PART-3 ECONOMIC EVALUATION

Standard Evaluation 3~1

3-1-1 Assumptions

a) Ore Reserve and Production Rate

A total ore reserve is assumed of 2,872,500 tons at a grade of 1.94% Cu, as shown in Table 7 of the Part 1.

It is also assumed that the production be resumed at a rate of 50,000 tons per month. Accordingly, the ore reserve is sufficient to continue the production at this rate for approximately 4.8 years.

b) Capital Expenditure

In addition to the capital expenditures which are explained in 1-9-1 and 2-9-1, a total sum of US.\$3,099,000 is allocated for the working capital to keep the production at a steady rate.

Table- 24 Capital Expenditure

	Yen(1000)	U.Sh(1000)	US.\$(1000)
Mine			
Mining	863,850	30,591	4,857
Milling	191,460	6,779	854
Engineering	215,330	7,624	959
Subtota1	1,270,640	44,994	5,670
Contingency	88,860	3,147	398
General	80,500	2,850	360
Transportation	60,000	2,125	268
Total	1,500,000	53,116	6,696
Working Capital	453,352	14,734	1,858
Smelter			
Smelting	723,800	25,630	3,231
Installation	55,000	1,948	246
Transportation	29,000	1,027	129
General	81,000	2,868	362
Escalation & Others	81,000	2,868	362
Total	969,800	34,341	4,330
Working Capital	302,804	9,841	1,241
Grand Total	3,225,956	112,032	14,125

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The working capital consists essentially of the inventries for 6 months at the Mine and for 12 months at the Smelter,

The total capital expenditure is summerized in Table 24.

c) Operating Cost

The monthly operating costs for the Mine and the Smelter are separately explained in 1-9-2 and 2-9-2, and are quoted again in Table-25 as follows.

	,		
	U.Sh(1000)	US.\$	US\$/crude ore ton
Mining	2,764.4	348,608	6.97
Engineering	1,493.5	188,340	3.77
Milling	718.0	90,545	1.81
Smelting	1,301.7	164,145	3.28
Administeration	771.6	97,299	1.95
Subtota1	7,049.2	888,937	
Conc. Transportation	307.9	38,830	0.78
Bank Interest (8% Annually)	49.3	6,219	0.06
Provision for	95.3	12,017	0.24
Total	7,501.7	946,003	18.86

Table- 25 Summary of Monthly Operating Cost

d) Production Schedule

The annual production schedule is tabulated in Table26.

In general, it is economically more effective to mine higher grade ore in earlier stages. However, such a variation in mining grade is not taken into account in this evaluation.

The following assumptions are made for the mill recovery, the concentrate grade, the moisture content in the Cu-concentrate, the smelting recovery and the blister grade (Table-21 and 2-9-4).

Mill Recovery	92.80%
Concentrate Grade	28,50%
Moisture Content	8.50%
Smelting Recovery	95.00%
Blister Grade	99.00%

SCHEDULE (1)	
 Table26 FRODUCTION	

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		5.%	2.14	2.06	1.92	1.81	1.77	-1 -8 -1	1-94	28.5	66	
	Total	Tonnage	733,100	171,400	695,100	521,600	81,180	670,120	2,872,500	181,298	49,58I	
									 . :			
· · ·												
		· ·				· · · · · · · · · · · · · · · · · · ·		 				
4		% C	2.14	2.06	1.92			1.84	1.93	28.5	66	
	5 TH	Tonnage	65,100	27,400	215,100			164,900	472,500	29,694	8,121	
		л. С. %	2.14	2.06	1.92	1 81		1.34	1.94	28.5	66	
	4 TH	Tonnage	167,000	36,000	120,000	158,600		118,400	600,000	37,901	10,365	
		ភីស	2.14	2.06	1.92	1.81		1.84	1.94	28.5	66	
	3 RD	Tonnage	167,000	36,000	120,000	159,000		118,000	600,000	37,901	10,365	
		n % 0	2.14	2.06	1.92	1.81	1.77	1.84	1.94	28.5	66	
	2 ND	Tonnage	167,000	36,000	120,000	96,000	21,180	147,820	600,000	37,90I	10,365	
· · ·		n Cr	2.14	2.06	1.92	1.81	1.77	1.84	1.94	28.5	66	
	1 ST	Tonnage	167,000	36,000	120,000	96,000	60,000	121,000	600,000	37,901	10,365	
1	Year		Eastern	Stream	Buhunga/ Namhuga	Upper Bukangama	Middle Bukangama	Lower Bukangama	Total	Concentrate	Blister	
						de Ore	na)	·		Ŭ		

e) Revenue and Marketting Cost

The copper price of UK. ±694.5 per ton as of May 10th, 1978 is applied to the gross revenue estimation.

The actual gross revenue is assumed to be 99% of the copper price above mentioned, according to the recent sales contract.

The exchange rate of US.\$ 1.795 for UK \pm 1 as of May 10th, 1978 is used for conversion from one to the other.

The following assumptions are made for the marketting costs on the basis of the actual contracts in 1977.

Inland Freight (Jinja-Mombasa)		
& Port Handling Charge	32.413	US.\$/ton
Ocean Freight	87.632	US.\$/ton
Refining Charge(incl. sales commission, sampling & others.)	200.882	US.\$/ton

f) Accumulated Loss

The accumulated loss of Kilembe Mines Ltd. is estimated at US.\$ 12,515,375 by the end of November, 1977. A sum of US.\$ 7,050,976 has been loaned from the Berclay Bank of Uganda by the end of October,1977.

No information is available in regard to the financial status of Kilembe Mines Ltd. after the above period.

The accumulated loss and loan by the time of resuming production (March 1 st, 1980) are estimated by assuming as follows;

Monthly Expenses	US.\$
Salaries and Wages	385,408
Incidentals	43,641

The incidental expense is assumed at US.\$ 87,282 for the month of December 1977, and there-after at US.\$43,641 monthly.

It is also assumed that the capital expenditure, the accrued expenses and interest on the bank loan be loaned from the Bank. The interest rate on the bank loan is assumed at 8% per annum.

The accumulated loss, loan and interest as of February 29, 1980 are estimated as follows;

Accumlated loss

US.\$ 26,620,768

Accumlated Loan and Interest	US.\$ 23,171,010
Loan and Interest for the Capital Expenditure	US,\$ 14,730,089
Total Loan as of Feb.29,1980	US.\$ 37,901,099

g) Operating Profit (Loss)

In case that the monthly operating profit is negative(loss), the monthly loss is assumed to be restored by bank loan (overdraft) every month at an interest rate of 8% per annum. The interest on the monthly loan is included in the monthly operating cost. The accrued loan and interest at the year end are accumulated at an interest rate of 8% per annum by the end of the production.

In case that the monthly operating profit is positive, it is treated in the same manner as above, only in reversed sign. It is based on the assumption that the monthly operating profit be retained at an interest rate of 8% per annum.

3-1-2 Result of Cash Flow Analysis

The cash flow analysis is made by using a computor IBM 360-168, and its result is given in Table 27.

The result indicates that an annual loss ranging between US.\$ 1,693,000 and 2,063,000 is anticipated every year during the period of the production on the basis of the assumptions given in the proceeding section. The total loss will amount to US.\$ 8,994,000 by the time of exhausting the given ore reserve, in addition to the accumlated loss of US.\$ 26,620,768 before starting the production.

The bank loan and interest will be accrued to US.\$ 62,403,000 at the end of the production.

The project is apparently unprofitable on the basis of the assumed copper price, UK \pm 694.5.

TABLE 27-A OPERATING PRUFIT	(LOSS) STA	STATEMENT	1-1-0N	ON)	MARK 1 .000US\$)	JS\$)
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1 DRE MILLED 2 GRADE 3 BLISTER PRODUCTION TONS 1	1 600000	600000 1 600000 1 10 941 10 36541	2000000 500000 1026541 1026541	600000 1 600000 1 1 • 941 10365 • 1	472500+1 1+881 7910+1	2872500
4 GROSS REVENUE (+000USH)	129224	1 72922a1 12322a1	12922•1 12922•1 102555•1	12922#1 102555#1		61549 61549 488483
FREIGHT ON RAIL DCEAN FREIGHT RIFINING CHARGE E		1 10 20 10 1 10 00 00 1 10 00 00	0000	336 336 208 208 208 208 20 20 20 20 20 20 20 20 20 20 20 20 20		1001 4324 9928
9 TULAL SHIPPING + NAFKELING	I 332741 I 2640141 I	332741 2640141	3327#1 1 26401#1 *	3327e1 26401e1 1	20148+1 20148+1 20148	158450 1257530
11 PROSPECTING 12 DEVELOPMENT + DRILLING 13 STOPING	1 50.1		50•1 50•1	1 = 4 9 0 9 0 1 = 4 1 =	557•1	151. 3230. 8733
A HOIST + TRAMMING MINE ADMINISTRACTION		004	4 6 6 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7		1 1 1 1 1 1 1 1 1 1 1 1 1 1	NO 1000 1000 1000 1000 1000
TECHNICAE SEKVIS ENGINEERING ADMINISTBATTON +			2 0 0 2 0 0 2 0 0 2 0 0 2 0 0 0 0 0 0 0	17988 1799 1	1 0 0 0 4 1 0 0 0 4 1 0 0 0 0	04852 4936 4936 4936 4936 4936 4936 4936 4936
CONCENTRATOR SMELTING	10874		1.0261	1087	- 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0	5252 9520
OTHERS FREIGHT	1 462•] 1 466•]		462•1 466•1	462•1 466•1	385.	2232
23 BANK INTEREST 4 PROV FOR APPROPRIATION	1 63°	63.1 144	699 144 144	61+1 144+1	62#1 120#1	313
25 TOTAL PRODUCTION EXPENSES 26 (+000USH)	11341.	11341 1341 196009	113414 19009	11289 89594	9386a 74489 a 14489 a	54698 434111
PERAT	13856	13856+1	1746e1	-1693-1 -1693-1 -13440-1	-2063.I -16373.I	
29 OVERDRAFT FOR OPERATION 30 "FOR CAPITAL COST 31 " ACCUMLATED	I 1746. I 15908. I 25023.	3631+1 3631+1 17181+1 27025+1	2918566	7815 2040 31522	10503.1 21376.1 33523.1	10503 18277 33623
2 ØVERDR 3 #	1 42677 . 1 338709 .	47837.1 379662.1	5341001	59377 * 471242•	65502+1 519859+1	62403 495262
34 ACCUMLATED PROFIT (+000USH) 35 ************************************	r -28367+1	1 = 2389894			-282659e1	F
, , , , , , , , , , , , , , , , , , , ,	******	, : : : : : : : : : : : : : : : : : : :				

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NO.ª L+I 1.795 32.413 200.882 55028. 38489. 87,632 55696 9 60 00 97299 90545 . 4.69 4203 50396 48973 49901 34312 64145 12017 -2662] ***** PARAMETER LIST (3/1) 5/M) € /M) (M/8) (W/\$) (\$/L) (3/5) 67.9 \$/W) (M/ S (M/8) (W/\$) €/¥ (\$ / L E A ₽ /₩ PROV. FOR APPROPRIATION ACCUMLATED PROFIT ROSPECTING EVELOPMENT + DRILLING N/N ドン WINE ADMINISTRATION TECHNICAL SERVISE **** HOIST + TRAMMING FREIGHT ON RAIL BANK INTREST ADMINISTRATION CONCENTRATOR ON RAI FINING CHARG RECOVER' EXCHANGE RAT **NGINEERING** FREIGI RECOVE ONC. GRADE METAL PRICE FABLE 27-B AOISTURE SMELTER OTHERS **ELISTER** STOPING FREIGHT EAN F 5 4 2

3-2 Variations

3-2-1 Ore Reserve

Assuming the ore reserve of 4,120,110 tons at a grade of 1.69% Cu, the cash flow analysis is made in the same manner as in the standard case.

Of other standard assumptions, the expected mill recovery is altered to 92.20% in accordance with the mill head grade of 1.69% Cu. The production schedule is accordingly modified as shown in Table 28. The mine life is prolonged to 6.9 years from 4.8 years of the standard case.

The computor out-put of the cash flow analysis is given in Table 29. The operating loss, ranging from US.\$ 2,967,000 to 3,117,000, will be accumulated up to US.\$ 21,078,000 by the end of the production, on top of the accumulated loss before starting the production.

The accrued loan and interest will amount to US.\$ 88,713,000.

This case is more unprofitable than the standard case.

3-2-2 Copper Price

Assuming that there happens to be a sudden improvement in the copper maket in the immediate future, the standard evaluation is re-examined for various copper prices.

The total operating loss and profit will be balanced at the copper price of UK± 792 .

The cash flows for the copper prices 20% and 40% higher that of the standard assumptions are estimated and given in Table 30 and 31.

In the former case, at the copper price of UKE 833.4 per ton, the annual operating profit is expected to range from US.\$ 935,000 to 988,000 except for the last year of the production, when the annual operating loss of US.\$ 30,000 is incurred. However, the operating profit including interest (Negative overdraft) is far in sufficient to pay off the accrued loan and interest for the capital expenditure.

In the latter case, at the copper price of UK.5 972.3, the annual operating profit will exceed US.\$ 3,500,000 except for the last year. The retained operating profit with interest is expected to surplus the accrued loan and interest for the capital expenditure by US.\$ 1,385,000 at the end of the production. The accrued loan and interest for the capital expenditure will be paid off at a copper price of UK.5 960.

