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IRON BLOW METALLURGICAL SCOPING STUDY – SCOPING LEVEL PROCESS PACKAGE (PDC, MASS BALANCE, CAPEX AND OPEX)

PROJECT: PNX-RP-002

DATE: 22/01/2016

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1. EXECUTIVE SUMMARY

Recently, Phoenix Copper (PNX) begun drilling and collecting samples for metallurgical test work on their Iron Blow deposit.

BHM Process Consultants Pty Ltd (BHM) assisted with metallurgical test work design, management and analysis of this material. After this was complete, BHM prepared a scoping-level process package based on the metallurgical test work results, as well as assumptions, and experience knowledge. The information BHM provided included: process flow design (PFD), process design criteria (PDC), mass balance (based on metallurgical test work), CAPEX and OPEX estimates.

- Circuit mass balance (from metallurgical test work) shows a target overall recovery of gold, silver and zinc of 59.79%, 80.24% and 82.24% respectively. These values were selected based on the massive sulphide zone metallurgical test work and refer to the total recovery to both the Pb/Cu cleaner concentrate and the zinc cleaner concentrate.

- The mass balance, CAPEX and OPEX values were based on a 350,000 dmt/annum processing rate, 8.7%Zn head grade and an 85% zinc recovery to zinc concentrate. The proposed circuit design was based on producing a gold-silver dore bar and a zinc concentrate product.

- Assumptions made in the creation of the mass balance, process design criteria, process flow diagram (PFD), CAPEX and OPEX were based on verbal and written communication with specialist vendors, project experience in similar operations and operational experience in similar operations.

- PFD includes a two stage crushing circuit, followed by a one-stage closed-circuit milling circuit. A separate Pb/Cu rougher/scavenger circuit and Zn rougher/scavenger flotation circuit. Both circuits require the rougher/scav concentrate to be re-ground and then cleaned in another flotation circuit. The Pb/Cu cleaner concentrate is then leached with the pregnant solution send to electrowinning to produce a gold-silver dore bar. Zn concentrate is thickened and filtered before trucked for sale.

- Total capital expenditure for the proposed process flow diagram was ~$AUD 6.78 million (± 30%). This does not include GST. Civils, structural and piping were also not included in the CAPEX estimate.

- Total OPEX for the proposed PFD was ~$AUD 14.4 million per annum (± 30%). This equated to an operating cost of AUD$ 41.11/t milled, or AUD$ 556/t zinc produced. Sections included in this estimate were, labour, electrical power, reagents, consumables, maintenance, general and administration.

- Battery limits of this study included site services (water, waste treatment, buildings), final product transport logistics and the tailings storage facility (TSF)

2. INTRODUCTION

Phoenix Copper Ltd (PNX) are currently looking at developing two main base metals / precious metals deposits in the Northern Territory, Australia, namely: Iron Blow and Mt Bonnie.

PNX has completed a number of drill holes, mainly in the Iron Blow deposit. There has been some sighter metallurgical test work and mineralogy investigation of this deposit completed earlier in the year. The low-level scoping study was completed and a tentative processing circuit design was created based on the scoping study laboratory results and subsequent mass balance. The CAPEX and OPEX was also created based on the processing circuit design.

3. ASSUMPTIONS

3.1. MASS BALANCE

Assumptions were made in determining the mass balance, which formed the basis of equipment selection and sizes. These assumptions included:

- 350,000 dmt per annum processing rate
- Milling circuit utilisation of 89.6%, typical of most milling circuits
- Use of test work results, and assayed head grades, of the Massive Sulphide Zone (MSZ) only from the metallurgical test work
- A solids SG and concentrate SG of 2.7t/m3 and 4.0t/m3 respectively based on similar deposits
- Feed and underflow densities within comminution circuits and thickeners were estimated based on previous experience with similar scale processes and equipment
- Portion of metal units in Pb/Cu Cleaner Tail recovered to Pb/Cu Cleaner Concentrate:

Au	Ag	Cu	Pb	Zn
25%	25%	30%	30%	0%

- Portion of metal units in Zn Cleaner Tail recovered to Zn Cleaner Concentrate:

Au	Ag	Cu	Pb	Zn
25%	25%	20%	20%	40%

- Mass split of cleaner concentrate doesn’t change with the recirculating streams
- Calculated recoveries are from cleaner recovery laboratory test work
- Portion of metal units in Pb/Cu Cleaner Tail recovered to Zn Cleaner Concentrate

Au	Ag	Cu	Pb	Zn
10%	10%	10%	10%	60%

- Calculated overall target recoveries of gold, silver and zinc of 59.79%, 80.24% and 82.24% respectively. Overall recovery refers to the recovery to both the Pb/Cu cleaner concentrate and zinc cleaner concentrate

- Assumed same cleaner concentrate grades with recycle streams due to difficulty in modelling changes in concentrate assay grades.

3.2. CAPEX

Some assumptions were also necessary to complete the CAPEX estimation of the project.

- 350,000 dmt per annum processing rate through crusher and mill
- Crushing circuit utilisation of 41.7%, as per Metso design
- Crushing work index of 16.16kWh/t, as per PNX historical data
- Crushing product size of 10mm, as advised for a typical milling feed size
- Milling circuit utilisation of 89.6%, typical of most milling circuits
- Crushing work index of 16.16kWh/t, as per PNX historical data
- Mill bond work index of 15.5kWh/t, as per PNX historical data
- Estimated cyclone feed and underflow densities from experience in similar operations
- Estimated thickener underflow densities from experience in similar operations

3.3. OPEX

Some assumptions were also necessary to complete the OPEX estimation of the project:

- Target zinc recovery of 85%, based on metallurgical test work on MSZ material
- Zinc head grade of 8.7%Zn, from MSZ metallurgical test work
- 350,000 dmtpa
- Power cost of 29 AUDc/kWh
- Diesel cost of AUD1.25/L
- DIDO operation as opposed to FIFO operation
- Reagent usages based on metallurgical test work
- Reagent unit costs based on supplier information and experience with similar/or identical reagents at other operations

4. MASS BALANCE (LABORATORY TEST WORK)

The following mass balance was created (from laboratory test work) assuming that the cleaner tails streams report to the final tail. Subsequent calculated assays and recoveries where then created (Table 1). All assumptions for the creation of the mass balance are shown above in Section 3.3.

The resulting mass balance is shown below in Table 1.

	Assays								RECOVERY (%)								
	Au	Ag	Cu	Pb	Zn	Fe	S	As	Mass	Au	Ag	Cu	Pb	Zn	Fe	S	As
	ppm	ppm	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Pb/Cu Rougher Feed	**2.62**	**184.08**	**0.52**	**1.10**	**8.17**	**36.62**	**30.08**	**1.25**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Pb/Cu Rougher Con	7.26	660.63	1.62	3.36	7.08	28.25	24.53	2.21	23.04	63.95	82.68	71.43	70.52	19.96	17.77	18.79	40.55
Pb/Cu Rougher Tail	1.23	41.43	0.19	0.42	8.50	39.12	31.73	0.97	76.96	36.05	17.32	28.57	29.48	80.04	82.23	81.21	59.45
Zn Rougher Feed	1.23	41.43	0.19	0.42	8.50	39.12	31.73	0.97	76.96	36.05	17.32	28.57	29.48	80.04	82.23	81.21	59.45
Zn Rougher Con	2.25	85.58	0.49	0.69	28.65	25.90	33.85	1.63	21.87	18.79	10.17	20.53	13.69	76.67	15.47	24.62	28.42
Zn Rougher Tail	0.82	23.90	0.08	0.32	0.50	44.38	30.90	0.71	55.09	17.26	7.15	8.03	15.79	3.38	66.76	56.59	31.04
Pb/Cu Cleaner Feed	7.26	660.63	1.62	3.36	7.08	28.25	24.53	2.21	23.04	63.95	82.68	71.43	70.52	19.96	17.77	18.79	40.55
Pb/Cu Cleaner Con	**18.15**	**1960.14**	**4.61**	**9.77**	**5.22**	**15.89**	**18.04**	**1.52**	**6.81**	**47.21**	**72.48**	**60.20**	**60.49**	**4.35**	**2.95**	**4.08**	**8.28**
Pb/Cu Cleaner Tail	2.70	115.65	0.36	0.68	7.86	33.43	27.25	2.49	16.23	16.73	10.20	11.24	10.03	15.61	14.82	14.71	32.27
Zn Cleaner Feed	2.25	85.58	0.49	0.69	28.65	25.90	33.85	1.63	21.87	18.79	10.17	20.53	13.69	76.67	15.47	24.62	28.42
Zn Cleaner Con	2.14	112.81	0.67	0.76	46.84	14.04	33.52	0.80	12.72	10.38	7.79	16.26	8.78	72.87	4.88	14.17	8.14
Zn Cleaner Tail	2.40	47.77	0.24	0.59	3.39	42.37	34.31	2.77	9.16	8.41	2.38	4.27	4.91	3.80	10.59	10.44	20.28
Final Tail	1.378757	45.11891	0.152466	0.419595	2.314098	41.93909	30.54852	1.301491	80.48	42.40	19.73	23.54	30.73	22.78	92.17	81.74	83.58

Table 1: Rougher and Recleaner Mass Balance- incl cleaner tail recirc

When including the assumption of Pb/Cu cleaner tails material reporting to the zinc cleaner concentrate, the recovery to zinc cleaner concentrate increases and is shown below in Table 2.

	Assays								RECOVERY (%)								
	Au	Ag	Cu	Pb	Zn	Fe	S	As	Mass	Au	Ag	Cu	Pb	Zn	Fe	S	As
	ppm	ppm	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Zn Cleaner Con	2.14	112.81	0.67	0.76	46.84	14.04	33.52	0.80	12.72	12.06	8.81	17.38	9.78	82.24	4.88	14.17	8.14
Final Tail	1.38	45.12	0.15	0.42	2.31	41.94	30.55	1.30	80.48	40.73	18.71	22.42	29.73	13.42	92.17	81.74	83.58

Table 2: Zn Recleaner Mass Balance- incl cleaner tail recirc – adjusted

5. MASS BALANCE (PLANT DESIGN) AND PROCESS DESIGN CRITEREA

Numbers taken from Table 1 were used to form a mass balance that could be used to estimate the processing equipment selection and sizing. This complete mass balance can be found in Appendix A. A subsequent water balance around the processing site was also created and can be located in Appendix B.

