.

APPENDIX 9

TRANSFER SITE POLITICS

APPENDIX 9

TRANSFER SITE POLITICS

Introduction

Though normally thought of as endless miles of uninhabited forest and tundra, land in the Northwest Territories is very jealously guarded, and acquisition of land for industrial development can be an extremely lengthy process. The reasons for the difficulty in acquiring land may be quite complex and are often politically motivated. Questions relating to such things as environmental impact, socio-economic benefits, priority use, etc. are usually considered. Another big political hurdle is Native Land Claims, which is a very controversial issue, especially when natives see development opportunities pass them by while the Land Claims Agreement remains unsettled.

Discussion

Recognizing the likelihood of encountering difficulties in acquiring a suitable site for construction of the Transfer Facility, Giant has made application for three separate sites through three regulatory agencies.

These three sites are known as: the Enterprise Site, the Indian Cabins, Alta. site, and the Crown Land, NWT. site. Regulatory agencies for each site are Territorial Government, Alberta Government Forestry Service, and the federal Department of Indian Affairs and Northern Development (DIAND) respectively. The approval process has now been going on since August, 1986 for the most desireable site at Enterprise, NWT., since February, 1988 for the Indian Cabins, Alta. site and since May, 1988 for the Crown Land, NWT. site.

Enterprise Site

An integral part of the approval process for the Enterprise site, is the requirement to gain the approval of the residents of the community.

This almost ensures that the project will provide some economic benefit to the residents if approval is to be given. In this case, a public meeting between Giant and the Enterprise Settlement Council has resulted in conditional approval for the project. The conditions being that the residents must be satisfied that location of the plant will pose no health risks and, that there be some, so far undefined, benefit to the community. The community recognizes that they are to benefit from providing operating labour, sewer and water services, etc. They also expect that Giant, as a gesture of good faith, will make a contribution to a worthwhile community initiative.

A negotiating committee, made up of members of the Settlement Council and of residents opposed to the project, will meet with a Giant committee on October 5th to discuss public health issues. This will be the first of a series of meetings that are expected to culminate in a final agreement with the community of Enterprise. Once this is achieved, the Territorial Government may grant approval for lease of the site. As a condition, they may require certain operating and monitoring practices to be carried out, for the purpose of environmental protection.

Indian Cabins, Alberta Site

Justification for applying for land in Alberta, a site costing an additional $60,000/yr in increased transportation costs, lies in the uncertain political situation in NWT. Proceeding through a lengthy application process only to have the application rejected in the end, could be very expensive. Although outright rejection is not considered likely, the possibility has not been discounted

The original site selected in Alberta, immediately south of the Alta.- NWT border, was rejected by the Forestry Service on the grounds that it was less than 800 meters from flowing water. This is one of the many environmental requirements that the Forestry Service has established for this installation. As a result of the original site rejection, three additional potential sites, all meeting the environmental requirements, were located just south of Indian Cabins about 20 km from the border.

Officials from the Forestry Service have been asked to comment on the sites and to outline any further requirements they may have before the lease application is approved. One item, posed more as a suggestion than a requirement, related to a public meeting with the residents of Indian Cabins. It is Giant's position that site location must meet the approval of nearby residents and a public meeting will be held, unless one of the NWT sites is approved in the interim.

Crown Land, NWT.

All applications for lease of federal lands, or projects funded by the federal government, are subject to an intensive environmental review process known as EARP, the Environmental Assessment Review Process. The scope of the process varies, depending on the potential environmental or socio-economic impact of the project. It can also be quite dependent upon the public perception of the project, lobbying by interest groups, media-coverage of the project, etc..

The EARP process begins with a RERC meeting, in this case, on Sept. 29, 1988. this is the Regional Environmental Review Committee made up of the following:

Six Department Managers of DIAND
Four various officials of DOE
One representative from Fisheries and Oceans
Three various officials from GNWT
Two observer status, INAC

In addition, the Chairperson, on the advice of RERC members, will invite the proponent and may invite representatives of public interest groups, native, and regional and national organizations, or technical and scientific experts to participate in RERC meetings.

At the RERC meeting, the proponent is invited to describe his project in some detail. Following questions by members of the committee, the proponent will be excused from the meeting. The committee will probably require more information in the form of an IEE, Initial Environmental Evaluation. Terms of reference for the IEE will be outlined.