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TABLE 28 PRODUCTION SCHEDULE(II)

	n v v	1.95	2.06	1.85	I.41	1.29	1.74	1.69	28.5	66
Total	Tonnage	892,300	171,400	767,700	1,151,010	367,740	769,960	4,120,110	225,260 2	61_603_8
	n S K	1.96	2.06	1.85	1.41 1.	1.29	1.74	l.69 4,	28.5	66 6
HI 2	Tonnage	112,300	21,400 2	95,700]	143,010 1	49,740	97,960	520,110	28,436	2 777 7
	۳ Cu	1.96	2.06	1.85	1.41	1.29	1.74	1.69	28.5	. 00
6 TH	Tonnage	130,000	25,000	112,000	168,000	53,000	112,000	600,000	32,804	67.0 2
	°. %	1.96	2.06	1.85	1.41	I.29	1.74	1.69	28.5	00
ET 2	Tonnage	130,000	25,000	112,000,	168,000	53,000	112,000	600,000	32,804	120 0
••••••	% Cu	1.96	2.06	1.85	1.41	1.29	1.74	1.69	28.5	00
4 TH	Tonnage	130,000	25,000	112,000	163,000	53,000	112,000	600,000	32,804	- - - - - - - - - - - - - - - - - - -
	n %	1.96	2.06	1.85	1.41	1.29	1.74	1.69	28.5	00
3 RD	Tonnage	130,000	25,000	112,000	168,000	53,000	112,000	600,000	32,804	, 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	۳ % ۲	1.96	2.06	1.85	1 41	1.29	1.74	1.69	28.5	
2 ND	Tonnage	130,000	25,000	112,000	168,000	53,000	112,000	600,000	32,804	r F () ()
· ·	си С С	1.96	2.06	1.85	1.41	1.29	1.74	1.69	28.5	
l ST	Tonnage	130,000	25,000	112,000	168,000	53,000	112,000	600,000	32,804	7 7 0
Year		Eastern	Stream	Buhunga/ Namhuga	Upper Bukangama	Middle Bukangama	Lower Bukangama	Total	Concentrate	
			J	<u></u>	910 8		<u>ا</u> ا	L, _, _, .,	Ĉ	

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TABLE 29-A OPER	ATING PRO	(LOSS)	STATEMENT	N0+2+1		(NO MARK	1350000	
ł	1 157 YEAR I	ŧω	3RD YEAR I	4TH YEAR 1	5TH YEAR I		7TH YEA	TOTAL
I 1 ORE MILLED I 2 GRADE I 3 BLISTER PRODUCTION TONS I I 3 BLISTER PRODUCTION TONS I	60000000000000000000000000000000000000	1691 14691 14691	169 • 1 169 • 1 169 • 1 169 • 1 169 • 1	16991 19991 19991	1+1798 1+1798 1+1798	1900009	520110•1 1+691 7777•1	1 +120110+1 4 +120110+1 4 +120110+1
I 4 GROSS REVENUE (*000UJSH)		11184+1 88761+1	11184•1 88761•1	11184 11184 88761 81	**************************************	8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7695. 76963.	760951001
I 6 FREIGHT ®N RAIL J/M I 6 FREIGHT ®N RAIL J/M I 7 OCEAN FREIGHT I 8 RIFINING CHARGE ETC I 9 TOTAL SHIPPING * MARKETING	879 - 12 879 - 12 870	2291 808 802 879	1 N N 00 00	10.000	8791	1 N N 00 00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1001-1001-1001-1001-1001-1001-100000-1000-1000-100000-1000000
F	1 22850•1 1	22850e1	22850•1	22850.1	22850#1	22850.1	1,9808e1 *	156910•1
III PROSPECTING III DEVELOPMENT + DRILLING III DEVELOPMENT + DRILLING		0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	00 00 00 00 00 00		i vo	1 30:U 1 50 0 1 50 0	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
114 HOIST + TRAMMING 115 MINE ADMINISTRACTION	1 • 660 • 1 660 • 1						6059 I	16767 + 1 4567 + 1 2848 - 1
6 TECHNICAL SERVICE 7 ENGINEERING	I 588•I	588•1 1799•1	un (~	588 799	588.1	1799	539•1 1649•1	4065°I 12442°I
ILS ADMINISTRATION + GENEEXP. 119 CONCENTRATOR	I 1168•I I 1087•I	1.168.1	1168.1 1087.1	1168#1 1087#1	1168a1 1087a1	1168•1 1087•1	1070.I 996.I	8076e1 7515e1
O SMELT	I 1970•I I 462•I	1,970,1 1,627,0	ው ጥ	6 4 7 9	1970e1 462e1	1970-1	1806eI 423eI	13624-1
N m	1 40341	1+604	403•1 109•1	403.1	403•1 107•1	403-1	350.T	2770e1 1+127
4 PROV. FOR APPROPRIATION	1 144ª 1	144#1	44	144ª	1 0 7 7 1 1 0 7 7 1 1	1444	132•I	1 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.
5 TOTAL PRODUCTION EXPENSES 6 " " 1.000	11325•1 11325•1 11325•1	11325 89877 89877 11325		11272 89462	11272a1 1272a1 19462a1	11272 9462	316 872	78106+1 619889+1 19889+1
ERATING	1 - 3020e I 1 - 3020e I 1 - 239666 - I		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12967	12967	+2967+) •23551+]	I ● 2 E 2 5 2 ₩ 1	167289-1
129 DVERDRAFT FOR OPERATION 130 " FOR CAPITAL COST 131 " ACCUMLATED	1 - 25029 - 1 25029 - 1 25023 - 1	6281+1 17181+1 27025+1	9803.1 18556.1 29187.1	13555-1 20040-1 31522-1	1760 1760 1649 1649 1649	21983•) 23375•) 36767•)	26858•I 25245•I 39709•I	2685841 2685841 22685841 321266
132 OVERDRAFT TOTAL 133 " 1	1 343952¢1 348823¢1 1 348823¢1	5048761 1+199004	57546 . 1 456717 . 1	5511 516802 516802	73294 I	82125+ 651784-)	91812 728669#1	8871391 70407491 1
134 ACCUMLATED PROFIT (+000USH)	X X I + 295641 • I I 1 235244 • I I 1 1 1 X + 1 X +		10891 1080 1080 1080 1080 1080 10 10 10 10 10 10 10 10 10 10 10 10 10	1 306484	1330278a1	135383	1 +378566+1	

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367.ªI 32.413 87.632 6.94.90 164145 38489 12017. **≈26621**¢ 200.882 92 a Z 28.5 499014 5 S 150396. 55028 34312 97299 505 55696 4203 48973 90545 (M/S) ("// 5) (\$ / M) (\$/W) (M) 8 (M/ \$) (M/S) (W/ 3) (& / M S/M (8) х 9 ¥/\$ PROV. FOR APPROPRIATION (S/M 18/L PROSPECTING DEVELOPMENT + DRILLING MINE ADMINISTRATION TECHNICAL SERVISE ACCUMLATED PROFIT PUIST + TRAMMING REFINING CHARGE FREIGHT ON RAIL ADMINISTRATION ON RAI RECOVERY RIF. RECOVERY CONCENTRATCR SMELTER KCHANGE RAT ENGINEERING BANK INTREST EAN FREIGT CONC. GRADE MOISTURE METAL PRICE STOPING BLISTER LHD I HAN OTHERS 52 4 ò 12 \sim 3 ထ ø σ

TABLE 29-B ***** PARAMETER LIST ***** N0,2*1

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OPERATING PROFIT (LOSS) STATEMENT NO.1.2

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JTEM 	IST YEAR I	ZND YEAK I	3RD YEAR I	4TH YEAR I	5TH YEAR I	TOTAL T
MILLED TONS I E 100 STER PRODUCTION TONS I I I	600000 1 941 10365 1 1	6000000 1 941 1 941 1 0 365 0 1 1 0 365 0 1	400 10	600000 I 10941 10365#1 10365#1	1 - 200 1 - 20	2872500 . I I 49372.I I
REVENUE (,000USH) I	15506.1 123066.1 123066.1	123066+1	15506.1 123066.1 123066.1	15506e1 123066e1	11834•1 93917•1	19859#1###
FREIGHT ON RAIL J/M I DOCEAN FREIGHT UN RAIL J/M I DOCEAN FREIGHT RIFINING CHARGE ETC	20802 20801 20802 20801	* 1 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2	336.1 *	336=1 336=1 208=1 208=1 208=1 208=1	2566 2566 2589 2589 2689 2689 2689 2689 2689 2689 2689 26	160001 160001 432701 991801
SHIPPING + MARKETING I 1 (+000USH) I 1	3327•1 26401•1	3327•1 26401•1	3327 3327 26401	3327•1 26401•1	2539.I 20148.I I	1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 2 1 1 2 2 2 2 1 1 2 2 2 2 1 1 2 2 2 1 1 1 2 2 2 1 1 1 2 2 1 1 2 2 2 1 1 2 2 2 1 1 2 2 2 2 1 2
L PROSPECTING DEVELOPMENT + DRILLING I	50% I	6 50 e 1	50 • L	668 ∎ 568 ∎		151#1 3230#1
VG TRAMMING	1805•1 660-1	1805.I	1805.I 660.I	1805•1 660-1	1504aI 550aI	8723.1
ADMINISTRACTION			(F) F () (+12+1 +12+1	19 10 10 10 10 10 10 10 10 10 10 10 10 10	100 100 100 100 100 100 100 100 100 100
	1+6621	1-99571	1,799.1	n r~	190691	
ISTRATION & GENERALS I	1087.1	1168 1	1168.1 1087.1	116841	973#I 905#I	5643#1 5252#1
1 SU 2	1-0791	1*0261	1970 <u>-</u> 1	ion is	1641.81	9520.1
	4004 466e I	4004 4004	40201 4660	100/01 100/01	2000 2000 2000 2000	2220+1
INTEREST 8% I FOR APPROPRIATION 1	1944 1444 1444 1444	1044	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.20.1	136e I 697ei
OTAL PRODUCTION EXPENSES 1 (*000USH) 1	11244•1 89240•1	11244 1 1244 1 89240 1	11244 1 89240 • 1 1	11192 11192 88825	9325#1 74004#1 1	1 14249 134249 190549
RATING PROFIT (+000USH) I	1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 +	1 - 4 2	935•1 7424•1	* 1 * 0 * 1 * 0 * 88 * 0 * 0 * 0 * 0 * 0 * 0 * 0 * 0 * 0 * 0		14 14 14 14 14 14 14 14 14 14 14 14 14 1
REPRAFT FOR DPERATION I RPRAFT FOR CAPITAL COST I R ACCUMLATED I		1 1 9 4 6 4 1 1 7 1 8 1 4 1 1 7 1 8 1 4 1 2 7 0 2 9 4	18556 I	20040 . 1 31522 . 1	21376#1 23623#1	182779=1 182776=1 3362341
DVERDRAFT TOTAL (+000USH)I	3174296.1 317429.1	42260+1 335399+1	6 .7	47294a1 375352a1	50420a1 400159a1	47321e1 375563e1 375563e1
CCUMLATED PROFIT (*000USH)	-25686+1 -25686+1	-196429 I				* ***

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2-1-SN TABLE 30-8 ****

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0 t 1 M - 0 M - 1 N - 0 0 M	0 9 0 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	N 00:00 10 N 00:00 10	5000 5000 5000 5000	4 4 9 9 4 9 4 9 4 9 4 9 4 9 4 9 4 9 4 9	200 PH
(ト/エ) (キ/エ) (キ/こ) (キ/こ)		ጽ ጽ ጽ ም ት	(8/M) (8/M) (8/M)	(X/4) (X/4) (X/4) (X/4)	
METAL PRICE EXCHANGE RATE FREIGHT ON RAI OCEAN FREIGT	REFINING CH MILL RECOVE RIF. RECOVE	BLISTER CONC. GRADE MOISTURE PROSPECTING	DEVELOPMENT + DK STOPING HOIST + TRAMMING WINF ADMINISTRAT	TECHNICAL SERVI ENGINEERING ADMINISTRATION CONCENTRATOR	0 SMELTER 1 OTHERS 2 FREIGHT ON RAIL K/J 3 SANK INTREST 4 PROV. FOR APPROPRIATION 5 ACCUMLATED PROFIT

PARAMETER LIST *****

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(LOSS) STATEMENT OPERATING PRUFIT

53800.1 16523¢1 131136¢1 86168 I 683876 32239 1 255863 1 15845•1 [25753•1 2872500#1 1600e1 4327e1 9918e1 151e] 3230e] 5252. 2232• 2220• •585• 697. +19662_{\$} 33623* 8723**.** 3192**.** 1990**.** 2840• 8694• 56430 9520¢ 8277. 49372e 426987° TOTAL 10098.1 180142.1 I IST YEAR I ZND YEAR I 3KD YEAR I 4TH YEAR I 5TH YEAR I -19662°I 21376eI 35338.1 190851 105570 2539a1 2004.1 15903.1 1910161 256**.**] 693**.**] 550.1 343.1 490.1 973.1 9263.8. 472500. 20148.01 557. 499] 905. 356. - 0 g -120 a. 336234 904 e 13519° 1589. 641. 385. -12102 I 18091-1 35212#1 279461#1 11095e1 88056e1 3669 29120ªÎ 1,941 336.) 908.] 2082.01 3327.1 716350 20040 31522 600000a] 26401. 133 10365. 168. 668* 799* 087. 970. 462. 4660 660**.** 588. -15771.I 18091•I 143577•I 36001•1 285723•1 3617,1 28704.01 18556.I 29187.I 600000°I 336•1 908•1 2082.1 3327.1 26401.1 50.] 668.1 087.4 970 88471. 1°94] -664 466. 144 10365 660. 168. 1147. ell741e 462. el31. N0.1-3 =19387. =153869.1 18091.1 143527.1 1114791 88471+1 3617.1 28704.1 -7523•1 17181•1 27025•j 1,941 10365 1 3327°I 26401eI 6000004 336•] 908•] 2082•] 50.41 366834 291137al 668. •026 466. 1444 660. 087. 462+ 168. #131. 805. 6 #23004 J 18091.I -3617.1 15908.1 25023.1 3617•1 28704•1 37315°I 296149•I 600000°I 336 • I 908 • I 2082.1 3327.1 26401+1 668•I 1,941 50. [805.] 799. 168.1 466. 144. 11147. 88471•1 087. 970. 4620 a131.e 10365+ 660. (+SUDDO+) 10NS 13% 10NS 10NS (+SU000+) (HSU000+) (HSU000+) (HSU000+) (+SU000+) 28 80 9 TOTAL SHIPPING + MARKETING FOR OPERATION FOR CAPITAL COST 25 TOTAL PRODUCTION EXPENSES ADMINISTRATION + GEN.EXP. CONCENTRATOR PROV. FOR APPROPRIATION PROSPECTING DEVELOPMENT + DRILLING HOIST + TRAMMING MINE ADMINISTRACTION 5 TECHNICAL SERVICE 7 ENGINEERING FREIGHT ON RAIL K/J BANK INJEREST FREIGHT ON RAIL J/M. OCEAN FREIGHT ACCUMLATED RIFINING CHARGE ETC ORE MILLED GRADE BLISTER PRODUCTION 34 ACCUMLATED PROFIT 35 27 OPERATING PROFIT 32 OVERDRAFF TOTAL 33 TEM GROSS REVENUE ********** 29. OVERDRAFT -----SMELTING STOPING OTHERS z 5 4 50 ¢ æ Ē

(NO MARK : .000USS)

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TABLE 31-A

TABLE 31-B

NG	8	72.	I.*795	41	•63	88.	٠	95 e	66°	28 e 5		20	ഹ	99	5502	431	48973 .	990	23	O	164145*	38489°	6 	a Ø		
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*** PARAMET		·		W/0 -		Ŵ		·.					DRILLING		D N	ATION	с Ш С		:				L ×/J		CURIATION	E H
* * * * * * * * * * * * * * * * * * *	1 1 1 2	IL PRICE	×	ON R	IN PREIGT		, RECOVERY	RECOVERY	STER	GRADF.	STURE		LOPMENT +	e i	5T + TRAMMING	Ë	_	NIN		O L V			Z O	INTRE	. FOR APPR	ED PRC
T ABI E		1 META		и Ш Н П Н П Н С				7 RIF.									16 TECHNICA	\sim	ω	σ	0	r1	N		C.	5 ACC

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ATION FOR METAL PRICE VS. OPERATING PROFIT TOTAL ***** (OPERATING PERIOD ; SEVEN YEARS) ODERATING PROFIT = 146,80 * METAL PRICE * 128809 MARGINAL POINT1 (OPERATING PROFIT TOTAL = 0) ; 878 (L/T) MARGINAL POINT2 (CPERATING PROFIT TOTAL = CAPITAL COST) ; 1029(L/T) MARGINAL POINT3 (OPERATING PROFIT TOTAL = CAPITAL COST) ; 1299 (L/T)	10000 2000 4000 0P- PROFIT TOTAL (,000UJSS)
FIG. 33 ***** EQUATION	■ 20000 ■10000 0 750 = + 850 = + 950 = + 2000 = + 2000 = + 2000 = + 2000 = + 2150 = + 2250 = + 2350 = + 2600 = + 2600 = + 2650 = +