A process design criteria was formed using data from the mass balance and equipment selection from vendors, and can be viewed in Appendix C.

6. PROCESS FLOW DIAGRAM

The process flow diagram can be seen in Diagram 1 below. This design is based on laboratory test work results from MSZ metallurgical test work.

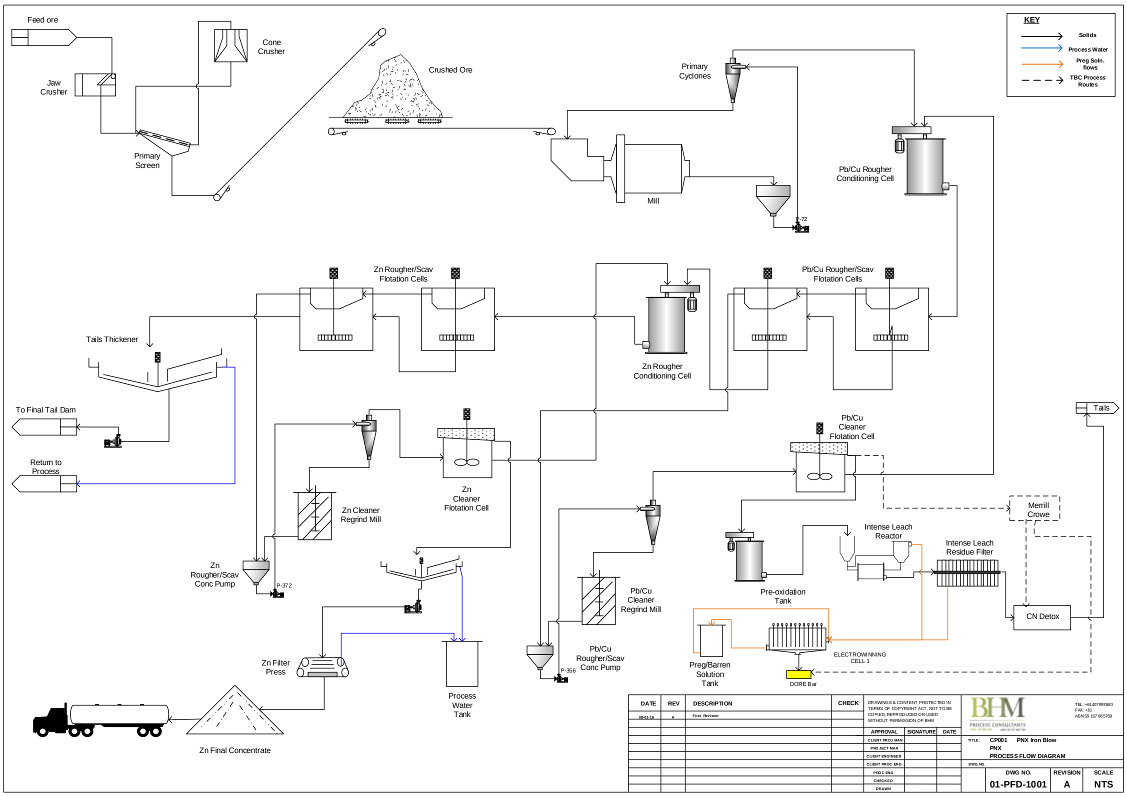

Diagram 1: Proposed process flowsheet - PNX

The PFD in Diagram 1 includes a two stage crushing circuit, followed by a one-stage closed-circuit milling circuit (ball mill).

A target flotation feed size p80 of 75µm is achieved before feeding the Pb/Cu rougher feed conditioning cell. The Pb/Cu rougher/scavenger circuit produce a concentrated Pb/Cu concentrate product which is subsequently re-ground in a fine grinding closed-circuit to achieve a particle size of p80 28µm. The finely ground concentrate is then cleaned in a separate Pb/Cu cleaner flotation bank. The Pb/Cu cleaner flotation tails is returned to the head of the rougher bank, whilst the Pb/Cu (and high precious metals) cleaner concentrate is sent to the pre-oxidation circuit followed by the Intensive Cyanide Leach (ICL) stage to leach the precious metals into solution. The pregnant solution is sent to the electrowinning cell, followed by smelting, to produce a dore bar, whilst the high grade silver ICL tail is kept for further processing. A provision for a Merrill Crowe circuit to replace the pre-oxidation and ICL stage is also included to maximise silver recovery.

The Pb/Cu rougher/scavenger circuit tails feeds the zinc rougher/scavenger circuit. The zinc rougher/scavenger circuit concentrate is re-ground in a fine grinding closed-circuit to achieve a particle size of p80 35µm. The finely ground concentrate is cleaned in a separate zinc cleaner flotation bank with the zinc cleaner concentrate sent to a thickener/ filter press for final concentrate transport, whilst the zinc cleaner flotation tails is returned to the head of the zinc rougher bank. The zinc rougher tails is thickened to recover process water.

7. PROCESS FLOW DIAGRAM - KEY INPUTS AND CAPEX ESTIMATE

Each unit process was separated and an estimated capital created. It must be noted that these CAPEX estimates are ± 30% based on verbal, and written, conversation and statements with specific vendors, and using operating experience.

7.1. CRUSHING CIRCUIT – KEY INPUTS AND CAPEX ESTIMATE

The crushing circuit designed was based on some key assumptions. A bond crushing work index of 16.16kWh/t was selected based on PNX inputs from historical data. A feed size of 500mm and crushing circuit product size of 10mm was selected from vendor inputs, to allow a sufficient feed size for the subsequent milling circuit. The crushing circuit was modelled using Metso software and a typical crusher utilisation of 41.7%. As such, a two stage jaw-gyratory crusher (closed circuit) option was selected. A crusher throughput of 350,000 tonnes per annum was used.

Table 3 shows the estimated capital cost for this circuit

ITEM	DETAILS/SIZE	COST ESTIMATE	Max Feed Size	Max Prod Size	Ref. Source
		$AUD	mm	mm	-
Primary Crusher	Metso C106 Jaw Crusher	$ 254,448	600	40	Metso (email)
Primary Crusher Area Dust Collector	Insertable dust filter with integral exhaust fan and air pulse bag cleaning. 1000 m3/hr	$ 19,000	-	-	BHM (equipment spec. on similar project)
Primary Crusher Discharge Conveyor	1-2 m in length	$ 15,000	-	-	BHM (equipment spec. on similar project)
Primary Metal Detector	TBA	$ 15,000	-	-	BHM (equipment spec. on similar project)
Vibrating Screen	Joest SRZ 2130x4880, 37kW	$ 21,500	40	10	Metso (email)
Secondary Crusher	Metso Gyratory Crusher GP200S	$ 347,264	40	12	Metso (email)
Secondary Crusher Discharge Conveyor	4-5 m in length	$ 25,000	-	-	BHM (equipment spec. on similar project)
	TOTAL	**$ 697,212**			

Table 3: Estimated CAPEX for crusher area

7.2. MILLING CIRCUIT - KEY INPUTS AND CAPEX ESTIMATE

The milling circuit designed was based on some key assumptions. A bond work index of 15.5kWh/t was selected based on PNX inputs from historical data. A mill feed size of 10mm was selected, with a target flotation product size p80 of 75µm (metallurgical test work). Based on this information a one stage, closed-circuit ball mill was selected.

The milling circuit utilisation used was 89.6%, as this is typical of other milling circuits and recommended by the vendor Osbourn. A mill throughput of 350,000 dry metric tonnes per annum (dtpa) was used, with a calculated milling throughput of 44.6 dtph. Therefore, a design throughput rate of 53.5 dtph, based on a 20% buffer, was selected.

Table 4 shows the estimated capital cost for this circuit

ITEM	DETAILS/SIZE	COST ESTIMATE	Max Feed Size	Max Prod Size	Ref. Source
		$AUD	mm	mm	-
Primary Mill	12' x 18' NCP Osbourn Ball Mill (overflow type), 1200kW	$ 1,112,734	10	0.075	Osbourn (email), sizing numbers from PNX met testwork
Primary Cyclone Pump	1 Duty, 1 Standby; Metso horizontal shaft slurry pump	$ 19,352	-	-	BHM (equipment spec. on similar project)
Primary Mill Feed Conveyor	TBC	$ 15,000	-	-	BHM (equipment spec. on similar project)
Primary Cyclone Cluster	TBC	$ 50,000	-	-	BHM (equipment spec. on similar project)
Primary Mill Weightometer	Single roll weightometer suitable for 600 wide belt with 35" idlers	$ 12,000			BHM (equipment spec. on similar project)
	TOTAL	$ 1,209,086			

Table 4: Estimated CAPEX for milling area

7.3. FLOTATION CIRCUIT - KEY INPUTS AND CAPEX ESTIMATE

The flotation circuit design was based on metallurgical test work of the Massive Sulphide Zone material. The selection of a rougher-scavenger circuit for both the Pb/Cu circuit and zinc circuit was chosen based on metallurgical test work results, along with the respective regrind and cleaner flotation circuit. Design feed flows used to each flotation bank were based on the mass balance, which assumed that both cleaner tails product would report back to their respective rougher feed streams.

Flotation rougher and cleaner banks were sized based on mass flow data from the metallurgical test work mass balance, with typical laboratory scale up factors employed to achieve a residence time of 25 min for the rougher cells and 15 min for the cleaner cells. A 15% air hold up volume was also used in the float cell volume calculations.