After the IEE has been screened by RERC, a recommendation will then be made to INAC on whether to to proceed to the established regulatory approvals stage, or to refer the project to the Minister of the Department of the Environment, for a full panel review by FEARO (Federal Environmental Assessment Review Office).

NIMBY (Not In My Backyard) Syndrome

A degree of public hysteria has accompanied the applications for land in the NWT and lobby groups opposing both the Crown Land and the Enterprise sites have been formed. According to newspaper reports, "A petition protesting regular shipments of arsenic trioxide from Yellowknife to Enterprise will be presented to Western Arctic MP Dave Nickerson, the Federal Lands Bureau and the Territorial Ministry of Lands..".The article goes on to say," We are against having the transfer site there (a lot near Alexander Falls outside of Enterprise). The general feeling in Enterprise is we don't want it here period.".

APPENDIX 10

ARSENIC PLANTS SITE VISITS

APPENDIX 10

ARSENIC PLANTS SITE VISIT

Introduction

Though Giant has piloted what is believed to be a unique purification process for arsenic trioxide, fuming technology has been applied to production and purification of arsenic trioxide for at least 84 years in North America. For example, the Anaconda Reduction Works in Montana began to recover arsenic from flue dust using primitive fuming technology in 1904. The same technology has been performing good service in other plants for many years, and in other cases, some quite modern plants have recently been built. In all cases, arsenic trioxide is produced as a by-product from some other metal smelting or roasting operation. Giant's situation differs only in that it has probably the world's largest stockpile of crude arsenic trioxide feedstock, and has developed a purification process that will produce an extremely high purity product normally only achieved using expensive hydrometallurgical techniques.

Discussion

An incomplete list of plants using fuming purification technology includes:

- Lepanto, Phillipines
- Salsigne, France
- Pennaroya, France
- Boliden, Sweden
- IMM, Mexico
- Kwe-Kwe, Zimbabwe
- Lancefield JV, Western Australia

Of the above, Salsigne is said to have the most sophisticated process, capable of producing a super high purity product, +99.5% pure, quite similar, in fact, to that expected from the Giant plant. Salsigne apparently uses a 2 stage condensation process, removing bismuth in an electrostatic precipitator following the first stage of condensation, and producing a high purity As_2O_3 product in the second. The purity of the Salsigne product is such that they are able to sell 1 kg bags of it for use in glass production. The Salsigne process is of particular interest to Giant since it has a number of similarities to the process proposed for the Giant plant; production of a separate product using electrostatic precipitation, for example. Giant's plant will likely produce antimony oxide using an ESP, though at present it is not clear that two stage condensation will be necessary. The Salsigne plant is similar in size to the proposed Giant plant as well. Salsigne sells 7000 tpa arsenic trioxide products of various grades up to 99.5% As_2O_3.

The glass industry accounts for a large part of the Salsigne arsenic sales.

Boliden in Sweden is also a major supplier of arsenic trioxide produced from a fuming process. Boliden has antimony in its feed, just as Giant does, but so far, it is not clear how they are able to control antimony contamination of their product.

The IMM plant in Mexico is an exact copy of Asarco's Tacoma WA plant, which recently discontinued production of arsenic trioxide. The most interesting feature of this plant is the condensation process which takes place in long brick flues. The slow cooling taking place in the flues results in the formation of a coarse crystalline product which settles out in chambers known as 'kitchens'. As the kitchens become filled with product, they are emptied by using a double drum slusher and scraper.

Depending on the locations of the kitchens along the flue, various grades of product are produced, the very low grade product being recycled to the roaster.

This condensation process was very likely borrowed from the Anaconda Reduction Works plant, which had a similar arrangement of flues and kitchens. In Anaconda's case, formation of crystalline As_2O_3 largely took place on the walls and roof of the 240 foot long flue. Periodically this formation would be scaled off and transported to the crushing/screening plant.

Recommendation

Invaluable knowledge gained from many years of experience in producing arsenic trioxide can be made available to Giant through visits to operating plants. Techniques for protection of the workforce from arsenic exposure, method for production and handling of coarse, crystalline product, procedures for control of impurities in the product, etc, etc, would all be extremely useful.

It is recommended that the Arsenic Reclaim Plant design team at Giant make arrangements to visit a number of operating plants in Europe and Mexico before detailed plant engineering begins.

Plants that should be visited include Penaroya and Salsigne in France, Boliden in Sweden and IMM in Mexico. The visits should take place in October, 1988 if possible, so that worthwhile new ideas picked up from the visits can be incorporated in the initial plant design.