	** I 1ST YEAR I	ZND YEAR I	3RD YEAR 1	4TH YEAR I	5TH YEAR I	6TH YEAR 1	7TH YEAR I	TOTAL
1 DRE MILLED 2 GRADE 3 BLISTER PRODUCTION 70NS	x00009 190009 190009 1191468 1191468 1191468 1191468 11914 11911	60000+1 60000+1 8971+58	1 1 1 1 1 5 9 1 1 5 9 1 1 5 9 1 1 5 9 1 1 5 9 1 1 5 9 1 1 5 9 1 1 5 9 1 1 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 + 00000 1 + 60000 1 + 691 1 + 691 1 + 100 1	* 100 100 100 100 100 100 100 100 100 100	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
4 GROSS REVENUE (+000USH)	**************************************	1342141 1342141	10651401	13421+1 106514+1	13421-1-4 13421-1 106514-1	13421+1 106514+1	11634eI 92331eI I	92158.1 73141281
6 EREIGHT ON RAIL J/M 7 OCEAN FREIGHT 8 RIFINING CHARGE ETC	X ************************************	291.1 786.1 1802.1	291•1 291•1 786•1 1802•1	291e1 786e1 1802e1	29101 78601 18020	291-1 786-1 1802-1	252•1 681•1 1562•1	1997e1 5399e1 12375e1
9 TOTAL SRIPPING + MARKETING 10 (+000USH)	2879•1 22850•1	2879.1 2285041	22850+1 22850+1	2879e1	2879#1 22850#1	2879•1	2496.1 2496.1 9808.1 1	19771+1 19771+1 156910+1
11 PROSPECTING 12 DEVELOPMENT + DRILLING				1 0		1 00 1 9 1 9	1 o	
13 SUPPING 14 HOIST + TRAMMING	I 1805. I 660. I	n n	1805e1 660e1	1805•1 660•1	1805+1 660+1	1805•1 660•1	1654e1 605e1	124830
J5 MINE ADMINISTRACTION 16 TECHNICAL SERVICE	T 41241	41241 58841	412+1 588+1	412•1 588•1	412#1 588#1	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	377.1	2848.
17 ENGINEERING 18 ADMINISTRATION + GEN.EXP.	I 1799.I I 1168.I	0 00	79	P	146671 1468#1	1799*1 1168•1	1649.1	1244201 807601
15 CONCENTRATOR 20 Smelting	I 1087•I I 1970•I	10261	1087.1 1970.1	1087.1	1970.1	1087.01	996ø1 1806•1	50
- 2	I 462ªI 403•I	462•I	462 •1 403 •1	462•1 403•1	462 m I 403 m I	4004 4003	4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	51
3 BANK INTER 4 PROV. FOR	I 25•1 144•1	1 * 7 * 1 7 * 7 * 1 1 * 7 * 1	25 - 1 2 4 4 - 1	23 I 144	23•1 144#1	23.	36•I	182.
25 TOTAL PRODUCTION EXPENSES 26 (+000USH)	I 1241. 189211. I	11241.01 89211.1	11241 •1 19211 •1 19211 •1	11188 88796e1 1	1 196788 188796	111288 11288 11288	10251+1 10251+1 81354+1	77538• 615377*
*	* 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	₩ >=t == ===============================		8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	126474 15424 151335 15135	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	=1113•1 =8831•1	#5150 #60875
29 OVERDRAFT FOR OPERATION 30 ************************************	**************************************	145401 17181-1 270254	2270 1 2270 1 2918756 1	3098	39924 39924 3404434 340444	23375=1 23375=1 36767=1	6468 • I 25245 • I 39709 • I	6468 22146
OVE	1 41631•1 330405•1	45660*1 362382•1	50013•1 396925•1	54660e] 433808e]	59679. 173646. 1	65101. 516671.	71422+1 566841+1	683230 5422460
354 ACCUMLATED PROFIT (1000USH) (1000USH)	X⇔========= I = 27320⊕I I = 216826⊕I I = 216826⊕I			+233056	=====================================	= 3322 = 1		
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(NO MARK : 000US\$)

UPERATING PROFIT (LOSS) STATEMENT NO.2.2

TABLE 32-A

N0,2-2 833.4 1.795 32**.**413 87**.**632 164145• 38489• ດ ຄື 4203. 200.882 28.5 55696# 50396 56 55028 97299 92 ŝ 34312 48973 90545 12017 49901 =26621 (\$/L) (\$/L) (\$ /W) (3/L) (W/S) (8'N) (W/S) (3/5) (M/ S) (\$ / M) (\$/W) (W/5) Я К \$ / H (W/9 (L/T ۲ ۲ \$ /M 8 28 96 PROV. FOR APPROPRIATION PRILLING アン HOIST + TRAMMING VINE ADMINISTRATION ECHNICAL SERVISE ACCUMLATED PROFIT REFINING CHARG ADMINISTRATION CONCENTRATCR FREIGHT ON RAL BANK INTREST ON RAI . RECOVERY PROSPECTING DEVELOPMENT + STOPING RIF. RECOVERY CHANGE RATI ENGINEERING CEAN FREIGT METAL PRICE CONC. GRADE **NOISTURE** SMELTER BLISTER RETGER DTHERS NILL ທ່ ŝ 4 ∞ σ N

PARAMETER LIST ***** TABLE 32-B

TABLE 33-A UPERATING PROFIT (LOSS) STATEMENT NO.2.3

(NO MARK : +000USS)

	I IST YEAR I	і Ш			5TH YEAR I	6TH YEAR 1	I 7TH YEAR I	TOTAL
1 DRE MILLEED TONS 2 GRADE % 3 BLISTER PRODUCTION TONS	6000041 16941 19941 19941	1 + 1268 1 + 60000 1 + 691 1 + 1268	600000	1 = 1 7 2 8 1 = 600000 1 = 6 7 2 8 1 = 1 7 2 8 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1 7 1	1691 1991 1991	169 • 1 169 • 1 169 • 1 169 • 1	169-1 169-1 169-1 169-1	4120110. 61605°
4 GROSS REVENUE (+000USH)	** I 15657eI I 124266eI I	12426641	15657e1 15657e1 124266e1	124266a1	124266#1	15657a 124266e	1 1 1 1 1 1 1 1 2 2 3 1 1 1 1 1 2 2 3 1 1 1 1	107518• 853314•
6 FREIGHT ON RAIL U/M 7 OCEAN FREIGHT 8 RIFINING CHARGE ETC	1 291 1 291 1 286 1 280 2 1	291+1 786+1 1802+1	291+1 786+1 1802+1	291•1 786•1 1802•1	291e 1 291e 1 286e 1	1919 1919 1919 1919 1919 1919 1919 191	1 252•1 681•1	12375e
5 TOTAL SHIPPING + MARKETING 10 (1000USH)	2879•1 2879•1	2879	2879+1	2820 2820 2820 2820 2820 2820 2820 2820	2879	2879*1	2496 19808 19808	19771 1569100
I PROSPECTING 2 DEVELOPMENT + DRILLING 3 STOPING		200 200 200 200 200 200 200 200 200 200	808 1 805 1		1 00			151-151-151-151-151-151-151-151-151-151
4 HOIST + TRAMMING 5 MINE ADMINISTRACTION 6 TECHNICAL SERVICE	I 660•I I 6412•I 588•I	660#1 4120 588	φ ⊷•∞	6 6 6 7 8 7 8 7 8 8 8 8 8 8 8 8 8 8 8 8	√ 0 ~ + 00	5 4 6 5 4 1 5 4 1 1 5 4 1 5 1 5 4 1 5		4067e 2867e 4055e
7 ENGINEERING 8 ADMINISTRATION + GEN.EXP.		799	108	0.01	- ~ ~ i	1168	040 1040	12442
			ወሎወ	1970 - 1 1970 - 1 462 - 1		1970*) 1970*)		13624
22 RREIGHT ON RAIL K/J 23 Bank Interest 24 prove for Appropriation		400 1950 1950 1950 1950 1950 1950 1950 19	4 00 4 4 00 4 4 0 4 0	403a1	40341 144141	044 044 044	979 979	2770 #3864 997
25 TOTAL PRODUCTION EXPENSES 26 (*000USH)	1 1 1 1 1 1 1 1 2 7 4 1 1 1 1 1 2 7 4 1 1 1 1 1 2 7 4 1 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 4 1 1 1 5 7 1 1 1 5 7 1 1 1 5 7 1 1 1 5 7 1 1 1 5 7 1 1 1 5 7 1 1 1 5 7 1 1 1 5 7 1 1 1 1	11157. 88546.	11157• 88546•)	11104 8813041	11104#1 88130#1	11104+	10185 10185 101837 1018 10	76969 610865
ATING	12870e1	1622e1 12870a	12870.	1232850	1974 - 1 1978 - 1 1328 5 -	13285	10420 1040 1040 1040 1040 1040 1040 1040	10778
25 OVERDRAFF FOR OPERATION 30 "FOR CAPITAL COST 31 " ACCUMLATED	I 15909 I	-3373*1 17181•1 27025•1	-5264• 18556•	7359		=12066	13922•1 25245•1 39709•1	*13922 *13922 221469 39709
32 OVERDRAFF TOTAL (+000USH) 33 "	1 - 26116 1 - 263108 1 - 263100 1 - 263100 1 - 2631000000000000000000000000000000000000	40833• 324072•	42479 337133	1 44203.	46065. 365595.	1 48076. 1 381558.	н н н н н н н н н н н н н н н н н н н	47933. 380417.
35 ACCUMLATED PROFIT (1000USH)	*	• • • • • • • • • • • • • • • • • • • •	I =172669.	159384	1 1 2 6 0 9 9 e	1 #16735	1 25739 1 1 225739 1 1 225739 1	
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N0,2-3 32.413 1.795 972.3 ഹ ജ യ 28.5 4203. 55028 e 55696. 50396. 34312* 200.882 92 . **6**66 49901 97299 38489 12017 -266214 90545 64145 48973 24 PROV. FOR APPROPRIATION (\$/M) 25 ACCUMLATED PROFIT (3/L) (e / L) (J/s) (W/S) \$ /M) 5 /M) (W/\$) (%/%) (%/%) (3/5) €/14 € / M) (≅∕\$ (M/8 (M/3) <u></u> Т С ROSPECTING EVELOPMENT + DRILLING とくつ N N MINE ADMINISTRATION TECHNICAL SERVISE HOIST + TRAMMING EFINING CHARGE FREIGHT ON RAIL BANK INTREST ADMINISTRATION ON RAI RECOVERY . RECOVERY EAN FREIGT CONCENTRATOR XCHANGE RAT NGINEERING ONC. GRADE METAL PRIC OISTURE DNIGOTS LISTER SMELTER REIGHT THERS Ц П С 0 ∾ m N œ თ 2

***** PARAMETER LIST **** T ABLE 33-B

Provided that the copper price of UK.±1270 per ton be attained, all the debt, including the accumlated loan and interest before starting the production, could be written off. However, such a high copper price is highly improbable at the present market situation.

The relation between the copper price and the retained operating profit (loss) is shown in Fig 32.

In the case of the ore reserve of 4,120,110 ton at a grade of 1.69% Cu, the operating profit will be expected for higher copper prices than UK.± 878 per ton(Table 32). The copper price of UK.±1029 will be required to pay off the accrued loan and interest for the capital expenditure.

An extraordinarily high copper price such as UK. \pm 1299 per ton will be needed for the write-off of all the debt (Table 33).

The relation between the copper price and the retained operating profit is shown in Fig 33.

At any event, a much higher copper price than that prevailing at the present time will be essential to make the project profitable.

3-2-3 Others

The following factors will be influencial to the profitability of the project. However, they are not taken into account for the cash flow analysis, because it is hardly possible at the present time to estimate their values and/or costs due to many unknown elements.

a) Number of Staffs and Labours

If it is possible to decrease the number of the staffs and labours, without affecting the production, the operating cost will be substantially improved, because the salaries and wages account for more than 45% of the operating cost. At the present time, it is difficult to estimate the optimum number of the staffs and labours as afore-mentioned (1-9-2).

However, it is recommended to decrease the number by increasing the productivity per person as the operation proceeds.

b) Location of Smelter

The Kilembe Mine and the Jinja Smelter are located some 500 km apart from each other.

It is considered to move the Smelter to the site in proximity with the Kilembe Mine. However, the preliminary estimation indicates that the construction of a new smelter will require approximately US.\$14,200,000(2-9-3) which is more than three times of the investment for the improvement of the existing Jinja Smelter.

In general, the production rate of 50,000 tons per month appears to be too small to justify the construction of a new smelter.

c) Sales of Concentrate

It seems to be easier to find a market for the Cu-concentrates than for the blister. If it is possible to sell the Cu-concentrate instead of the blister, no capital expenditure is necessary for the reconstruction of the Jinja Smelter. On the other hand, the transportation cost per copper metal ton will become higher.

There is another problem to market the Cu-concentrate, that is, the availability of the stock yard for the concentrate at Mombasa.

d) Recovery of Cobalt

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The ore of the Kilembe Mine contains an appreciable amount of cobalt as afore-mentioned. The cobalt occurs mostly in close affiliation with pyrite without forming any specific cobalt minerals, although a minor amount of siegenite has been identified (Appendix-5, 1-2-3 b)). The distribution of cobalt in the products of the Kilembe Mine for the years, 1968, 1971, 1974 and 1976 is tabulated in Table 34. The pyrite concentrates, which are stock piled in an open dam near the filter plant, appear to contain more than 1.3% of cobalt according to the production record in Table 34.

Most of cobalt supplied to the world market at the present time is recovered from copper and/or nickel ores containing 0.1 to 0.5% of cobalt (Table 35) as by-product.

The cobalt grade of the ore in the Kilembe Mine seems to be moderate in comparison with those in the presently producing mines. However, the cobalt content in the concentrates is rather low and hardly possible to be increased by way of flotation due to its nature closely associated with pyrite.

At the Keretti Mine of Outokumpu Oy, Finland, cobalt is being commercially recovered from pyrite concentrates containing only 0.69% cobalt.