Table 5 shows the estimated capital cost for this circuit

ITEM	DETAILS/SIZE	QUANTITY	COST ESTIMATE	Ref. Source
		(#)	$AUD	-
Rougher/scavenger Conditioning Tank	Outotec OKTOP Conditioning tank	2	$ 140,000	Outotec (email)
Rougher/scavenger Flotation	4x Outotec e20 flotation cells	2	$ 920,000	Outotec (email)
Cleaner Flotation	3x Outotec OK3 flotation cells	2	$ 520,000	Outotec (email)
Conc Flotation Pump	Metso VS L150 O5. Vertical cantilever shaft sump type pump	2	$ 12,616	BHM (equipment spec. on similar project)
Zn Flotation Tail Pump	Metso HR150 horizontal shaft slurry pump	1	$ 9,676	BHM (equipment spec. on similar project)
Air Blowers	2 xContinental Multistage Centrifugal 77-04 Blowers	2	$ 164,000	Outotec (email)
		TOTAL	$ 1,766,292	

Table 5: Estimated CAPEX for flotation area

7.4. REGRIND CIRCUIT - KEY INPUTS AND CAPEX ESTIMATE

The regrind circuit was designed and sized based on metallurgical test work and the mass balance flow rates. The target product particle size for the Pb/Cu regrind mill was p80 28 µm, whilst the zinc regrind was p80 38 µm, both from metallurgical test work.

Table 6 shows the estimated capital cost for this circuit

ITEM	DETAILS/SIZE	COST ESTIMATE		Max Feed Size	Max Prod Size	Ref. Source
		$AUD		p80 µm	p80 µm	-
Pb/Cu Rougher/scavenger Regrind Mill	1 x Outotec HIG110 with 110kW installed FCA	$	630,000	55	25	Outotec (email)
Pb/Cu Rougher/scavenger Regrind Cyclone Cluster	TBC	$	30,000	55	25	BHM (equipment spec. on similar project)
Zn Rougher/scavenger Regrind Mill	1 x Outotec HIG110 with 110kW installed FCA	$	630,000	55	38	Outotec (email)
ZnRougher/scavenger Regrind Cyclone Cluster	TBC	$	30,000	55	38	BHM (equipment spec. on similar project)
	TOTAL	**$**	**1,320,000**			

Table 6: Estimated CAPEX for regrind areas

7.5. PRE-OXIDATION, LEACHING AND ELECTROWINNING CIRCUIT - KEY INPUTS AND CAPEX ESTIMATE

Two options exist for this circuit due to the high silver content in the metallurgical test work ICL tail. It was recommended that any future metallurgical testing attempt a Merrill Crowe test. As such, a Merrill Crowe Circuit has also been included in this sub-section.

The Gekko ILR was selected based on capability (leaching of high grade gold concentrates) and given throughput rates to the vendor. As the ILR would likely be ran in batch-mode, a solids residue filter would be required. This equipment type was selected based on experience using a similar filter in very similar duty conditions, including material type, and feed size.

The Merrill Crowe was selected as an alternative to leach more of the silver credits from the feed material. This design was selected by the vendor based on input flows from the mass balance.

Table 7 shows the estimated capital cost for this circuit

ITEM	DETAILS/SIZE	COST ESTIMATE $AUD	Ref. Source
Pre-oxidation tank	8.9m3, c/w baffles, stiffener ring, outlet and drain nozzles. Rubber lined	$ 30,000	BHM (equipment spec. on similar project)
Intense Leach Reactor (ILR)	1 x Gekko ILR5000BA batch units	$ 649,000	Gekko (email)
Intense Leach Reactor (ILR) Residue Filter	Manual batch filter - plate and frame filter. Material Specific filtration rate of 7 kg/cm2	$ 30,000	BHM (equipment spec. on similar project)
Electrowinning Package	Cathode/Anode washing bay, Pneumatic sludge pumps, high-pressure washer, sludge settling tank, sludge filter press, calcine ovens, barring furnace (tilted), furnace fume extraction system, dore safe, dore scales, flux scales, workbench	$ 310,000	BHM (equipment spec. on similar project from Como Engineering)
	TOTAL	**$ 1,019,000**	

OR

ITEM	DETAILS/SIZE	COST ESTIMATE $AUD	Ref. Source
Merrill Crowe Circuit Package	1 x DE Filter x 1, Vacuum tower, Zn dust addition circuit, MC filter x 1, high temperature calcine over	$ 2,666,815	FLSmidth (email)
DE feed Filter	Manual batch filter - plate and frame filter. Material Specific filtration rate of 7 kg/cm2	$ 30,000	BHM (equipment spec. on similar project)
Electrowinning Package	Cathode/Anode washing bay, Pneumatic sludge pumps, high-pressure washer, sludge settling tank, sludge filter press, calcine ovens, barring furnace (tilted), furnace fume extraction system, dore safe, dore scales, flux scales, workbench	$ 310,000	BHM (equipment spec. on similar project from Como Engineering)
	TOTAL	**$ 3,006,815**	

Table 7: Estimated CAPEX for pre-oxidation/leach areas

7.6. CONCENTRATE AND TAILS THICKENING AND FILTERING CIRCUIT - KEY INPUTS AND CAPEX ESTIMATE

The zinc cleaner concentrate is to be thickened before sent to the filtering plant, with the filtered product transported offsite as final concentrate. The zinc thickener size and type was selected by the vendor based on the mass balance feed flows, and assuming a thickener underflow density of 60% solids (w/w). This density was chosen based on operating experience with zinc material at fine grind sizes.

The filter press type and size was also chosen type was selected by the vendor based on the mass balance feed flows, and assuming filter cake moisture of 9%. Again, this density was chosen based on operating experience with zinc concentrate material at fine grind sizes. Design of the filter was based on an operating schedule of 12 hours per day. This was chosen based on the small masses of feed and similar operating schedules for small filter plants.

The tailings thickener was selected by the vendor from an assumed underflow density of 55% solids (w/w) (operating experience) and mass balance inputs. A zinc concentrate solids SG of 3.8t/m3 was selected for the design from experience with zinc concentrate material.

Table 8 shows the estimated capital cost for this circuit

ITEM	DETAILS/SIZE	COST ESTIMATE $AUD	Ref. Source -
Zn Concentrate Thickener	Outotec High-rate thickener, 3m diameter	$ 140,000	Outotec (email)
Final Tails Thickener	Outotec High-rate thickener, 11m diameter	$ 300,000	Outotec (email)
Final Tails Thickener Underflow Pump	TBA	$ 30,000	BHM (equipment spec. on similar project)
Zn Concentrate Filter	Novatek MKMHH470 Pressure Filter - Manual. Operating 1 shift per day only	$ 62,696	Outotec (email)
	TOTAL	**$ 532,696**	

Table 8: Estimated CAPEX for thickening and filter areas

7.7. CYANIDE DETOX CIRCUIT - KEY INPUTS AND CAPEX ESTIMATE

The ICL residue will need to be detoxified to remove any free or WAD cyanide before discharging to the TSF for environmental reasons. An INCO detox circuit was chosen based on operation experience at other sites and the likely size of the detox unit.

Table 9 shows the estimated capital cost for this circuit.

ITEM	DETAILS/SIZE	COST ESTIMATE $AUD	Ref. Source -
DETOX Circuit	NaCN, Cu2+ detox circuit. Incl O2 tank, sparges, peroxide feed tank, reactor vessel (Ref from past work)	$ 240,000	BHM (equipment spec. on similar project)
	TOTAL	**$ 240,000**	

Table 9: Estimated CAPEX for the detox areas

7.8. TOTAL CAPEX ESTIMATE

Each unit process was separated and an estimated CAPEX created. It must be noted that these CAPEX estimates are ± 30% due to verbal quotes, and assumptions as stated in each section.

Table 10 shows the estimated capital cost for this circuit.

AREA	AMOUNT ($AUD)	DIST. (%)
CRUSHING	$ 697,212	10.3
MILLING	$ 1,209,086	17.8
FLOTATION	$ 1,766,292	26.0
REGRIND	$ 1,320,000	19.5
PRE-OX, LEACH AND ELECTOWINNING	$ 1,019,000	15.0
THICKENING AND FILTERING	$ 532,696	7.9
DETOX	$ 240,000	3.5
TOTAL - CAPEX	**$ 6,784,286**	**-**

Table 10: Estimated CAPEX for each unit process section

8. OPEX ESTIMATES

Operating estimates for the above process design have been created and split up into seven main sub-sections:

- Labour
- Electric Power
- Reagents
- Consumables
- Maintenance
- General and Administration

The following data was used to create the OPEX costs (see below Table 11). Note that all OPEX is in AUD.

INPUTS		
Feed to Plant (Mined Ore)	350,000	dry t/a
Target Plant Zn Recovery (to Zinc con)	85.0%	%
Feed Grade - Zn	8.70	%
Production Zn tonnes	25,883	tonnes/annum
Plant Au Recovery (overall)	59.8%	%
Feed Grade - Au	1.90	g/t
Production Zn tonnes	12,783	oz/annum
Plant Ag Recovery (overall)	80.3%	%
Feed Grade - Ag	171.00	g/t
Production Zn tonnes	1,544,572	oz/annum
Power Cost	29.0	AUDc/kWh
Diesel Cost	1.25	AUD/L

Table 11: Key processing assumptions in OPEX estimates

Target zinc recovery of 85% was based on metallurgical test work on MSZ material. The zinc head grade of 8.7%Zn was chosen from MSZ metallurgical test work also. A yearly processing rate of 350,000 dmtpa was selected, as has been throughout the report. A power cost of 29 AUDc/kWh was selected based on recent a recent similar study of a remote Australian location. Finally, a diesel cost of AUD1.25/L was selected based on petrol prices seen around the country.

8.1. OPEX ESTIMATES – LABOUR

The Labour costs can be seen below in Table 12.

The labour force was selected based on operating experience in similar sized processing plants. An eight days on-six days off roster was selected as it is a common remote Australian mining roster. A drive-in-drive-out type roster was included as per PNX recommendations.

On costs of 23% were used, as this number is realistic of most Australian operations of this size and expected administration overheads and finances. A camp cost of $75/day was selected based on operating experience in similar sized processing plants.

Based on the above information the overall cost of labour was ~AUD$5.4 million.

LABOUR								
	People on plant	Day/Night	Roster	No. of shifts	Total people	Base salary $/ yr	On cost %	Total $/ yr
Salary								
Mill manager	1	Day only	8/6	1	1	200,000	23%	246,000
Plant Metallurgist	1	Day only	8/6	1	1	138,000	23%	169,740
Laboratory Technician	4	Day only	8/6	1	4	87,500	23%	430,500
Shift Supervisor	1	D & N	8/6	4	4	110,000	23%	541,200
Crusher Operator	1	D&N	8/6	4	4	90,000	23%	442,800
Grinding Operator	1	D&N	8/6	4	4	90,000	23%	442,800
Float Operator	1	D&N	8/6	4	4	90,000	23%	442,800
Filter Operator	1	D&N	8/6	4	4	90,000	23%	442,800
Day Crew / Trainee Operator	1	Day only	2/1	2	2	77,000	23%	189,420
Maintenance Supervisor	1	Day only	5/2	1	1	130,000	23%	159,900
E&I Technician	1	Day only	8/6	2	2	120,000	23%	295,200
Boilermaker and Fitter	2	Day only	8/6	2	4	120,000	23%	590,400
Trade Assistant	1	Day only	8/6	2	2	77,000	23%	189,420
Storeman	1	Day only	8/6	2	2	80,000	23%	196,800
							SUB TOTAL	4,779,780
	Days on Site		People		$/day			
Accom and Messing	208		40		75		SUB TOTAL	624000
TOTAL NUMBER OF PEOPLE	**18**				**39**			
Grand Sub Total								5,403,780
CONTINGENCY						0%		0
TOTAL LABOUR COST, $/ yr								5,403,780

Table 12: Labour OPEX estimates

8.2. OPEX ESTIMATES – ELECTRIC POWER

Electric power consumption was split up into the unit process areas (Table 13). Each processing area duty connected power value was obtained from vendor estimates on power consumption of selected equipment in the process design. The utility factor was obtained based on recent a recent study of a similar Australian processing plant layout and size. A power unit cost of AUDc 29.0/kWh was selected based on a recent similar study of a remote Australian location.

Based on the above information the overall cost of electric power was ~AUD$3.65 million.

ELECTRIC POWER						
AREA	Duty Connected Power kW	Utility Factor	Avail %	Drawn Power kW	Annual kWh	Cost $/ yr
Crushing	278	40%	60%	111	584,467	169,495
Grinding	1,200	65%	90%	780	6,149,520	1,783,361
Flotation	421	87%	90%	366	2,887,673	837,425
Filtration	50	36%	90%	18	141,912	41,154
Regrind	320	36%	90%	115	908,237	263,389
Tailings	200	67%	90%	134	1,056,456	306,372
Water Distribution	80	77%	90%	62	485,654	140,840
Reagents	50	77%	90%	39	303,534	88,025
Laboratory (allowance)	5	50%	99%	3	21,681	6,287
Office building	10	50%	99%	5	43,362	12,575
Grand Sub Total	2,614			1,632		3,648,924
CONTINGENCY					0%	0
TOTAL POWER COST, $/ yr						3,648,924

Table 13: Electric Power OPEX estimates

8.3. OPEX ESTIMATES – REAGENTS

The Reagent costs can be seen below in Table 14.

The types of reagents selected were based on those used in the MSZ metallurgical test work. The specific reagent unit consumptions were also based on consumptions observed in the MSZ metallurgical test work program. The unit cost of each reagent was obtained from chemical suppliers. The NaCN and lime unit cost was recent data obtained from an operating gold plant in Western Australia. The dissolved oxygen and MIBC was estimated based from operational knowledge at similar processing circuits. A yearly processing rate of 350,000 dtpa was selected, as has been throughout the report.

Based on the above information the overall cost of reagents was ~AUD$3.24 million.

REAGENTS					
ITEM	Unit Consumption Amount	Unit	Usage t/a	Unit Cost $	Total $/ yr
Lime	1.37	kg/t	479.50	330	158,235
Aerophine 3418A	60	g/t	21.00	2,778	58,333
NaCN (flotation)	120	g/t	42.00	3,063	128,646
NaCN (leaching)	15000	g/t (conc)	96.00	3,063	294,048
ZnSO4	800	g/t	280.00	2,650	742,000
CuSO4	1500	g/t	525.00	2,650	1,391,250
SIPX	240	g/t	84.00	2,222	186,667
Dissolved Oxygen, MIBC, Cytec					200,000
Flocculant - Conc Thk	15	g/t solids	5.25	3,680	19,320
Flocculant - Tailings Thk	50	g/t solids	17.50	3,680	64,400
Grand Sub Total					3,242,899
CONTINGENCY				0%	0
TOTAL REAGENT COST, $/ yr					3,242,899

Table 14: Reagent OPEX estimates

8.4. OPEX ESTIMATES – CONSUMABLES

Consumables was split up into the unit process areas (Table 15) as best as possible. Mill liner replacement consumption was based on typical practises on similar size mines. Grinding media consumption was selected based on a similar operating ore-body and ball mill in Australia. The Jaw and cone crusher liner replacement was also selected based on a similar operating ore-body as well as equipment type and sizes Australia

Laboratory samples of 18 per day is typical of this type of flotation circuit, whilst diesel allowance of 150,000L was selected based on a recent similar study of a remote Australian processing site and size.

Based on the above information the overall cost of consumables was ~AUD$1.65 million.

CONSUMABLES					
ITEM	Consumption		Quantity	Unit Cost	Total
	Amount	Unit	per annum	$	$/ yr
Mill Liners (replace every 12-18 months)	0.08	kg/t	26,250	4.0 $/kg	105,000
Primary Grinding Media Mill Balls	1.0	kg/t	350	1,671 $/t	584,850
Jaw Crusher Liners		ea	4	18,000	72,000
Cone Crusher Liner		ea	6	56,000	336,000
Laboratory/Samples	18	samples / day	6570	18	118,260
Diesel for Mobile Equipment	Allowance		150,000	1.3 $/L	187,500
Mobile and Hire Equipment	Allowance				250,000
Grand Sub Total					1,653,610
CONTINGENCY				0%	0
TOTAL CONSUMABLES COST, $/ yr					1,653,610

Table 15: Consumables OPEX estimates

8.5. OPEX ESTIMATES – MAINTENANCE

The maintenance costs can be seen below in Table 16. The area equipment CAPEX was selected from the numbers in the CAPEX section of this report. The Factor % of Directs was selected based on realistic and similar numbers to that of operating processing plants, of this size, in Australia.

Based on the above information the overall cost of maintenance was ~AUD$239,594.

MAINTENANCE			
AREA	AREA EQUIPMENT CAPEX $	Factor, % of Directs	Maintenance Cost $/ yr
Crushing	697,212	7.5%	52,291
Grinding	1,209,086	4.0%	48,363
Flotation	1,766,292	2.5%	44,157
Regrinding	1,320,000	2.5%	33,000
Pre-oxidation and leaching	1,019,000	2.5%	25,475
Thickening and Filtration	532,696	4.0%	21,308
Utilities and Services	300,000	2.5%	7,500
Reagents	200,000	2.5%	5,000
Buildings	100,000	2.5%	2,500
Grand Sub Total	7,144,286		239,594
CONTINGENCY		0%	0
TOTAL MAINTENANCE COST, $/ yr			239,594

Table 16: Maintenance OPEX estimates

8.6. OPEX ESTIMATES – GENERAL AND ADMINISTRATION

The general and administration costs can be seen below in Table 17. This number was selected based on a recent similar study of a remote Australian processing site and size.

Based on the above information the overall cost of maintenance was ~AUD$200,000.

GENERAL AND ADMINISTRATION				
ITEM		Quantity per Annum	Unit Cost $	Total $/yr
General Freight (excl. reagents)	Allowance	50	2000	100,000
Consultants	Allowance			100,000
Grand Sub Total				200,000
CONTINGENCY			0%	0
TOTAL ADMINISTRATION COST, $/ yr				200,000

Table 17: General and Administration OPEX estimates

9. CONCLUSIONS

9.1. CAPEX

BHM Process Consultants have performed this CAPEX-OPEX to determine rough costs of the project, based on assumptions as well as verbal and written information supplied by specialist vendors. As such, these values should be given a variance of ± 30% with respect to the below Table 18 costs.

AREA	AMOUNT ($AUD)	DIST. (%)
CRUSHING	$ 697,212	10.3
MILLING	$ 1,209,086	17.8
FLOTATION	$ 1,766,292	26.0
REGRIND	$ 1,320,000	19.5
PRE-OX, LEACH AND ELECTOWINNING	$ 1,019,000	15.0
THICKENING AND FILTERING	$ 532,696	7.9
DETOX	$ 240,000	3.5
TOTAL - CAPEX	**$ 6,784,286**	**-**

Table 18: Overall CAPEX estimates and distribution

As can be seen in the above table the greatest distribution of CAPEX is from the flotation circuit (at 26%), followed by regrind (19.5%) and milling (17.8%).

The overall CAPEX estimate is ~AUD$6.78 million.

9.2. OPEX

The OPEX costs were divided into the main sections and displayed as an overall cost (AUD), cost per tonne milled, and cost per tonne of zinc concentrate produced (Table 19). The tonnes milled were 350,000 dtpa whilst the tonnes of zinc concentrate produced were based on a head grade of 8.7%Zn and recovery of 85% (metallurgical test work) and a zinc concentrate grade of 50%Zn (assumed from operating experience).

OPERATING COST SUMMARY				
	% Total Cost	**Total, AUD/yr**	**AUD/ t milled**	**AUD/ Tonne Zn**
LABOUR	38%	5,403,780	15.44	208.78
POWER	25%	3,648,924	10.43	140.98
REAGENTS	23%	3,242,899	9.27	125.29
CONSUMABLES	11%	1,653,610	4.72	63.89
MAINTENANCE MATERIALS	2%	239,594	0.68	9.26
GENERAL & ADMINISTRATION	1%	200,000	0.57	7.73
	TOTAL	**14,388,807**	**41.11**	**556**

Table 19: Overall OPEX estimates and distribution

The above table shows that the bulk of the OPEX lies in the labours costs (38%), followed by power (25%) and reagents (23%). Overall OPEX per annum is ~AUD$14.4 million. This equates to AUD$41.11/tonne milled, or AUD$556/tonne of zinc concentrate produced.