The Falconbridge Nickel Mines Ltd., the former management, has studied the recovery of cobalt from the pyrite concentrates. However, the commercial production of cobalt has never been realized. Table 34 Copper and Cobalt Distribution

62.04 29.55 54.70 100.00 6.04 61,99. 31.97 3.41 100.00 5.75 39.55 100.00 7.37 45.88 46.75 100.00 ю О Distribution % 100.001 93.09 I.02 5.89 92.40 1:09 92.29 1.10 6.61 2.13 6.41 6.51 91.46 100.00 100.00 100.00 Сu 0.16 1.38 0.09 0.16 0.16 0.06 0.15 0.21 1.34 0.05 0.16 1.34 0.07 0.17 0.21 8 1.31 Grade % 28.38 1.79 0.35 0.13 27:69 0.14 0.12 1.75 28.88 0.30 0.13 27.73 1.85 0.52 1.80 0.27 g Distribution % 100.001 100.001 87.26 100.001 5.60 6.36 88.04 5.97 5.66 100.00 7.66 86.23 5.91 6,83 88.37 6.11 Amount Tonnage 23,670 22,429 56,639 56,010 64,766 39,686 926,760 623,488 396,485 70,982 799,139 826,851 708,230 45,056 350,386 947,627 Pyrite Conc. Pyrite Conc. Copper Conc. Copper Conc. Pyrite Conc. Copper Conc. Copper Conc. **Pyrite Conc** Product Mill Feed Mill Feed Mill Feed Mill Feed Tailing Tailing Tailing Tailing 1976 1974 Year 1968 1971

Co and Other Metal Contents in Ore and Concentrates of Some Mines in the World Table 35

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1

July, 1958-June, 1959 Falconbridge Nickel Mines Ltd. Not Producing Pyritë Conc. Remarks 1967 - 1968 Garnierite Cobaltite Laterite Laterite 17.74 Co (%) N A 0.69 3.82 3.57 Ñ A 2.0 0.4 I I I ł Concentrate (B) N± (%) 2.0 13.0 N.A. 1 I I. ī. ł. ı. ı ı I Ν.Α. Cu(%) 0.15 3.30 5.84 Ν.Α. Ν.Α. 1.8 ī ī. ī F i 0.23 Co (%). N.A. N.A. N.A. 0.27 0.74 2.5 ł ı ī. i ī Concentrate (A) (%) IN N.A. Ν.Α. ı ı I ī ī ī ł 1 I 33.84 34.11 Cu (%) 21.35 Ν.Α. N A N.A. 46. i 1 ł 1 1 0.18-0.25 Co(%) 0.23 0.10 0.70 0.29 0.12 0.35 0.25 0.07 10.0 14.0 0.1 Mill Feed 2.54 0.48 1.25 1.54 Ni(%) 1.2 1.2 ł ı I I Cu(%) 3.02 2.21 2.05 0.86 1.50 4.67 0.9 I ï ı 1 . N Mine/Location Black Bird Georgian Bay Levisa Bay Bou Azzer Lynn Lake Outo Kumpu Nonoc Is. Chibuluma Rhokana Kolwezi Moneo Ergani Philippines Caledonia Finland Morocco Country Cuba Turkey Canada Zambia Zambia Canada U.S.A. Zaire New

The last feasibility study for the recovery of cobalt was undertaken by a consulting company, Atkins, Hatch and Associates Ltd, Toronto, Ontario, Canada in 1967. The further metallurgical research was carried on in Canada by the Falconbridge Nickel Mines Ltd and the Lakefield Research of Canada Ltd, until 1970. According to the reports of the above studies, the recovery of cobalt seems to be practical. However, the figures used in these reports are out of date for the present use.

The present cobalt market is abnormally tight mainly due to the conflict going on in Zaire, who supplies more than 50% of the world demands for cobalt. When the problems in Zaire are settled, the cobalt price will be stabilized.

The recent progress in the development of the deep ocean floor implies the possiblity to recover cobalt from manganese nodules in near future. If a project of the deep ocean development is commercialized, cobalt will be oversupplied in the world market.

Never-the-less, the recovery of cobalt would contribute substantially to the profitability of the mine, if it is commercially realized.

It will be indispensabed to carry out an extensive research including metallurgy, marketting of cobalt and sulphuric acid, capital and operating cost and others, before starting the program for the recovery of cobalt.

Unfortunately, this report cannot go in detail on this subject any further due to insufficient time and information.

APPENDICES

LIST OF ORE RESERVE APPENDIX-1

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Eastern

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		Proved		Probabl	e	
Ore Block	Ledger	Tonnage(M.T.)	Cu %	Tonnage(M.T.)	Cu %	Remarks
45-650, Ser. R. Pillar	E-2	32,000	1.34			Temporary Pillar
45-2100. 48-18 Rem.	E-3	1,000	1.75			Temporary Pillar
48-17 Rem.	E-3	3,000	2.33			Temporary Pillar
Dome Central. Rem-17	E4	1,000	4.00			
Rem-18	E-4	1,400	2.00			
Rem-3	E-4	500	1.69			
Rem-1	E-4	2,000	2.32			· · · · · · · · · · · · · · · · · · ·
Rem-23	E-4	500	4.00			
Rem2	E-4	6,000	2.65			
·			· · ··· · ···		·····	· · · · · · · · · · · · · · · · · · ·
Dome West. Rem-11	E5	7,000	1.65			H.W. Ore
12-H1ge.	E-5	7,000	1.65			Temporary Pillar
43-680. 160. Ser.R.	E-8	2,000	2.05			Temporary Pillar
7 Hlge.	Е-8	16,500	1.75		·	Temporary Pillar
43-900N. 11 Hlge.	E-9	11,500	1.90	· · · · · · · · · · · · · · · · · · ·		Temporary Pillar
43-900W. 5 Hlge.	E-10	9,700	1.29			Temporary Pillar
			·			
43-900S. 43-720 Rem.	E-10	1,000	1.30	1,200	1.30	
W. of Dike	E-10	13,000	1.29			
	1 10	<u>-</u>	1.127			
1200 Shaft	E-11	110,000	1.71	· · · · · · · · · · · · · · · · · · ·		Temporary Pillar
	<u> </u>	110,000		·		Temporary Tritian
43-1300/1600. Pillar	E-12	18,000	2.24			Temporary Pillar
	E-12	10,000	2.24		·	
43-1610/1617. 43-1610	E-13	5,000	2,02			
1810 S.R.	E-13	2,200	1.90			Temporary Pillar
1010 3.K.	- <u>1</u> -13	2,200	1.90		·	Temporary rittat
43-2600W. 2550	E-15	1,000	2.23			Temporary Pillar
2550 3 Hlge.	E-15	3,000				Temporary Pillar
2580 Rib.	E-15 E-15	13,200	1.78			Temporary Pillar Temporary Pillar
	······································					· · · · · · · · · · · · · · · · · · ·
4303 S111 2460 Rib.		9,000	<u>1.78</u> 1.70		· · · ·	Temporary Pillar Temporary Pillar

Eastern

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		Proved		Probabl	e	
Ore Block	Ledger	Tonnage(M.T.)	Cu %	Tonnage(M.T.)	Cu %	Remarks
43-2700 W/S. 4303 Sill	E1.6	2,000	2.54			Temporary Pillar
43-27 Low.	E-16	4,500	1.83			Temporary Pillar
10 Hlge.	E16	8,000	1.61			Temporary Pillar
					<u></u> .	
44-2700 2680 Rib	E-16	7,500	1.92			Temporary Pillar
2550 S.R.	E-16	14,000	1.34			Temporary Pillar
2850 Rib	E-16	3,000	1.81			Temporary Pillar
		· · · · · · · · · · · · · · · · · · ·				
44-2000W. 1770	E-17	1,000	2.06			Temporary Pillar
1780	E-17	3,000	1.96			Temporary Pillar
3 Hlge.	E-17	2,000	1.86		····	Temporary Pillar
12 Hlge.	E-17	6,500	1.83			Temporary Pillar
2050 XC 4513	E-18	19,800	1.65		· .	Temporary Pillar
43-15 East	E~19	2,800	1.45			· · · · · · · · · · · · · · · · · · ·
42-07 H.W.	E-20	21,000	1.62			
42-05 н.พ./4203	E-20	71,400	1.08			
740 Sect.	E-20	12,000	1.13			
42-1800 1390 F.W.	E-20	5,100	1.17			
1390 H.W.	E~20	45,800	1.06			
4304 111ge	E-20	6,400	1.82			Temporary Pillar
42-1600 1390/1450	E-20	16,400	1.38	· · · · ·	· · · · · · · · · · · · · · · · · · ·	
42-33 East	E-21	10,300	2.19			
42-11	E-21	2,200	1,27			
41-27 'East	E-22	4,600	1.78			
2000 Shaft Access	E23	38,100	2.25			Temporary Pillar
2000 Shaft	E-23	14,000	1.54			Temporary Pillar
S. of 2000 Shaft	E-23	6,200	2.73			

Eastern

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		Proved		Probab1	e	999-2014
Ore Block	Ledger	Tonnage(M.T.)	Cu %	Tonnage(M.T.)	Cu %	Remarks
2300 Shaft	E-24	8,000	1,59		:	Temporary Pillar
<u>W. of 2300 shaft</u>	Е-24	1,800	2.31			
4050 L. S111	E-24	33,000	1.80			Temporary Pillar
4033	Е-24	3,400	1.85			
4053	E-25	65,500	1.66			
· · · · · · · · · · · · · · · · · · ·						
39-28 4051 Hlge.	LE-1	3,600	1.81			Temporary Pillar
2300 Shaft	LE-1	86,900	2.14			Temporary Pillar
39-50	LE-1	8,900	1.58			· · · · · · · · · · · · · · · · · · ·
38-32	le-2	14,300	2.16	· · · · · · · · · · · · · · · ·		······
<u>38-50 East</u>	LE-2	8,600	4.70	······································		
<u> 20-30 Edst</u>	<u></u>	0,000	4.70	· · · · · · · · · · · · · · · · · · ·		
36-28 East	LE-3	40,600	2.23		·	
36-28 West	LE-3	10,400	2.10			
36-32	le-3	19,100	1.80	9,600	1.65	
36-31	LE-3	4,900	5.85	4,800	2.93	
36-33	LE-3	63,400	2.46	21,400	2.93	
36-50	LE-3	5,900	1.96			
36-52	le-3	21,000	2.73	15,900	2.99	
35-50	LE-3	48,800	3.36			
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		Proved		Probabl	e	
Ore Block	Ledger	Tonnage(M.T.)	Cu %	Tonnage(M.T.)	Cu %	Remarks
4300-4540. 45-30	S-1	4,900	2.24			
W. of 45-30	S-1	4,500	2.05	· ·		Temporary Pillar
44-25E	S-2	6,600	2,13			Temporary Pillar
45-19	S-2	8,800	1.51			Temporary Pillar
						
Bclow 4300L. 426-22N	S4	2,000	3.90		1	
4230E	\$⊶5	19,400	1.55		. 	
41-30	\$ -5	33,400	1.72	:		
41-30W	S-5	53,800	1.86	· · · · · · · · · · · · · · · · · · ·		
40-25W	S-6	14,300	3.56		·	
40-30	<u>8-6</u>	23,700	2.52			
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List of Ore Reserve

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		Proved		Probab1	е	
Ore Block	Ledger	Tonnage(M.T.)	Cu %	Tonnage(M.T.)	Cu %	Remarks
Block 7 40-57E	BH-1	26,900	1.85			
40-57W	BH-1	13,700	1.61			
40~58W	BH-1	5,600	2.12			
40-59	BII-1	34,900	1.49	20,200	1.36	
			·			
41-57 Low.	BH-2	8,500	1.43			Temporary Pillar
41→57 Up.	BH-2	17,800	2.55			
41-58	ВН-2	6,000	1.85			
				a al		
41-59 S.	ВН-3	21,300	1.78			
41-59 N.	BH-3	15,000	2.60			· · · · · · · · · · · · · · · · · · ·
41-43	ВН-3	28,300	3.11			
43-17 Hlge	ВН-3	5,800	3.78			Temporary Pillar
Block 8 44-52 C.	BH-5	14,300	1.85		····	4
44-52 W.	BH-5	11,500	1.60			
43-52 W.	BH-5	15,900	.91			
43-52 C.	BH-5	13,800	1.18			
43-52 E.	BR-5	_28,300	1,33			
41~52 E.	BH-5	6,500	1.24			:
42-52	BH-5	16,700	1.41			
40-52	BII-5	42,400	1.32			
		· · · · · · · · · · · · · · · · · · ·				
Block 10 29 XC	BH-6	7,000	1.43			······
34/35 XC	вн-6	18,100	1.46			
Below 4050L. Block 7.	вн-7			60,500	1.41	
12 XC	BH-8			105,900	1.70	
			· · · · · · · · · · · · · · · · · · ·	100,000		
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List of Ore Reserve

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		Proved		Probab1	e	
Ore Block	Ledger	Tonnage(M.T.)	Cu %	Tonnage(N.T.)	Cu %	Remarks
Above 4570L. 457-53 W.	NH-1	800	1.07			
457-53 E.	NH-1	37,500	1.67	· · · ·		
· · · · · · · · · · · · · · · · · · ·			· . : ·	·		
4050/4570 4350	NH-2	3,500	2.55			Temporary Pillar
43-51 Low.	NH-2	61,900	3.14			-
4480-50	NH-2	6,500	2.96		· · · · · · · · · · · · · · · · · · ·	
44-4570	NH2	37,300	2.46			
4050-44 W.	NH-2	32,900	1.94	6,800	1.75	·
4050-44 E.	NH-2	15,800	1.18	19,800	1.18	
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Upper Bukangama

List of Ore Reserve

1720 Winz Pillar Remarks Ore ore Ore Ore ЪW м н ъц H.W. **1.06** 1.15 . 67 I.13 1.11 Cu % 1.17 -62 1.10 .83 I.22 1.08 1.40 - 89 1.37 Minable Ore Tonnage(M.T.) 14,490 8,350 9,730 2,650 35,540 24,840 6,310 26,680 12,190 10,360 15,070 13,460 62,790 15,990 ~ .20 20 .20 . 20 20 .20 20 20 2 20 22 20 .20 20 ð Dilution Tonnage(M.T.) 1,590 1,230 1,350 1,970 8,190 350 4,640 2,090 l,760 3,240 1,090 820 3,480 1,890 сu % 1.31 1,19 1.25 66 1.55 71 I.23 25 1.29 1.211.58 74 1.27 1.37 Extractable Ore Tonnage(M.T.) 10,600 7,260 8,500 9,010 2,300 30,900 12,600 13,900 11,700 21,600 5,490 23,200 13,100 54,600 Tonnage(M.T.) 8,540 6,460 10,000. 64,200 2,710 14,800 16,300 13,800 25,400 27,300 12,500 10,600 15,400 36,300 Av. Grade (Cu %) 1.19 .74 - 99 1.55 1.31 .71 .92 1.21 1.58 1.25 1.23 1.37 1.29 1.27 Av. Thick (Ft.) 25 46 ဂ္ဂ 24 20 30 23 21 29 22 53 37 ŝ 22 - 6411 - 6318 6383 - 6318 6386 - 6258 6583 - 6518 6551 - 6506 6381 - 6316 6018 - 5940 6555 - 6466 6531 - 6526 6501.- 6416 6338 - 6290 6534 - 6517 6557 - 6547 Level Ore Block 6455 6393 1350 W Section 1450 W 1400 W 1500 W 1550 W З В 1700 W . 1600 1650