Regards,

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Principal Metallurgist

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APPENDIX A – MASS BALANCE

Phoenix Copper Pty Ltd

Iron Blow Process Plant Mass Balance

BHM PROCESS CONSULTANTS

ROM Ore (Crusher Feed) Moisture Content	3.0	%	Ore Solids S.G	2.70	
	3.5		Solution S.G	1.00	
			Crushed Ore Bulk Density	2.30	t/m³
Pb/Cu Ro Concentrate	4.0				
Zn Concentrate	3.80				

Process Stream		Throughput			Solid	Slurry/Solution		Flow rate			Stream
Description	PFD Stream #	Solids (t/h)	Solution (t/h)	Slurry [(1)] (t/h)	SG (#)	Density (% solids)	Density (t/m³)	Solids (m³/h) [(2)]	Solution (m³/h)	Slurry (m³/h)	Split (%)
Crushing Circuit											
ROM Feed	1	54.00	0.55	54.55	2.70	99.00	2.65	23.48	0.55	24.02	
Primary Crusher Throughput	2	54.00	0.55	54.55	2.70	99.00		23.48			
Secondary Crusher Throughput	3	54.00	0.55	54.55	2.70	99.00		23.48			
Total Dust Suppression Water	4		0.27						0.27		
Crushing Circuit Product	5	54.00	0.55	54.55	2.70	99.00	2.65	23.48	0.55	24.02	
Milling Circuit											
Mill Feed Ore		44.59	0.45	45.04	2.70	99.00	2.65	16.52	0.45	16.97	
Primary Cyclone Feed		87.64	77.72	165.37	2.70	53.00	1.50	32.46	77.72	110.18	
Primary Cyclone Overflow		44.59	66.89	111.48	2.70	40.00	1.34	16.52	66.89	83.40	
Pb/Cu Roughing and Scavenger											
Rougher feed (fresh)		44.59	66.89	111.48	2.70	40.00	1.34	16.52	66.89	83.40	
Rougher feed		54.17	99.01	153.18	3.00	35.36	1.31	18.1	99.01	117.1	
Pb/Cu Rougher/Scav Concentrate		10.27	19.08	29.35	4.00	35.00	1.36	2.57	19.08	21.65	
Pb/Cu Rougher/Scav Tail		43.89	79.93	123.82	2.70	35.45	1.29	16.26	79.93	96.19	
Pb/Cu Ro/Scav Con Regrind											
Regrind Cyclones New Feed	33	10.27	19.08	29.35	4.00	35.00	1.36	2.57	19.08	21.65	
Regrind Mill Discharge Water	35		0.0						0.0		
Regrind Mill Discharge	36	23.0	9.9	32.9	4.0	70.0	2.11	5.8	9.86	15.6	
Regrind Cyclones Total Feed	37	33.3	40.68	74.0	4.0	45.0	1.51	8.3	40.68	49.0	
Regrind Milling Cyclone Overflow	38	10.3	30.82	41.1	4.0	25.0	1.23	2.6	30.82	33.4	
Regrind Cyclone Underflow	39	23.0	9.86	32.9	4.0	70.0	2.11	5.8	9.86	15.6	
Pb/Cu Cleaner											
Cleaner feed		10.27	30.82	41.10	4.00	25.00	1.23	2.57	30.82	33.39	
Pb/Cu Cleaner Concentrate		0.70	1.30	2.00	4.00	35.00	1.36	0.17	1.30	1.47	
Pb/Cu Cleaner Tail		9.57	32.12	41.70	4.00	22.96	1.21	2.39	32.12	34.51	
Pb/Cu Cleaner Preoxidation/Leach											
Pre-ox/Leach feed		0.70	1.30	2.00	4.00	35.00	1.36	0.17	1.30	1.47	
Preg solution		0.00	0.92	0.92	4.00	0.00	1.02	0.00	0.90	0.93	
Pre-ox/Leach tail		0.70	0.38	1.08	4.00	65.00	1.95	0.17	0.37	0.54	
Zn Roughing and Scavenger											
Rougher feed		43.89	79.93	123.82	2.70	35.45	1.29	16.26	79.93	96.19	
Rougher feed (incl Cl tail recirc)		52.25	110.91	163.16	3.00	32.02	1.27	17.4	110.91	128.3	
Zn Rougher/Scav Concentrate		9.57	15.62	25.19	3.80	38.00	1.39	2.52	15.62	18.14	
Zn Rougher/Scav Tail		42.67	95.29	137.96	2.70	30.93	1.24	15.81	95.29	111.10	
Zn Ro/Scav Con Regrind											
Regrind Cyclones New Feed		9.57	15.62	25.19	3.80	38.00	1.39	2.52	15.62	18.14	
Regrind Mill Discharge Water			0.0						1.0		
Regrind Mill Discharge		21.4	9.2	30.6	3.8	70.0	2.07	5.6	9.19	14.8	
Regrind Cyclones Total Feed		31.0	37.91	68.9	3.8	45.0	1.50	8.2	37.91	46.1	
Regrind Milling Cyclone Overflow		9.6	28.72	38.3	3.8	25.0	1.23	2.5	28.72	31.2	
Regrind Cyclone Underflow		21.4	9.19	30.6	3.8	70.0	2.07	5.6	9.19	14.8	
Zn Cleaner											
Cleaner feed		9.57	28.72	38.29	3.80	25.00	1.23	2.52	28.72	31.24	
Zn Cleaner Concentrate		1.22	2.26	3.48	3.80	35.00	1.35	0.32	2.26	2.58	
Zn Cleaner Tail		8.36	30.98	39.34	3.80	21.24	1.19	2.20	30.98	33.18	
Zinc Conc Thickener											
Final Flotation Concentrate		1.2	2.3	3.5	3.8	35.0	1.3	0.3	2.3	2.6	
Concentrate Area Washdown/Misc			1.0						1.00		
Concentrate Thickener Feed		1.2	3.3	3.5	3.8	35.00	1.35	0.32	3.26	3.58	
Concentrate Thickener Underflow		1.2	0.81	2.03	3.8	60.0	1.79	0.32	0.81	1.13	
Concentrate Thickener Overflow			2.4						2.45		
Zinc Conc Filtering (Semi-cont 12hr/day)											
Concentrate Filter Feed Solids Throughput		1.2	0.8	2.0	3.8	60.0	1.8	0.3	0.8		
Concentrate Filter Cake		1.2	0.12	1.34	3.8	91.0	3.04	0.32	0.12	0.44	
Concentrate Filtrate			0.7						0.7		
Filter Wash Water			0.5						0.50		
Total Filter Water Return			1.2						1.19		
Final Tail Thickening											
Final Tail Concentrate		42.7	95.3	138.0	2.7	30.9	1.2	15.8	95.3	111.1	
Thickener Area Washdown/Misc			1.0						1.00		
Final Tail Thickener Feed		42.7	96.3	138.0	2.7	30.93	1.24	15.81	96.29	112.10	
Thickener Underflow		42.7	34.92	77.59	2.7	55.0	1.53	15.81	34.92	50.72	
Thickener Overflow			61.4						61.37		
Final Tail Thickening											
TMF Consolidation Density		42.67	12.04	54.71	2.70	78.00	1.97				
Tailing Dam Decant Return			22.88						22.88		

		Mass	Assays														
		Mass	Au	Ag	Cu	Pb	Zn	Fe	S	As	Sb	Te	Si	Al	Ca	Mg	LOI_{1000}
		(kg)	ppm	ppm	%	%	%	%	%	%	%	ppm	%	%	%	%	%
Pb/Cu Rougher Feed	**calc**	**10.72**	**2.62**	**184.08**	**0.52**	**1.10**	**8.17**	**36.62**	**30.08**	**1.25**	**0.14**	**1.91**	**2.76**	**0.33**	**2.65**	**2.45**	**16.39**
Pb/Cu Rougher Con	assay	2.47	7.26	660.63	1.62	3.36	7.08	28.25	24.53	2.21	0.26	3.93	6.31	0.21	2.00	4.74	17.00
Pb/Cu Rougher Tail	calc	8.25	1.23	41.43	0.19	0.42	8.50	39.12	31.73	0.97	0.11	1.30	1.70	0.36	2.85	1.76	16.21
Zn Rougher Feed	assay	8.25	1.23	41.43	0.19	0.42	8.50	39.12	31.73	0.97	0.11	1.30	1.70	0.36	2.85	1.76	16.21
Zn Rougher Con	assay	2.34	2.25	85.58	0.49	0.69	28.65	25.90	33.85	1.63	0.13	1.80	0.92	0.18	0.98	0.96	17.63
Zn Rougher Tail	calc	5.91	0.82	23.90	0.08	0.32	0.50	44.38	30.90	0.71	0.10	1.10	2.01	0.44	3.59	2.08	15.65
Pb/Cu Cleaner Feed	assay	2.47	7.26	660.63	1.62	3.36	7.08	28.25	24.53	2.21	0.26	3.93	6.31	0.21	2.00	4.74	17.00
Pb/Cu Cleaner Con	**calc**	**0.73**	**16.01**	**1868.22**	**4.24**	**9.07**	**5.22**	**15.89**	**18.04**	**1.52**	**0.56**	**4.39**	**10.89**	**0.10**	**0.76**	**7.26**	**12.80**
Pb/Cu Cleaner Tail	calc	1.74	3.60	154.20	0.52	0.97	7.86	33.43	27.25	2.49	0.14	3.74	4.39	0.26	2.52	3.68	18.76
Zn Cleaner Feed	assay	2.34	2.25	85.58	0.49	0.69	28.65	25.90	33.85	1.63	0.13	1.80	0.92	0.18	0.98	0.96	17.63
Zn Cleaner Con	**calc**	**1.36**	**1.56**	**101.34**	**0.62**	**0.65**	**45.21**	**14.04**	**33.52**	**0.80**	**0.08**	**0.96**	**0.53**	**0.12**	**0.28**	**0.07**	**16.70**
Zn Cleaner Tail	calc	0.98	3.20	63.69	0.30	0.74	5.65	42.37	34.31	2.77	0.20	2.98	1.46	0.24	1.95	2.20	18.91
Final Tail	calc	8.63	1.65	54.70	0.19	0.50	2.57	41.94	30.55	1.30	0.12	1.85	2.43	0.38	3.19	2.41	16.65