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				LIST OF USE ASSETVE	97 - 1991		OFFEL PURALBANA	e de la companya de la company			0/7
)	Ore Block	Av.	Av.		Extractable Ore	s Ore	Dilution	- g	Minable Ore	ге	
Section	Level	Thick (Ft.)	Crade (Cu %)	Tonnage(M.T.)	Tonnage(M.T.)	Cu %	Tonnage (M.T.)	Cu %	Tonnage (M.T.)	2 n 2	Remarks
1750 W	6610 - 6606	28	1.08	30,800	26,200	1.08	3,930	.20	30,130	- 76	H.W. Ore
	6381 - 6167	52	1.30	67,100	57,000	1.30	8,550	.20	65,550	1.16	1760 Winz Pillar
	6561 - 6545	25	2.45	11,000	9,350	2.45	1,400	.20	10,750	2.16	F.W.Ore
1800 W	6509 - 6446	83	1.52	37,500	31,900	1.52	4,790	. 20	36,690	1.35	
	6463 - 6202	22	1.82	31,500	26,800	1.82	4,020	.20	30,820	1.61	H.W.Ore
	6202 - 5934	18	1 66	30,400	25,800	1.66	3,870	.20	29,670	1.47	H.W.Ore
	6427 - 6201	24	1.11	30,200	25,700	1.11	3,860	.20	29,560	66.	F.W.Ore
	6009 - 5938	17	01.I	7,290	6,200	01.1	930	.20	7,130	.98	F.W.Cre
·									-		
1850 W	6605 - 6603	61	2.01	12,500	10,600	2.01	1,590	.20	12,190	1.77	
1840 W	6107 - 6025	65	1.39	16,000	13,600	1.39	2,040	.20	15,640	1.23	
1860 W	6107 - 6029	55	1.40	13,800	11,730	1.40	1,760	.20	13,490	1.24	
м 0061	6673 - 6646	28	. 92	8,750	7,440	.92	1,120	. 20	8,560	.83	
	6637 - 6620	14	3.23	4,580	3,890	3.23	580	.20	4,470	2.84	H.W. Ore
	6597 - 6583	27	1.41	8,540	7,260	1.41	1,090	.20	8,350	1.25	F.W. Ore
							· .		:		
1950 W	6704 - 6655	16	1.28	7,920	6,730	1.28	1,010		7,740	1.14	
2000 W	5985 - 5870	38	3.85	46,300	39,400	3.85	5,910	.20	45,310	3.37	
									-	:	
2050 W	6687 - 6637	36	1.70	30,400	25,800	1.70	3.870	.20	29,670	1.50	
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Upper Bukangana

List of Ore Reserve

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List of Ore Reserve

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Upper Bukangama

		Remarks											 :						
	e	Cu %	1.45	1.53		1.11	1.90	1.02	.88	1.35	1.22	1.02	 .86	1.29	1.57	1.07	 88	1.20	1:03
	Minable Ore	Tonnage(M.T.)	30,940	18,630		7,740	45,310	11,250	9,170	47,960	36,460	30,130	29,560	6,110	8,140	22,200	27,260	17,710	30,360
	L	Си %	- 20	.20		.20	.20	.20	. 20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
	Dilution	Tonnage(M.T.)	4,040	2,430		1,010	5,910	1,470	1,200	6,260	4,760	3,930	3,860	800	1,060	2,900	 3,560	2,310	3,960
-	Ore	Cu %	1.64	1.73		1.25	2.16	1.14	98.	1.52	1.37	1.14	96.	1.45	1.78	1.20	1.10	1.35	1.15
	Extractable	Tonnage(M.T.)	26,900	 16,200	:	6,730	39,400	9,780	7,970	41,700	31,700	26,200	25,700	5,310	7,080	19,300	23,700	15,400	26,400
		Tonnage(M.T.)	31,700	19,000		7,920	46,300	11,500	9,380	49,000	37,300	30,800	 30,200	6,250	8,330	22,700	27,900	18,100	31,000
	Av.	Grade (Cu %)	1.64	1.73	-	1 25	2.16	1.14	96	1.52	1.37	1.14	96	1.45	1.78	1.20	 1.10	I.35	1.15
	Av.	Thick (Ft.)	26	34	-	20	68	19	- 15	67	44	1.8	 21	15	14	18	23	24	14
	Ore Block	Level	6674 - 6624	6657 - 6612		6587 - 6573	6381 - 6279	6185 - 6062	6536 - 6520	6383 - 6284	6384 - 6270	6480 - 6265	1227 - 6531	6568 - 6565	6554 - 6510	6480 - 6305	6730 - 659I	6538 - 6527	6540 - 6265
	10	Section	2100 W	 2150 W		2250 W			2300 W		2350 W	2400 W	2450 W	-			2500 W		:

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- Andrewski (* 1997) Stanovski (* 1997) 3/6

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ö	Ore Block	AV.	Av.		Extractable	Оте	Dilution	ц	Minable Ore	0	
Section	Level	Thick (Ft.)	Grade (Cu %)	Tonnage(M.T.)	Tonnage(M.T.)	Cu %	Tonnage (M.T.)	Cu %	Tonnage(M.T.)	Cu %	Remarks
2550 W	6704 - 6593	18	.87	18,100	15,400	.87	2,310	.20	17,710	- 78	
	6581 - 6539	20	1.18	10,600	9,010	1.18	1,350	.20	10,360	1.05	
	6510 - 6336	16	99	24,800	21,100	66.	3,170	.20	24,270	.87	
2600 W	6756 - 6724	25	.93	6,250	5,310	.93	800	.20	6,110	.83	
	6686°- 6603	21	1.11	16,300	13,900	1.11	2,090	.20	15,990	66.	
	6521 - 6454	19	1.23	11,300	9,610	I.23	1,440	.20	11,050	1.10	
2650 W	6792 - 6764	20	. 95	4,580	3,890	.95	580	.20	4,470	.85	
	6691 - 6604	33	.95	20,000	17,000	.95	2,550	.20	19,550	.85	
	6580 - 6529	19	1.04	10,200	8,670	J. 04	1,300	-20	9,960	.93	
	6502 - 6489	16	1.82	6,040	5,130	1.82	770	-20	5,900	1.61	
2700 W	6853 - 6727	19	1.26	15,000	12,800	1.26	1,920	.20	14,720	I.12	
	6686 - 6640	31	1.10	11,300	9,610	1.10	1,440	.20	11.050	. 98	
	6581 - 6515	16	2.06	10,800	9,180	2.06	1,380	.20	10,560	1.82	
			:				:				
2750 W	6845 - 6652	27	.96	36,000	30,600	.96	4,590	.20	35,190	.86	
	6580 - 6502	17	1.35	9,790	8,320	1.35	1,250	.20	9,570	1.20	196 - 19 - 1 - - - - -
2800 W	6879 - 6725	26	. 92	27,100	23,000	.92	3,450	.20	26,450	.83	
	6686 - 6649	36	1.71	15,600	13,300	1.71	2,000	.20	15,300	1.51	
	6579 - 6502	19	.92	8.750	7.440	.92	1,120	.20	8,560	.83	

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Upper Bukangama

List of Ore Reserve

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List of Ore Reserve

Upper Bukangama

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Remarks 1.50 .85 1.39 1.03 1.85 1.85 1.15 1.96 1.34 1.20 .90 1.85 17 .83 1.57 1.71 20 Tonnage(M.T.) Minable Ore 6;310 3,880 4,680 17,480 12,080 4,890 18,040 7,130 3,250 13,690 10,360 11,440 8,140 21,970 14,030 11,440 ~ .20 20 50 20 -20 20 ន 20 20 20 - 20 20 20 20 20 .20 3 Dilution Tonnage(M.T.) 510 1,490 610 820 6930 420 1,790 1,350 1,490 1,060 2,870 1,830 2,280 1,580 640 2,340 Сц % .95 I.93 1.16 1.00 2.10 2.10 2.IO 1.70 1.29 .93 1.35 1.57 .85 2.23 1.51 1.77. Extractable Ore Tonnage(M.T.) 5,490 3,370 2,830 9,010 9,950 9;950 7,080 12,200 4,070 4,250 15,700 6,200 19,100 15,200 10,500 11,900 Tonnage(M.T.) 11,700 11,700 3,960 3,330 10,600 8,330 22,500 17,900 6,460 7,290 14,000 14,400 4,790 12,300 5,000 I8,500 1.29 Av. Grade (Cu %) .95 I.57 1.93 1.16 1.00 2.10 2.10 2.10 1.70 .85 .93 2.23 1.35 1.51 1.77 Av. Thick (Ft.) 20 52 E. φ 19 65 16 16 5 24 12 18 19 27 24 37 - 6533 6891 - 6830 - 6738 6818 - 6761 6868 - 6729 6791 - 6742 6687 - 6640 6701 - 6645 6888 - 6821 6908 - 6889 6964 - 6899 6686 - 6657 6927 - 6891 - 6738 6869 - 6741 6685 - 6657 Level Ore Block 6807 6807 6580 2950 W 3150 W 3220 W 2900 W 3000 W 3100 W 3050 W Section 2850 W

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0/0		Remarks			·															
1	0)	Си %	2.49	66.	4	1.03	 I.93	- 89		.95		2.57				 			 	
;	Minable Ore	Tonnage(M.T.)	30,130	3,670		15,070	4,680	12,190		47,730		5,090								
BMI		Cu %	.20	.20		.20	.20	.20		.20		.20								
upper bukangama	Dilution	Tonnage(M.T.)	3,930	 480	· · -	1,970	610	л,590		6,230		660	-		· .					
•	Ore	Cu %	2.83	1.11		1.16	2.19	66.		1.06	· .	2.92								
erve	Extractable Ore	Tonnage(M.T.)	26,200	3,190		13,100	4,070	10,600		41,500		4,430	4				:			
LIST OI UTE RESERVE		Tonnage(M.T.)	30,800	3,750		15,400	4,790	12,500		48,800		5,210								
1 .:	Av	Crade (Cu %)	2.83	11.1	a 1 4	1.16	2.19	66.		1.06		2.92		 				 		
	-	Thick (Ft.)	17	 23		1.9	 14	18		31		16		 						
· · · · · · · · · · · · · · · · · · ·	Ore Block	Level	6935 - 6837	6873 - 6867		6885 - 6815	6954 - 6914	6885 - 6837		6934 - 6844		6931 - 6927								
	IO	Section	3300 W	3400 W		3450 W	 3500 W		- -	3550 W		3600 W								

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Upper Bukangama

List of Ore Reserve

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List of Ore Reserve

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Middle Bukangama

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1720 Winz Filler Remarks 1.28 1.10 1.14**L.2**8 1.65 I.83 1.47 1.02 .48 L.22 2.63 .97 Tonnage(M.T.) Cu % Minable Ore 50,950 24,840 1,960 23,460 8,560 7,130 2,320 35,650 46,230 9,420 7,820 14,720 .20 .20 20 s.e . 20 .20 - 20 . 20 .20 . 20 20 . 20 20 g Dilution Tonnage(M.T.) 260 6,650 3,240 3,060 1,120 930 300 4., 645 1,230 1,020 l,920 6,030 Cu X 1.66 1.28 1.44 1.44 2.08 1.07 1.14 1.23 3.00 .52 1.37 l.87 Extractable Ore Tonnage (M.T.) 1,700 7,440 6,200 2,020 31,000 44,300 12,800 21,600 20,400 40,200 8,190 6,800 Tonnage (M. T.) 52,100 2,000 2,380 36,500 25,400 24,000 8,750 7,290 9,630 8,000 15,000 47,300 Av. Grade (Cu %) 1.07 1.66 7.14 1.23 l.28 1.44 1.44 1.87 3.00 2.08 .52 1.37 Av. Thick (Ft.) 17 20 20 15 ġ. 14 26 엄 28 51 24 14 · • . - 5820 - 5578 5940 - 5578 - 5605 5600 - 5578 5616 - 5607 - 5523 5722 - 5622 5719 - 5703 5671 - 5595 5570 - 5536 - 5657. Level Ore Block 5940 5856 5938 5743 5580 1720 W 1600 W Section 1800 W 1535 W 1680 W M 006T 12 XC 13 XC 18 XC 19 XC

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Middle Bukangama

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	Remarks																						
υ	Cu %	1.30		1.23	L.23	1.29	2.57	1.79	1.28		- 96	1.62		1.43	 1.26	.57	1.12		98	1,17	.67		
Minable Ore	Tonnage (M.T.)	. 6,340		9,450	13,340	16,680	6,520	6,190	2,610	-	14,380	6,840		14,030	31,630	34,270	19,900		31,970	5,540	6,520		
	Cu %	.20		.20	.20	.20	.20	.20	.20		. 20	.20		.20	.20	.20	.20		- 20	.20	.20		
Dilution	Tonnage(M.T.)	890.		1,230	1,740	2,180	850	810	340		1,880	890		1,830	 4,130	4,470	2,600		4,170	720	850		
Ore	Cu Z	1.46 ·		1.38	1.39	 1.45	2.92	2.03	1.44		1.08	1.83		1.61	 1.42	62	1.26		1.10	1.31	.74	•	
Extractable	Tonnage (M.T.)	5,950		8,220	11,600	14,500	5,670	5,380	2,270		12,500	5,950	÷	12,200	 27,500	29,800	17,300		27,800	4,820	5,670		
	Tonnage(M.T.)	7,000		9,670	13,700	17,000	6,670	6,330	2,670		14,700	7,000		14,300	32,300	35,000	20,300		32,700	5,670	6,670		-
Av.	Crade (Cu %)	1.46		1.38	1.39	1.45	2.92	2.03	1.44		1.08	1.83		1.61	1.42	. 62	1.26		1.10	1.31	-74		
Av.	Thick (Ft.)	24	:	19	29	18	22	19	19		17	17		17	27	23	23		24	10	25		
Ore Block	Level	5735 - 5702		5767 - 5698	5587 - 5531	5804 - 5697	5592 - 5568	5546 - 5516	5498 - 5465		5769 - 5675	5630 - 5606		5772 - 5688	5799 - 5630	5636 - 5533	5563 - 5476		5787 - 5727	5690 - 5653	5563 - 5533		•
6	Section	20 XC		21 XC		22 XC					23 XC		-	24 XC	25 XC				26 XC				

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Remarks 1.58 1.55 - 83 1.80 I I.23 -87 1.34Tonnage(M.T.) Cu % Minable Ore 17,940 30,940 73,030 30;020 14,720 7,130 111,400 Сц % .20 .20 2 .20 -20 20 .20 Dilution Tonnage(M.T.) 9,530 2,340 4,040 14,500 1,920 930 3,920 Cu % 1.79 1.38 1.75 . 97 .92 2.04 1.51 Extractable Ore Tonnage(M.T.) 63,500 15,600 26,900 26,100 12,800 6,200 96,900 Tonnage (M.T.) 74,700 30,700 I8,300 31,700 15,000 114,000 7,300 Av. Grade (Cu[.]%) 1.79 2:04 1.51 1.38 1.75 .92 .97 Av. Thick (Ft.) 38 18 23 26 ĥ **5**8 16 5055 - 4948 5031 - 4975 4950 - 4844 4913 - 4744 5050 - 4744 5052 - 5017 4932 - 4917 Level Ore Block Section 20 XC 21 XC 22 XC 19 XC