Mass	RECOVERY (%)														
Mass	Au	Ag	Cu	Pb	Zn	Fe	S	As	Sb	Te	Si	Al	Ca	Mg	LOI_{1000}
%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
100.00	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
23.04	63.95	82.68	71.43	70.52	19.96	17.77	18.79	40.55	42.14	47.51	52.58	14.72	17.37	44.65	23.89
76.96	36.05	17.32	28.57	29.48	80.04	82.23	81.21	59.45	57.86	52.49	47.42	85.28	82.63	55.35	76.11
76.96	36.05	17.32	28.57	29.48	80.04	82.23	81.21	59.45	57.86	52.49	47.42	85.28	82.63	55.35	76.11
21.87	18.79	10.17	20.53	13.69	76.67	15.47	24.62	28.42	19.77	20.69	7.28	11.65	8.05	8.60	23.52
55.09	17.26	7.15	8.03	15.79	3.38	66.76	56.59	31.04	38.09	31.79	40.14	73.63	74.59	46.75	52.59
23.04	63.95	82.68	71.43	70.52	19.96	17.77	18.79	40.55	42.14	47.51	52.58	14.72	17.37	44.65	23.89
6.81	**41.63**	**69.08**	**55.38**	**56.20**	**4.35**	**2.95**	**4.08**	**8.28**	**26.72**	**15.67**	**26.82**	**2.03**	**1.94**	**20.21**	**5.31**
16.23	22.31	13.60	16.05	14.32	15.61	14.82	14.71	32.27	15.42	31.84	25.76	12.69	15.42	24.44	18.57
21.87	18.79	10.17	20.53	13.69	76.67	15.47	24.62	28.42	19.77	20.69	7.28	11.65	8.05	8.60	23.52
12.72	**7.58**	**7.00**	**15.19**	**7.55**	**70.34**	**4.88**	**14.17**	**8.14**	**6.96**	**6.39**	**2.44**	**4.83**	**1.32**	**0.38**	**12.96**
9.16	11.21	3.17	5.34	6.14	6.33	10.59	10.44	20.28	12.82	14.31	4.84	6.83	6.72	8.22	10.56
80.48	50.78	23.92	29.43	36.25	25.31	92.17	81.74	83.58	66.33	77.95	70.74	93.14	96.73	79.41	81.73

APPENDIX B – WATER BALANCE

Phoenix Copper Ltd

Iron Blow Processing Plant Water Balance

BHM PROCESS CONSULTANTS

PROCESS WATER

Stream Description	Flow Type	Stream Flow rate (m^3/h)	Batch Flow Frequency (#/day)	Batch Flow Duration (h)	Daily Flow Continuous (m^3/day)	Daily Flow Average (m^3/day)
Process Water from Process Water Tank						
Crushing Circuit Dust Suppression Water	Dayshift	0.3	1	12	3	3
Mill Addition Water	Continuous	66.4			1,594	1,594
Pb/Cu Cleaner dilution water	Continuous	11.7			282	282
Zn Cleaner dilution water	Continuous	13.1			314	314
Wash-down area	Continuous	0.5			12	12
Total Process Water from Process Water Tank	Continuous	**91.9**			**2206**	**2,206**
Water to Process Water Tank						
TMF Return Water	Continuous	84.3			2,022	2,022
Raw Water Make-Up	Continuous	7.7			184	184
Total Water to Process Water Tank	Continuous	**91.9**			**2,206**	**2,206**

APPENDIX C – PROCESS DESIGN CRITEREA

Phoenix Copper Ltd - Iron Blow Project

Process Design Criteria

BHM PROCESS CONSULTANTS

DATA SOURCES:

1	PNX Instruction or Supplied Data
2	Test work
3	Mass Balance
4	BHM Information or Recommendation
5	Vendor Data/Recommendation
6	Calculation
7	Assumption

Item	Parameter	Unit	Value/Description	Source	Revision
1	**DESIGN ORE CHARACTERISTICS**				
	Ore re-processed from the Nullagine Heap Leach Tailing facility				
1.1	**Ore Description**				
	Description	-	Polymetallic Cu, Pb and Zn sulphide with precious metals	1	A
	Tonnes Available	t	350,000	1	A
	Average Gold Grade (MSZ)	g/t	1.9	2	A
	Average Gold Grade (GZ)	g/t	1.2	2	A
	Average Silver Grade (MSZ)	g/t	170.9	2	A
	Average Silver Grade (GZ)	g/t	14.2	2	A
	Average Copper Grade (MSZ)	%	0.5	2	A
	Average Copper Grade (GZ)	%	0.3	2	A
	Average Lead Grade (MSZ)	%	1.1	2	A
	Average Lead Grade (GZ)	%	0.1	2	A
	Average Zinc Grade (MSZ)	%	8.8	2	A
	Average Zinc Grade (GZ)	%	0.2	2	A
	Moisture Content	%	3.00	7	A
	Ore True Specific Gravity	#	2.70	1	A
	Crushed Ore Bulk Density	t/m^3	2.30	1	A
2	**PROCESS PLANT PRODUCTION**				
	Process plant will aim at recovering the gravity recoverable gold component of the Nullagine Heap Leach Tails material via a crushing and gravity separation process. This will be processed on a 24 hour per day operation until all of the material has been reprocessed.				
2.1	**Production Design Basis**				
	Annual Plant Throughput Rate	t	350,000	6	A
3	**CRUSHING**				
	Crushing of material to 100% passing 10mm by a 2-stage crushing circuit.				
3.1	**General**				
	Blend Crushing Work Index	kWh/t	16.16	1	A
	Crushing Circuit Annual Throughput	t/annum	350000.0	1	A
	Crushing Circuit Average Throughput	tpd	540.0	5	A
	Crushing Circuit Average Throughput	t/h	54.0	5	A
	Crushing Circuit Average Availability	%	41.67%	5	A
	Nominal Final Product Size (P100)	mm	10.0	5	A
3.2	**Primary Crushing**				
	ROM Bin Capacity	m^3	21.7	6	A
	ROM Bin Capacity	t	50.0	7	A
	ROM Bin Capacity	min	55.6	6	A
	Primary Crusher Type	-	Jaw Crusher Metso C106	5	A
	Primary Crusher Size	mm	TBA		A
	Primary Crusher Closed Setting	mm	40.0	5	A
	Primary Crusher Installed Power	kW	110.0	5	A
	Primary Crusher Feed Rate	t/hr	54.0	5	A
3.3	**Product Screen and Secondary Crushing**				
	Product Screen Type	-	CVB201 - Vibrating	5	A
	Product Screen Size (L x W)	m	TBA		A
	Product Screen Panel Apertures	mm	10.0	5	A
	Product Screen Installed Power	kW	TBA		A
	Product Screen Feed Rate	t/hr	81.0	6	A
	Secondary Crusher Type	-	Gyratory GP200S	5	A
	Secondary Crusher Make/Model	-	Metso	5	A
	Secondary Crusher Nominal Operating CSS	mm	12.0	5	A
	Secondary Crusher Installed Power	kW	160.0		A
	Secondary Crusher Feed Opening	mm	12.0	5	A
	Secondary Crusher Feed Rate	t/hr	27.0	7	A
	Secondary Crusher Feed Hopper	t			A