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Lower Bukangama

List of Ore Reserve

1/3			Remarks														-							
		Ore	cu %	. 97	1.96	 1.37	1.37	1.86		1.54	1.00	·	1.47	1.43	1.64		1.58	1.88	1.70	1.10	 2.33	2.73	1.66	
		Minable O	Tonnage(M.T.)	19,900	15,620	3,910	1,150	30,590		5,180	9,780		4,600	7,820	11,040		8,510	32,890	7,130	6,210	18,860	15,640	30,940	
383			Cu %	- 20	.20	.20	-20	.20		-20	.20		.20	.20	.20		. 20	. 20	.20	.20	.20	.20	.20	 .
Lower Bukangama		Dilution	Tonnage(M.T.)	2,600	2,040	510	150	3,990		680	1,280		600	1,020	1,440		1,110	4,290	930	810	2,460	2,040	4,040	
•		Ore	Cu X	1 09	2.22	1.54	1.54	2.11		1.74	1.12		1.66	1.62	1.86	-	1.79	2.13	1.93	1.24	2.65	3.11	1.88	
serve	-	Extractable	Tonnage(M.T.)	17,300	13,600	3,400	1,000	26,600		4,500	8,500		4,000	6,800	9,600		7,400	28,600	6,200	5,400	16,400	13,600	26,900	
List of Ore Reserve			Tonnage (M.T.)	20,300	16,000	4,000	1,200	31,300		5,300	10,000		4,700	8,000	11,300		8,700	33,700	7,300	6,300	19,300	16,000	31,700	
		Av.	Crade (Cu %)	1-09	2.22	1.54	1.54	2.11		1.74	1.12		1.66	1,62	1.86		1.79	2.13	1.93	1.24	2.65	3.11	1.88	
		AV.	Thick (Ft.)	15	Т 6 Т	15	15	26		25	42		28	32	38		49	42	11	15	32	40	19	
:		Ore Block	Level	4800 - 4714	4605 - 4577	4829 - 4770	4786 - 4770	4670 - 4622		4782 - 4757	4664 - 4649		4860 - 4826	4782 - 4755	4664 - 4640		4836 - 4832	4783 - 4707	4707 - 4640	4584 - 4545	4937 - 4883	4843 - 4813	4795 - 4630	
	··· •·	Ö	Section	6 XC		7 XC			-	8 XC			9 XC				TO XC				TT XC			

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Lower Bukangama

	Remarks															·						
9	Cu %	2.70	1.10		2.22	1.30	1.72	1.19		1.47	1.38		1.50	1.95	.77		2.68	2.65		2.06	2.30	
Minable Ore	Tonnage(M.T.)	36,460	19,550		30,940	13,000	33,930	14,380		16,680	8,860	-	13,340	9,780	14,720		16,330	4,260		10,470	48,880	
ď	Си %	.20	.20		.20	.20	 .20	.20	· · · · · ·	.20	.20		. 20	.20	.20		.20	.20		.20	.20	
Dilution	Tonnage (M.T.)	4,760	2,550	: .	4,040	1,700	4,430	1,880		2,180	1,160		1,740	1,280	1,920		2,130	560		1,370	6,380	-
Ore	Cu X	3.07	1.24		2.52	1.46	 1.95	1.34		J.66	1.56		1.70	2.21	.85		3.05	3.02		2.34	2.62	
Extractable	Tonnage (M.T.)	31,700	17,000		26,900	11,300	29,500	12,500		14,500	7,700		11,600	8,500	12,800	-	14,200	3,700	· · · · · · · · · · · · · · · · · · ·	9,100	42,500	
:	Tonnage (M.T.)	37,300	20,000		31,700	13,300	34,700	14,700		17,000	9,000		13,700	000°0T	15,000		16,700	4,300		10,700	50,000	
Av.	Crade (Cu %)	3.07	1.24		2.52	1.46	1.95	1.34		1.66	1.56		1.70	2.21	85		3.05	3 02		2.34	2.62	
AV.	Thick (Ft.)	21	17		18	24	14	34		20	10		13	15	21		13	14		27	27	
Ore Block	Level	5010 - 4822	4786 - 4682		5010 - 4838	4589 - 4547	5049 - 4826	4588 - 4543		4793 - 4720	4588 - 4541		4923 - 4834	4793 - 4726	4705 - 4637		4920 - 4818	4793 - 4767		5009 - 4972	4949 - 4809	
ő	Section	12 XC			13 XC		14 XC			15 XC			16 XC				17 XC			18 XC		

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	Remarks	· · · · · · · · · · · · · · · · · · ·																					
 	cu %	1.37																					
Minable Ore	Tonnage (M.T.)	6,840																					
	сц %	. 20																					
Dilution	Tonnage (M. T.)	890																· · · ·					
Ore	Си %	1.55							:							· · · · · · · · · · · · · · · · · · ·							
Extractable Ore	Tonnage(M.T.)	5,950									-	-										-	
	Tonnage(M.T.)	7,000																				•	
Av.	Crade (Cu %)	1.55					 								· · · ·			-, ,,,,,,					
	Thick ((Ft.)											:									 		
Ore Block	Level	5805 - 5766						· · ·										-					
Or	Section	27 XC									····	· · ·											-

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Middle Bukangama

List of Ore Reserve

APPENDIX~2 PRESENT CONDITIONS OF MACHINES AND EQUIPMENT KILEMBE MINE

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APPENDIX-2

PRESENT CONDITIONS OF MACHINES AND EQUIPMENT

(KILEMBE MINE)

1. Underground Facilities

(1) Hoist Motors

Capacity(HP)	Voltage	RPM	Nos. Operative	Nos. Inoperative
250	3300	750	3	0
250	3300	585	1	0
160	415	960	3	1
100	415	740	1.	1
90	415	735	1	1
150	415	735	1	1

(2) Rock Drills and Air-legs

	Туре	Weight (kg)	Length (mm)	Dia.(In.)of Cylinder	Stroke (mm)	Numbers Operative	Inoper- ative	
3	-Jack Hammer	23	590	3	33	200	32	
	3-Stoper	41	1,450	1	33	31	70	
3	-Air-legs		1,125	$2\frac{1}{16}$	900	163	- 33	
Un	ified Air le	gs 5	1,450	$2\frac{15}{16}$	1,300			

(3) Shovel Loaders

Туре	Bucket(m ³)	Loading Ability(m3/Min)	Weight(t)	Numbers Operative	Inopera- tive
Eimco 803 Hopper Loader	0.295	1.27	4.45	.2	2
Cavo 310 Jopper Loader	0.124	0.99	3.27	4	3
Eimco 21B Rocker Shovel	0.28	1.4	3.27	28	13

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(4) Scraper

	Numl	pers
Capacity(HP)	Operative	Inoperative
20	8	4
30	16	1
50	4	2
25	35	2
25/45	14	. 2
35	1.1	2
7.5	2	2
	0	5
	20 30 50 25 25/45 35	Capacity(HP) Operative 20 8 30 16 50 4 25 35 25/45 14 35 11 7.5 2

(5) Mine Cars

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Туре	Dumping Mechanism	Capacity (m ³)	Weight (kg)	Numbers Operative	Inoperative
Hudson	Mannal	0.54	510	10	12
Hudson	Mannal	0,67	510	. 8	12
Hudson	Mannal	0.75		11	17
Hudson	Cylinder	1.3		103	119
Allen	Cylinder	1.4	1,400	46	45
Gregg	Ramp Cylinder	2.2		7 · . :	12
Hudson	Ramp Cylinder	2.4	2,930	73	82
Gregg	Ramp Cylinder	3.5	5,130	21	28
Gregg	Ramp Cylinder	3.4	3,590	4	8
Hudson	Ramp Cylinder	4.8	5,130	10	8

(6) Locomotives

Туре Мо	otor(HP)	Weight(kg)	Speed(km/H)	Numbers Operative	Inoperative
Electric Clay- ton $3\frac{1}{2}$ ton	11	3,290	5,8	8	2
Electric Clay- ton $7\frac{1}{2}$ ton	2-30	8,630	3.84	4	0
BEV 128	2-18	7,000	6.4-12.8	8	14
BEV 227	2-4	5,000	6.4-12.8	7	8
BEV 417	4	2,000	5.6-9,6	10	14
Westing House	25	8,000		0	3
IME-2C3-A2			8.8	1	0

(7) Motors For Locomotives

Туре	Capacity(HP)	Voltage(V)	Numbers Operative	Inoperative
Electric $3\frac{1}{2}$ ton	11	72	9	4
Electric $7\frac{1}{2}$ to	n <u>30</u>	240	3	3
128	18	240	2	0
227	4	60	10	12
417	4	48	8	9
128 BT	19	240	1	10
128	15/12	96	1,	25
		1		

(8) Batteries	For Locomotive	S	Numbe	ers
Туре	Capacity(Ah)	Voltage(V)	Operative	Inoperative
$3\frac{1}{2}$ Clayton	263	72	9	8
$7\frac{1}{2}$ Clayton	263	192	6	6
BEV 128BT	389	168	1 .	10
BEV 128	445	96	10	25
BEV 227	445	60	10	24
BEV 417	389	48	8	18

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(9)	Pumps
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	•	Numbers	
Туре	Capacity(1/min)	Operative	Inoperative
A.Sh Pump	730-2,200	36	29
3GT Pump	2,730	3	3
Mono-Pump	360	10	18
Harland Pump	2,390	3	0
DRL SBx5B		2	3
DRL 6Bx8B		2	1
DRL 8Bx10B		1	0
Holman Pump		3	3
C.P. Pump		3	2
Warman Pump		1	2

(10) Motors For Pumps

Туре	Capacity(HP)	Voltage(V	/) RPM	Numbers Operative	Inoperative		
D106/D108L	15	415	960	2	12		
Flygt B2125	11	415	2,800	1	15		
D6M6K	25	415	1,100	6	3		
B831V-2	30	415	1,450	11	7		
B831V-2	90	415	2,930	2	10	· · ·	
2613/57	100	415	2,960	0	2		
UZ 572	180	415	1,485	2	1		
B831V-2	50	415	1,460	1	2		į

(11)	Venti	lation Fans	
· T	уре	Motor(HP)	Dia.(In.

	1			S	
Туре	Motor(HP)	Dia.(In.)	Capacity (m3/min)	Operative	Inoperative
Buffalo	50	54	1,500	2	0
Aeroto	50	60	1,500	1	0
Woods	50	60	1,850	2	4
Woods	2-25	30	1,300	2	0
Woods	10	24	440	2	0
Woods	8,6	19	220	2	1
Woods	4	19	150	0	1
Woods	4	15	110	Ö	1
Safanco	45	30	1,100	4	2
Meco	10	24	500	2	1
Meco	5	20	300	4	6
Meco Air CF	4	16	150	3	0
		·	15		

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2. Mill Plant Facilities

(1) Primary Crushing Section

Items	Nos.	Specification	Present Condition
Trench Scraper	1	56"J212	Operative
Grizzly	. 1	4'x5'	Operative
Telsmith Feder	1	48"x10 1/2"	To be replaced
Brake Crusher	1	48"x36",	Liner worn out
P1 Conveyor	1	750mmx53.4m	Operative
Double Deck Screen	• 1	5'x10'	Operative
P2 Conveyor	1	900mmx50m	Belt damaged
Magnet for P2 Conveyor	1		Operative
P3 Conveyor	1	900mmx54.6m	Belt damaged
P4 Conveyor	1	750mmx54m	Belt damaged
P5Shuttle Conveyor	1	750mmx72m	Belt removed Gear damaged
Classifier	1	66 ¹¹	Screw damaged
Wood chip Screen	1		Operative
P6 Conveyor	1	450mmx108.6m	Gear damaged
Surge Bin	1	18'x20',200tons	Good
Manual Hoist	1	10 tons	Operative
Electric Hoist	1	1 tons	Operative
Pumps	12		Operative
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(2) Secondary Crushing Section

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Items	Nos.	Specifications	Present Condition
Stockpile chute	15	3/8" thick	4 damaged
Vibrating Feeder	2	12'x4'	damaged
S1 Conveyor	1	900mmx156m	Belt damaged
S1 Conveyor Magnet	1	36"x27"	Operative
52 Conveyor	1	750mmx105m	Belt damaged
Conc Crusher	1	$5\frac{1}{2}$ ' Standard	Operative
S3 Conveyor	1.		Belt damaged
S3 Conveyor Magnet	1	36"x27"	Operative
Screen	2	6'x16', 3/4"	Screen damaged
Electric Crane	1	15 tons	Operative
Conc Crusher	2	5 1/2' Short Head	Operative

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Items	Nos.	Specifications	Present Condition
S4 Conveyor	ì	600mmx54m	Belt damaged
85 Conveyor	1.	750mmx56.4m	Belt damaged
S6 Conveyor	1	750mmx62.7m	Belt damaged
S7 Conveyor	1	750mmx64.5m	Belt damaged
S8 Conveyor	1	600mmx135m	Belt damaged
S9 Conveyor	1	600mmx218.4m	Operative
S9 Conveyor Tripper	1.		Chute damaged
Electric Crane	1	10 tons	Operative
No.1No.5 Silos	5	26'x32', 850tons	Steel plates of side walls damaged
No.6 Silo	1	36'x32', 1600tons	Steel plates of side walls damaged
Vibrating Feeders	8		Operative

(3) Grinding Section

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Items	Nos.	Specifications	Present Condition
No.1/2 Weightmeter	2	· · ·	Operative
No.4 Rod Mill	1	8'x12', 18rpm	Operative
Distributor	1.	5'2"x6'	Operative
No.3 Cyclone	2	24"	Operative
No.3 Ball Mill	1	8'6"x8', 21.5rpm	Outlet frange damaged
No.5 Cyclone	2	24"	Operative
No.5 Ball Mill	1	8'4"x8', 18rpm	Operative
No.7 Rod Mill	1	2.2mx3m	Operative
No.6 Cyclone	2	18"	Operative
No.6 Ball Mill	1	7'x8', 22rpm	Gear box damaged
Overhead Travelling Crane	2	10 tons	One inoperative due to lack of electrical parts
No.1 Thickener	1	30'x10',68rpm	Operative
No.2 Thickener	1	30'x10', 25rpm	Operative
No.3 Thickener	1	50'x10'	Operative
Silo Conveyors	4	600mmx90m,600mmx36	im Operative
Weightmeters	2	600mmx18m,450mmx33	Bm Operative
Classifier	1	42"	Operative
Dorroco Pumps	2	4",Rubber Diaphram	n No spare diaphrams
Spargo Pump	1	8",Rubber Liner	Operative
Spargo Pump	1.	4",Rubber Liner	Bed frame damaged
Vacseal Pump	2	4",Rubber Liner	Operative

(4) Flotation

Items	Nos.	Specifications	Present Condition
Flotators	74	#48 Agitairs	Cells highly corroded
Flotators	28	#24 Denver	Cells highly corroded
No.1 Cyclones	2	12", Rubber Lining	Operative
No.1 Ball Mill	1	5'x12',30rpm	Gear box damaged
No.2 Cyclones	4	12" Rubber Lining	Operative
No.2 Ball Mill	1	5'x8', 28rpm	Operative
Crane	. 1	3 tons	Operative
A.Sh Pump	2	4",5" Rubber Lining	Operative
Wilfley Pump	4	2", 3", 4", FC.	Operative
Blowers	2	12"x30", SS.	Operative
Cu. Conc. Tank	1	2.4	in good condition
Py. Conc. Tank	1	2.4 [¢]	in good condition

(5) Lime Grinding

Items No.s Specifications Present Condition Feed Conveyor 1 600mmx30m Operative 0.9mx2.4m,1/2"th. Operative 1 Screen 30" 1 Operative **Classifier** Ball Mill 0.9mx1.2m,60rpm Operative 1 1 Operative Agitation Tank 2 Operative Pumps 1 Operative Distributor

(6) Filtering			
Items	Nos.	Specifications	Present Condition
Thickeners	2	7.2mx3m,12mx3m	Rake rubber damaged
Dorrco Pumps	4	4 ¹¹	Diaphrams damaged
Disc Filter	2	1.8mx1.8m	Leaf frame damaged
Storage Tanks	2	4.2mx4.2m	in good condition
R1 Conveyor	. 1	750mmx45m	Belt damaged
R2 Conveyor	1	450mmx189m	Operative
R3 Conveyor	. 1	900mmx72m	Operative
Roots Blowers	2	1 1/2", FC	to be renewed
Vacuum Pumps	2	18"x7", FC	Casing broken

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Item	Nos,	Specifications	Present Condition
Pulsometer pump	1	4", FC	Bearings broken
Spargo Pump	1	2",Rubber Liner	Bearings broken
Wilfley Pump	. 1	3", FC	Bearings broken
Vaccum Pump	1	FC	inoperative due to lack of spare parts
Allweiler Pumps	4		Bearings broken
Compressor	1		Operative
Vacseal	1	Rubber Liner	Operative
Water Pump	1	FC	Operative

3. Surface Transportation Facilities

Item	Oper- ative	Inope- rative	Specifications	Remarks
Land Rovers	19	5	2286CC	Engine Spare parts needed
Pick-up Trucks	15	13	1000-2197CC	Engine Spare parts needed
Bulldozers	9	7	67-245HP,Diesel	Spare parts needed one to be replaced
Graders	1	0	100HP	and the second sec
Trailer Truck	0	1		Spare parts needed
Trucks w/ Hoist	1	2	7-6tons,Diesel	Spare parts needed
Trucks w/ Compressor	0	4	98-125HP	Spare parts needed one to be replaced
Tractors	5	2	:	Spare parts needed
MF Trailers	2	1	2 tons	Spare parts needed
Bucket loader	0	1	500kg	Spare parts needed
Roller	1	0	1200 m¢	in good condition
Crane Truck	0	1	3 tons	Spare parts needed
Cleaner	0	1		Spare parts needed
Truck w/ welding mach	ine 1	0		in good condition
Lorries	4	19	46 tons	Spart parts needed 3 to be replaced

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APPENDIX-3 PRICE ESTIMATIONS OF MACHINES, EQUIPMENT AND THEIR SPARE PARTS.

KILEMBE MINE

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Tation Monthlyton	Ttama	د				Estimated Price	Ce Ce
racilities, Machines	T Cems	sheculications	Auguri cy	wergnr(Kg)	1000 Yen	1000 U.Sh	us.s
Hoists	Rope	11	в40 т	1,700	600	21	2,679
	Rope	7/8"	3,915 m	5,500	2,000	11	8,929
	Rope	3/4"	300 m	300	120	4	536
	Rope	5/8"	1.050 m	006	400	14	1,786
Hoist Motors	Spare Parts	160HP x 415V x 960rpm	l set	50	500	18	2,232
	Spare	100HP x 415V x 740rpm	I set	50	500	18	2,232
	Brake Shoes, Electric Parts		l set	200	1,000	35	4,464
Rock Drills	Jack Hammers	TY24LD	100	2,600	20,200	715	90,179
	Stopers	TY24C-0S	50	2,500	15,900	563	70,982
	Air Legs	XOL-30A	25	300	1,600	57	7,143
	Air Legs	XSL-30	25	300	1,600	57	7,143
	Rod	22 Taper 12° x 1000m	300	1,000	3,000	106	13,393
	Bit	22 CB	600	500	4,200	149	18,750
	Spare parts		l set	1,500	7,860	278	35,089
	Exploders		3 sets	50	600	21	2,679
Crusher	Liners	Fixed / Mobile	1 set	5,500	2,200	78	9,821
	Bearings		l set	200	1,800	64	8,036
Drilling Machine	Diamond Crowns	AX, BX	6 set	300	1,500	53	6,696
	Rods	AX, BX					
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Underground (1)

Underground (2)

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Underground (3)

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Eacilitica Machinge	1 + 0 - 10	Crockfinet one	Outstitue	Waiohr(Vo) -		ESTIMATED FILCE	9
racilities, machines	Y LEMS	opectificacture	קעםתוגוע	METRILLES/	1000 Yen	1000 U.Sh	US.\$
Locomotives	Electric Locomotives	E18-HP	3	24,000	50,300	1,781	224,554
	Electric Locomotives	EL4-HT	2	8,000	17,260	611	77,054
	Battery Locomotives	BL8-M	4	32,000	45,600	1,614	203,571
	Battery Locomotives	BL6-H	9	36,000	56,820	2,012	253,661
	Battery Locomotives	BL3-H	۳ ۱	000.6	17.790	630	79.420
	Spair parts	EL8-HP/EL4-HT	l set	2,000	2.500	89	11.161
	Spair parts	BLS-M/BL6-H/BL3-H	l set	3,000	4,000	142	17,857
	Starters, Controllers		20 sets	2,000	30,000	1,062	133,929
	Batteries	BL8-M	2	4,000	5,440	193	24,286
	Batteries	BL6-H	ĉ	5,000	6,960	246	31,071
	Batteries	BL3-H	2	1,600	2,320	82	10,357
	Battery Chargers	SG3-260-80JBY	2	800	3,100	110	13,839
	Battery Chargers	SG3-132-100JBY	ŝ	006	5,790	205	25,848
	Battery Chargers	SG3-66-100JBY	2	400	2.780	98	12,411
	Bearings		50	1.000	1,000	35	4,464
	Miscellaneous Parts		1 set	5,000	1,000	35	4,464

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ð	us.\$	83,036	67,857	18,080	18, 214	82,991	1,563	2,232	3,348	4,688	6,250	7,813	4,464	28,929	51,429	18,304	8,929	69,643	22,768				
Estimated Price	1000 U.Sh	658	538	143	144	658	12	18	27	37	50	62	35	229	408	145	11	552	181				
	1000 Yen	18,600	15.200	4.050	4.080	18,590	350	500	750	I,050	1,400	1,750	1,000	6,480	11,520	4,100	2,000	15,600	5,100				
TT = 1 − 71 − 1	weignt(Kg)	6,000	4,000	2.000	1, 500	6,600	609	700 -	800	1,300	1,500	1,800	5,000	3,400	5,100	3,000	 800	1,800	1,000				
	Auanci ty	m		l set	ę	11	Ŋ	5	ŝ	ŝ	. 5	Ω	1 set	 2	ę	l set	4 sets	600 sets	3 sets		- 1		
	specifications	2.4m ³ /Min x 200m Ag	2.8m ³ /Min x 100m Ag		1.2m ³ /min x 50mH x 30kw	2.4m ³ /min x 50mH x 45kw	7.5KW x 415V x 4P	11KW x 415V x 4P	15KW x 415V x 4P	22KW x 415V x 4P	30KW × 415V × 4P	37KW x 415V x 4P		750m ³ /min x 900mm x 45HP	300m ³ /min x 500mm x 20HP		A.C.AT8SP4 (90-505A)	(Lumps, Belts, Butteries)					
ŀ	l tems	Main Body	Main Body	Spare parts	Main Body	Main Body	Motors for Turbin and	Slurry Pumps					Pipes, Elctric Parts, etc	Main Body	Main Body	Bearings,Casing, etc.	Welding Machine sets	Mine Safety Lump Sets	Buttery Chargers				
- - - - - - - - - - - - - - - - - - -	Facilities, Machines	Turbín Pumps			Slurry Pumps									Fans			Miscellaneous						

Underground (4)

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Ð	US.S	7,321	3,660	13,393	161,786	112,679	38,482	17,188	9,375	88,393	12,143	139,286	35,714	55,804	69,196	51,339	10,714	22,321	23,214	22,321	66,964			
Estimated Price	1000 U.Sh	58	29	.90T	1,283	894	305	136	74	101	96	1,105	283	443	549	407	85	177	184	177	531			
	1000 Yen	1,640	820	3,000	36,240	25,240	8,620	3,850	2,100	19,800	2,720	31,200	8,000	12,500	15,500	11,500	2,400	5,000	5,200	5,000	15,000 L			
	weignt(kg)	1,500	300	4,000	37,000	20,000	10,000	4,000	3,300	20,000	3,500	10,000	3,000	5,000	3,000	5,000	1,300	300	300	10,000	50,000			
	Quantity	7	l set	2	1	1	2	1	1	1	l	l set	l set	. Т	1	1	2		8	l set	1 set			
	Specifications				Cat. D8K	Cat. D7G	with 6t & 3t Cranes	with 4.5 & 3t Cranes	2 tons	15 tons TL-150	6 tons	for new vehicles	for old vehicles				Gas Engine EGW-270YS	300A, 200A						
	1 tems	Land Rover	The above Spare parts	Vans, & Pick-Ups	Bulldozer	Bulldozer	Trucks with Cranes	Truck with Cranes	Folk Lift	Crane Car	Lorry	Spare parts	Spare parts	Horizontal Borining	Milling Machine	Turning Lathe	Welding Machine	Starters	Telephone	Spare parts	Elemental Materials			
;	Facilities, Machines	Transportation												Machine Shop										

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Surface (1)

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Tertificies, Nachines Itees Specifications Quarkity Nachines Itees Specifications Quarkity Nachines Itees Specifications Quarkity Nachines Itees Specifications Specifi								
Valves iS sets 750 3700 105 22 Atter-coolers 3 1,500 5,000 177 22 V-Belt 1 1 2 2 2 2 V-Belt 1 1 1 1 000 15 2 V-Belt 1 1 1 1 0 1 0 1 2 <th></th> <th></th> <th></th> <th>Quantity</th> <th>Weight(kg)</th> <th>1000 Yen</th> <th>Estimated Pri 1000 U.Sh</th> <th></th>				Quantity	Weight(kg)	1000 Yen	Estimated Pri 1000 U.Sh	
After-coolers 3 1,500 5,000 177 V-Beit 1 1 1 1 1 Pipes, Electric Farts, etc. 1 1 1 1 1 Pipes, Electric Farts, etc. 2 1 1 1 1 1 Nope 2 1 </td <td></td> <td>Valves</td> <td></td> <td></td> <td>750</td> <td>3,000</td> <td>106</td> <td>I3,393</td>		Valves			750	3,000	106	I3,393
W-Beit 1 set 500 10 18 Pipes, Electric Farts, etc. 1 set 2,500 1,000 35 Rope 29 m. 475 m. 14,000 5,230 185 Rope 300 m. Rubbered 100 1,000 35 185 Guid rollers 300 m. Rubbered 100 1,000 1,000 35 Pipe, File 300 m. Rubbered 100 1,000 1,000 35 Pipe 300 m. Rubbered 100 1,000 1,000 35 Pipe 100 1,000 1,000 35 18 Pipe 100 1,000 1,000 1,000 18 18 Pipe 1 1 1 18 18 18 Pipe		After-coolers		3	1,500	5,000	177	22,321
Fipes,Ellectric Farts, etc. 1 set 2,500 1,000 35 Rope 29 mm 4750 m 1,000 5,230 185 Rope 300 mm Rubbered 100 1,000 5,230 185 Cuid rollers 300 mm Rubbered 100 1,000 5,230 185 Provide 100 1,000 1,000 5,230 185 Provide 300 mm Rubbered 100 1,000 5,230 185 Provide 900 mm Rubbered 100 1,000 1,000 5,230 185 Provide 900 mm Rubbered 100 1,000 1,000 1,000 1,000 1,000 Provide 1,000 1,000 1,000 1,000 1,000 1,000 1,00		V-Belt			500	500	18	2,232
Rope 29 mm 4750 m 14,000 5,230 185 Ouid rollers 300 mm Rubbered 100 1,000 15 35 Height 100 1,000 1,000 15 35 185 Ouid rollers 300 mm Rubbered 100 1,000 1,000 35 Height Height Height Height Height Height 185 Height Height Height Height Height Height Height Height Height Height Height Height Height Height Height Height Height		Pipes,Electric Farts, etc.			2,500	1,000	35	4,464
Rope 29 mm 4750 m $14,000$ $5,230$ 185 Guid rollers 300 mm Rubbered 100 $1,000$ 35 Particle 300 mm Rubbered 100 $1,000$ 35 Particle 100 $1,000$ 35 35 Particle 100 100 $1,000$ 35 Particle 100 100 $1,000$ 35 Particle 100 100 100 $1,000$ 35 Particle 100 100 100 100 100 100 Particle 100 100 100 100 100 100 Particle 100 100 100 100 100 100 Pa								
Guid rollers 300 mm Rubbered 100 1,000 35 Partial rollers 800 mm Rubbered 100 1,000 35 Partial rollers 800 mm Rubbered 800 1,000 35 Partial rollers 800 mm Rubbered 800 1,000 35 Partial rollers 800 mm Rubbered 800 800 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 85 Partial rollers 800 mm Rubbered 800 mm Rubbered 85 85 85 Partial rollers 800 mm Rubbered		· :	9 mm	4750 m	14,000	5,230	185	23,348
		Guid rollers	300 mm Rubbered	100	000'T	1,000	35	797*7
						-		
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Surface (2)

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Crushing)	
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Plant	
MIII	

	Ð	us.\$		1,339		3 , 571	8,571	3,571	6,696	1,161	4,911	4,018	5,357	3,125	3,571	5,536	1,161	2,679	2,232	2,232			 	·	
	Estimated Price	1000 U.Sh		11 II		28	68	28	53	6	39	32	42	25	28	44	6	21	18	18					
-	1	1000 Yen		300		800	1,920	800	1,500	2,600	1,100	900	1,200	200	800	1,240	2,600	600	500	500					<u> </u>
	tites and the Area	wergnt(kg)		200		3,000	4,800	200	1,000	г,600	600	4,000	2,000	500	600	700	I,000	300	300	2,500					
		ναμειτά		l set		1 set	1 set	l set	100 m	200 m	I10 m	200	-1	2	2	2	2	30	П	1 set					
		opecifications							900 mm	750 mm	450 mm			2" Rubber	3" Rubber	4" Rubber	6" Rubber								
-		Ltems	Main Body, Ropes,	Spare parts	Belt,	Grizzly Spare Parts	Liners	Bearings	Belt	Belt	Belt	Carrier & Return Rollers	Screw	Slurry Pumps	Slurry Pumps	Slurry Pumps	Slurry Pumps	Bearings	Screen	Steel		-			
		facilities, Machines	Scraper		Constant Feeder		Brake Crush		Conveyor				Classifier	Pumps					D.D Screen	Miscellaneous					

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Facilities, Machines Stock Pile Chute						Estimated Price	ð
Stock Pile Chute	L tems	Specifications	Quantity	Weight(kg)	1000 Yen	1000 U.Sh	US.\$
	Spare parts		15 sets	5,000	1,500	53	6,696
Vibro. Feeder	Spare parts		2 sets	2.000	600	21	2,679
Conveyor	Belt	900 mm	200 m	2,000	3,000	90T	13,393
	Belt	750 mm	300 m	2.400	3.900	138	17,411
	Belt	600 mm	400 m	2,400	4,800	170	21,429
	Carrier Rollers		400	8,000	1,800	64	8,036
	Gear Box	20HP x 40/1	4	800	2,400	85	10,714
Cone Crusher	Liners	5 1/2'	3	12,000	4,400	156	19,643
	Bearing		3		2,400	85	10,714
S.D.Screen	Main body		2	200	400	14	1,786
Silos	Side Plates		6 sets	30,000	3,000	106	13,393
Vibro. Feeder	Chute		ŝ	т,000	2,400	85	10,714
Miscellaneous	Steel		l set	2,500	500	18	2,232
							-
				-			