4	**MILLING CIRCUIT**				
	Crushed material is milled in a one-stage closed circuit configuration.				
4.1	**General**				
	Milling Circuit Configuration	-	One stage closed-circuit	5	A
	Primary Product Size (P_{80})	µm	75.0	2	A
	Regrind Product Size (P_{80})	µm	28-35	2	A
	Grinding Circuit Annual Operating Hours	h	7,850	4	A
	Grinding Circuit Average Availability	%	89.6	6	A
	Design Average Mill Throughput Rate	t/annum	350000	1	A
	Average Mill Throughput Rate	t/day	1070	6	A
	Average Mill Throughput Rate	t/h	44.6	6	A
	Design Mill Throughput Rate	t/h	53.5	6	A
4.2	**Ore Comminution Characteristics**				
	Bond Rod Mill Work Index	kWh/t	15.5	1	A
	Bond Ball Mill Work Index	kWh/t	-		A
	Bond Abrasion Index	#	-		A
	Mill Feed Moisture Content	%	2.5	7	A
	Mill Feed Size (P_{80})	µm	10000.0	4	A
4.3	**Primary Grinding**				
	Mill Type	-			
	Mill Configuration	-			
	Mill Internal Diameter (Inside Steel)	mm	TBA		A
	Mill Shell Liner Thickness (Nominal Average)	mm	TBA		A
	Mill Internal Diameter (Inside Liners)	mm	TBA		A
	Mill Shell Effective Grinding Length (Inside filler	mm	TBA		A
	Design Mill Feed Size (P_{80})	mm	10.0	4	A
	Mill Product Size (P_{80})	µm	75.0	2	A
	Bond Rod Mill Work Index	kWh/t	15.5	1	A
	Bond Rod Power Requirement	kWh/t	-		A
	Bond Ball Mill Work Index	kWh/t	-		A
	Bond Ball Power Requirement	kWh/t	-		A
	Total Bond Factors	#	-		A
	Total Mill Power Requirement (Pinion)	kWh/t	-		A
	Mill Pinion Power Required	kW	1200.0	5	A
	Mechanical and Electrical Losses	%	90.0	5	A
	Maximum Mill Motor Power	kW	1333	6	A
	Recommended Installed Mill Motor Power	kW	1400.0	6	A
4.4	Primary Classification				
	Classification Method	-	Cyclone	4	A
	Cyclone Type	-	TBA	4	A
	Number of Cyclones Installed	#	6.0	7	A
	Nominal Number of Operating Cyclones	#	4.0	7	A
	Primary Grinding Circuit Circulating Load	%	197%	7	A
	Cyclone Feed Solids Throughput	t/h	87.6	6	A
	Cyclone Feed Slurry Density	% solids	53.0	6	A
	Cyclone Feed Slurry Density	kg/L	1.5	6	A
	Cyclone Feed Slurry Flowrate	m3/h	110.2	6	A
	Cyclone Feed Size (P80)	µm	-		A
	Cyclone Overflow Solids Throughput	t/h	44.6	6	A
	Cyclone Overflow Slurry Density	% solids	40.0	2	A
	Cyclone Overflow Slurry Density	kg/L	1.3	6	A
	Cyclone Overflow Slurry Flowrate	m3/h	83.4	6	A
	Cyclone Overflow Size (P80)	µm	75.0	2	A
4.5	Regrind Grinding				
	Mill Type	-	Outotec HIG110	5	A
	Mill Configuration	-	Closed circuit	4	A
	Mill Internal Diameter (Inside Steel)	mm	TBA		A
	Mill Shell Liner Thickness (Nominal Average)	mm	TBA		A
	Mill Internal Diameter (Inside Liners)	mm	TBA		A
	Mill Shell Effective Grinding Length (Inside filler	mm	TBA		A
	Design Mill Feed Size (P80)	µm	55.0	7	A
	Mill Product Size (P80)	µm	25-38	2	A
	Bond Rod Mill Work Index	kWh/t	TBA		A
	Bond Rod Power Requirement	kWh/t	TBA		A
	Bond Ball Mill Work Index	kWh/t	TBA		A
	Bond Ball Power Requirement	kWh/t	TBA		A
	Total Bond Factors	#	TBA		A
	Total Mill Power Requirement (Pinion)	kWh/t	TBA		A
	Mill Pinion Power Required	kW	110.0		A
	Mechanical and Electrical Losses	%	90.0		A
	Maximum Mill Motor Power	kW	122		A
	Recommended Installed Mill Motor Power	kW	TBA		A
	Mill Installed Power	kW	TBA		A
4.6	Regrind Classification				
	Classification Method	-	Cyclone	4	A
	Cyclone Type	-	TBA		A
	Number of Cyclones Installed	#	6.0	4	A
	Nominal Number of Operating Cyclones	#	5.0	4	A
	Primary Grinding Circuit Circulating Load	%	2.2	7	A
	Cyclone Feed Solids Throughput	t/h	33.3	6	A
	Cyclone Feed Slurry Density	% solids	45.0	6	A
	Cyclone Feed Slurry Density	kg/L	1.5	6	A
	Cyclone Feed Slurry Flowrate	m3/h	49.0	6	A
	Cyclone Feed Size (P80)	µm	TBA	6	A
	Cyclone Overflow Solids Throughput	t/h	10.3	6	A
	Cyclone Overflow Slurry Density	% solids	25.0	6	A
	Cyclone Overflow Slurry Density	kg/L	1.2	6	A
	Cyclone Overflow Slurry Flowrate	m3/h	33.4	6	A
	Cyclone Overflow Size (P80)	µm	25-38	2	A

5	**FLOTATION CIRCUIT**				
	Flotation circuit to comprise of Pb/Cu rougher and scavenger cells, followed by cleaner cells. Identical setup for the Zn circuit. Tails of both cleaners will report back to the head of their respective rougher cells.				
5.1	**General**				
	Flotation Feed Solid Throughput (Continuous)	t/h	44.59	2	A
	Flotation Gold Recovery (of Feed)	%	59.27	3	A
	Flotation Silver Recovery (of Feed)	%	81.29	3	A
	Flotation Copper Recovery (of Feed)	%	77.58	3	A
	Flotation Lead Recovery (of Feed)	%	70.27	3	A
	Flotation Zinc Recovery (of Feed)	%	86.58	3	A
5.2	**Trash Screen**				
	Trash Screen Type	-	TBA		A
	Trash Screen Size (L x W)	m	TBA		A
	Trash Screen Area	m^2	TBA		A
	Trash Screen Aperture	µm	TBA		A
	Trash Screen Superficial Velocity	m/h	TBA		A
	Trash Screen Spray Water	m^3/h	TBA		A
5.3	**Conditioning Tank**				
	Residence Time	min	10	4	A
	Tank Type	-	OK TOP	5	A
	Number Tanks	#	2	4	A
	Tank Volume	m^3	16.03	6	A
5.4	**Rougher Flotation**				
	Rougher Flotation Feed Slurry Density (New)	% solids	40.00	3	A
	Rougher Flotation Feed Slurry Density (New)	kg/L	1.34	3	A
	Rougher Flotation Feed Slurry Flowrate (New, Continuous)	m^3/h	83.40	3	A
	Rougher Flotation Feed Slurry Density (Actual)	% solids	35.36	3	A
	Rougher Flotation Feed Slurry Density (Actual)	kg/L	1.31	3	A
	Rougher Flotation Feed Slurry Flowrate (Act., Continuous)	m^3/h	117.06	3	A
	Aeration Factor	%	15	5	A
	Froth Factor	%	0	5	A
	Nominal Rougher Flotation Flowrate (Continuou	m^3/h	135	3	A
	Laboratory Batch Rougher Flotation Time	min	9	2	A
	Scale-Up Factor	-	2.5	5	A
	Rougher Flotation Time Required	min	22.5	5	A
	Rougher Flotation Volume Required	m^3	50	6	A
	Rougher Cell Size	m^3	20	5	A
	Rougher Flotation Cell Type	-	OK e20	5	A
	Number of Rougher Flotation Cells	-	4	5	A
	Design Rougher Flotation Residence Time	min	25	5	A
5.5	**Cleaner Flotation**				
	Cleaner Flotation Feed Slurry Density	% solids	25.00	3	A
	Cleaner Flotation Feed Slurry Density	kg/L	1.23	3	A
	Cleaner Flotation Feed Slurry Flowrate (Continu	m^3/h	33.39	3	A
	Aeration Factor	%	15	5	A
	Froth Factor	%	5	5	A
	Nominal Cleaner Flotation Flowrate (Continuou	m^3/h	40	3	A
	Laboratory Batch Cleaner Flotation Time	min	5	3	A
	Scale-Up Factor	-	2.5	5	A
	Cleaner Flotation Time Required	min	12.5	3	A
	Cleaner Flotation Volume Required	m^3	8	3	A
	Cleaner Cell Type	-	OK3	5	A
	Number of Cleaner Flotation Cells	-	3	5	A
	Design Cleaner Flotation Residence Time	min	17	5	A

6.0	**ZN CONCENTRATE THICKENING AND FILTRATION**				
	Flotation concentrate is thickened prior to filtration and packaging for despatch. The filtration circuit is operated on a semi-continuous basis, i.e.: dayshift only where the concentrate filter feed tank is allowed to rise to accommodate the overnight production.				
6.1	**Concentrate Thickening**				
	Conc. Thickener Feed Solids Throughput (Contin	t/h	1.22	3	A
	Conc. Thickener Type	-	Metso HRT	5	A
	Conc. Thickener Flux	$t/m^2/h$	TBA		A
	Conc. Thickener Area Required	m^2	TBA		A
	Conc. Thickener Diameter Required	m	3	5	A
	Conc. Thickener Diameter Installed	m	3	5	A
	Conc. Thickener Underflow Density	% solids	60	3	A
	Conc Thickener Underflow Flowrate	m^3/h	1.13	3	A
	Conc. Thickener Overflow Flowrate	m^3/h	2.45	3	A
	Conc. Thickener Flocculent Dose Rate	g/t solids	TBA		A
6.2	**Concentrate Filtration**				
	Filtration Circuit Annual Operating Hours	h/a	4,380	6	A
	Filtration Circuit Average Availability	%	50.0	6	A
	Filtration Circuit Operating Schedule	h/day	12	4	A
	Design Concentrate Production Rate	t/day	15	6	A
	Filtration Circuit Throughput Rate	t/h	1.2	6	A
	Filter Type	-	Novatek MKMHH470	5	A
	Filter Operation	-	Manual	5	A
	Filter Cake Moisture Content	%	91	3	A
	Flocculent Dose Rate to Conc. Filter	g/t solids	TBA		A
	Filter Area Required	m^2	TBA		A
6.3	**Concentrate Packaging**	-	Truck Loadout from Concentrate Bunker	4	A
7.0	**PB/CU CONCENTRATE PRE-OXIDATION AND CYANIDE LEACHING**				
	The reground Pb/Cu cleaner concentrate will be pre-oxidised in a open air tank, before being sent to a separate Intensive leach reactor (ILR) for leaching of gold material.				
7.1	**Conc. Silo**				
	Silo Residence Time	hr	12	4	A
	Silo Size	m^3	17.7	6	A
7.2	**Pre-oxidation**				
	Tank size	m^3	8.85	6	A
	Pre-oxidation dissolved oxygen	ppm	>15	2	A
	Pre-oxidation time	hr	8	2	A
	Method of operation	-	Batch	4	A
7.3	**Intensive Cyanide Leach (ICL)**				
	ICL type	-	Gekko	5	A
	Leach time	hr	12	5	A
	Feed rate	tph	0.70	3	A
	Design Leach Recovery	**% Au**	**TBD**		A
	Current Operating Leach Recovery	**% Au**	**76%**	2	A
7.4	**Leach Residue Filter**				
	Type	-	Plate & Frame	4	A
	Operation	-	Manual	4	A
	Material Specific Filtration Rate	kg/cm2	TBA		A
	Total Filter Area	m	39.0	4	A
	Max. Throughput Tonnage	t / shift	8.4	6	A
8.0	**ICL ELCTROWINNING**				
	The pregnant solution from the ILR will be sent to the electrowinning circuit where gold is precipitated onto the cathodes and then smelted to produce dore bars.				
8.1	**Electrowinning Cell 1**				
	Cell # 1	-	Standard	5	A
	Cell Size	m^3	3.5	4	A
	No. Cathodes	#	TBD		A
	Solution Feed Flowrate	m^3/hr	0.9	3	A
	Nominal EW run time	hrs	12.0	5	A
	Target Barren Liquor Concentration	ppm Au	< 5	4	A
	Operating Current	A	>2000	5	A
	% Feed -500 um	%	48.0	5	A
9.0	**ICL RESIDUE PROCESSING (HIGH-SILVER)**				
	The ILR residue contains high levels of silver. This will either be processed via Merrill Crowe or will be sold as a high grade silver product.				
9.1	**MERRILL CROWE**				
	Merrill Crowe Type	-	FLSmidth	5	A
	Merrill Crowe Volume	m^3	196	5	A
	Merrill Crowe Feed Rate	m^3/hr	1.47	3	A
10.0	**TAILINGS THICKENING & DISPOSAL**				
	Flotation tails are thickened prior to disposal in the Tailings Management Facility by conventional sub-aerial deposition. Supernatant solution is returned to the process.				
10.1	**Tailings Thickening**				
	Tailings Thickener Feed Solids Throughput (Con	t/h	42.7	6	A
	Tailings Thickener Type	-	Outotec HRT	5	A
	Tailings Thickener Diameter Required	m	11.0	5	A
	Tailings Thickener Underflow Density	% solids	55	3	A
	Tailings Thickener Underflow Flowrate	m^3/h	50.7	3	A
	Tailings Thickener Overflow Flowrate	m^3/h	61.4	3	A
10.2	**TSF**				
	TSF Type	-	Lined Dam	4	A
	Portion of re-stacked water recovery to TSF	%	45%	7	A
	TSF return water	m3/h	22.9	4	A
11	**AIR SUPPLY**				
	Air supply for control of valves and instrument air.				
11.2	**General**				
	Source	-	Air Compressors	7	A
	Number of Units	-	1.0	7	A
	Air Flow Capacity (per Compressor)	Nm^3/h	TBD	5	A
	Discharge Air Pressure	kPag	TBD	5	A