Mill Plant (Secondary Crushing)

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Mill Plant (Grinding)

ę	us.\$	1,786	3,705	8,929	32,589	16,830	19,018	10,268	1,786 L	10,714	38,839	L,563	7,143	4,866	6,696	13,393	, A. 76 3149						
Estimated Price	1000 U.Sh	14	 29	71	258	133	151	81	14	85	308	12	57	39	53	106							
I	1000 Yen	400	830	2,000	7,300	3,770	4,260	2,300	400	2,400	8,700	350	1,600	1,090	1,500	3,000				-			
	wergnt (kg)	200	600	1,000	29,100	33,000	30,000	500	100	600	3,000	100 T	600	100	100	5,000							
•	Quancity	2 sets	 1	5	29.1 tons	33 tons	30 tons	10	2	16	e	10 sets	2	5 sets	l. set	I set				- <u></u>			
	pecifications							24" NR	18" NR	12" NR			318						-				
;;	Lens	Spare parts	Gear Box	Metal	Liners	Rods	Balls	Liners	Liners	Liners	Main Body	Diaphrams, Balls	Main Body	Spare parts	Spare parts	Pipes, Valves, Spare Parts							
	racilities, Machines	Weight Meter	Mills					Cyclones			Derroco Pumps		Slurry Pumps		Crane	Miscellaneous							

	3					Estimated Price	9
Facilities, Machines	Items	Specifications	Quantity	weignt(kg)	1000 Yen	1000 U.Sh	US.\$
Agitairs	Impellers, Stabilízers						
			30 sets	3,000	12,000	425	53.571
	Motors	15 KW	ΠO	3,000	1,500	53	6,696
	Motors	LI KW	10	2,000	I,200	42	5,357
	Cells	$6t \ge 2.7m^2$	102	5,000	1,000	35	4,464
Mills	Metal		2 sets	200	800	28	3,571
	Gear Box		-1	800	760 -	27	3,393
Slurry Pumps	Main Body	ф.	°.	1,000	1,860	66	8,304
	Main Body	3 ^{II}	en	900	1,200	42	5,357
	Main Body	2"	3	700	1,050	37	4,688
Metars	Weight Meters		4	2,000	4,000	142	17,857
	PH Meters		2	50	800	28	3,571
	Pulp Density Meters		2	100	1,600	57	7,143
	Flow Meters		2	100	2.400	85	10,714
Pipe Lines	Tailing Pipes	8" SGP	1,000 m	30,000	5,800	205	25,893
	Py Conc. Pipes	4" SGP	1,300 m	16,000	I,950	69	8,705
	Cu Conc. Pipes	4" SCP	1,300 m	16,000	1,950	69	8,705
Laboratory	Standard Screens						
	& other instruments		1 set	200	5,000	177	22,321
Miscellaneous	Piper, Valves, etc.		L set	5,000	1,000	35	4,464
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Mill Plant (Flatation)

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Plant	
Filter	
Crushing	
(Lime C	
Plant	
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		s		2	2			Ŀ,		4	 ور	5	6	6		9	80	4	4						
	e	SU US	1,339	2,232	2,232		13,393	625		176,964	6,696.	2,902	8,929	2,009	13,393	8,036	3,348	5,804	4,464					 	
	Estimated Price	1000 U.Sh	11	18	18		106 J	5		1,403	53	23	71	JI	106	64	27	46	35						
		1000 Yen	300	500	500		3,000	140		39,640	1,500	650	2,000	450	3,000	1,800	750	1,300	1,000						
		Weight(kg)	100	200	2,500		т,000	100		10,000 L	1,000	400	1,000	2,000	300	T,000	100	200	5,000			 			
		Quantity	3 sets				7	4		2 sets	100 1	50 m	200 #	100	н	3	5 sets		l set						
		ltions																							
		Specifications	-								900 mm	750 mm	450 mm		400 KW	3"									
			`	ts		-	 		ps,	vers	-														
sr Plant)		Items	Spare Parts	Liners, Spare Parts	Pipes etc.		Rake	Diaphrams	Discs, Vacuum pumps,	Slurry pumps, Recievers	Belt	Belt	Belt	Carrier Rollers	Heater	Main Body	Spare parts	Main Body	Pipes, Valves						
ing Filte	· .	les								S											 .				
Mill Plant (Lime Crushing Filter Plant)		Facilities, Machines	Pumps	M111	Miscellaneous		Thickeners	Dorroco Pumps	Disc Filters,		Conveyors					Slurry Pumps		Weight Meters	Miscellaneous						

APPENDIX-4 BASIC DATA FOR OPERATING COST ESTIMATION

KILEMBE MINE

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Mining-Development

				Total	н Н
	Major	Subordinate	Winze, Ventilation. etc.	u.sh.	US.\$
Scheduled Advance	300 m	200 m			
Nos. of Faces	11	8			<u>N</u> .
Advance/Round	1.3 m	1.3 m			
Labour Strength	66	79	(13)		
Machine	22	16			
Loader	11				
Timber	11	7ę			
Pipe & Rail	11	Ø			
General	- 77	24	13		
Nos. of Drills	28				
Nos. of Stopers		20			
Nos. of Loders	24				
Cost				374,725	47,254
Labour	99 x 21d x 43.13sh = 89,667 sh	66 x 21d x 43.13sh = 59,778 sh	13 x 21d x 43.13sh =11,774sh	161,219	
Explosives	$219sh \times 300m = 65,700 sh$	$299.23 \text{sh} \times 200 \text{m} = 59,846 \text{sh}$	3,280sh	128,826	
ANFO	12.4kg/m	19.10kg/m			
Gelignite	3.1kg/m	4.78kg/m			
D.S.Det.	22.3 unit/m	22.3 unit/m			
Tímber	1977 Budget 1,780 sh	Av. 775 - 777 37,000 sh	460sh	39,240	
Bits,Rods,etc.	15,660 sh	10,440 sh	1,340sh	27,440	
Reserves	Av. 175 & 176 6,000 sh	12,000 sh		18,000	

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Mining-Stoping	50			
		2	 Total	
	Scoping	Sana-Lilling	U.Sh.	US.\$
Preduction	50,000 tons			
Nos. of Stopes	50 + 10 (spares)			
Labour Strength	522	132		
Machine	166			
Timber	22			
Scraper	111			
General	223	132		
Nos. of Drills	125			
Nos. of Stopers	63			
Nos. of Scrapers	63			hathat ann an
			-	
Cost			1,192,707	150,404
Labour	522 x 21d x 43.13sh = 472,791sh	132 x 21d x 43.13sh = 119,556 sh	592,347	
Explosives	$4.285sg \times 50,000T = 314,250sh$	3,000 sh	217,250	-
ANFO	0.347kg/ton			
Gelignite	0.039kg/ton			h. Farmigan
M.S.Det.	0.17 unit/ton			
Timber	0.0019m/ton 84,260 sh	'76 actual 0.55sh/t 27,500 sh	111,760	
Bits & Rods	1.04sh/ton 52,000 sh		52,000	*****
Rock Bolts, etc.	0.17unit/ton 86,100 sh	'76 actual 1.62sh/t 81,000 sh	167,100	
Reserve	0.345sh/ton 17,250 sh	'76 actual 0.70sh/t 35,000 sh	52,250	

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			· · · · ·	Total	L.
	Diamond Drilling	Hoist & Tramming	Administeration	U.Sh.	US.\$
Scheduled Advance	1000 m				
Nos. of Machines	3 units				
Advance/Shift	ъ Ч				
Labour Strength	24	400	18		
Supervisor			26		-
Artisan	2		37		
Ganger			4		
D.D.Operator	22				
Traming		268			
Hoisting		61			:
Surf. Transport.		τz			
Office			8		Q
Others			6		
Cost				777,719.	98,073
Man Power	23,327 sh	362,292 sh	207,790 sh	593,409	
Supervisor			26x4800sh = 124,800 sh		
Artisan	2 x 1700 sh 3,400 sh		37x1700sh = 62,900 sh		
Labour	22x21dx43.13sh = 19,927 sh	400x21dx43.13sh = 362,292 sh	1.8x21dx53.15 = 20,091 sh		
Explosives		Av.75'/76' 0.267sh/ton 13,350 sh		13,350	
Timber		Av.75'/76' 0.27sh/ton 13,500 sh		13,500	
Supplies	45.60sh/m 45,600 sh	Budget '77 0.43sh/ton 21,500 sh	Budget '77 16,320 sh	83,420	
Sundries		Budget '77 0.24sh/ton 12,000 sh	Budget '77 16,320 sh	28,320	
Reserves		Budget '77 0.28sh/ton 14,000 sh	Budget '77 600 sn	14,600	
Surf. Transport.			Budget '77 31,120 sh	31,120	

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Technical Services

	وبواسم والبراج والمقاد المالي والمراجع والمتحافظ المراجع والمحافظ والمحافظ والمحافظ والمحافية والمحافية والمحاف			· · · · · · · · · · · · · · · · · · ·			
		- . ,.	•			Tot	Total
	Geology, Surveying, Assaying	saying	Safety & Secu	Security	Training	U.Sh.	us.\$
Labour Strength		133		60	17		I VALUE ANICON
Supervisors	24		4		2		
Artisans	23		6		4		
Labours	78		07		11		
Causal	8		7				
Cost						388,453	48,985
Man Power	236	236,581 sh		80,938	28,414	345,933	
Supervisor	24x4800sh = 115	115,200 sh	4x4800sh =	19,200 sh	2x4800 = 9,600 sh		
Artisan	23x1700sh = 39	39,100 sh	9x1700sh =	15,300 sh	4x1700 = 6,800 sh		
Lab. & Cas.	86x21dx45.56sh= 82	82,281 sh	47x21dx47.05 =	46,438 sh	llx21dx52.01sh = 12,014 sh		
Supplies						31,000	
Surf.Transport.						11,520	
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Milling Cost (Supplies)

81,770 5,246 4,375 1,018 958 21,571 2,317 625 960 3,589 830 10,179 3,482 625 1,313 420 3,629 l7,769 2,500 7,143 22,188 7,597 201 42,430 US.S 19,825 27,612 10,412 · 18,374 28,778 28,461 648,439 56,644 4,956 1,594 8,073 7,600 171,059 4,956 7,613 6,582 34,694 140,910 80,719 175,951 60,247 3,331 41,601 336,470 COST/Month U.Sh. 4,970 560 I,600 2,280 1000 Yen 780 228 1,175 519 215 804 186 980 140 45 813 140 294 76 Sh/Tΰ.Sh. HWW/LL40 UNIT PRICE 130,000/Unit 160,000/Set 400/Kg 420/Kg 1,200/Kg 450/Kg 350/Kg 250,000/T 114,000/T 142,000/T 400,000/T 8;600/m² 130,000/m $1,560/m^{2}$ 70,000.T Yen 1,830 MWH 650 Kg 1.4T 6.4T 35.OT 20.0T /Month 62.5m 350Kg 700Kg 100Kg 650Kg 60 m² 500Kg T001 25m² 21 570m CONSUMPTION Mill Feed Toh 3.8Kg 36.6 KWH 3.6 KWH 23.4 KWH 9.6 KWH 13g148 138 288 128g 4008 7008 78 89 73 Spare parts for Flotators Spare parts for Pumps Grinding & Flotation Steel Bars, Plates Flotation Reagents Items Grinding Balls Screen (Steel) Crusher Liners Filter Canvas Conveyor Belt Miscellaneous Grinding Rods Filter Plant Steel Pipes Mill Liners AX-343 AF-238 DF-250 Repair Parts & Materials Lubricants AX-325 Z-200 Lime Crushing Consumables Total (Material) Cost Electricity Operating

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Milling (Labour Cost)

	• •				Total	L.
	Concentrator	ator	Dam and Fipe Lines	Hima Lime Work	U.Sh.	US.\$
Labour Strength		124	15	48		
Supervisors	8					
Artisans	J.6			T		
Labours	100			47		
Contractors			15			
Cost					850,601	107,263
Man Power		150,200 sh	10,500	sh 41,462 sh	202,162	25,493
Supervisors	8 x 4,800sh =	38,400 sh				
Artisan	16 x 1,700sh =	27,200 sh		$1 \times 1,700 \text{sh} = 1,700 \text{sh}$		
Labour	100 x 846sh =	84,600 sh		^m		
Contractors			15 x 670sh = 10,500 sh	sh [
Material Cost	-				648,439	81,770

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Engineering

Total	us.s					<u>, , , , , , , , , , , , , , , , , , , </u>	172,375														
Tot	U.Sh.						1,366,937	696,007				289,400	23,480	121,770	236,280						
	Electrical	155 155	16	29	110			247,190 sh	: 4800sh = 76,800 sh	1700sh =	ll0x2ldx52.42sh =121,090 sh			0.198sh × 615,000KWH							
		141						190,875 sh	43,200 sh 16 x	32,300 sh 29 x	115,375 sh 110x2			UEB.							
	Underground		6	19	113				9 x 4800sh =	19 x 1700sh =	113 x 21d x 48.62sh =										
	al.	169						257, <u>942</u> sh	67,200 sh	64,600 sh	= 126,142 sh										
	Mechanical		14	38	117	•			14 x 4800sh =	38 x 1700sh =	117 x 21d x 51.34sh			# #							
		Labour Strength	Supervisors	Artisans	Labours	Casuals	Cost	Man Power	Supervisors	Artísans	Labours	Supplies	Surf. Transport.	Electricity	Reserves						

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Total	U.Sh. US.\$						336,395 42,421															
	Nkombe Saw Mill	154	2		92	59	336,395sh	222,035sh	$2 \times 4.800 \text{sh} = 96.000 \text{sh}$. 11	21sh = 7	- 11		15,480sh	-							
<u>,</u>		Labour Strength	Supervisors	Artisans	Labours	Casuals	Cost	Man Power	Supervisors	Artisans	Labours	Casuals	Supplies	Rentals	Surf. Transport.				-			

Administeration

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		Dercossale	serit ces		
	Administeration, store	r stanners	2))) 11 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2) 2)	U.Sh.	us.s
Labour Strength	65	59	80.		
Supervisors	16	7	22		
Artisans	28	15	26		
Labours	21	24	30		
Casuals		13	2		
Cost				771,779	97,324
Man Power	145,400 sh	95,712 sh	181,727 sh	422,839	
Supervisor	$16 \times 4,800 \text{sh} = 76,800 \text{sh}$	$7 \times 4800 \text{sh} = 33,600 \text{sh}$	$22 \times 4800 \text{sh} = 105,600 \text{sh}$		
Artisans	$28 \times 1700 \text{sh} = 47,600 \text{sh}$	$15 \times 1700 \text{sh} = 25,500 \text{sh}$	$26 \times 1700 sh = 44,200 sh$		
Lab. & Cas.	$21 \times 21d \times 47.62sh = 21,000 sh$	37 x 21d x 47.12sh = 36,612 sh	32 x 21d x 47.51=31,927 sh		
Supplies	6,420 sh		46,960 sh	53,380	
Rental & Others				71,880	
Surf. Transport.				48,880	
Reserves				174,800	
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