APPENDIX D – DETAILED EQUIPMENT INFORMATION

CRUSHER

ITEM	DETAILS/SIZE	COST ESTIMATE	Max Feed Size	Max Prod Size	Ref. Source
		$AUD	mm	mm	-
Primary Crusher	Metso C106 Jaw Crusher 110kW	$ 254,448	600	40	Metso (email)
Primary Crusher Area Dust Collector	Insertable dust filter with integral exhaust fan and air pulse bag cleaning. 1000 m3/hr	$ 19,000	-	-	BHM (equipment spec. on similar project)
Primary Crusher Discharge Conveyor	1-2 m in length	$ 15,000	-	-	BHM (equipment spec. on similar project)
Primary Metal Detector	TBA	$ 15,000	-	-	BHM (equipment spec. on similar project)
Vibrating Screen	Joest SRZ 2130x4880, 37kW	$ 21,500	40	10	Metso (email)
Secondary Crusher	Metso Gyratory Crusher GP200S	$ 347,264	40	12	Metso (email)
Secondary Crusher Discharge Conveyor	4-5 m in length	$ 25,000	-	-	BHM (equipment spec. on similar project)
	TOTAL	**$ 697,212**			

MILLING

ITEM	DETAILS/SIZE	COST ESTIMATE	Max Feed Size	Max Prod Size	Ref. Source
		$AUD	mm	mm	-
Primary Mill	12' x 18' NCP Osbourn Ball Mill (overflow type), 1200kW motor, Conventional motor, rubber-lined	$ 1,112,734	10	0.075	Osbourn (email), sizing numbers from PNX met testwork
Primary Cyclone Pump	1 Duty, 1 Standby; Metso HR150 ENR-S C4HC (or equiv.) horizontal shaft slurry pump c/w centrifugal seal, base frame, C type vee belt drive system, motor and guards	$ 19,352	-	-	BHM (equipment spec. on similar project)
Primary Mill Feed Conveyor	TBC	$ 15,000	-	-	BHM (equipment spec. on similar project)
Primary Cyclone Cluster	TBC	$ 50,000	-	-	BHM (equipment spec. on similar project)
Primary Mill Weightometer	Single roll weightometer suitable for 600 wide belt with 35" idlers c/w 4 additional balanced idlers, speed sensor and data transmitter.	$ 12,000			BHM (equipment spec. on similar project)
	TOTAL	**$ 1,209,086**			

FLOTATION

ITEM	DETAILS/SIZE	QUANTITY	COST ESTIMATE
		(#)	$AUD
Rougher/scavenger Conditioning Tank	1x Outotec OKTOP 1 x OC-ND-T030-000-BC-IEC Conditioning tank, complete with electric motor, agitator, impeller, gear base plate, gearbox, grating and handrails	2	$ 140,000
Rougher/scavenger Flotation	4x Outotec e20 flotation cells in a FB-1-1-1-1-PV configuration, complete with 37 kW motors (TBC), central crowder and internal perimeter launders, maintenance access door at ground level, 3 mm rubber lining throughout, fully automatic air control, walkways, handrails, grating, stainless steel launder lips, pinch valves for level control	2	$ 920,000
Cleaner Flotation	3x Outotec OK3 flotation cells in a FB-3-PV configuration, complete with 11 kW motors (TBC), straight back wall crowder and front launder, maintenance access door per bank, 3 mm rubber lining throughout, automatic air control per bank of cells with manual trim valve per cell, any applicable walkways, handrail, grating, pinch valve for level control,	2	$ 520,000
Conc Flotation Pump	Metso VS L150 O5. Vertical cantilever shaft sump type pump with suction extension, vee belt drive and motor. Hard iron construction.	2	$ 12,616
Zn Flotation Tail Pump	Metso HR150 ENR-S C4HC (or equiv.) horizontal shaft slurry pump c/w centrifugal seal, base frame, C type vee belt drive system, motor and guards	1	$ 9,676
Air Blowers	2 xContinental Multistage Centrifugal 77-04 Blowers, in a duty & standby configuration (2 x 37kW)	2	$ 164,000
		TOTAL	**$ 1,766,292**

REGRIND

ITEM	DETAILS/SIZE	COST ESTIMATE	Max Feed Size	Max Prod Size	Ref. Source
		$AUD	p80 µm	p80 µm	-
Pb/Cu Rougher/scavenger Regrind Mill	1 x Outotec HIG110 with 110kW installed FCA	$ 630,000	55	25	Outotec (email)
Pb/Cu Rougher/scavenger Regrind Cyclone Cluster	TBC	$ 30,000	55	25	BHM (equipment spec. on similar project)
Zn Rougher/scavenger Regrind Mill	1 x Outotec HIG110 with 110kW installed FCA	$ 630,000	55	38	Outotec (email)
ZnRougher/scavenger Regrind Cyclone Cluster	TBC	$ 30,000	55	38	BHM (equipment spec. on similar project)
	TOTAL	**$ 1,320,000**			

PREOX/LEACH

ITEM	DETAILS/SIZE	COST ESTIMATE	Ref. Source
		$AUD	-
Pre-oxidation tank	8.9m3, c/w baffles, stiffener ring, outlet and drain nozzles. Rubber lined	$ 30,000	BHM (equipment spec. on similar project)
Intense Leach Reactor (ILR)	1 x Gekko ILR5000BA batch units	$ 649,000	Gekko (email)
Intense Leach Reactor (ILR) Residue Filter	Manual batch filter - plate and frame filter. Material Specific filtration rate of 7 kg/cm2	$ 30,000	BHM (equipment spec. on similar project)
Electrowinning Package	Cathode/Anode washing bay, Pneumatic sludge pumps, high-pressure washer, sludge settling tank, sludge filter press, calcine ovens, barring furnace (tilted), furnace fume extraction system, dore safe, dore scales, flux scales, workbench	$ 310,000	BHM (equipment spec. on similar project from Como Engineering)
	TOTAL	**$ 1,019,000**	

OR

ITEM	DETAILS/SIZE	COST ESTIMATE	Ref. Source
		$AUD	-
Merrill Crowe Circuit Package	1 x DE Filter x 1, Vacuum tower, Zn dust addition circuit, MC filter x 1, high temperature calcine over	$ 2,666,815	FLSmidth (email)
DE feed Filter	Manual batch filter - plate and frame filter. Material Specific filtration rate of 7 kg/cm2	$ 30,000	BHM (equipment spec. on similar project)
Electrowinning Package	Cathode/Anode washing bay, Pneumatic sludge pumps, high-pressure washer, sludge settling tank, sludge filter press, calcine ovens, barring furnace (tilted), furnace fume extraction system, dore safe, dore scales, flux scales, workbench	$ 310,000	BHM (equipment spec. on similar project from Como Engineering)
	TOTAL	**$ 3,006,815**	

THICKENING AND FILTRATION

ITEM	DETAILS/SIZE	COST ESTIMATE	Ref. Source
		$AUD	-
Zn Concentrate Thickener	Outotec High-rate thickener, 3 diameter, elevated, mild-steel, one-piece tank design	$ 140,000	Outotec (email)
Final Tails Thickener	Outotec High-rate thickener, 11 diameter, elevated, mild-steel, one-piece tank design	$ 300,000	Outotec (email)
Final Tails Thickener Underflow Pump	TBA	$ 30,000	BHM (equipment spec. on similar project)
Zn Concentrate Filter	Novatek MKMHH470 Pressure Filter - Manual. Operating 1 shift per day only	$ 62,696	Outotec (email)
	TOTAL	**$ 532,696**	

DETOX CIRCUIT

ITEM	DETAILS/SIZE	COST ESTIMATE $AUD
DETOX Circuit	NaCN, Cu2+ detox circuit. Incl O2 tank, sparges, peroxide feed tank, reactor vessel (Ref from past work)	$ 240,000
	TOTAL	**$ 240,000**